A-21   Thematic Poster - **Concussion: Novel Research Findings**

Wednesday, May 30, 2018, 9:30 AM - 11:30 AM
Room: CC-Mezzanine M100C

86   **Chair:** Jeffrey M. Mjaanes, FACSM. *Northwestern University, Evanston, IL.*

(No relevant relationships reported)

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87   Board #1   May 30 9:30 AM - 11:30 AM

Risk Of Concussion By Sex And Activity In U.S. Service Academy Cadets

Kenneth L. Cameron[1], Megan N. Houston[1], Kathryn L. O'Connor[2], Karen Y. Peck[1], Steven J. Svoboda[1], Tim Kelly[1], C. Dain Allred[3], Darren E. Campbell[3], Christopher J. D'Lauro[3], Jonathan C. Jackson[3], Brian R. Johnson[3], Gerald T. McGinty[3], Patrick G. O'Donnell[4], Paul Pasquina[5], Thomas McAllister[6], Michael McCrea[7], Steven P. Broglio, FACSM[2]. *[1]United States Military Academy, West Point, NY. [2]University of Michigan, Ann Arbor, MI. [3]United States Air Force Academy, Colorado Springs, CO. [4]United States Coast Guard Academy, New London, CT. [5]Uniformed Services University of the Health Sciences, Bethesda, MD. [6]Indiana University, Indianapolis, IN. [7]Medical College of Wisconsin, Milwaukee, WI.* (Sponsor: Steven P Broglio, FACSM)

(No relevant relationships reported)

Purpose: Examine the relative risk of concussion between males and females across three U.S. Service Academies based on level of sport competition, participation in physical education classes, military training, and free time activities.
Methods: We conducted a prospective cohort study using data from the Concussion Assessment, Research and Education (CARE) Consortium at three U.S. Service Academy sites (U.S. Military, U.S. Air Force, U.S. Coast Guard). Between August 2014 and June 2017, 10,603 participants were enrolled across the three sites. Participants were actively followed for incident concussions following enrollment. Incidence proportions, risk ratios (RR), and 95% confidence intervals (CI) were calculated by sex for concussions sustained by level of sport participation, physical education, military training, and free time activities.
Results: Of the 10,603 participants enrolled, 10,599 (n=2521 female) had complete data for the current analysis and 639 sustained a concussion during the follow-up period. The overall incidence of concussion across all sites was 6.03 (95%CI: 5.58-6.50) per 100 subjects. Females were nearly twice as likely (RR=1.93, 95%CI: 1.65-2.25, p<0.001) to sustain a concussion across all three academies regardless of activity. Females participating in club sports (RR=1.52, 95%CI: 1.06-2.19, p=0.022), physical education classes (RR=2.06, 95%CI: 1.49-2.86, p<0.001), military training (RR=2.32, 95%CI: 1.49-3.60, p<0.001) and free time activities (RR=2.83, 95%CI: 1.91-4.20, p<0.001) were also at significantly higher risk for injury. There were no differences in concussion risk among males and females participating in NCAA varsity (RR=1.11, 95%CI: 0.81-1.55, p=0.499) or intramural athletics (RR=1.04. 95%CI: 0.48-2.28, p=0.902). This held true even when football athletes and injuries were removed from the analysis for NCAA varsity athletes (RR=1.38, 95%CI: 0.96-1.98, p=0.077).
Conclusions: These preliminary findings suggest that the risk of concussion among females is nearly twice as high when compared to males at U.S. Service Academies. This increased risk ranges from 1.5 to nearly 3 times higher when compared to males across a number of activities. Further analysis is needed to better understand the factors associated with this sex discrepancy.

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88   Board #2   May 30 9:30 AM - 11:30 AM

Trends In Concussion Incidence In High School Sports, 2008-09 To 2015-16

John D. Reynolds[1], Andrew E. Lincoln[2], Shane V. Caswell[3], Reginald E. Dunn[2], Lisa H. Hepburn[2]. *[1]Fairfax County Public Schools, Fairfax, VA. [2]MedStar Health, Baltimore, MD. [3]George Mason University, Manassas, VA.*

(No relevant relationships reported)

Although many studies have documented the effects of concussions in high school athletes, few recent studies have analyzed incidence rates of concussions in high school contact sports.
PURPOSE: To explore recent trends in sports concussion at the high school level for the period 2008-09 to 2015-16 in light of changes in concussion-related legislation, educational requirements, and public awareness.

METHODS: Sport-related concussion data were prospectively reported in an electronic medical record-keeping program by certified athletic trainers for 25 high schools in a large public school system over a consecutive eight-year period (academic years 2008-09 to 2015-16). The population included 115,439 student athletes over the study period in six boys' sports (football, soccer, lacrosse, wrestling, baseball, and basketball) and six girls' sports (soccer, lacrosse, basketball, cheerleading, softball, and field hockey). Incidence rates and rate ratios were calculated.
RESULTS: Over the eight years, there were 7,419 concussion injuries in 7,789,818 Athlete-Exposures (AEs), for an overall incidence rate of 0.95 concussions per 1000 AEs. Football (n=3118, 1.85 per 1000 AEs) accounted for 42% of all concussions and had a concussion rate nearly 9 times greater than baseball (n=108, 0.21 per 1000 AEs). Among girls' sports, cheerleading experienced the highest number of concussions (n=587, 0.89 per 1000 AEs), while girls' soccer had the highest incidence rate (n=525, 0.97 per 1000 AEs). The overall (12-sport) concussion rate increased 39% from 0.54 per 1000 AEs in 2008-09 to 0.76 per 1000 AEs in 2015-16. During this time, there was a 149% rise in overall concussion rate from 2008-09 to its peak in 2011-12 (1.35 per 1000 AEs), followed by a 44% decline to 2015-16.
CONCLUSION: This study presents the first evidence of a significant decline in high school sport-related concussion rates, which occurred from 2011-12 to 2015-16. The decline may reflect the combined effects of local school district policy changes and education programs, passage of a state concussion education law, nationwide rule changes within individual sports, more effective protective equipment, and changes in player behavior and technique.

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89   Board #3   May 30 9:30 AM - 11:30 AM

Concussion Incidence in United States High School Boys' Ice Hockey, 2008/09-2015/16 School Years

Juleah M. Heath[1], Lauren A. Pierpoint[2], John M. Rosene[1], Zachary Y. Kerr[3]. *[1]University of New England, Biddeford, ME. [2]Colorado School of Public Health, Aurora, CO. [3]University of North Carolina at Chapel Hill, Chapel Hill, NC.*

(No relevant relationships reported)

In recent years, the sport of ice hockey has grown in participation and popularity. Subsequently, there is a greater interest in the risk of injuries associated with participation, particularly concussions at the high school level. **PURPOSE:** To examine the concussion rates and mechanisms in high school boys' ice hockey in the 2008/09-2015/16 school years. **METHODS:** Data were obtained from the National High School Sports-Related Injury Surveillance System (HS RIO) during the 2008/09-2015/16 school years. HS RIO used a convenience sample of high school boys' ice hockey programs. Athletic trainers provided detailed reports on injuries and athlete-exposures (AE). Injury rates per 1,000AE, injury rate ratios (IRR), and injury proportion ratios (IPR) with 95% confidence intervals (CI) were calculated. **RESULTS:** Overall, 323 concussions were reported during the 2008/09-2015/16 school years, of which most occurred during competition (85.4%) and in-season (92.9%). These concussions were reported across 467,278AE, for a concussion rate of 0.69/1,000AE. The concussion rate was higher in competition than practice (1.75 vs. 0.15/1000AE; IRR=11.51; 95%CI: 8.45, 15.68). Most concussions were due to contact with another player (47.1%), followed by contact with the boards/glass (31.6%). Concussions occurred while being checked (36.5%), skating (28.2%), and chasing a loose puck (10.5%). Most concussions occurred in wings (47.1%), followed by defensemen (28.5%) and centers (11.5%). When comparing injury mechanism distributions between being checked and checking, the proportion of concussions due to contact with another player was higher in checking than being checked (68.8% vs. 41.5%; IPR=1.66; 95%CI: 1.12, 2.45). Of the seven concussions sustained by goalies, 42.9% were due to contact with the puck; in comparison, no concussions among all other competition positions had concussions reported to be due to contact with the puck. **CONCLUSION:** Concussions in high school boys' ice hockey occur mainly in competition and result from player contact. These concussions appear to be position dependent with the highest incidence occurring to wings. Examination of adaptations to the checking rule or teaching the checking technique may lead to a reduction in concussive events.

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90   Board #4   May 30 9:30 AM - 11:30 AM

The Effect of Concussion on Subsequent Musculoskeletal Risk in High School Athletes

Alex Nusbickel, Ashley Zapf, Brady Tripp, Terrie Vasilopoulos, Daniel Herman, FACSM. *University of Florida College of Medicine, Gainesville, FL.*

(No relevant relationships reported)

PURPOSE: Prior studies in collegiate and professional athletes have noted an increased risk of musculoskeletal (MSK) injury after concussion; however, the effect in younger athletes at lower levels of competition is unknown. This study compared the risk of MSK injury in concussed high school athletes after return to play to that of non-concussed athletes.

METHODS: High school athletic training room electronic medical records from the 2010-2011 to the 2014-2015 seasons were queried for time-loss concussion and MSK injury in football, volleyball, basketball, soccer, lacrosse, baseball, and softball athletes from twelve local high schools. Concussed athletes were assessed for presence of MSK injury within 365 days prior to and subsequent to the concussion. Non-concussed athletes who experienced MSK injury were assessed for the presence of a second MSK injury within 365 days. Non-injured athletes were recorded for every year without injury. Chi-square analyses were conducted to compare the frequency of subsequent musculoskeletal injury in the athlete-years with prior concussion, prior concussion with prior musculoskeletal injury, and neither prior musculoskeletal injury or concussion. Odds ratios with 95% confidence intervals were calculated, and significance was set a-priori at P = 0.05.
RESULTS: Of the total number of athlete-years in this study (n=14461), 1.8% sustained a concussion and 8.3% experienced a MSK injury within a year of concussion. MSK injury was significantly associated with previous concussion (p < 0.001), and athletes with a concussion displayed nearly three times the likelihood of subsequent MSK injury in the following year when compared to those without previous concussion (OR=2.9, 95%CI: 1.9-3.7). This relationship proved similar in both male (OR=2.9, 95%CI: 2.1-4.0) and female (OR=2.8, 95%CI: 1.3-6.3) athletes. However, no difference in rates of later MSK injury was observed in the athletes with prior MSK injury or a combination of prior MSK injury and concussion (p= 0.34).
CONCLUSIONS: High school athletes who sustain a concussion display an elevated risk of subsequent MSK injury at rates comparable to higher-level concussed athletes and to athletes who have sustained a prior MSK injury. Neuromechanical rehabilitation during concussion recovery may be needed to moderate this effect.

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91   Board #5   May 30 9:30 AM - 11:30 AM
Risk of Lower Extremity Musculoskeletal Injury after Concussion: A Meta-Analysis

April McPherson[1], Takashi Nagai[1], Kate Webster[2], Timothy Hewett, FACSM[1]. [1]Mayo Clinic, Rochester, MN. [2]LaTrobe University, Melbourne, Australia.
(No relevant relationships reported)

Estimates of the incidence of sport-related concussions range from 1.6 to 3.8 million cases per year. Short- and long-term consequences of concussion are continued topics of intensive research. In addition to an increased risk of suffering a second concussion or musculoskeletal (MSK) injury upon return to sport (RTS), long-term term sequelae include increased risk of mild cognitive impairment to severe neurodegenerative disease. Several recent studies have investigated the effect of concussion on lower extremity MSK injury.
PURPOSE: To perform a systematic review and meta-analysis to determine the risk of lower extremity MSK injury after concussion.
METHODS: A comprehensive search of electronic databases through to September 2017 was performed by two independent reviewers and supplemented by manual searches of the reference lists of included studies. Two search concepts were used; the first terms were 'cognition', 'brain', and 'brain injuries'; the second were 'athletic injuries' and 'lower extremity.' Studies were included if they reported the number of lower extremity injuries in athletes after RTS from a concussion diagnosis. Nine studies were included for data extraction and analysis. Data regarding number of injuries after concussion were combined via odds ratio (OR) and incidence rate ratio (IRR) meta-analysis using a random effects model. 95% confidence intervals (CI) were also calculated.
RESULTS: Seven of the nine included studies individually reported higher rates of lower extremity MSK injury after concussion, while two reported no significant difference in injury risk between concussed athletes and non-concussed control athletes. Results of the meta-analysis show that athletes who suffered a concussion had 2.06 times the odds of sustaining a lower extremity injury after RTS compared to a control group (OR = 2.06, 95% CI 1.48-2.88). Athletes who suffered a concussion had a 1.67 times higher incidence rate of lower extremity injury per athletic exposure after RTS (IRR = 1.67, 95% CI 1.42-1.96).
CONCLUSION: Based on the evidence of higher risk of lower extremity MSK injuries after concussion, concussed athletes should be examined not only for their cognitive function prior to RTS, but also screened for neuromuscular risk factors associated with lower extremity MSK injuries.

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92   Board #6   May 30 9:30 AM - 11:30 AM
Concussion Symptom Clusters And Return-To-Play Time In College Athletes With Sports-Related Concussions: 2009-2010, 2013-2014 DISC

Adrian J. Boltz[1], Marc H. Feinberg[2], Terry D. Smith[1], Tammie M. Johnson[1], Michael R. Richardson[1], James R. Churilla, FACSM[1]. [1]University of North Florida, Jacksonville, FL. [2]Florida Atlantic University, Boca Raton, FL. (Sponsor: James R. Churilla, FACSM)
(No relevant relationships reported)

PURPOSE: Examine the relationship between Concussion Symptom Clusters (CSCs) and return-to-play time using a representative sample of college athletes with sports-related concussions. **METHODS:** Data from the 2009-2010 and 2013-2014 academic years (n=1670) were obtained from the Datalys Center for Sports Injury and Prevention Inc. database. Exploratory factor analytic methods were applied, and the resulting factors were used in multinomial regression modeling to identify associations between CSCs and return-to-play time. **RESULTS:** A 4-factor solution accounted for 48.8% of the variance and included an audio-vestibular, somatic, amnesic, and affective factor structure. Audio-vestibular symptoms were associated with increased odds of prevented participation at 7-13 days, 14-29 days, greater than 30 days, and out for remainder of season, respectively (p<0.05). Somatic symptoms were associated with decreased odds of prevented participation at 7-13 days and greater than 30 days, respectively (p<0.05). Amnesic symptoms were associated with decreased odds of prevented participation at 1-6 days, 7-13 days, 14-29 days, and greater than 30 days, respectively (p<0.05). Affective symptoms were associated with decreased odds of prevented participation at 7-13 days, 14-29 days, greater than 30 days, and out for remainder of season, respectively (p<0.05). **CONCLUSIONS:** Specific CSCs were significantly associated with return-to-play time in college athletes, (p<0.05).

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93   Board #7   May 30 9:30 AM - 11:30 AM
Longitudinal Study Of Concussion In 6-14 Year Old Football Players Measuring Incidence, Risk Factors And Duration Of Symptoms

Sara P. Chrisman[1], Wren L. Haaland[2], Stanley A. Herring, FACSM[3], Emily Kroshus[2], Teah R. Hoopes[2], Shannon K. Higgins[2], Frederick P. Rivara[1]. [1]Seattle Children's Research Institute and University of Washington, Seattle, WA. [2]Seattle Children's Research Institute, Seattle, WA. [3]University of Washington, Seattle, WA. (Sponsor: Stan Herring, FACSM)
(No relevant relationships reported)

Football is a popular sport, but is not without risk. Concern has been raised about concussion in youth football. However, there is little data regarding concussion risk or natural history of concussion for youth younger than high school. **PURPOSE:** To collect prospective data regarding: 1) incidence of concussion, 2) risk factors for concussion, and 3) natural history of concussion in 6-14 year old football athletes. **METHODS:** We conducted a prospective cohort study with youth football athletes and their parents during a 10-week season. Youth who sustained a concussion were contacted weekly to determine mechanism of injury and time to return to: 1) school 2) sport and 3) baseline concussion symptoms. Logistic regression was used to estimate odds of sustaining a concussion based on baseline demographic factors. Baseline measures of mental health and concussive symptoms were compared between concussed and non-concussed youth using Student's t-tests. Time to return to school, sport and baseline symptoms were examined using survival curves. **RESULTS:** 610 youth were followed and 38 sustained a concussion, for a one season athlete-level concussion incidence of 5.9%. Two-thirds occurred during games and approximately half from head to head collisions. Youth with a history of concussion had a 3-fold increased risk for sustaining an incident concussion, and those with history of depression had a 5-fold increased risk. No other demographic factors were associated with increased risk for concussion. Following a concussion, 50% of athletes returned to school by 3 days, 50% returned to sport by 10 days, and 50% returned to a baseline level of symptoms by 2.5 weeks. Two youth returned to sport before their symptoms had returned to baseline levels, but no complications were noted with these youth. **CONCLUSIONS:** Concussion rates in this study were higher than previously reported, affecting 6 out of every 100 youth playing for one season. History of prior concussion and history of depression were both associated with greater risk. Further research is needed to explore ways to continue to improve safety in youth football. Funding for this project was provided by Seattle Pediatric Concussion Research Collaborative and the University of Washington Sports Health and Safety Institute.

94   Board #8   May 30 9:30 AM - 11:30 AM

Concussion Is Associated With Adverse Health Outcomes: A 15-Year Follow-Up Of Former College Football Players

Zachary Y. Kerr[1], Leah C. Thomas[1], Janet E. Simon[2], Michael McCrea[3], Kevin M. Guskiewicz, FACSM[1]. [1]University of North Carolina at Chapel Hill, Chapel Hill, NC. [2]Ohio University, Athens, OH. [3]Medical College of Wisconsin, Milwaukee, WI. (Sponsor: Kevin Guskiewicz, FACSM)
(No relevant relationships reported)

Previous research has found an association between concussion and adverse health outcomes in former professional football players. Less is known about such an association in former players without professional football experience. **PURPOSE:** Examine whether concussion history - without professional football exposure - was associated with adverse health outcomes in former college football players, 15 years following their collegiate playing career. **METHODS:** A sample of 204 former collegiate football players that played at least one season of football in 1999-2001 and did not play professional football completed an online questionnaire. Data included: lifetime concussion history; Physical Composite Score (PCS) and Mental Composite Score (MCS) from the Veterans RAND 36 Item Health Survey; the depression module of the Patient Health Questionnaire (PHQ-9); and the CAGE alcohol dependence questionnaire. Multivariable binomial regression models estimated prevalence ratios (PR) with 95% confidence intervals (CI) while controlling for demographics/playing history covariates through forward selection model building. **RESULTS:** Overall, 84.3% reported a concussion history; 22.1% and 39.2% of participants reported PCS and MCS scores <50, respectively (i.e., worse health than US national averages); 19.1% reported PHQ-9 scores ≥10 (i.e., moderate/severe depression) and 24.8% reported CAGE scores ≥2 (i.e., alcohol dependence). The prevalence of having MCS <50 was higher in those reporting ≥3 versus 0 concussions (PR=2.5; 95% CI: 1.3, 4.9). Controlling for body mass index (BMI), the prevalence of moderate/severe depression was higher in those reporting ≥3 versus 0 concussions (PR=4.2; 95% CI: 1.0, 16.3). Controlling for BMI, the prevalence of having PCS <50 was higher in those reporting ≥3 versus 1-2 concussions (PR=2.6; 95% CI: 1.3, 5.0), but not 0 concussions (PR=1.5; 95%CI: 0.6, 3.6). No associations were found for alcohol dependence. **CONCLUSION:** Associations between multiple concussions and adverse health outcomes were found in former collegiate football players without professional football exposure, but were limited to those reporting ≥3 concussions. Continued examination within non-professional football populations is needed, but findings highlight a need for concussion prevention efforts.

A-22   Thematic Poster - **Exercise Biomarkers**

Wednesday, May 30, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100C

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95   **Chair:** Joseph Weir, FACSM. *University of Kansas, Lawrence, KS.*
(No relevant relationships reported)

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96   Board #1   May 30 9:30 AM - 11:30 AM

Cell-free, Circulating Dna As A Novel Marker For Player Load In Soccer

Nils Haller, Susanne Helmig, Pascal Taenny, Julian Petry, Sebastian Schmidt, Perikles Simon. *Sports Medicine, Mainz, Germany.*
(No relevant relationships reported)

PURPOSE: The relevance of biomarkers reflecting internal player load in intermittent sports such as football is questionable, so far. Increased levels of circulating DNA (cfDNA) have been demonstrated in a variety of exercise settings. Recently, it has been shown that cfDNA increased depending on intensity and duration during aerobic running. In this context, cfDNA was suggested to be applied in intermittent exercise, however the effects of short repeated sprinting as an essential feature of intermittent sports on cfDNA values are unknown. For the first time, we assessed both alterations of cfDNA due to repeated sprinting and due to a professional football game. **METHODS**: First, nine participants were subjected to a standardized sprint training session in a cross-over design of five maximal sprints of 40 meters with either "short" (1 minute) or "long" pauses (5 minutes) in between. Capillary cfDNA and lactate were measured after every sprint and venous cfDNA before and after each series of sprints. In addition, capillary cfDNA and lactate values were monitored in 23 professional football players during the course of a training week at rest (baseline) and in all 17 enrolled players following a regular season game. Game data in terms of total distance, sprints and intense runs was recorded for each player using the OPTA-System. **RESULTS**: Venous cfDNA and lactate increased in "short" (2.8-fold, p<0.0001 and 5.6-fold, p<0.0001) and less pronounced during "long" (1.9-fold, p=0.0051 and 3.6-fold, p<0.0001). The season game increased cfDNA 22.7-fold (p<0.0001) and lactate 2.0-fold (p=0.09) compared to baseline. CfDNA increases correlated with distance covered during game (spearman's r=0.87, p=0.0012), while no correlation between lactate and the tracking data could be found. **CONCLUSIONS**: Here we show for the first time that cfDNA could be an objective marker for player load in intermittent sports reflecting total distance covered during professional soccer.

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97   Board #2   May 30 9:30 AM - 11:30 AM

Detection of Functional Overreaching in Endurance Athletes Using Proteomics

David C. Nieman, FACSM[1], Arnoud Groen[2], Artyom Pugachev[2], Gianmarco Vacca[3]. [1]Appalachian State University, Kannapolis, NC. [2]ProteiQ Biosciences GmbH, Berlin, Germany. [3]Università degli Studi di Milano-Bicocca, Milan, Italy.
(No relevant relationships reported)

There is a strong demand for diagnostic tools to identify athletes in various training states. **PURPOSE:** To determine if a cluster of proteins could be identified through proteomics procedures that are linked to functional overreaching (FOR) in male endurance athletes. **METHODS:** Participants (N=10, age 38.3±3.4 y, VO_{2max} 41.3±1.7 ml·kg^{-1}·min^{-1}) served as their own controls and in random, counterbalanced order either ran/cycled 2.5 h (70.0±3.7% VO_{2max}, 79.6±6.3% HR_{max}) three days in a row (FOR) or sat in the lab (rest) (separated by three weeks) (7:00 - 9:30 am, overnight fasted state). Participants provided fingerprick samples for dried blood spot samples (DBS) pre- and post-exercise/rest each of the three days, and then at 7:00 am during two additional recovery days. Participants also completed the Training Distress Scale (TDS) (19-items) at 7:00 am each of the five mornings during each trial (FOR and rest). Proteins were solubilized from DBS, digested into peptides and measured with nanoLC-MS in data independent acquisition mode (Q-Exactive, Thermo Fisher Scientific, Waltham, MA). The RAW MS data files were processed using Spectronaut™ software (Biognosys, Schlieren, Switzerland). Following data independent acquisition (DIA method), 594 proteins were identified and quantified. Proteins were considered for the FOR cluster if they were elevated during one of the two recovery days but not more than one of the exercise days (compared to rest). The Generalized Estimating Equation (GEE) was used to identify proteins linked to FOR (between trial contrasts, P≤0.05 for proteins with CV<15%, P≤0.01 with CV>15%). **RESULTS:** TDS scores differed between FOR and rest trials, peaking on the first recovery day (9.8±3.8, 3.5±2.6, respectively, P=0.029). A total of 13 proteins was linked to FOR and of these, 11 were related to the immune system, and two to exercise-induced physiological responses. Immune-related proteins included those associated primarily with the acute phase response, complement activation, and granulocyte function. **CONCLUSIONS:** This study utilized targeted, DIA proteomics procedures to identify a cluster of 13 proteins linked to FOR (7.5 h of high intensity exercise over three days), and 85% of the proteins were related to immune system activation during the 2-day recovery period.

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98   Board #3   May 30 9:30 AM - 11:30 AM

Changes In Functional Activation Of Memory T Cells Following Exercise: A Pilot Study

Hunter D. Peterson, Alexander K. Holbrook, Allyson Ihlenfeldt, Brad W. Macdonald, Samantha A. Bianchi, Eric C. Bredahl, Michael A. Belshan, Jacob A. Siedlik. *Creighton University, Omaha, NE.* (Sponsor: Joseph P. Weir, FACSM)
(No relevant relationships reported)

Memory T (T_M) cells function to provide long-lasting protection against re-exposure to pathogens. The recall response of T_M cells to foreign antigen is quicker and of a greater magnitude than a naïve T cell. How functional activation is altered in T_M cells following a bout of exercise is not well known. **PURPOSE:** To quantify exercise induced changes in surface markers of early, middle, and late stage activation in memory T cells (CD4$^+$CD45RO$^+$CD45RA$^-$) obtained from human subjects. **METHODS:** Utilizing a cross over design, untrained subjects completed a control and exercise visit. The control visit consisted of 30 min of seated rest while the exercise session entailed 3 sets x 10 reps squat at 70% 1-RM, 3x10 leg press at 70% 1-RM, and 3x10 leg extensions at 70% 1-RM with 2 min rest between sets. Venous blood samples were obtained pre and post each visit. CD4$^+$ T cell isolation from peripheral blood was conducted through negative selection using a Human CD4$^+$ T cell enrichment kit. CD4$^+$ T cells were plated at 1.5 x 10^6 cells/ml in 200 µl of ImmunoCult T-cell expansion media directly after isolation and costimulated through CD3+CD28 or no stimulation. Cells were incubated for 1 and 3 d at 37°C in a humidified incubator with 5% CO$_2$ and then analyzed by flow cytometry. Early (CD69), middle (CD25),

and late (HLA-DR) markers of activation within the CD45RO$^+$CD45RA$^-$ subset were quantified at days 0, 1, and 3. Data were analyzed using two-way RMANOVAs. **RESULTS:** There were no significant differences in any markers of activation at the pre measure (p > .05). Preliminary data suggests exercise does not alter functional activation in non-stimulated CD45RO$^+$CD45RA$^-$ cells. There does appear to be a functional impact related to the T_M cells ability to respond to stimuli post-exercise with two-fold increases observed in HLA-DR expression for cells co-stimulated through CD3+CD28. **CONCLUSIONS:** Exercise-induced alterations in functional activation of T_M cells will need to be better quantified to determine not only the magnitude of change, but also to identify a kinetic profile of marker expression. Quantification of changes in this subset of cells will aid in our understanding how immune responses following vaccination are affected by exercise stress.

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99   Board #4   May 30 9:30 AM - 11:30 AM

Ultra-endurance Triathlon Performance And Markers Of Whole-body And Gut-specific Inflammation

Kyle A. Smith[1], Jacob N. Kisiolek[1], Margaret C. Morrissey[1], Patrick G. Saracino[1], Brandon D. Willingham[1], Samantha M. Leyh[1], Daniel A. Baur[1], Marc D. Cook[2], Michael J. Ormsbee, FACSM[1]. [1]*Florida State University, Tallahassee, FL.* [2]*North Carolina Agriculture and Technical State University, Greensboro, NC.*
(No relevant relationships reported)

PURPOSE: To examine the influence of the Ultraman triathlon (3 days of non-continuous racing; stage 1: 10 km swim and 144.8 km cycle; stage 2: 275.4 km cycle; stage 3: 84.4 km run) on circulating plasma concentrations of whole-body (CRP, IL-6, and IL-10) and gut-specific inflammatory markers (IL-17 and IL-23) in trained participants (N = 17; 14 men, 3 women), and determine whether these variables influence performance. **METHODS:** Fourteen triathletes (age: 39 ± 8 yrs) were evaluated pre-race and post-race for circulating concentrations of CRP, IL-6, IL-10, IL-17, and IL-23. Blood samples were drawn two days prior to stage 1 (1600 h) and one day after stage 3 (1200 h). Plasma biomarker concentrations were determined by ELISA according to manufacturer's instructions. Data were analyzed with SPSS and significance was accepted at p < 0.05. Values are reported as means ± SD. Data points (for blood biomarkers) greater than 2 SD from the mean were removed as outliers. **RESULTS**: Plasma CRP significantly increased from pre-race (266.27 ± 276.18 ng/mL) to post-race ($25,891.94 \pm 12,888.65$ ng/mL; p < 0.001). Plasma IL-10 increased from pre-race (3.46 ± 2.98 pg/mL) to post-race (5.15 ± 1.89 pg/mL). Pre-race concentrations of IL-6 were below detectable limits; post-race IL-6 concentrations were 4.00 ± 3.74 pg/mL. Both pre-race and post-race concentrations of IL-17 and IL-23 were below detectable limits. Pearson's correlation between mean finish time and post-race CRP and post-race IL-10 was 0.35 and 0.54 (p < 0.05), respectively. **CONCLUSIONS**: The significant increase in CRP during the race may have been due to muscle damage. The greater anti-inflammatory capacity of the athletes likely led to increased clearance of IL-6, IL-17, and IL-23 the day after the race; the increase in IL-10 concentrations during the race reflect this anti-inflammatory response. A significant positive correlation between post-race IL-10 concentrations and mean finish time may indicate that a relationship between anti-inflammatory responses and performance exists.

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100   Board #5   May 30 9:30 AM - 11:30 AM

Development Of A Consumer-Oriented Microbiome Tracker

Shawn M. Talbott, FACSM[1], Marc P. Oddou[2], Bret J. Stephens[2]. [1]*EQQIL, Draper, UT.* [2]*Wasatch Scientific Services, Murray, UT.*
Reported Relationships: **S.M. Talbott:** *Ownership Interest (Stocks, Bonds); Partner in development of BiomeTracker.*

Background: Interest in and knowledge of the gut microbiome has increased exponentially in the past decade. This once overlooked component of the gastrointestinal tract is now implicated in multiple aspects of human health, including mental wellness (e.g. depression, anxiety, stress), metabolic (e.g. diabetes, obesity), neurologic (e.g. Alzheimer's, autism), gastrointestinal (e.g. irritable bowel syndrome, Crohn's), and immunologic (e.g. inflammation, cancer), among others. **Purpose/Objectives:** Currently, most laboratory methods to test the microbiome rely on 16S ribosomal RNA sequencing. This testing method has several drawbacks, including: slow turnaround time, inconclusive quantification of low abundance species, labor intensive library preparation, and relatively high cost. Furthermore, the output is generally geared toward the scientific community, and are not particularly intuitive for the general public (e.g. consumers, patients). **Methods:** Herein, we have developed a consumer-facing microbiome test and scoring system (BiomeTracker) that provides an attractive alternative to 16S rRNA-based testing services. This system allows samples to be processed quickly at low cost, and provides an easy to understand

score for bacterial composition and health. **Results:** BiomeTracker analysis was performed in parallel with 16S sequencing for human fecal samples, with similar abundance quantification for major phyla through families of bacteria. As a proof of concept, patient baseline and final samples following microbiome intervention (diet and supplementation) were tested, and BiomeTracker was able to accurately assess changes of low abundant species known to function in a healthy gut. **Conclusions:** We envision that this system can be used by scientists and consumers alike to more quickly and easily evaluate the efficacy of dietary interventions on microbial composition and function.

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101   Board #6   May 30 9:30 AM - 11:30 AM

CD4$^+$ T Cell Activation Markers Altered Following Resistance Training In Untrained Subjects: A Pilot Study

Brad W. Macdonald, Alexander K. Holbrook, Allyson Ihlenfeldt, Hunter D. Peterson, Samantha A. Bianchi, Eric C. Bredahl, Michael A. Belshan, Jacob A. Siedlik. *Creighton University, Omaha, NE.* (Sponsor: Joseph P. Weir, FACSM)
(No relevant relationships reported)

Assessment of immune function in response to exercise is commonly done via proliferative assays. These assays are often performed on mixed cell populations and fail to quantify discrete activation elements upstream of the proliferative response. Together these factors limit our ability to understand how subsets of immune cells respond to exercise and hinder our ability to target interventions towards a specific cellular response. **PURPOSE:** To quantify exercise-induced changes in surface markers of early, middle, and late stage activation in CD4$^+$ cells. **METHODS:** Utilizing a cross over design, untrained subjects completed a control and exercise visit. The control visit consisted of 30-min seated rest while the exercise session entailed 3 sets x 10 reps squat at 70% 1-RM, 3x10 leg press at 70% 1-RM, and 3x10 leg extensions at 70% 1-RM with 2 min rest between sets. Venous blood samples were obtained pre and post each visit. CD4$^+$ T cell isolation from peripheral blood was conducted through negative selection using a Human CD4$^+$ T cell enrichment kit. CD4$^+$ T cells were plated at 1.5×10^6 cells/ml in 200 μl of ImmunoCult T-cell expansion media directly after isolation and costimulated through CD3+CD28 or no stimulation. Cells were incubated for 1 and 3 d at 37°C in a humidified incubator with 5% CO$_2$ and then analyzed by flow cytometry. Purity of cell samples was assessed following T cell isolation (day 0) by staining with anti-CD4. Data analyses utilized two-way RMANOVAs. **RESULTS:** There were no significant differences in any markers of activation at the pre measure (p > .05). Preliminary data suggests there exists two separate effects: 1) An exercise alone effect with alterations in CD25 expression observed in the non-stimulated cells, and 2) An exercise effect on the ability of cells to respond to stimuli with changes in CD25 and HLA-DR expression observed in cells co-stimulated through CD3+CD28. **CONCLUSION:** Exercise induced alterations in T cell activation likely need to be quantified on a subset basis. Using mixed cell populations limits the development of exercise strategies targeting improvements in specific factors of immune function, and possibly leading to misinterpretation of exercise-derived immunological data.

A-23   Thematic Poster - **Exercise Intensity and Psychology**

Wednesday, May 30, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100E

102   **Chair:** Yuri Feito, FACSM. *Kennesaw State University, Kennesaw, GA.*

(No relevant relationships reported)

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103   Board #1   May 30 9:30 AM - 11:30 AM

The Effects of Resistance Exercise Training on Depressive Symptoms: A Meta-Analysis of Randomized Controlled Trials

Brett R. Gordon[1], Cillian P. McDowell[1], Mats Hallgren[2], Jacob D. Meyer[3], Mark Lyons[1], Matthew P. Herring[1]. [1]*University of Limerick, Limerick, Ireland.* [2]*Karolinska Intitutet, Stockholm, Sweden.* [3]*Iowa State University, Ames, IA.*

(No relevant relationships reported)

The physical benefits of resistance exercise training (RET) are well documented. Less is known regarding the effects of RET on mental health outcomes. Recent meta-analytic evidence supported the anxiolytic effects of RET, but no quantitative synthesis of the effects of RET on depressive symptoms has been conducted.
Purpose: To estimate the effect of RET on depressive symptoms, and to determine whether variables of logical, theoretical, and/or prior empirical relation with depressive symptoms account for significant variation in the overall effect.
Methods: Fifty-four effects were derived from 33 articles published before August 2017, located using Google Scholar, MEDLINE, PsycINFO, PubMed, and Web of Science. Trials involved 1,877 participants (mean age=52 ± 18 years) and included both randomization to RET (n=947) or a non-active control condition (n=930) and a validated measure of depressive symptoms assessed at baseline, mid-, and/or post intervention. Hedges' d effect sizes were computed and random effects models were used for all analyses. Meta-regression was used to examine participant and trial characteristics as moderators of the overall mean effect.
Results: RET significantly reduced depressive symptoms by a moderate-sized mean effect Δ of 0.66 (95%CI: 0.48-0.83; z=7.35; p<0.001). Significant heterogeneity was indicated ($Q_{T(53)}$=216.92, p<0.001, I^2=76.03%, 95%CI: 72.67%-78.97%), and sampling error accounted for 32.9% of observed variance. Total volume of prescribed RET, participant health status, and strength improvements were not significantly associated with the overall effect of RET on depressive symptoms. However, smaller reductions in depressive symptoms were found in trials with blinded allocation and/or assessment (Δ=0.56, 95%CI: 0.40-0.71; z=7.03 p<0.001).
Conclusions: The available empirical evidence supports the antidepressant effects of RET. RET significantly reduced depressive symptoms in otherwise healthy participants and those with a physical or mental illness. Improvements were not moderated by total prescribed volume of RET or significant improvements in strength. Higher quality randomized controlled trials that blind both allocation and assessment and compare RET to other empirically-supported treatments for depressive symptoms are needed.

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104   Board #2   May 30 9:30 AM - 11:30 AM

The Relationship Between Affect And Enjoyment During High-intensity Interval Training In Overweight Sedentary Adults

Marcus W. Kilpatrick, FACSM, Andrew M. Rice, Jacob D. Stankich, Shelbey E. Lane. *University of South Florida, Tampa, FL.*

(No relevant relationships reported)

Intense exercise is well-established as a methodology for improving metabolic health and performance parameters, both via continuous and high-intensity interval training (HIIT). Research to date has demonstrated that more intense exercise tends to produce less favorable affective and enjoyment responses but the relationship between these two variables has not been established. **PURPOSE:** Assess the relationship between affective and enjoyment responses during HIIT and moderate continuous exercise among overweight and insufficiently active adults. **METHODS:** 48 overweight-to-obese participants (mean BMI = 28, mean VO2 peak = 29 ml/kg/min) completed four counterbalanced trials comprised of a 30-minute continuous trial at 33% peak power (CONT) and three 20-minute interval trials that alternated between 85% and 15% peak power using 1:1 work-to-recovery ratios: 15 secs (HIIT-15), 30 secs (HIIT-30), and 60 seconds (HIIT-60). Affect was measured using the Feeling Scale (FS) and enjoyment was measured using the Exercise Enjoyment Scale (EES). **RESULTS:** Data was submitted to RM ANOVA and correlational analyses. Findings indicated that affect and enjoyment declined during HIIT-60 but was preserved during all other trials. All correlations for assessments taken at the same point during exercise

were significant (p < 0.05) ranging from 0.31 to 0.70. Inspection of the correlation values indicate that the correlation decreased during the CONT trial (0.62 to 0.31) but remained relatively constant for all three HIIT trials. Additionally, correlations were slightly higher in the HIIT-60 trial than other HIIT trials. **CONCLUSIONS:** Findings indicate that correlations between affect and enjoyment are strong during HIIT and continuous moderate exercise. The finding that correlations decreased over time during the moderate continuous condition suggests a dissociation between the processes that underlie affect and enjoyment. Likewise, the maintenance of similar correlations throughout all of the HIIT trials suggests that within this particular exercise context that the underlying processes are not considerably unique. Collectively, the findings indicate that HIIT produces affective and enjoyment responses that are generally positive and therefore appropriate for overweight, sedentary populations.

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105   Board #3   May 30 9:30 AM - 11:30 AM

Affective Responses To High-Intensity Interval Training In The Severe Domain

Robert W. Pettitt, FACSM[1], Zachery A. Roloff[2], Luke M. Krynski[2], Mark E. Hartman[3], Panteleimon Ekkekakis, FACSM[3], Nathan D. Dicks[4]. [1]*Rocky Mountain University of Health Professions, Provo, UT.* [2]*Minnesota State University, Mankato, Mankato, MN.* [3]*Iowa State University, Ames, IA.* [4]*North Dakota State University, Fargo, ND.*

(No relevant relationships reported)

High-intensity interval training (HIIT) has been used to enhance critical power (CP); yet, research on prescriptions using the CP concept is limited. The dual-mode theory (DMT) of affective responses suggests that participants would report homogenous reduction in pleasure above CP; but, supporting research is based predominantly upon incremental exercise responses. **Purpose**: We investigated affective responses to HIIT prescriptions of different intensities and durations derived using CP and the finite work capacity >CP (W'). **Methods:** Eight competitive cyclists completed a 3-min all-out exercise test with a verification bout for determining peak oxygen uptake (VO_{2peak}). On separate occasions, HIIT bouts were performed on a cycle affixed to a CompuTrainer. The Feeling Scale (FS) was administered each minute. **Results:** VO_{2peak} (ml·kg⁻¹·min⁻¹) values from the verification bout (58.7 ± 6.9), 4 X 3-min 60%W' condition (57.4 ± 8.2), 3 X 3-min 80% W' condition (58.3 ± 5.7), 4 X 5-min 60% W' condition (54.3 ± 8.0), and the 4 X 5-min 80% W' condition (55.7 ± 7.4) did not differ (F = 2.10, p = 0.25). Strong measurement agreement was observed for VO_{2peak} across conditions (ICC$_a$ = 0.85, typical error = 2.37 ml·kg⁻¹·min⁻¹, coefficient of variation = 4.6%). Time- and interval-dependent reductions in FS were observed with each interval condition, culminating with negative FS ratings (i.e., displeasure). **Conclusion**: The 60% and 80% W' HIIT conditions for either the 3 or 5 min durations evoked consistent VO_{2peak} values and negative ratings of affect. These data provide empirical support for the CP concept to standardize HIITs and provide more stable conditions for systematic affective responses to severe exercise using the FS.

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106   Board #4   May 30 9:30 AM - 11:30 AM

Relationship Of Exercise Intensity Tolerance To Cardiometabolic Risk Factors And Body Composition In Healthy Females

Elise C. Brown, Mary A. Elsesser, Samantha C. Orr, Timothy A. Rengers, Ryan T. Tyler, Evan Eschker, Tamara Hew-Butler, FACSM, Charles R.C. Marks, Myung D. Choi, Kristen R. Landis-Piwowar. *Oakland University, Rochester, MI.*

(No relevant relationships reported)

When compared with moderate-intensity exercise, high-intensity exercise has been found to result in superior or equal improvements in cardiometabolic (CMB) health and body composition. However, individual differences exist in one's ability to tolerate higher intensities of exercise which may put those with a lower tolerance at risk for less favorable CMB health and body composition. **PURPOSE:** Therefore, the purpose of this study was to examine the associations of exercise intensity tolerance and individual CMB risk factors and body composition variables in young adult females. **METHODS:** The sample consisted of 25 non-obese [body mass index (BMI) < 30 kg/m2] apparently healthy females aged 22.6 ± 4.2 years examined in a cross-sectional study. After obtaining informed consent, each participant had measures of exercise intensity tolerance using The Preference for and Tolerance of the Intensity of Exercise Questionnaire, individual CMB risk factors, and body composition including anthropometric and imaging variables assessed. Spearman's rho (ρ) was computed to examine the bivariate correlations between exercise intensity tolerance and CMB risk factors and body composition variables. Statistical significance was set a priori at P≤0.05. **RESULTS:** Exercise intensity tolerance was associated with a number of CMB risk variables including resting heart rate (ρ = -0.56, P < 0.01), systolic (ρ = -0.48, P = 0.01) and diastolic (ρ = -0.57, P < 0.01) blood pressure, total cholesterol (ρ = -0.53, P < 0.01), triglycerides (ρ = -0.52, P < 0.01), and low-density lipoprotein (LDL) cholesterol (ρ = -0.48, P = 0.02). For body composition, exercise intensity tolerance was correlated with waist-to-height ratio (WHtR) (ρ = -0.48, P = 0.02),

bone mineral content ($\rho = 0.42$, P = 0.04), bone mineral density ($\rho = 0.47$, P = 0.02), bone density T-score ($\rho = 0.49$, P = 0.02), and bone density Z-score ($\rho = 0.46$, P = 0.02). **CONCLUSIONS:** Exercise intensity tolerance was negatively associated with resting heart rate and blood pressure, total cholesterol, triglycerides, LDL, and WHtR, and positively associated with bone density variables. These findings suggest that as exercise intensity tolerance increases, so does the favorability of CMB health and bone density in young adult females.

107   Board #5   May 30 9:30 AM - 11:30 AM

A Follow-up Study on the Rehabilitation Effect of Tai Chi for Female Individuals with Substance Abuse

Dong Zhu[1], Guobin Dai[1], Ding Xu[2]. [1]Shanghai University of Sport, Shanghai, China. [2]Shanghai Drug Administration, Shanghai, China.
(No relevant relationships reported)

PURPOSE: The aim of this study was to investigate the relapse of female amphetamine type stimulants (ATS) dependents who had received rehabilitation treatment after 4 years.
METHODS: Eighty female individuals with ATS dependence were randomly assigned to Tai Chi intervention (TC) and standard care (SC) for 6 months. The TC group was tutored for exercise intervention based on a simplified 24-Form Tai Chi, and the exercise activities in the SC group included 5 minutes of recreation activity (Guang Bo Ti Cao), 5 minutes of gesture language exercises, and self-study. Outcome measurements were applied with Pittsburg Self-Rated Sleep Quality Index (PSQI), Self-rated Depression Scale (SDS), and fitness evaluation at the baseline, 3 months and 6 months. A follow-up relapse investigation was also conducted. The investigation content was relapse of ATS dependents who had completed treatment from Shanghai mandatory detoxification and rehabilitation center (SMDRC). Pearson chi-square test was applied for categorical variables and independent sample t-test was applied for continuous variables at the baseline comparison, repeated measures analysis of variance was applied with year of drug dependent as the covariate.
RESULTS: 4 ATS dependents in TC and 10 ATS dependents in SC were found relapse, the relapse in the TC group was 9.5% and in the SC group was 26.3%. The cessation duration of ATS dependents from left SMDRC to be found relapse was 517 days in TC and 219 days in the SC group, the numbers of relapse in TC was significantly less than that of in SC group tested by chi-square test. The PSQI scores of sleep duration, need for sleep medications, daytime dysfunction were found to have a significant difference by time × group interaction after 6 month. The SDS showed no significant difference between the two groups, but the score of SDS in TC decreased after 6 months intervention and no changes in SC. The pulse rate was significantly decreased in the TC group compared to the SC group after 6 months.
CONCLUSIONS: The 4 year follow-up study indicated that TC is a cheap and potential supplementary treatment for ATS dependents. The results provided an evidence that Tai Chi can reduce female ATS dependents relapse.

108   Board #6   May 30 9:30 AM - 11:30 AM

Cognitive Reappraisal Improves Psychological State During Endurance Exercise

Grace E. Giles[1], Julie A. Cantelon[1], Marianna D. Eddy[1], Tad T. Brunyé[1], Heather L. Urry[2], Holly A. Taylor[2], Caroline R. Mahoney[1], Robin B. Kanarek[2]. [1]U.S. Army Natick Soldier Research, Development, and Engineering Center, Natick, MA. [2]Tufts University, Medford, MA.
(No relevant relationships reported)

Topic 702: Cognition and Emotion
Title: Cognitive reappraisal improves psychological state during endurance exercise
Giles, G.E.[1,2,3], Cantelon, J.A.[1,2,3], Eddy, M.D.[1,2,3], Brunye, T.T.[1,2,3], Urry, H.L.[1,3], Taylor, H.A.[1,3], Mahoney, C.R.[1,2,3], Kanarek, R.B.[3]
[1]US Army Natick Soldier, Research, Development, and Engineering Center [2]Center for Applied Brain and Cognitive Sciences [3]Tufts University
PURPOSE: To determine whether emotion regulation strategies, specifically cognitive reappraisal and distraction, influence psychological state and prefrontal cortex oxygenation during endurance exercise.
METHODS: Twenty four individuals (15 female; age 18-33 years) participated. All ran regularly: at least 30 miles per week, with at least one run per week of 9 miles or more. On three separate occasions, participants ran for 90 minutes at 75-85% age-adjusted maximum heart rate while employing one of three emotion regulation strategies: no instruction, cognitive reappraisal, i.e. reevaluating the running experience to reduce felt negative emotions, and distraction, i.e. re-directing attention by focusing on neutral thoughts unrelated to the running experience. Participants completed subjective measures of valence (on a scale from "very bad" to "very good"), arousal ("low arousal" to "high arousal") and perceived exertion ("no exertion at all" to "maximal exertion") before, every 30 minutes during, and after exercise. Functional near-infrared spectroscopy (fNIRS) was used to quantify changes in prefrontal cortex oxygenation (O_2Hb).

RESULTS: Participants felt lower emotional arousal and physical exertion when instructed to utilize cognitive reappraisal than when given no emotion regulation instruction, but not when instructed to utilize distraction. Emotion regulation strategies did not influence emotional valence or prefrontal cortex oxygenation.
CONCLUSION: Emotion regulation strategies benefit psychological state during endurance exercise, independent of reductions in prefrontal cortex oxygenation.

109   Board #7   May 30 9:30 AM - 11:30 AM

Effect Of Continuous Exercise At Self-selected Intensity And Hiit On Psychophysiological Responses In Overweight Women

Sergio G. da Silva[1], Sandro S. Ferreira[1], Lucio Follador[1], Erick D. Garcia[1], Ragami C. Alves[1], Vinicius FS Andrade[1], Sara C. Barbosa[1], Leticia M. Oliveira[1], Carlo Baldari, FACSM[2]. [1]Universidade Federal do Parana, Curitiba, Brazil. [2]IUniversity of Rome "Foro Italico", Rome, Italy.
(No relevant relationships reported)

PURPOSE: To compare the effects of continuous exercise at self-selected intensity and high-intensity interval training (HIIT) on physiological, perceptual, and affective responses in overweight women. **METHODS:** Twenty-eight overweight or obese women were randomly assigned to 1 of 2 groups: continuous exercise at self-selected intensity (SS, n = 14) or high-intensity interval training (HIIT, n = 14; 10 x 60 s). Both groups underwent 4 weeks of training, 3 days/week, 20 min each session, on a cycle ergometer. Rating of perceived exertion (RPE; OMNI-Cycle), affective responses (pleasure/displeasure; Feeling Scale), and heart rate (HR) were recorded during each session. Peak oxygen uptake (VO_{2peak}), body mass, and maximal power were assessed pre- and post-intervention. **RESULTS:** A two-way ANOVA revealed no effect of the intervention on BMI and maximum power output in both groups. VO_{2peak} increased similarly in both groups (SS pre: 22.9 ± 2.9 ml.kg^{-1}.min^{-1}, post: 25.4 ± 4.5 ml.kg^{-1}.min^{-1}; HIIT pre: 24.8 ± 3.9 ml.kg^{-1}.min^{-1}, post: 26.9 ± 4.2 ml.kg^{-1}.min^{-1}) ($p < .05$). Across the 4 weeks of the intervention, %HR (week 1: 77.7 ± 7.1; week 2: 75.9 ± 7.6; week 3: 75.4 ± 8.2; week 4: 76.6 ± 6.3) and RPE (week1 : 4.7 ± 1.2; week 2: 4.8 ± 1.2; week 3: 4.5 ± 1.6; week 4: 4.5 ± 1.7) were lower compared to HIIT (week 1: 83.3 ± 5.6; week 2: 82.1 ± 5.5; week 3: 82.4 ± 6.2; week 4: 81.7 ± 6.1) and (week 1: 5.4 ± 1.6; week 2: 5.7 ± 1.5; week 3: 5.4 ± 1.6; week 4: 5.1 ± 1.6) ($p < .05$). **CONCLUSION:** Four weeks of SS or HIIT had similar effects on cardiorespiratory fitness. SS was perceived as less strenuous, however, both groups exhibited similar affective responses.

110   Board #8   May 30 9:30 AM - 11:30 AM

Examining The Effects of Functional Resistance Training on Affect, State Anxiety and Enjoyment in College-Age Females

Jamie Faro[1], Phil Gona[1], Marisa Hastie[2], Laura L. Hayman[1], Julie Wright[1], Jessica Whiteley[1]. [1]University of Massachusetts Boston, Boston, MA. [2]Lasell College, Newton, MA.
(No relevant relationships reported)

College-aged females, who are less likely to meet ACSM resistance training (RT) guidelines than males, face a number of barriers to RT adoption and maintenance. Females experience more perceived barriers to RT (such as enjoyment, pleasure, embarrassment and anxiety) suggesting that programs could be developed to address these barriers. Functional RT (FRT) uses multi-joint exercises similar to activities of daily life and has yet to be compared to traditional RT using machines (TRT) to determine the effects of acute sessions in this population. **PURPOSE:** To compare the effects of an acute bout of both a functional and traditional RT program on affect, state anxiety (SA) and enjoyment. **METHODS:** Female students (n=27) ages 18-35 years (26±4.3 years; BMI=25.2±5.3 kg/m²) not currently meeting RT guidelines completed 4 trainer-led RT sessions (2 FRT, 2 TRT) within 4-weeks (2-7 days apart) in a randomized crossover design. Session 1 of each RT type familiarized participants to the exercises, while session 2 consisted of 2 sets of 10 repetitions at a moderate intensity (using RPE scale) and collection of assessment measures. Affect and SA were assessed pre, post, and 15 minutes post, while enjoyment was assessed at post. **RESULTS:** RPE did not differ significantly between types of training (FRT 5.8±1.2; TRT 6.2±1.1; p=0.09). Repeated measures ANOVA revealed no significant differences in change scores pre to post or 15 minutes post in affect (both p>0.05) nor SA (both p>0.05) between FRT and TRT; however, pre to post-exercise changes in affect were positive and greater in FRT (d=+.87) compared to TRT (+.77), and greater in decreases in SA (FRT, d=-.53; TRT, d= -.43). Between group results indicate enjoyment levels were significantly greater following FRT compared to TRT (p<0.05). Secondary outcomes reveal within-group increases in positive affect and decreases in SA pre to post and 15 minutes post-exercise (all p<0.05) in both types of RT. **CONCLUSION:** While no differences in affect or SA were found between types of RT, participants had significantly greater enjoyment levels following the FRT session.

Though both FRT and TRT sessions increased affect and decreased SA, higher levels of enjoyment following FRT may lead to increased adoption rates acutely and possibly increase the percentage of college-females meeting ACSM RT guidelines.

A-24   Thematic Poster - **Sex-Dependent Muscle Physiology**

Wednesday, May 30, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100F

111   Chair: Kimberly Huey, FACSM. *Drake University, Des Moines, IA.*

(No relevant relationships reported)

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112   Board #1   May 30 9:30 AM - 11:30 AM

The Influence of Oral Contraceptive Use on Skeletal Characteristics of Female Collegiate Rowers

Breanne S. Baker, Ivy E. Brown, Michael G. Bemben, FACSM, Allen Knehans, Debra A. Bemben, FACSM. *University of Oklahoma, Norman, OK.* (Sponsor: Dr. Debra Bemben, FACSM)

(No relevant relationships reported)

Physical activity promotes an osteogenic response leading to greater bone mineral density (BMD). Previous studies suggest women who use oral contraceptives (OC) may not experience the same magnitude of skeletal benefits from exercise compared to women not using OC. These findings are important for athletes competing in sports with a high prevalence of low BMD and fracture, such as rowing. **PURPOSE:** To examine skeletal health, OC usage, and injury rates in collegiate competitive female rowers. **METHODS:** Data from two cross-sectional studies were used to investigate body composition and skeletal attributes in 49 NCAA Division I female rowers. DXA was used to measure body composition and areal BMD (aBMD) of the total body, lumbar spine, and dual femur. pQCT was used to measure bone geometry of the 4%, 38%, 66% tibiae sites. **RESULTS:** There were no significant differences between OC users (n=14) and non-users (n=35) for age, height, weight, fat mass, bone free lean body mass, age at menarche, calcium intake, training volume, or years of rowing experience (p≥0.340). OC users had significantly greater total body aBMD, dual femoral neck (FN) aBMD, and dual total hip (TH) Z-Scores (p≤0.05). Bone strength index was greater in the non-dominant tibia of OC users at the 4% site (p=0.017). For tibiae 38% and 66% sites, OC users had greater cortical area and thickness, while non-users had greater endosteal circumference (p≤0.047). Rowers who reported fractures had significantly lower rib aBMD, non-dominant trochanter Z-Scores, and 66% tibiae muscle cross-sectional area compared to rowers who did not report fractures (p≤0.049). **CONCLUSIONS:** Rowers who use OC had greater bone density and quality at most sites as compared to non-users. Our findings suggest that in this population OC usage does not impair skeletal health.

Table 1. Skeletal differences between OC users and non-users.

Variable	OC Users (n=14)	Non-users (n=35)
Total Body aBMD (g/cm²)	1.305 ± 0.029*	1.241 ± 0.014
Dual FN aBMD (g/cm²)	1.206 ± 0.028*	1.132 ± 0.018
Dual TH Z-Score	1.008 ± 0.249*	0.358 ± 0.148
Mean 38% vBMD (mg/cm³)	966.63 ± 10.47**	914.77 ± 9.15
Mean 38% Cort Thickness (mm)	6.33 ± 0.10**	5.71 ± 0.09
Mean 38% Endo Circ (mm)	32.95 ± 0.91	36.83 ±0.84*
Mean 66% vBMD (mg/cm³)	744.92 ± 18.40*	698.90 ± 9.24
Mean 66% Cort Thickness (mm)	5.04 ± 0.15*	4.66 ± 0.07

* p≤0.05, ** p≤0.01

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113   Board #2   May 30 9:30 AM - 11:30 AM

T Cells Accumulate In Skeletal Muscle Following Contraction-induced Damage To A Greater Degree In Women

Michael R. Deyhle, Kaitlyn Evans, Chris Sutton, Seth Hampton, Jacob Parmley, Jacob R. Sorensen, 84602, Allen Parcell, FACSM, Robert Hyldahl, 84602. *Brigham Young University, Provo, UT.*

(No relevant relationships reported)

Immune cells, such as macrophages and monocytes are active participants in muscle repair/regeneration following damage. Recent studies have identified T cells as important mediators of effective muscle regeneration following traumatic injury. A few studies have reported that T cells also accumulate in muscle following damaging contractions, suggesting that they may also be involved in muscle repair and adaptation following contraction-induced damage. However, it is not clear: 1) when T cell accumulation peaks in following contraction-induced damage and 2) whether muscle T cell accumulation is different between men and women. The **PURPOSE** of this study was to identify the time course of CD8+ T cell accumulation following contraction-induced damage in men and women. **METHODS:** Six men and three women (22.2 ± 2.4 years of age) did 300 (30 sets of 10 reps) maximal-effort lengthening contractions (LC) of the knee extensor muscles using an isokinetic dynamometer. Maximal isometric torque of the knee extensors was measured before LC and at 5min, 24h and 72h-post. Muscle biopsies (vastus lateralis) were taken before LC and at 3h, 24h, and 72h-post LC. Intermuscular CD8+ T-cells were counted with immunohistochemistry and fluorescence microscopy. **RESULTS**: Compared to baseline values (207.2 ± 37 Nm), maximal isometric torque was significantly reduced 5min after (106 ± 45.7 Nm), 24h after (107 ± 50 Nm), and at 72h after LC (112 ± 70 Nm) (p<0.05). Torque loss between men and women was not different (p>.05), suggesting a similar degree of muscle damage. Intermuscular CD8+ cells were increased at 72h-post LC compared to baseline (5 fold, p=0.0008), 24h-post LC (3.2 fold, p=0.0016), and 3h-post LC (3.1 fold, p=0.018). T cell content before LC was not different between men and women, but accumulation following LC was significantly greater in women compared to men (Sex*Time, p=0.01). **CONCLUSIONS**: Following contraction-induced damage, muscle CD8+ T cell content peaks at or later than 72h, and the accumulation appears to be more robust in women than men.

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114   Board #3   May 30 9:30 AM - 11:30 AM

Sex-Related Differences in Muscle Composition and Motor Unit Firing Rates of the First Dorsal Interosseous.

Mandy E. Wray, Adam J. Sterczala, Jonathan D. Miller, Hannah L. Dimmick, Trent J. Herda. *University of Kansas, Lawrence, KS.*

(No relevant relationships reported)

PURPOSE: To determine sex-related differences motor unit (MU) firings during a high intensity contraction and muscle composition of the first dorsal interosseous (FDI) in recreationally trained individuals. METHODS: Nine males (mean±SD: age = 22±3 yr, height = 180.0±6.3 cm, weight = 73.4±10.3 kg, BMI = 22.5±3.3 kg/m²) and 11 females (mean ± SD: 164.23.7 cm, weight = 63.65.3 kg, BMI = 23.6± 2.1 kg/m²) recreationally active individuals volunteered for this study. The FDI was isolated and measured during abduction of the index finger against a metal force plate. A 5-pin electromyographic (EMG) sensor array was placed over the FDI to record muscle activity. EMG signals collected during the submaximal muscle actions were decomposed to extract action potentials and firing events of single MUs. Subjects completed isometric trapezoidal muscle action at 70% maximal voluntary contraction (MVC). Recruitment thresholds (RTs) and mean firing rates (MFR) at the targeted steady force were calculated for each MU and analyzed with a linear relationship for each subject. Normalized EMG amplitude was recorded for each subject at the targeted steady force. In addition, ultrasound scans of the FDI were completed prior to the experimental visit in order to determine the muscle cross-sectional area (CSA), echo intensity (EI), and subcutaneous fat (SF). Independent samples t-tests were analyzed to compare mean differences between males and females. RESULTS: Males had a significantly larger CSA (p<0.001) and peak torque during the MVC (p<0.001), while females had significantly higher y-intercepts from the MFR vs. RT relationship (p=0.036) with no differences in the slopes (p=0.398). No differences were found in normalized EMG (p=0.398), EI (p=0.423), and SF (p=0.400). CONCLUSION: Males have greater CSA, more contractile area, and generated more force. During the 70% MVC, females had significantly greater y-intercepts from the MFR vs. RT relationships, but slopes were similar. These relationships indicated greater MFRs of MUs with RTs from 25.1 to 59.2 in females. Greater MFRs for females may have been necessary to achieve the targeted force as a result of weaker higher-threshold MUs.

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115   Board #4   May 30 9:30 AM - 11:30 AM

Effects of Estrogen Receptor Alpha and Progesterone on Skeletal Muscle Fatigue and Recovery

Christine A. Cabelka[1], Brittany C. Collins[2], Cory W. Baumann[1], Espen E. Spangenburg[3], Dawn A. Lowe, FACSM[1]. *[1]University of Minnesota, Minneapolis, MN. [2]University of Utah, Salt Lake City, UT. [3]East Carolina University, Greenville, NC.*

(No relevant relationships reported)

Skeletal muscle function declines with aging, most notably at the time of menopause. Human and rodent research indicates that estrogen-based hormone therapy can attenuate the declines. However, the role of the major estrogen receptor in skeletal muscle (ER α) remains unclear. While estrogen appears to play a predominant role in maintenance of muscle strength the other key ovarian hormone, progesterone, has been implicated in protection against muscle fatigue. **Purpose:** We hypothesized

1) voluntary wheel running would not protect mice lacking estrogen receptor α in skeletal muscles (skmERαKO) against fatigue and 2) treatment with progesterone after ovariectomy would protect against fatigue. **Methods:** Study 1: 32 skmERαKO mice and WT (Flox) littermates were randomized into 4 groups: skmERαFlox-Run, skmERαKO-Run, skmERαFlox-Sed, and skmERαKO-Sed. Run groups were given free access to wheels for 20 wk. Sedentary mice remained in standard cages. *In vivo* and *in vitro* muscle contractility was measured at wk 20. Study 2: 40 female C57Bl/6J mice ran on wheels for 2 wk and then randomized into 4 treatment groups: E2, P4, E2+P4, or OVX. All mice underwent OVX, ran for another 2 wk, hormone pellets were implanted, and then mice returned to running wheels for 6 wk before *in vitro* soleus muscle contractility testing was completed. **Results:** Study 1: *In vivo* isometric, concentric and eccentric torque was low in skmERαKO groups compared to WT (p< 0.029). Additionally, muscles of skmERαKO mice had greater fatigue (p<0.001) and did not recover strength as well as WT (p<0.001). Study 2: After 60 fatiguing contractions, soleus muscles of the OVX+E2+P4 group maintained greater submaximal force than those of other groups (p<0.05). Immediately after the fatiguing contractions, OVX+E2+P4 muscles had greater maximal force production than the OVX+E2 group (p=0.027). **Conclusion:** SkmERαKO mice produce less force regardless of physical activity. Although 20 wks of wheel running partially prevented force loss during fatigue in skmERαKO mice, force production during recovery remained low, indicating that estrogens function through ERα in skeletal muscle. A combined treatment of E2+P4 protected soleus muscles against fatigue, suggesting both hormones have roles in preventing muscle fatigue. This work was supported by NIH grant R01-AG031743.

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116   Board #5   May 30 9:30 AM - 11:30 AM

Increased Quadriceps Muscle Attenuation Correlates With Reduced Cellular And Whole Muscle Function In Older Women

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(No relevant relationships reported)

PURPOSE: Adiposity adversely affects physical function in older adults, but the mechanism underlying this relationship remains unknown. The aim of this study was to examine ectopic fat located in or around muscle fibers, as reflected in the measurement of muscle tissue attenuation derived from computed tomography, and its relationship with skeletal muscle function in older adults from the molecular to the whole muscle level.
METHODS: Healthy older men and women had their body and thigh composition characterized by dual-energy X-ray absorptiometry and computed tomography, and their knee extensor function by dynamometry. Isometric tension (force per cross-sectional area) and myofilament stiffness properties were measured on single muscle fibers obtained from biopsies of the vastus lateralis.
RESULTS: Older women had greater absolute and relative body and thigh fat (all p < 0.05). However, quadriceps muscle attenuation was similar between sexes (51.4 ± 50.3 HU for men and women, respectively; p = 0.33). In women, lower quadriceps attenuation, representing greater fat deposition, was related to decreased whole muscle isometric torque (r^2 = 0.21; p < 0.05) and isokinetic power (r^2 = 0.18; p < 0.05), but no association was evident in men. In older women, lower quadriceps attenuation was associated with decreased isometric tension in myosin heavy chain (MHC) I (r^2 = 0.17) and IIA (r^2 = 0.36) muscle fibers (both p < 0.05). At the molecular level, lower quadriceps attenuation was associated with reduced myofilament lattice stiffness of MHC IIA fibers in older women (r^2 = 0.26; p < 0.05), but not men. Greater myofilament lattice stiffness, in turn, was strongly associated with higher isometric tension in MHC I (women r^2 = 0.30; men r^2 = 0.17) and IIA (women r^2 = 0.53; men r^2 = 0.40) fibers in both sexes (all p < 0.05); however, relationships were stronger in women.
CONCLUSIONS: Despite similar quadriceps muscle attenuation between sexes, impairments in force generation at the cellular and whole muscle levels were present only in older women. Our results suggest that greater quantities of fat in the muscle microenvironment alter skeletal muscle ultrastructure in ways that decrease myofilament stiffness, leading to reduced myosin-actin cross-bridge force transmission, and ultimately impaired cellular and whole muscle function.

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117   Board #6   May 30 9:30 AM - 11:30 AM

Myosin Super-relaxed State is Affected by Aging in Female But Not Male Skeletal Muscle

Sira M. Karvinen[1], Lien A. Phung[2], Brett A. Colson[3], David D. Thomas[2], Dawn A. Lowe, FACSM[2]. [1]*University of Jyväskylä, Jyvaskyla, Finland.* [2]*University of Minnesota, Minneapolis, MN.* [3]*University of Arizona, Tuscon, AZ.* (Sponsor: Dawn A. Lowe, FACSM)
(No relevant relationships reported)

Muscle weakness is consistently reported as an independent risk factor for high mortality in aged individuals. In aging females, ovarian hormone deficiency that occurs during menopause has a role in the loss of skeletal muscle strength. At the molecular level, the loss of muscle force production may be attributed to the slowing of myosin-actin cross-bridge kinetics and different structural states of the myosin head is key. There are three distinct functional states of the myosin head: active state, relaxed state (RX) and super-relaxed state (SRX). The SRX state is emerging as an important factor in muscle mechanics and regulation, yet its possible role in aging process has remained elusive. A previous study showed that estradiol-mediated signaling reversibly regulated ATP turnover in SRX state, which in turn may contribute to the age-related decline in muscle strength and function in females. **PURPOSE**: To further evaluate the role of ovarian hormones in SRX regulation during aging, we measured the SRX population and ATP turnover rate in skeletal muscle fibers from female and male mice during natural aging process. **METHODS**: The population of myosin heads in the SRX state and ATP turnover rate were measured in chemically skinned skeletal muscle (psoas) fibers from young (3-4 months old) and aged (28 months old) C57BL/6 female and male mice. Quantitative confocal microscopy of fluorescent MANT-ATP turnover was used to detect and quantitate myosin SRX in the fibers. **RESULTS**: In female mice, fibers from aged animals had faster SRX and RX myosin ATP turnover rates compared to those from young mice (SRX: 94 ± 6s vs 117 ± 9s, p = 0.033 and RX: 18 ± 1s vs 25 ± 2s, p < 0.001). There was no difference in turnover rates between fibers from young and aged male mice (SRX: p = 0.804 and RX: p = 0.202). We found no differences in the population of myosin heads in RX and SRX states between young and aged fibers in either sex (p ≥ 0.100). **CONCLUSION**: Our results indicate that ovarian hormones rather than aging process per se influence the myosin SRX state. This work was supported by R01-AR032961, R37-AG26160, T32-AR007612, and R01-AG031743.

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118   Board #7   May 30 9:30 AM - 11:30 AM

The Effects Of Whole-body Vibration On Posture, Balance, And Mobility In Women With Multiple Sclerosis

Eduardo Freitas, Christine Frederiksen, Ryan M. Miller, Aaron D. Heishman, Japneet Kaur, Karolina J. Koziol, Bianca A. R. Galletti, Debra A. Bemben, FACSM, Michael G. Bemben, FACSM. *University of Oklahoma, Norman, OK.* (Sponsor: Michael G. Bemben, FACSM)
(No relevant relationships reported)

PURPOSE: To investigate the effects of acute and chronic WBV on postural control, balance, and mobility in women with relapsing remitting multiple sclerosis (RRMS). **METHODS**: Twenty-one women were divided into a whole-body vibration (WBV: n=12) and a control (CON: n=10) group. WBV was submitted to 5 sets of vibration (30 Hz of magnitude and 3 mm of amplitude) for 30 s each with 1 min between trials maintaining a squat position with slight flexion of knees, hips, and ankle. CON group was not submitted to any vibration, but mimicked the vibration exposure by standing on the platform in a squat position. For the acute response, all measures were performed immediately pre and post for both testing conditions at week 1 and week 5. For the chronic adaptation, measurements were performed at baseline and after 5 weeks of WBV once a week. Participant's postural sway and balance were measured using a NeuroCom Balance Master. Field tests were used to measure mobility, fatigue, and flexibility and included timed-up and go test, 500 m walk, and seat reach flexibility. Two-way repeated measures ANOVA were used to test for group and time main effects. **RESULTS**: Acutely, no significant differences were observed for the field tests at week 1 or 5 (p>0.05); but, significant group*time interactions (p<0.05) revealed that WBV induced more stability as results from the sensory organization test improved from pre to post for the WBV group while it decreased for CON, at week 1 and 5. However, there was also a significant group*time interaction for the unilateral stance test, in which the CON group was significantly more stable (p>0.05) than the WBV group, at week 5. Chronically, WBV group presented greater stability as a significant group*time interaction (p>0.05) showed that participants in the WBV group improved their scored in the modified clinical test for sensory integration of balance, while CON decreased. Additionally, a significant group*time interaction (p>0.05) reviewed that WBV also increased walking speed, as CON decreased. Finally, a significant group*time interaction (p=0.05) reviewed that CON improved flexibility, when pre to post percent changes were calculated from week 1 to 2. **CONCLUSION:** Acute WBV did not improve postural balance, stability or mobility any in women with RRMS. However, chronic exposure improved stability and mobility.

A-25   Thematic Poster - **Walking Biomechanics**

Wednesday, May 30, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100H

119   **Chair:** Jean L. McCrory, FACSM. *West Virginia University, Morgantown, WV.*

(No relevant relationships reported)

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120   Board #1   May 30 9:30 AM - 11:30 AM

Decreased Gait Variability Following Anterior Cruciate Ligament Reconstruction Negatively Impacts Patient Function

Terry L. Grindstaff[1], Meredith Chaput[1], Brooke Farmer[1], Kayla Anderson[2], Amelia S. Lanier[2], Amelia S. Lanier[2], Brian A. Knarr[2], Christopher Wichman[3], Kimberly A. Turman[4]. [1]*Creighton University, Omaha, NE.* [2]*University of Nebraska at Omaha, Omaha, NE.* [3]*University of Nebraska Medical Center, Omaha, NE.* [4]*GIKK Ortho Specialists, Omaha, NE.* (Sponsor: Joan Eckerson, FACSM)

(No relevant relationships reported)

Limited knee motion and increased movement variability during gait occurs following anterior cruciate ligament reconstruction (ACL-R). Previous study findings have limited clinical application since they only included male participants and did not describe impairments in context to patient function. **PURPOSE:** To quantify differences in nonlinear measures of sagittal plane movement variability during running in individuals within 2 years of ACL-R compared to a healthy group. A secondary purpose was to determine the relationship between movement variability and patient-reported outcome measures. **METHODS:** Nineteen individuals with a history of ACL-R (13 female, 6 male; mean±SD age= 20.1±5.6 y; height= 172.9±8.0 cm; mass= 70.3±13.6 kg; time since surgery= 12.2±5.2 months; International Knee Documentation Committee subjective knee scale [IKDC]= 87.7±13.4) and twenty healthy participants (11 female, 9 male; age= 20.2±4.2 y; height= 175.6±9.6 cm; mass= 69.4±12.1 kg; IKDC= 97.2±4.3) performed 2 minutes of running. The primary outcome measures were sagittal plane movement variability (sample entropy) and IKDC subjective scores. A mixed model ANOVA was used to determine differences between sides (involved/uninvolved; nondominant/dominant) and groups. The relationship between movement variability and IKDC scores was quantified using a Pearson product moment correlation. **RESULTS:** There was a significant group x side interaction (F= 7.95, p= .01). The ACL group had significantly lower (F= 10.82, p= .002) sagittal plane movement variability compared to healthy individuals (nondominant= .3665±.0147; dominant= .3656±.0173) with significantly greater (t= -2.81, p= .01) deficits in the involved limb (.3406±.0265) relative to the uninvolved limb (.3550±.0169). There was a moderate relationship (r= .598, p= .007) between IKDC scores and sagittal plane movement variability during running. **CONCLUSIONS:** Individuals with a history of ACL-R demonstrate decreased sagittal plane movement variability during running compared to healthy individuals. Decreased movement variability manifests as more predictable movement in the involved relative to the uninvolved limb and negatively impacts patient function. Future studies should determine interventions to address movement variability impairments.

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121   Board #2   May 30 9:30 AM - 11:30 AM

Biomechanics of Walking in Healthy Adults at Different Gait Speeds

Matt Prebble[1], Siddhartha Sikdar[1], Oladipo Eddo[1], Stuart McCrory[1], Shane Caswell[1], Ana M. Azevedo[2], Nelson Cortes[1]. [1]*George Mason University, Manassas, VA.* [2]*University of Lisbon, Lisbon, Portugal.*

(No relevant relationships reported)

Lower extremity biomechanical parameters during gait are of interest in degenerative pathologies, such as knee osteoarthritis. However, few investigations have looked at the effect of walking speed on knee biomechanics (e.g., moments). **Methods**: 10 healthy volunteers (25.6 ± 5.0 years, 1.68 ± 0.11 m, 70.3 ± 18.0 kg) completed 3 trials each of walking at 4 different speeds [preferred (PS), fast (FS), slow (SS), & very slow (VSS)]. The range for each speed was determined by measuring a percentage of the participants PS: FS = (120 ± 5%), SS = (80 ± 5%), and VSS = (50 ± 5%). Speed was determined using timing gates (Power Systems Brower) placed 2.4 meters apart. Data was collected using a motion capture system (VICON, 200Hz) while participants walked across a ~6-meter walkway; 4 in-line force plates (Bertec, 1000Hz) captured ground reaction force. Sagittal and frontal plane kinematics and kinetics at the knee were calculated for the 4 speeds using Visual 3D. Differences between the 4 speeds were analyzed using a repeated-measures GLM with pairwise comparisons (p<0.05).

Results: Average speed for the 4 conditions were: PS = 1.06 ± .17 m/s, FS = 1.29 ± .21 m/s, SS = .90 ± .16 m/s, and VSS = .73 ± .11 m/s. There was a significant main effect for speed ($F_{2, 8}$ = 28.7, p = 0.034). Pairwise comparisons indicated a statistically significant difference in knee flexor moment for PS versus FS (PS = .181 ± .019, FS = .079 ± .015, p < .05) as well as in knee internal adductor moment for FS versus PS, SS, and VSS (FS = .026 ± .083, PS = -.437 ± .068, SS = -.579 ± .170, VSS = -.363 ± .112, p < .05). Knee flexor moments were smaller for FS versus PS, while FS was also smaller than PS, SS, and VSS for the knee adductor moment. **Conclusion**: Our findings agree with previous research that identified differences in knee flexor and adductor moments at different gait speeds. For pathological populations it is important to understand the effect of gait speed on knee adductor moment since it is a surrogate measure for joint loading. However, our sample size was small; therefore, the effect of gait speed on knee flexor and adductor moments should be further investigated. Future studies will seek to understand the relative contribution of the quadriceps's muscles at different speeds and its impact on knee joint loads.

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122   Board #3   May 30 9:30 AM - 11:30 AM

Impact of Lower-Extremity Gait Mechanics on Energy Cost of Walking in Younger and Older Adults

Dain P. LaRoche, FACSM, Victoria A. Gregory, Morgan P. Baumgartner, Breanna M. Bozzuto, Victoria M. Libby, Brittany N. Marshall. *University of New Hampshire, Durham, NH.*

(No relevant relationships reported)

The energy cost of walking (Cw) has been shown to be 20% greater in older adults than young, and the difference may be due to the adoption of different lower-extremity gait mechanics with age. **PURPOSE:** To determine if lower-extremity vertical stiffness (K_{vert}), joint range of motion, spatiotemporal gait parameters, and muscle activation explain the difference in Cw between young and old adults. **METHODS:** Twenty younger (29 ± 11 yr, 84.1 ± 17.4 kg, 28.6 ± 4.9 kg m^{-2}) and twenty older men and women (78 ± 9 yr, 78.7 ± 12.8 kg, 27.1 ± 4.4 kg m^{-2}) performed a four-minute, steady-state walk on an instrumented treadmill at 1.25 m s^{-1}. Concurrently, Cw was measured via indirect calorimetry, muscle activation of vastus lateralis (VL) and gastrocnemius lateralis (GL) was measured by electromyography, and lower-extremity kinematics and kinetics were measured by a 3D optical motion system and the treadmill's force plates. Maximal isokinetic knee extensor strength was measured on a dynamometer at 60 deg s[-1]. Multivariate analysis of variance was used to compare younger and older groups and Pearson correlation was used to relate variables. **RESULTS:** Knee extensor strength was 37% lower in older adults (1.47 ± 0.33 vs. 2.34 ± 0.56 Nm kg^{-1}, p < 0.001, respectively). Cw was not different between old and young (3.06 ± 0.34 vs. 2.91 ± 0.24 J m^{-1} kg^{-1}, p = 0.129). Older adults had 18% lesser K_{vert} (23.1 ± 5.6 vs. 28.0 ± 6.8 kN m^{-1}, p = 0.019), 20% narrower stride width (11.4 ± 3.0 vs. 14.3 ± 3.6 cm, p = 0.008), 39% lesser ankle range of motion (28 ± 5 vs. 39 ± 13 deg, p = 0.002), and greater VL (35 ± 23 vs 10 ± 6 % peak, p < 0.001) and GL (78 ± 58 vs. 47 ± 24, p = 0.025) activation than young. Cw was inversely related to knee range of motion (r = -0.43, p = 0.031), but only in older adults. In both groups, K_{vert} was inversely related to stride length (r = -0.36, p = 0.012) and positively related to stride frequency (r = 0.35, p = 0.012). **CONCLUSIONS:** When walking at a standard speed, at steady-state, the gross Cw was similar between older and younger people. While K_{vert} was not related to Cw as we hypothesized, it did differ between young and old, and varied in proportion to stride length and frequency.

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Increased Loading Rates During Walking in those with Chronic Ankle Instability Relative to Uninjured Controls

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(No relevant relationships reported)

Chronic ankle instability (CAI) is a multi-factorial condition linked with ankle post-traumatic osteoarthritis. Research has shown that CAI patients ambulate with altered kinematic patterns relative to uninjured controls. CAI patients also have increased loading rates relative to controls during running but little is known about how CAI effects loading rates while walking. **PURPOSE:** To compare the loading characteristics of CAI and control participants while walking. **METHODS:** 18 CAI (age:20.6±1.8 years, height:165.8±9.2cm, weight:67.3±12.7kg) and 18 healthy controls (age:20.6±1.0 years, height:168.7±10.3cm, weight:71.6±21.6kg) participated. CAI participants had a history of a lateral ankle sprain that required immobilization or non-weighting bearing for at least 3 days (10.1±8.5 days), experienced at least one episode of giving way within the past year (8.6±6.9 episodes) and experience at least one recurrent sprain between three and six months prior to participation. Each participant completed five walking trials at a self-selected speed. Vertical ground reaction forces (vGRF) were collected at 1200Hz from two adjacent force plates in the middle of the 5m walkway. Gait velocity, peak vGRF, time to peak vGRF, and loading rates were compared between groups. Normalized peak vGRF and loading rates,

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relative to body weight and gait velocity, were also compared. Independent t-tests assessed group differences with an alpha level of p<0.05. **RESULTS**: Gait velocity did not differ between the groups (CAI:1.27±0.11m/s, Control:1.23±0.08m/s, p=0.18). However, time to peak vGRF (CAI: 148.47±17.9s, Control:162.48±15.86s, p=0.018) and the normalized loading rate (CAI:5.69±0.62N/kg/s, Control: 5.29±0.44N/kg/s, p=0.034) were significantly different between the groups. No other group differences were noted (p>0.05). **CONCLUSION:** Those with CAI have less time to peak vGRF relative to uninjured controls while walking. Increased loading rates, when normalized to body weight and gait velocity, were also higher in CAI participants relative to controls. These altered loading patterns may play a role in the degeneration of talar articular cartilage following acute and recurrent lateral ankle sprains. This project was supported by a grant from the SouthEastern Athletic Trainers' Association.

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124   Board #5   May 30 9:30 AM - 11:30 AM

Spatiotemporal Comparisons Between Male and Female Soldiers While Walking With Heavy Loads

Joseph F. Seay, Victoria A. Gregory, Peter N. Frykman, Nathaniel I. Smith, Rebecca E. Fellin. *U.S. Army Research Institute of Environmental Medicine, Natick, MA.*

(No relevant relationships reported)

U.S. Army Soldiers have carried average loads of 45 kg in past conflicts. With the recent decision permitting women to enter Combat Arms roles, knowledge of whether men and women are affected differently by military load carriage has become more operationally relevant. Some studies have reported lighter loads have shown no differences in spatiotemporal (S-T) parameters between men v. women, while limited work comparing the effect of heavier carried loads (>30 kg) has resulted in observed S-T sex differences. However, none of these studies have systematically controlled for anthropometric differences. which may have contributed to those discrepancies. **PURPOSE**: To examine the effect of carrying light to heavy loads on S-T parameters in anthropometrically matched male and female Soldiers. **METHODS**: Eight male and 8 female Soldiers were matched on height and body weight (differences < 2.54 cm and 4.54 kg). All participants walked unloaded (BW), and with vest-borne loads of 15, 35 and 55 kg. Each load was carried for 10 min while walking on a level treadmill at 1.34 m·s⁻¹, with kinematics collected after 5 min. 2-way ANOVA RM compared the effects of load carriage on S-T variables between men and women. **RESULTS**: Several significant differences were observed as a function of increasing load (stride rate and % double support increased, stride length decreased), but no significant differences between men and women were observed (Table 1). **CONCLUSIONS**: Our results did not show the same discrepancies at the heaviest loads as reported in previous studies, suggesting that S-T differences may disappear at higher loads when anthropometry is tightly matched. **Disclaimer:** The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

Table 1. Spatiotemporal parameters for different loads and genders.

Parameter	Gender	BW	15 kg	35 kg	55 kg	
Gait cycle	M	1.04 ± 0.04	1.04 ± 0.03	1.04 ± 0.05	1.03 ± 0.04	*
(sec)	F	1.07 ± 0.04	1.07 ± 0.05	1.06 ± 0.05	1.05 ± 0.05	
% Dbl Sup	M	19.23 ± 1.43	21.47 ± 1.91	24.01 ± 2.38	27.40 ± 1.49	* +
(% Stance)	F	18.81 ± 1.48	21.65 ± 1.94	24.39 ± 1.88	26.91 ± 2.45	#
Stride rate	M	57.58 ± 2.38	57.73 ± 1.92	57.72 ± 2.58	58.54 ± 2.53	* +
(stride/min)	F	56.03 ± 2.31	56.21 ± 2.71	56.74 ± 2.76	57.11 ± 2.96	
Stride length	M	1.40 ± 0.05	1.39 ± 0.05	1.40 ± 0.06	1.38 ± 0.06	*
(m)	F	1.44 ± 0.06	1.43 ± 0.07	1.42 ± 0.07	1.41 ± 0.07	
Stride width	M	0.13 ± 0.02	0.13 ± 0.02	0.14 ± 0.03	0.14 ± 0.03	
(m)	F	0.12 ± 0.02	0.12 ± 0.03	0.12 ± 0.03	0.12 ± 0.03	

BW = Bodyweight only; % Dbl Sup = % Double Support
* sig different from BW; + sig different from 15 kg; # sig different from 35 kg

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Relationship Between First Metatarsal Motion and Metatarsal Load Distribution During Walking

Christopher Casillas, James Becker. *Montana State University, Bozeman, MT.*

(No relevant relationships reported)

Hypermobility of the first metatarsal (M1) has been theorized to alter plantar loading, and thus be one contributing factor in the development of second (M2) and third (M3) metatarsal stress fractures. To date, most studies examining these relationships have used static measures of M1 mobility. However, it has been shown that there is poor agreement between static measures of M1 mobility and M1 mobility during gait. **PURPOSE**: To quantify the relationship between sagittal plane M1 range of motion (ROM) during walking gait and vertical load distribution among the metatarsals. **METHODS**: Participants were 10 physically active individuals (sex: 5 M, 5 F; age: 21.8 ± 3.0 years). A 12-camera motion capture system recorded foot kinematics during walking while plantar pressures were recorded concurrently with a plantar pressure

mat located over the force plate. Participants completed 3 trials with both left and right feet (total: 60 trials). A multi-segment foot marker set was used to calculate movement of M1 relative to the midfoot. The plantar pressure data was used to identify the entire metatarsal region, as well as each individual metatarsal. Peak load in the metatarsals and percent of peak carried in each metatarsal were then calculated. A linear regression was used to determine the relationship between M1 ROM and percent peak load carried in each metatarsal. **RESULTS**: Peak load in the metatarsals was 1.25 (± 0.25) % body weight. At peak loading, M1, M2, M3 carried 19.14 (± 7.89), 24.53 (±3.92), and 28.37(±4.09) % of the load, respectively. Average ROM for M1 relative to midfoot was 7.84 (± 2.60°). There was not a significant relationship between M1 ROM and percent load under M1 ($R^2 = 0.05$, $p = 0.22$), M2 ($R^2 = 0.01$, $p = 0.70$), or M3 ($R^2 = 0.02$, $p = 0.25$). **CONCLUSION:** Our results do not support the hypothesis that M1 hypermobility increases loading of M2 and M3. Future studies should examine whether other aspects of dynamic M1 mobility instead of simple ROM may be related to increased loading of M2 and M3.

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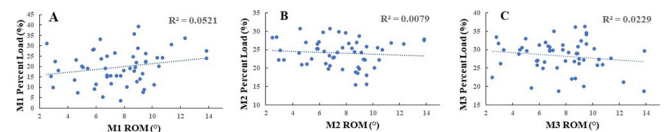
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Gait Biomechanics at Different Time Periods Following Anterior Cruciate Ligament Reconstruction

Christopher Johnston, Jonathan Goodwin, Brian Pietrosimone, FACSM, Troy Blackburn. *University of North Carolina at Chapel Hill, Chapel Hill, NC.*

(No relevant relationships reported)

Aberrant gait biomechanics following anterior cruciate ligament reconstruction (ACLR) are hypothesized to contribute to the increased risk of developing knee osteoarthritis (OA). It remains unclear how time since ACLR influences gait biomechanics.
Purpose: To determine how time since ACLR influences loading characteristics during walking gait following ACLR. **Methods:** Ninety-five (64 F, 31 M; 73.4±11.5 kg) individuals at least 6 months removed from unilateral ACLR and 25 (20 females, 5 males; 62.8±11.0 kg) uninjured controls volunteered for the study. The ACLR cohort was categorized into four groups based on time since ACLR: 6 months (n=24); 7-12 months (n=24); 13-36 months (n=21); >36 months (n=26). Kinetics and kinematics were sampled during walking gait at a self-selected speed with peak vertical ground reaction force magnitude (vGRF), peak instantaneous loading rate (ILR; first time derivative), and linear loading rate (LLR; slope), and peak internal knee extension, valgus, and varus moments identified during the first 50% of the stance phase. vGRF, ILR, and LLR were normalized to body weight (xBW) and moments were normalized to the product of BW and height (BW*ht). Outcomes were compared between groups via one-way ANOVA with Bonferroni corrections.
Results: vGRF was significantly lower in the 6 month (1.04±0.07 xBW) group compared to the uninjured (1.12±0.09 xBW; p=0.03) and 13-36 month (1.13±0.10 xBW; p=0.005) groups. LLR was significantly less in the 6 month (6.88±1.5 xBW/s) group compared to the 13-36 (9.02±2.0 xBW/s; p=0.005) and >36 month (8.57±2.2 xBW/s; p=0.038) groups. The internal knee extension moment was significantly larger in the 7-12 (-0.059±0.02 xBW*ht; p=0.006) and >36 month (-0.057±0.02 xBW*ht; p=0.01) groups compared to the uninjured group (-0.038±0.015 xBW*ht).
Conclusion: Based on these results, walking gait biomechanics fluctuate following ACLR as representative of lower loading early and increasing over time. Continued research should be conducted to determine the necessary ranges for joint loading during walking gait to preserve joint health following injury and take into consideration the changes in walking gait over time to establish how these alterations influence risk of OA.

A-26   Clinical Case Slide - **Hip and Pelvis I**

Wednesday, May 30, 2018, 9:30 AM - 11:10 AM
Room: CC-200E

127   **Chair:** Angela Smith, FACSM. *Nemours Children's Health System, Bryn Mawr, PA.*

(No relevant relationships reported)

128   **Discussant:** Kelly Lynne Roberts Lane, FACSM. *Fix It physical therapy, Mahtomedi, MN.*

(No relevant relationships reported)

129   **Discussant:** Robert Baker, FACSM. *Western Michigan University School of Medicine Clinics, Kalamazoo, MI.*

(No relevant relationships reported)

130   May 30 9:30 AM - 9:50 AM
Recurrent Hip Pain in a Preadolescent Soccer Athlete

Megan Fraker, Greg Canty. *Childrens Mercy, Kansas City, MO.*
(No relevant relationships reported)

HISTORY: 11yo male soccer player has worsening right hip pain vaguely localized to his groin. He has had right hip pain for 3-4 months which did not resolve with physical therapy following his initial visit. Recently progressed and unable to play with friends. Any activity, even walking, makes it worse. He also has a rash on his right knee and scrotal area that has not improved with antifungal or topical steroid treatment.
PHYSICAL EXAMINATION:Afebrile. Well appearing male. Erythematous plaque over his right patella and follicular papules on his scrotum. Full, passive range of motion both hips but pain with flexion and external rotation. His hip girdle strength was decreased: 4/5 flexion and abduction; 4+/5 hip adduction and extension. Antalgic gait and refuses single leg hop or squat attempts secondary to pain. Spine exam was normal. No other MSK swelling, tenderness, or limitations with active ROM.
DIFFERENTIAL DIAGNOSIS: 1. Stress fracture 2. Myositis 3. Juvenile Arthritis 4. Chronic infectious osteomyelitis 5. Chronic relapsing multifocal osteomyelitis(CRMO) 6. Neoplasm 7. Amplified pain syndrome 8. Chronic hip strain 9. Femoral-acetabular abnormalities/impingement
TEST AND RESULTS: -AP and frog view pelvis xray: no bony abnormality -MRI right hip with and without IV contrast: increased T2 signal right pubic ramus. Patchy edema in ilium near acetabula as well as in the introchanteric femoral neck -Lab(CBC, CMP, CK, ESR, CRP): all normal with exception of Hgb 12.5, Hct 36.7, ESR 31
FINAL WORKING DIAGNOSIS: Chronic relapsing multifocal osteomyelitis (CRMO)
TREATMENT AND OUTCOMES: 1. Ibuprofen 400mg TID initially-mild improvement 2. Rheumatology consult - whole body MRI with repeat labs plus vitamin D, immunoglobulin, UA with urine creatinine and urine calcium, TSH, ANA, HLA B27, SS A/SSB antibodies, and Quantiferon TB testing. 5. Started indomethacin 25mg BID and discontinued ibuprofen. Pain resolved, fatigue improved, and appetite increased. 6. CRMO officially diagnosed after full body MRI showed increased T2 signal in multiple bony sites and remaining lab was negative. 7. Dermatology consult diagnosed plaque psoriasis which can be associated with CRMO. Improved with topical calcipotriene and higher potency topical corticosteroid. 8. Two months after beginning indomethacin returned to soccer drills.

131   May 30 9:50 AM - 10:10 AM
Hip Pain Post Pregnancy

Sarah T. Yang. *Schwab Rehabilitation Hospital/University of Chicago, Chicago, IL.*
(No relevant relationships reported)

HISTORY: 28 year old woman with PMH Type 1 Diabetes Mellitus and hypothyroidism presented to clinic with severe right-sided groin pain 1 week after prolonged delivery resulting in C-section of a healthy infant. She received 2 weeks of PT per her OB with only temporary relief. She was then referred to PM&R . In clinic, she reported localized pain to her right groin and difficulty walking. Symptoms were exacerbated by sitting or lifting her R leg. She denied numbness, radiation, or bowel/bladder symptoms. Tylenol and tramadol provided minimal relief.
PHYSICAL EXAMINATION: She has considerable difficulty getting out of the chair to the bed. She ambulates with an antalgic gait. No specific tightness or tenderness surrounds the right pelvis or upper leg. Overall painful active ROM of the right hip, particularly with internal rotation. Supine PROM: flexion 115, ER 40, IR 15. Strength

4+/5 hip flexion and adduction, 4/5 abduction glut max, 4-/5 abduction glut medius. Leg lengths are equal. Neurovascular examination of the bilateral lower extremities is normal.
DIFFERENTIAL DIAGNOSIS: 1. Avascular necrosis 2. Labral injury 3. Sacroiliac joint dysfunction 4. Fracture
TEST AND RESULTS: **Xray of Hips and Pelvis** - No gross abnormalities. No acute fracture or subluxation. **MRI Hip wo cst** - Transient osteoporosis of the femoral head and neck with subchondral insufficiency fracture. Non-displaced anterior superior labral tear **DEXA** - lowest Z-score with a bone mineral density of 0.999 g/cm^2 and Z score of -1.8 (within age-expected range) **MRI Hip wo cst, 1 month later** - overall decrease in T2 bone marrow signal in the right femoral head and neck with persistent focus of subchondral fracture. Grade 2-3 right hip chondral thinning with small spur formation. Labral tear similar to prior exam **FINAL WORKING DIAGNOSIS**: Subchondral fracture secondary to Transient osteoporosis of the hip **TREATMENT AND OUTCOMES**: 1. Conservative treatment - protected weight-bearing with crutches, analgesia, and supportive PT.
2. Calcium and vitamin D supplementation. 3. On 4 week follow-up, she was upgraded to WBAT. 4. On 2 month follow-up, strength 5/5. Negative FABER and FADIR. Went for a walk for the first time. 5. On 3 month follow-up, no pain with passive ROM of hip. Strength normal. No TTP. Able to ascend/descend stairs without pain.

132   May 30 10:10 AM - 10:30 AM
Pubic Pestilence-Cross Country

Keirsten E. Smith, James B. Robinson, Earl R. Stewart, Brett C. Bentley. *University of Alabama Sports Medicine, Tuscaloosa, AL.*
(No relevant relationships reported)

HISTORY: An 18-year-old female collegiate cross-country runner presented with complaints of acute abdominal pressure for 3 days. Initially evaluated by ED treated for an UTI but her pain has persisted. The athlete did extra core work for 30 minutes prior to the onset of symptoms and does not usually do core-work. Her pain was peri-umbilical and LLQ, radiating to the left flank. The pain was relieved by ibuprofen and aggravated by movement and bending. Associated symptoms include bloating, decreased appetite, nausea. She denies back pain, fever, chills, dysuria, vaginal bleeding or discharge. She has no significant PMH.
PHYSICAL EXAMINATION: Examination revealed a thin female in pain. Abdomen soft, normal bowel sounds, severe tenderness to palpation over her rectus abdominis insertion LLQ with inability to leg-lift or sit-up. No CVA tenderness. Normal neurological exam.
DIFFERENTIAL DIAGNOSIS:
1. Exercise induced rhabdomyolysis
2. Rectus abdominis tear/hematoma
3. Osteitis pubis
4. Pubic osteomyelitis
5. Stress fracture pubic ramus
TEST AND RESULTS:
LABS: leukocytosis, elevated ESR/CRP, normal CMP, CK, UA
XR Pelvis revealed no acute osseous abnormality.
MRI pelvis showed moderate edema in the distal left rectus abdominis musculature, adductor group, and subcutaneous tissue. Signal changes of the left pubic ramus with some cortical discontinuity.
CT pelvis without contrast showed symphysis appearance most suggestive of osteitis pubis rather than fracture with cortical erosions on the left.
NM bone scan three-phase revealed mild increased activity in the pubis and symphysis.
FINAL/WORKING DIAGNOSIS: Pubic Osteomyelitis
TREATMENT AND OUTCOMES:
1. Operative left pubis debridement with deep bone debridement, cultures and pubic symphysis lavage performed
2. Prolonged antibiotic course was initiated initially with Vancomycin IV which was later changed to Clindamycin IV after surgical cultures grew back Propionibacterium Acnes and Methicillin Resistant Staphylococcal Epidermidis.
3. Returned to sports as tolerated after suture removal from surgical debridement with Groshong catheter in place. Her pelvis continued to hurt after long-distance exercises but she had no severe resting pain; therefore, inflammatory markers (ESR and CRP) were monitored as surrogate markers of the progress toward cure.

133   May 30 10:30 AM - 10:50 AM
Novel Treatment of Anterolateral Thigh Pain-Triathlon

Ciara Johnson, McCasey Smith, Neil Segal. *University of Kansas Medical Center, Kansas City, KS.*
(No relevant relationships reported)

HISTORY: A 49-year-old male, active duty Army, presented with a 4-month history of right anterolateral thigh pain and paresthesias. Pain was described as numb-like, stabbing, burning, and sharp. Symptoms began while cycling during a triathlon. After the race, there was increasing numbness and pain in left anterolateral thigh. Symptoms worsened with sitting, yoga, and flexion of the hip past 90°. He noted

Abstracts were prepared by the authors and printed as submitted.

increased weakness with running. Pregabalin, naproxen, tramadol, physical therapy, and inversion table were ineffective. He underwent 6 lateral femoral cutaneous nerve blocks under ultrasound guidance that provided positive diagnostic benefit, but temporary therapeutic benefit. At presentation, Visual Analogue Scale pain score was 6-8/10.**PHYSICAL EXAMINATION**:
Patient demonstrated allodynia of the right thigh 4-6cm lateral to the midpoint of the inguinal ligament from Pubic symphysis to ASIS that increased with resisted hip flexion. There was also diminished sensation over the right anterolateral thigh. Neurological and musculoskeletal examination was otherwise unremarkable.
DIFFERENTIAL DIAGNOSIS: 1. Meralgia Paresthetica 2. Lumbar Plexopathy3. L1, L2 Lumbar Radiculopathy **TEST AND RESULTS**: Lumbosacral MRI --Right L5-S1 disc protrusion resulting in mild lateral recess stenosis.
FINAL WORKING DIAGNOSIS: Meralgia Paresthetica **TREATMENT AND OUTCOMES**:
1. Cryoablation of Lateral Femoral Cutaneous Nerve under US guidance 2. Immediate, complete resolution of anterolateral thigh pain.3. Post-procedural pain score was 0/10, decreased from Pre-procedure pain score of 6/10. 4. Complete resolution of pain for 1.5 months post-procedure with return to activity. Continues to have 60-70% relief.5. Patient was able to return to running, cycling, and swimming.

134   May 30 10:50 AM - 11:10 AM
Groin Pain Following Spin Class in a Personal Trainer
Joseph Dadabo, Prakash Jayabalan. *Shirley Ryan AbilityLab/ Northwestern University, Chicago, IL.* (Sponsor: Joseph Ihm, FACSM)
(No relevant relationships reported)

History:
A 41 year old G3P1 woman 3 months postpartum presented with 2 days of groin pain that started after riding a stationary cycle. She also reported night sweats and fevers. She had left hip dysplasia and left femoral and obturator nerve palsy since birth. Now she described constant stabbing pubic symphysis pain with radiation into her right medial thigh. Pain intensity was 9/10 and worse with hip flexion, adduction, and walking. She required a walking stick for ambulation.
Physical Examination:
Tenderness to palpation over pubic symphysis and adductor muscles bilaterally, worse on right due to baseline sensory deficits on left. Strength 5/5 bilaterally for ankle dorsiflexion, plantar flexion, inversion, eversion, and EHL. Right hip flexion, hip abduction, and TFL strength 3/5, all with significant pain. Passive right hip adduction caused severe pain. Left hip flexion 2/5, hip adduction 1/5, and light touch sensation over left lateral thigh diminished, her baseline due to known nerve palsy. Reflexes 1+ on right and absent on left. Stinchfield's and scour tests positive on the right. FABER and log roll negative bilaterally.
Differential Diagnosis:
1. Athletic pubalgia
2. Hip flexor strain
3. Hip adductor tear
4. Hip labral tear
Tests and Results:
XR Hips: Left acetabular dysplasia and sclerosis. Avulsion fracture left inferior pubic ramus.
WBC: 16.0 (H)
ESR: 121 (H)
CRP: 9.9 (H)
MRI Pelvis: Avulsion fracture left medial pubic bone at origin of adductor muscles. 4.6 cm hematoma over left adductor muscles. Grade 1 strain proximal right adductor muscles. Bilateral sacral insufficiency fractures. Bilateral pubic reactive marrow edema.
Ultrasound-guided aspiration of adductor and pubic symphyseal fluid: Serosanguinous fluid, cultures negative.
Final Working Diagnosis:
1. Left pubic avulsion fracture at origin of adductor muscles with secondary hematoma
2. Grade 1 strain proximal right adductor muscles
3. Bilateral sacral insufficiency fractures
Treatment and Outcomes:
1. NWB left leg for 2 weeks
2. Tylenol PRN for pain. Stop NSAID's
3. Therapy - pelvic floor and lower extremity strengthening, stretching, gait stability, and balance upon return to full weight bearing
4. DEXA Scan: Normal bone mineral density
5. Calcium and vitamin D: Within normal limits
6. Normalization of WBC, ESR, and CRP on serial monitoring

A-27   Clinical Case Slide - **Medical Issues I**
Wednesday, May 30, 2018, 9:30 AM - 11:10 AM
Room: CC-200F

135   **Chair:** Kenneth P. Barnes, FACSM. *Elon University / Kernodle Clinic Orthopedics & Sports Medicine, Elon, NC.*
(No relevant relationships reported)

136   **Discussant:** Hallie Labrador. *NorthShore University HealthSystem, Gurnee, IL.*
(No relevant relationships reported)

137   **Discussant:** Suzanne S. Hecht, FACSM. *University of Minnesota, Minneapolis, MN.*
(No relevant relationships reported)

138   May 30 9:30 AM - 9:50 AM
Avoiding Grave Cardiac Outcomes in an Athlete with Grave's Disease
Sander Rubin, Robert Kiningham, FACSM. *University of Michigan, Ann Arbor, MI.*
(No relevant relationships reported)

HISTORY:
A 20yo male college football player presented to the athletic training room with 15 pounds of unexplained weight loss over a two-week period. He reported decreased appetite, increased general fatigue and muscle fatigue over the past two weeks. His review of systems was otherwise negative. He had no chronic medical problems or current medications. His family history was significant for asthma, hypertension, and diabetes mellitus type 2.
PHYSICAL EXAMINATION:
General - No acute distress, well-appearing
HEENT - Sclera anicteric, tympanic membranes normal
Neck - Supple. Thyroid palpable, no enlargement or nodules
Lymph nodes - No axillary, cervical, or supraclavicular lymphadenopathy
Respiratory - Clear to auscultation bilaterally, no dyspnea
Cardiovascular - Regular rate and rhythm, no murmur
Abdomen - Soft, non-tender, non-distended, no mass, bowel sounds present
GU - No testicular mass
DIFFERENTIAL DIAGNOSIS:
1. Mononucleosis
2. Neoplasm
3. Hyperthyroidism
4. HIV
5. Vitamin B12 or D Deficiency
6. Diabetes mellitus
TESTS AND RESULTS:
Initial Labs:
TSH - <0.01
Urinalysis - Normal
CMP - Na 139, K 3.9, Cl 105, CO2 29, UN 23, Cr 0.93, Glu 101, Ca 10, Pro 6.7, Alb 4, AST 48, ALT 83, Alk Phos 81, Bil 0.6
CBC - Wbc 8.1, Hgb 13.3, Hct 39, Plt 238
CK - 675
ESR - 20
CRP - 0.2
Monospot - Negative
Vitamin B12 - 782
Vitamin D (25HD) - 25
Follow-Up Labs:
Free T4 - 4.65
Free T3 - >20
Thyrotropin Receptor Ab - 11
Thyroid Stimulating Ig - 5.8
Hepatitis Panel - Negative
FINAL/WORKING DIAGNOSIS:
1. Hyperthyroidism due to Grave's Disease
TREATMENT AND OUTCOMES:
The patient was held from practice and referred to endocrinology for further evaluation and management. His increased liver enzymes were likely due to the hyperthyroidism. He was started on methimazole 20mg daily and inderal 10mg three times per day, with a plan to check thyroid and liver function tests every 2-4 weeks. He returned to football activities and did well until he started to lose weight and methimazole dosage had to be lowered due to elevated alk phos. A baseline EKG will be obtained to ensure he is not
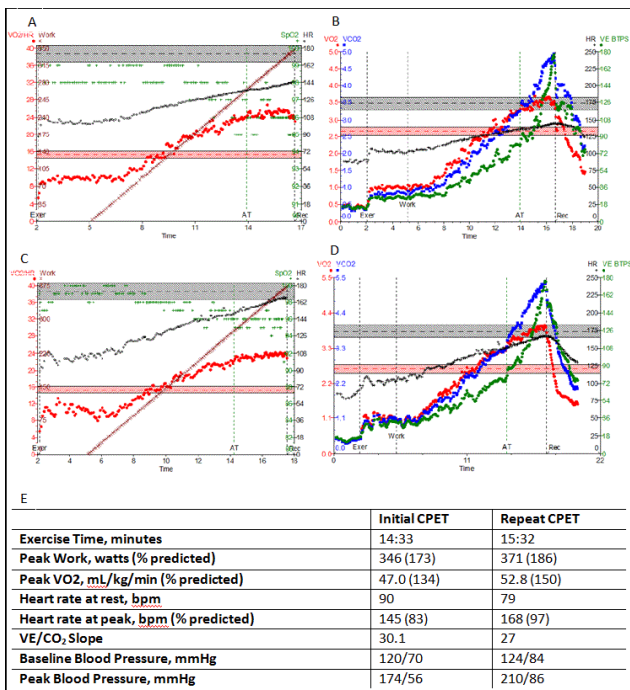
in atrial fibrillation. Given the increased risk of atrial fibrillation in his hyperthyroid state, he will be instructed to keep his heart rate target below 120bpm. Once his thyroid levels return to normal, he plans to undergo radioactive iodine ablation, likely after the football season.

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139   **May 30 9:50 AM - 10:10 AM**

Exercise Intolerance in an Endurance Athlete with Depression

Ankit B. Shah, Aaron L. Baggish, FACSM, Meagan M. Wasfy. *Massachusetts General Hospital, Boston, MA.*
(No relevant relationships reported)

HISTORY: A 46-year-old male competitive cyclist with a history of depression presented with concerns of decreased exercise tolerance. Over the past year, he has had difficulty maintaining as high a level of effort for a sustained period of time as he was accustomed. A year ago, his heart rate using a chest strap monitor during maximal perceived exertion was 170 beats per minute (bpm). This year, with similar effort, his heart rate does not rise above 150 bpm. Upon further questioning, he was started on two new medications in the last year, buproprion 200mg twice daily and desipramine, a tricyclic antidepressant (TCA) 150mg daily.**PHYSICAL EXAMINATION**: Resting heart rate was 65 bpm, he was normotensive and oxygen saturation was 100% on room air. Cardiopulmonary examination was normal.**DIFFERENTIAL DIAGNOSIS**: 1. Sinus node dysfunction 2.Myocardial Ischemia 3.Heart Failure 4. Medication side effect 5. Hypothyroidism**TEST AND RESULTS**: Thyroid panel, basic metabolic panel and complete blood count were within normal limits. Electrocardiogram showed normal sinus rhythm, left axis deviation with normal PR and corrected QT intervals. Exercise testing confirmed his subjective limitations and revealed chronotropic incompetence. We hypothesized that TCAs' previously described impact on central nervous system (CNS) B1 adrenergic receptors was the cause of his limitations. Desipramine was safely weaned off and repeat exercise testing revealed improved VO2 and normalization of peak heart rate. TCAs are known to reduce the sensitivity and/or density of B1 receptors in the CNS, and we propose that this side effect is likely due to similar impact on cardiac B1 receptors.

FINAL WORKING DIAGNOSIS: Desipramine use is a reversible cause of chronotropic incompetence and associated exertional limitation.**TREATMENT AND OUTCOMES**: His depression is well controlled on a different antidepressant regimen prescribed by his psychiatrist. He has not had recurrence of his exertional intolerance.

	Initial CPET	Repeat CPET
Exercise Time, minutes	14:33	15:32
Peak Work, watts (% predicted)	346 (173)	371 (186)
Peak VO2, mL/kg/min (% predicted)	47.0 (134)	52.8 (150)
Heart rate at rest, bpm	90	79
Heart rate at peak, bpm (% predicted)	145 (83)	168 (97)
VE/CO₂ Slope	30.1	27
Baseline Blood Pressure, mmHg	120/70	124/84
Peak Blood Pressure, mmHg	174/56	210/86

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140   **May 30 10:10 AM - 10:30 AM**

Exercise Intolerance-cycling

Devon E. Hutton, Sean C. Robinson. *Oregon Health and Science University, Portland, OR.* (Sponsor: Diane L Elliot, FACSM)
(No relevant relationships reported)

HISTORY: A 55-year-old competitive male cyclist presented with one year of progressive exercise intolerance, increased dyspnea on exertion, and four weeks of

bilateral ankle edema. He also reported chest discomfort with exertion, orthostasis, and weight gain. On review, he initially reported exercise intolerance with fatigue eight months earlier with EKG showing sinus arrhythmia and normal labs except low total protein. Cycling stress test with VO2 max showed ST depression in inferior leads and VO2 max of 27.6ml/kg/min. Follow up stress echo was negative for wall motion abnormality. **PHYSICAL EXAMINATION**: Examination revealed regular rate and rhythm without extra sounds, clear lungs bilaterally, and 1+ pitting edema up to shins. **DIFFERENTIAL DIAGNOSIS**: Ischemic cardiomyopathy, Hypothyroidism, Malignancy **TEST AND RESULTS**: Labs: Cr 0.81mg/dL, Total protein 5.9g/dL, Albumin 3.0g/dL, Hgb 15.0g/dL, Hct 43.5%, Ferritin 111ng/mL, TSH 2.05mlU/L, Testosterone 434ng/dL, Cortisol 14.6ug/dL, 24hr Urine protein 2773mg/24hr Echocardiogram: LV size and LVEF normal. Severe LV hypertrophy by area length method 144g/m2. RV size and RVEF normal. RV hypertrophy present. Moderate biatrial enlargement. Suggests infiltrative cardiomyopathy. **FINAL WORKING DIAGNOSIS**: AL Amyloidosis with infiltrative cardiomyopathy **TREATMENT AND OUTCOMES**: Ordered MR Cardiac w/wo: *Biventricular hypertrophy with preserved right and left ventricular systolic function. Dilated right atrium. Mild to moderate mitral and moderate tricuspid regurgitation. Small pericardial effusion. Abnormal late gadolinium enhancement of basal LV myocardium and both atria. Suggests cardiac amyloidosis.* Ordered UPEP/SPEP--*UPEP: Urine protein conc 82 mg/dl, Urine monoclonal protein free lambda light chains; SPEP: Serum lambda light chain 1230mg/L, Serum kappa/lambda ratio 0.008;* Referred to Heme/Onc--*Bone marrow biopsy: Monoclonal plasmacytosis, negative for amyloid deposition; Kidney biopsy: Amyloidosis, AL-lambda type, with predominant glomerular involvement; Started Andromeda Clinical Trial—Cyclophosphamide, Bortezomib, Dexamethasone (CyBorD), and Daratumamab;*

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141   **May 30 10:30 AM - 10:50 AM**

Left Lower Quadrant Abdominal Pain in a Division 1 Discus Thrower

Alyssa M. Neph[1], Tracy Bras[2], Kentaro Onishi[1]. *[1]University of Pittsburgh Medical Center, Pittsburgh, PA. [2]Maine General Orthopedics/Evergreen Sports Medicine Fellowship, Augusta, ME.* (Sponsor: Brian A. Davis, FACSM)
(No relevant relationships reported)

HISTORY: A 19-year old female Division 1 discus thrower with a history of ruptured left ovarian cyst presents with intermittent left lower quadrant abdominal pain that started 8 months ago. Focal pain is located superior and medial to the left anterior superior iliac spine and there is an associated bulge, reportedly brought by heavy activity, although not clinically reproducible. Physical therapy for core and lumbopelvic strengthening did not provide improvement. As CT and MRI were unremarkable, she was referred to our sports ultrasound clinic for a diagnostic ultrasound of the left lower abdominal region.
PHYSICAL EXAM: Non-antalgic gait with full lumbar and left hip range of motion. Mild tenderness to palpation medial to the iliac crest in the left lower quadrant without guarding or rebound. No palpable muscle defect is appreciated at rest or with valsalva maneuver. Transition from FABER to hip extension does not reproduce pain or snapping. Resisted sit up, Stinchfield, FAIR, and hip hyper flexion impingement tests were negative.
DIFFERENTIAL DIAGNOSIS
1. Sports hernia/athletic pubalgia
2. Ovarian cyst
3. Endometriosis
4. Inguinal hernia
5. Intra-articular hip pathology
6. Spigelian hernia
TEST AND RESULTS:
-Pelvic ultrasound and CT abdomen/pelvis: normal
-X-ray lumbar spine and pelvis: dextroscoliosis of lumbar spine, normal left hip and pelvis
-MRI pelvis: Right adnexal cyst measuring 4.9 x 4.2 cm. No inguinal hernia, edema, or fascial defect over the lower abdominal wall
-Left lower quadrant musculoskeletal ultrasound: 11 mm gap within transversalis fascia on the lateral edge of the left rectus abdominis muscle, just deep to the inferior epigastric vessels. Herniation was seen deep to the intermediate investing fascia and was exacerbated with coughing, laughing, and half sit-ups
FINAL/WORKING DIAGNOSIS
Type 1 Spigelian hernia
TREATMENT AND OUTCOMES:
1. Diagnostic laparoscopy identified a 12-15 mm area of defect in the left Spigleian fascia with pre-peritoneal fat herniation as seen on the diagnostic ultrasound. The defect was repaired in an open fashion with four sutures.
2. Gradual return to activity 12 weeks post repair with decreased pain during heavy weight lifting and participation in discus throwing.
3. Repeat ultrasound 4 months after surgical repair was normal with no visible abdominal wall defect.

142   May 30 10:50 AM - 11:10 AM

Effects Of An Exercise Program On Quality Of Life On A Rheumatoid Arthritis Patient: A Case Study

Diego A. Alonso-Aubin[1], Iván Chulvi-Medrano[1], Moisés Picón[1], Tamara Rial[2], Juan M. Cortell-Tormo[1]. [1]University of Alicante, Alicante, Spain. [2]International Hypopressive & Physical Therapy Insititute, Vigo, Spain. (Sponsor: Avery D. Faigenbaum, FACSM)

(No relevant relationships reported)

HISTORY: A woman 34-years-old, after 8-weeks of cardiac surgery (tricuspid surgery) wheelchair bound due to evolutioned Rheumatoid Arthritis (RA) since she was 9-years-old. **PHYSICAL EXAMINATION:** Height 1.40 meters, weight 36.1 kg, body mass index 18.41kg/m². Limited range of motion (overall ankylosis) and an overall and clinical muscular atrophy. **DIFERENTIAL DIAGNOSIS:** Diagnosis RA and CVD (tricuspid surgery). **TEST AND RESULTS:** Rheumatoid Arthritis Impact of Disease (RAID) scored 3.72 and SF-36 Health Survey (SF-36) total score 1730. Muscular function in handgrip was 1 in Oxford-scale. **FINAL/ WORKING DIAGNOSIS:** Rheumatoid Arthritis. Musculoskeletal pain and motor deficit. **TREATMENT AND OUTCOMES:** Specific pharmacologic treatment. 8-weeks of multicomponent physical exercise. 5 days/week. Multicomponent physical exercise: combined aerobic and resistance exercise program, including electrical nerve stimulation. Intensity associated with pain tolerance (tonification program), was used as monitoring the training. After 8weeks of multicomponent physical exercise she improves scores in RAID (3.57) and SF-36 (1865). The handgrip muscular function has increased to a 2.

A-38   Free Communication/Poster - **Blood Flow Restriction**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

160   Board #1   May 30 9:30 AM - 11:00 AM

The Retaining Effects of Running Training Combined with Blood Flow Restriction on VO₂max and Muscular Strength after Detraining

Yun-Tsung Chen[1], Mong-Da Hsu[1], Yao-Yi Hsieh[1], Jung-Charng Lin[2]. [1]National Taiwan Normal University, Taipei, Taiwan. [2]Chinese Culture University, Taipei, Taiwan.

(No relevant relationships reported)

Purpose: Concurrent improvements in maximal oxygen uptake (VO_2max) and muscle strength in aerobic (e.g., walking and running) training combined with blood flow restriction (BFR) has been reported. However, the retain effects of aerobic training combined with BFR on VO_2max and muscular strength is still unknown. Therefore, this study investigated the effects of 2 weeks detraining on VO_2max and muscle strength performance following running training combined with BFR. **Methods:** Twenty male athletes were recruited and pair matched into: (1) running training with thigh BFR group (RT-BFR, n=10), or (2) running training only group (RT, n=10). Before detraining, all subjects in both groups performed eight weeks of running training (24 sessions). RT-BFR group performed running sessions with pressure cuff belts. The occlusion pressure was 1.3 x resting systolic blood pressure. VO_2max, all out time (AOT), muscular strength and hamstring/quadriceps (H/Q) ratio were assessed before and after the detraining. **Results:** There were no differences ($p > .05$) between groups in VO_2max (-3.5 ± 3.6 vs. -0.8 ± 6.3 %), AOT (-3.4 ± 3.6 vs. -1.6 ± 4.0 %), isokinetic knee extensor (60º/s, -3.5 ± 8.5 vs. -1.2 ± 9.7 %; 180º/s, -0.2 ± 7.1 vs. 4.0 ± 10.8 %), flexor strength (60º/s, -2.9 ± 8.4 vs. 0.9 ± 8.9 %; 180º/s, -7.8 ± 11.4 vs. 1.6 ± 12.9 %) and H/Q ratio (60º/s, 0.9 ± 9.4 vs. 2.9 ± 11.1 %; 180º/s, -7.3 ± 11.6 vs. -2.2 ± 7.8 %) after 2 weeks detraining. However, the RT-BFR decreased H/Q ratio from 0.75 to 0.69, which may alleviate the training-induced injury protective effects in hamstring. **Conclusions:** There were similar retaining effects on aerobic capacity and muscular strength between groups after 2 weeks detraining. However, only RT-BFR group was shown to have higher VO_2max (65.1 ± 5.2 vs. 64.3 ± 4.7 ml/kg/min), AOT (15.9 ± 1.7 vs. 15.4 ± 1.4 min), knee extensor (60º/s, 2.5 ± 0.5 vs. 2.3 ± 0.4 Nm/kg; 180º/s, 1.9 ± 0.2 vs. 1.6 ± 0.2 Nm/kg) and flexor strength (60º/s, 1.5 ± 0.2 vs. 1.4 ± 0.3 Nm/kg; 180º/s, 1.3 ± 0.2 vs. 1.2 ± 0.2 Nm/kg) performance when compared with pre-training. Thus, the findings suggest that RT-BFR may be considered as a practical training strategy for concurrent increase in VO_2max and muscular strength performance. In addition, the training effects are maintained within 2 weeks of detraining in athletes.

161   Board #2   May 30 9:30 AM - 11:00 AM

Exercise with Blood Flow Restriction and Power Development of the Lower Body

Justin Faller[1], Susan Sotir[2], Kristen Ouellette[2], Vicent J. Paolone, FACSM[2], Brian Thompson[2]. [1]Skidmore College, Saratoga Springs, NY. [2]Springfield College, Springfield, MA. (Sponsor: Vincent J. Paolone, FACSM)

(No relevant relationships reported)

Sixty to eighty percent of one repetition maximum (1 RM) is generally recommended to elicit improvements in muscular fitness, however these intensities may not be appropriate for all populations and situations. A new training technique has been reported to elicit increases in musle strength and size uses low intensity resistance training (~ 20% 1RM) in combination with blood flow restriction (BFR) to the working muscle. BFR training has also been reported to reduce atrophy experienced during immobilization. Muscular power can improve due to increases in muscular strength and size, which can be beneficial to athletic performance. Acute changes in power output have been observed following near maximal resistance exercise efforts, however this has not been examined extensively in BFR training. **PURPOSE:** To determine the acute effects low intensity resistance exercise with BFR has on power output of the lower body. **METHODS:** Resistance trained males (n = 14) completed three experimental sessions in which lower body power output and vertical jump height were measured pre and post exercise protocol. Exercise protocols consisted of the barbell back squat with either 20% 1 RM and blood flow restriction (BFR) for 15 repetitions, or a high load (90% 1 RM) without restriction for 3 repetitions, and no exercise (control). Vertical jump height and lower body power output were assessed using a portable force plate before and following the barbell back squat. A two-way repeated measures ANOVA was utilized to examine exercise protocol and vertical jump height as well as exercise protocol and power output. **RESULTS:** Vertical jump height following BFR exercise was reduced when compared to vertical jump height before BFR exercise (46.4±5.6 cm vs. 43.6±4.6 cm, p <0.05). No differences in vertical jump height were observed with 90% 1 RM (45.4±4.7 cm vs. 46.2±4.9 cm, p>0.05) or in the control group (47.6±5.9 cm vs. 45.6±5.7 cm, p>0.05). Power output was unaffected by condition but decreased from pre to post exercise (62.2±7.5 w/kg vs. 60.9±7.7 w/kg, p<0.05). **CONCLUSION:** A decrement in vertical jump height was experienced after an acute bout of BFR with low load resistance exercise. Low load resistance exercise with BFR or high intensity resistance exercise may not be beneficial as part of a warm up to acutely enhance vertical jump or power output.

162   Board #3   May 30 9:30 AM - 11:00 AM

The Effect of Blood Flow Restriction Training on Body Composition and Muscular Strength in College-Aged Individuals.

Zachary R. Salyers, Jame Larkin, Michael Lane, Aaron Sciascia. *Eastern Kentucky University, Richmond, KY.*

(No relevant relationships reported)

Scientific Abstract SampleBFR training utilizes workloads between 20-30% of an individual's one repetition maximum, with one set of 30 reps, followed by 3 sets of 15 reps while incurring little to no muscle damage. Future research should be conducted to determine if BFR training is an effective training method. **PURPOSE:** To determine the effects of practical blood flow restriction training on body composition and muscular strength in college-aged individuals when compared to a traditional resistance training protocol. **METHODS:** This study consisted of two randomized groups, an experimental group (BFR), and a traditional resistance training (TRT) control group. The subject's characteristics were (mean ± SD, N=9, 8 males, 1 female) age, 22.3 ± 1.6 years; height, 68.9 ±2.7 inches; weight, 183.7±40.4 lbs.; body fat percentage, 21.2±8.6. All participants completed pre-testing measures of girth of both arms and legs, upper chest, and shoulders. Body composition was determined using air displacement plethysmography via BodPod (COSMED USA, INC., Concord, CA) to determine fat free mass and body fat percentage. Maximal strength was assessed on the bench press and back squat to determine workloads during the training programs. Both groups completed a four-week training program consisting of both upper and lower body training. The BFR program consisted of four sets (1 set x 30 repetitions and 3 sets x 15 repetitions). Loads progressed from 20 to 32% of each person's 1RM over the four weeks. The TRT program consisted of four sets with progressive loads of 65%, 75%, 80% and 85% with 15, 10, 8, and 6 repetitions respectively. Post testing measures followed the pre-testing regimen .regimen. Within and between group differences from pre topre-to post testing were determined via paired and independent t-tests. . **RESULTS:** No significant differences were found among any of the body composition measurements as well as squat performance. The BFR group demonstrated significantly greater increases in bench press performance (pre: 198 ±79 lbs.; post: 211±83 lbs.) after the training program (p=0.004) compared to the TRT group.

CONCLUSION: In a limited sample, BFR training was shown to be a comparable training method when compared to traditional hypertrophy training. The findings were specific to increases in bench press performance.

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163   Board #4   May 30 9:30 AM - 11:00 AM

Early Adaptations In Strength As A Result Of Blood Flow Restriction Training Is Not Mode-specific

Ethan C. Hill, Terry Housh, FACSM, Cory Smith, Joshua Keller, Richard Schmidt, Glen Johnson, FACSM. *University of Nebraska - Lincoln, Lincoln, NE.* (Sponsor: Terry Housh, FACSM)
(No relevant relationships reported)

PURPOSE: Low-intensity blood flow restriction training has been demonstrated to elicit increases in muscle strength comparable to training at high intensities of exercise without blood flow restriction. Eccentric muscle actions are a key component to induce favorable adaptations in muscle, but there is limited information regarding the effects of eccentric (Ecc-BFR) versus concentric (Con-BFR) blood flow restriction training. The purpose of this investigation was to examine Ecc-BFR versus Con-BFR training on muscle strength. **METHODS:** Twenty-four untrained women (mean age ± SD = 21.9 ± 1.4 years) were randomly assigned to 2-wk of Ecc-BFR (n = 12) at 30% of their eccentric peak torque (PT) or 2-wk of Con-BFR (n = 12) at 30% of their concentric PT. Training was performed 3 times per week for 2-wk and consisted of 75 repetitions each training session performed over 4 sets (1×30, 3×15) and each set was separated by 30-s of rest. All training and testing procedures were performed on an isokinetic dynamometer at a velocity of $120° \cdot s^{-1}$. At baseline and after 2-wk of training, indices of muscle strength (eccentric PT, concentric PT, and maximal voluntary isometric contraction [MVIC]) were assessed. Training-induced changes in muscle strength were examined using a 2 (Time [baseline, 2-wk]) × 2 (Group [Ecc-BFR, Con-BFR]) × 3 (Mode [eccentric PT, concentric PT, MVIC]) mixed factorial ANOVA. **RESULTS**: There were no significant ($p > 0.05$) interactions, but there were significant ($p < 0.05$) main effects for Time and Mode, but not for Group. Muscle strength increased 12.0% (collapsed across Group and Mode) from baseline (24.2 Nm) to 2-wk (27.1 Nm), and eccentric PT (34.6 Nm) was greater than concentric PT (20.4 Nm) and MVIC (22.0 Nm), but concentric PT and MVIC were not different (collapsed across Time and Group). **CONCLUSIONS:** These findings indicated that low-intensity Ecc-BFR and Con-BFR training elicited comparable increases in muscle strength following 2-wk of resistance training. In addition, the increases in muscle strength were not mode-specific and increased for all modes of testing (eccentric PT, concentric PT, and MVIC) regardless of the training modality (Ecc-BFR or Con-BFR). Collectively, these results suggested that Con-BFR training resulted in comparable increases in muscle strength when compared to Ecc-BFR training.

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164   Board #5   May 30 9:30 AM - 11:00 AM

Acute Effects Of Resistance Training With And Without Blood Flow Restriction On Muscle Thickness

Iván Chulvi-Medrano[1], Moisés Picón[1], Juan M. Cortell-Tormo[1], Diego A. Alonso-Aubin[1], Tamara Rial[2], José Fernández-Sáez[1], Daniel Alonso[3], Yasser Alakhdar[3]. *[1]University of Alicante, Alicante, Spain. [2]International Hypopressive and Physical Therapy Institute, Vigo, Spain. [3]University of Valencia, Valencia, Spain.*
(No relevant relationships reported)

Low-intensity resistance exercise associated with blood flow restriction (LI-BFR) has demonstrated to be an effective strength training methodology with similar hypertrophy gains than conventional resistance exercise (RE). **PURPOSE:** To compare the acute effects of high intensity RE (HI), low intensity RE (LI) and low intensity RE with blood flow restriction (LI-BFR) on muscle thickness in healthy subjects. **METHODS:** 52 subjects (27.3 ± 7 years; BMI: 27.3 ± 3.1) were randomly assigned into three groups: High intensity (HI, 75%-1RM; n=15); low intensity (LI, 30%-1RM; n=13); and low intensity with blood flow restriction training (LI-BFR, 30%-1RM and 30% of total vascular restriction; n=24). All participants performed four sets of plantar flexion in the leg press machine with 1 set of 30 repetitions following 3 sets of 15 (for LI and LI-BFR group) or 10 repetitions (HI group). An inflated cuff at 30% of total vascular restriction of each individual (mean: 47.6 ± 19.8 mmHg) was attached at the calf of the dominant leg. The muscle thickness of gastrocnemius (G) and anterior tibial (AT) was measured before, immediately after the fourth set, 60min post-exercise and 24h post-exercise with ultrasound. **RESULTS:** Significant muscle thickness increase of the G and AT was observed in the LI-BFR group (p<0.001) after the fourth set (G: pre: 1.91 ± 0.26 cm; post: 2.10 ± 0.23 cm; AT: pre: 1.89 ± 0.36 cm; post: 2.15 ± 0.49 cm) and 60min post-exercise (G: pre: 1.91 ± 0.26 cm; post: 2.14 ± 0.23 cm; AT: pre: 1.89 ± 0.36 cm; post: 2.20 ± 0.48 cm). HI and LI groups also promoted significant muscle thickness increase (p<0.05) in the G after the fourth set (HI: pre: 1.83 ± 0.37 cm; post: 2.03 ± 0.32 cm; LI: pre: 1.70 ± 0.26 cm; post: 1.81 ± 0.27 cm) and 60min post-exercise for LI group (pre: 1.70 ± 0.26 cm; post: 1.83 ± 0.23 cm). Significant intergroup differences were observed in G muscle thickness after the fourth set (p=0.011) and 60min post-exercise (p=0.004) and also in AT muscle thickness after the fourth set (p=0.001), 60min (p=0.006) and 24 hours post-exercise (p<0.001). **CONCLUSION:** LI-BFR group showed the highest increase in muscle thickness of the G when compared to HI and LI groups. Only LI-BFR group was able to achieve significant increase of AT muscle thickness.

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165   Board #6   May 30 9:30 AM - 11:00 AM

Acute Cardiovascular Responses To Resistance Training With And Without Blood Flow Restriction

Moisés Picón[1], Iván Chulvi-Medrano[1], Juan M. Cortell-Tormo[1], Diego A. Alonso-Aubin[1], Tamara Rial[2], José Fernández-Sáez[1], Daniel Alonso[3]. *[1]University of Alicante, Alicante, Spain. [2]International Hypopressive and Physical Therapy Institute, Vigo, Spain. [3]University of Valencia, Valencia, Spain.*
(No relevant relationships reported)

Recently, it has been suggested that resistance exercise (RE) can be applied for cardiovascular function, maintenance and/or for rehabilitation purposes. **PURPOSE:** To compare the acute effects of high intensity RE (HI), low intensity RE (LI) and low intensity RE with blood flow restriction (LI-BFR) on heart rate (HR) and blood pressure (BP) in healthy subjects. **METHODS:** 52 subjects ($(27.3 \pm 7$ years; BMI: 27.3 ± 3.1) were assigned into three groups: High intensity (HI, 75%-1RM; n=15); low intensity (LI, 30%-1RM; n=13); and low intensity with blood flow restriction training (LI-BFR, 30%-1RM and 30% of total vascular restriction; n=24). All participants performed 4 sets of plantar flexion in the leg press machine with 1 set of 30 repetitions following 3 sets of 15 (for LI and LI-BFR group) or 10 repetitions (HI group). Blood flow restriction was achieved using a cuff positioned on the dominant calf. The cuff was inflated at 30% of total vascular restriction of each individual (mean: 47.6 ± 19.8 mmHg). Cardiovascular variables were obtained during and after the session. **RESULTS:** Results indicated that HR increased significantly during the 4 exercise set for all groups (p <0.05), although the highest increases were found during the last set for the HI group (pre: 70.0 ± 10.0 bpm; post: 81.6 ± 11.7 bpm; p<0.001) and during the first set for the LI-BFR group (pre: 66.1 ± 12.9 bpm; post: 73.7 ± 15.1bpm; p<0.001). There were no significant differences in BP for any group. However, significant intergroup differences were observed in systolic BP during the first set for HI and LI-BFR groups when compared to LI group (p=0.03). HI and LI-BFR promoted significant systolic BP reductions (p<0.001) 30min post-exercise (pre: 126.1 ± 11.7 mmHg; post: 112.3 ± 14.0 mmHg), 45min post-exercise (pre: 126.1 ± 11.7 mmHg; post: 113.1 ± 10.2 mmHg) and for HI group post-15min (pre: 123.6 ± 15.7 mmHg; post: 115.0 ± 15.9 mmHg), post-45min (pre: 123.6 ± 15.7 mmHg; post: 114.4 ± 16.7 mmHg) and post-60min (pre: 123.6 ± 15.7 mmHg; post: 113.3 ± 14.7 mmHg). There were no significant changes (p>0.05) for diastolic BP and HR of the LI-BFR group. **CONCLUSION:** LI-BFR resistance training is able to generate an acute hemodynamic and cardiovascular response similar to HI and LI resistance exercise. HI and LI-BFR seem to promote a hypotensive post-exercise response.

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166   Board #7   May 30 9:30 AM - 11:00 AM

Blood Flow Restriction During Barbell Squats does not Alter Performance or Muscular Damage

Teresa Wiczynski, Joseph Badinger, Cody E. Morris, Ray VanWye, Scott Arnett, Lee J. Winchester. *Western Kentucky University, Bowling Green, KY.* (Sponsor: Scott Lyons, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine if an acute bout of blood flow restriction (BFR) during barbell squat training at 75% of 1 Repetition Maximum (1RM) would hinder performance or enhance muscular damage and inflammation when compared to traditional resistance training.
METHODS: 13 recreationally resistance trained men and women between the ages of 18 and 30 were recruited for this study. Participants were asked to complete 3 separate sessions for the course of this study. During session 1, the individuals 1RM on a bench press was assessed. During sessions 2 and 3, participants were asked to perform 5 sets of barbell squats until failure for each set at 75% of their tested 1RM. Half of the participants performed traditional resistance training during session 2 and blood flow restricted resistance training during session 3. This was reversed for the other half of the participants to avoid the possibility of a training effect. Perceived limb pain and number of repetitions performed were evaluated for each set. Venous blood samples were collected at each time point to assess muscular damage and inflammation, through ELISA analysis of myoglobin and IL-6, respectively. All 3 sessions occurred at least 7 days apart.
RESULTS: No significant differences were observed in the total number of repetitions performed between traditional and BFR resistance training (47.0 ± 14.7 vs 44.9 ± 10.8; p = .289). However, BFR training resulted in a significantly elevated average perceived pain rating when compared to traditional training (6.58 ± 1.35 vs 7.18 ± 1.23; p = .011). Myoglobin was elevated in the plasma during both traditional (4.47 ± 3.31) and

BFR (4.99 $\pm$ 3.5) training when compared to baseline (2.73 $\pm$ 2.48; p for both < .05), but there was no significant difference in myoglobin between the two conditions (p = .398). IL-6 is currently being assessed.

CONCLUSIONS: Our current results indicate that blood flow restriction training results in an increase in perceived pain rating during acute bouts of resistance training. However, it does not impair muscular performance or enhance muscular damage when compared to traditional resistance training. Future studies are needed to address the mechanism behind the ability of BFR training to enhance muscular performance.

A-39   Free Communication/Poster - **Cardiovascular**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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167   Board #8   May 30 9:30 AM - 11:00 AM
The Effect Of Different Exercises On Qt Dispersion In Sedentary Women.

Guner Cicek[1], Oguzhan Celik[2]. [1]hitit university, Corum, Turkey. [2]Mugla Sitki Kocman University, Mugla, Turkey. (Sponsor: Mark D. Peterson, FACSM)
(No relevant relationships reported)

The effect of different exercises on QT dispersion in sedentary women.
Background: QT dispersion (QTd) is a marker of myocardial electrical instability, and is a clinical metric known to predict ventricular arrhythmias and sudden cardiac death. Regular exercise has been shown to decrease both QTd and risk for cardiovascular mortality in various populations; however, the extent to which exercise modalities differ with respect to QTd adaptive response is less well-understood.
PURPOSE: The purpose of this study was to investigate the effect of different exercise modalities on QTd in sedentary women**. METHODS:** A total of 26 volunteers were recruited and randomized into an aerobic exercise group (n=16; 35±2.2 years) and a resistance exercise group (n=10; 36.3±2.8 years). In both groups, exercise took place 4 days per week, for 16 weeks, and with 60 minute session. Heart rate (HR) was monitored continuously during all sessions, with the goal of maintaining an intensity of 60-70% max HR. Before and after the interventions, a standardized 12-leadsurface ECGs and blood pressure, were recorded. Pre and post intervention changes were assessed within subjects and between groups.**RESULTS:** Following the exercise interventions, there was a decrease in the body mass, body mass index (BMI), and systolic and diastolic blood pressure in both intervention groups. There were also increases in the values of RR intervals, T wave, and P wave, and decreased resting HR for the aerobic exercise group (p<0.05), but not significantly in CSG. In addition, for the aerobic exercise group, QTd decreased in from 50±15.0 to 26.2±11.4 ms, and QTc decreased in from 17.3± 5.3 to 8.3±3.7 ms (p<0.01). For the resistance exercise group, QTc decreased from 16.3±4.5 to 11.3±3.9 ms (p<0.05). **CONCLUSION:** The results of this study indicate that aerobic exercise significantly reduces the indices of ventricular repolarization dispersion among sedentary woman. While there were improvements in QTc for the resistance exercise group, QTd parameters improved to a greater extent.
Key Words: Sedentary woman, exercise, ventricular repolarization

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168   Board #9   May 30 9:30 AM - 11:00 AM
Heat Rate Variability:Meaningful Change and Reliability using a Heart Rate Sensor Chest Strap and an Android Phone Application

Nathan J. Hellyer, Sonya Blyakher, Sarah Costello, Kaitlin Wohnoutka. *Mayo Clinic College of Medicine, Rochester, MN.*
(No relevant relationships reported)

PURPOSE:Heart rate variability (HRV), or the beat-to-beat variance in heart rate, is an adjunct measure of stress and physiological fatigue. Physically active individuals and athletes may use HRV as a measure of recovery from physical exhaustion, but change in HRV naturally fluctuates and meaningful change has not been well described. Therefore, the purpose of our investigation is to investigate reliability and minimal detectable difference in HRV measurement.
METHODS:We employed a test-retest reliability design with five minute resting heart rate measurements taken one week apart in eleven male and eleven female subjects (23±1 years old; BMI 22.7±2.3 kg/m²) positioned in a supine posture. HRV was collected by a Polar H7 heart rate sensor strap with data collected by a commercially available HRV android application, HRV Elite. Artifact detection and HRV analysis was performed using ARTiiFACT software to generate the root mean square of the successive differences (RMSSD) values for each HRV measurement. Intraclass correlation coefficients (ICC) were calculated to examine reliability and a minimal detectable difference was calculated to examine change detectable beyond the limitations of error. **RESULTS**:: RMSSD means on trial one and two were 75.0

(s.d.=27.8) milliseconds and 68.3 (s.d.=28.8) milliseconds, respectively. We observed an ICC of 0.947 (95% confidence interval 0.803-0.987). We calculated the minimal detectable difference to be 18.4 milliseconds.
CONCLUSIONS:HRV measurements taken from a heart rate strap and android phone application appear reliable in young, healthy subjects at rest as indicated by a relatively high ICC. However, a daily change in RMSSD needs to be considered with respect to innate measurement error in order to reflect meaningful change, which for the Polar H7 sensor and HRV Elite application pairing appears to be slightly greater than eighteen seconds.

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169   Board #10   May 30 9:30 AM - 11:00 AM
Chronic Effects of an Elevation Training Mask on Aerobic Capacity, Anaerobic Endurance, and Pulmonary Function

Tyler Heimdal[1], Lavan Rajan[1], Justin Vickery[1], Ujalashah Dhanani[1], Joshua Harris[1], Michael Moreno[2], David Huston[3], Patrick McCulloch[1], Bradley Lambert[1]. *[1]Houston Methodist Hospital, Houston, TX. [2]Texas A&M University, Houston, TX. [3]Texas A&M Health Science Center, Houston, TX.*
(No relevant relationships reported)

Elevation training masks (ETM) have become popular in professional & recreationally active populations to enhance performance via purported adaptations associated with high elevation training (HET) and respiratory muscle training (RMT). **PURPOSE**: To compare the effect of training with (TM) to without (CON) wearing the ETM. **METHODS**: 8 healthy recreationally active adults (TM: M=2, F=2; 26.25±1.50; 25.05±1.42 kg·m²| CON: M=3, F=1; 31.5±6.95 yr; 24.92±1.83 kg·m²) were recruited & provided consent for this study. VO$_2$max and time to exhaustion (TTE) were assessed (Bruce protocol GXT, w/ & w/o ETM). Anaerobic endurance was assessed using two consecutive 300-yrd shuttle sprints (separated by 5min). Pulmonary function was assessed using a metabolic cart (FVC, MVV, FEV1). Following group assignment (TM and CON), subjects trained 3d/wk for 12 wks alternating between steady state running (Progression: 65->85% VO2max, 30->45min) and intense sprint conditioning every other session with VO$_2$max reassessment following wk 6. The TM group performed all sessions wearing the ETM at manufacturer reported simulated altitude of 9,000 ft. A (2)group x (2)time ANCOVA followed by a Tukey's post-hoc test was used to detect within group and between group differences following training. Type I error set at α=0.05. **RESULTS:**

WEDNESDAY, MAY 30, 2018

	AEROBIC CAPACITY								
	VO2max (ml/kg/min)			Unmasked Time to Exhaustion			Masked Time to Exhaustion		
GROUPS	Pre-Training	Post-Training	% Change	Pre-Training	Post-Training	% Change	Pre-Training	Post-Training	% Change
TM	37.10 ± 3.23	42.35 ± 4.08†	14.12 ± 4.93*	628 ± 46.89	694 ± 46.89†	10.51 ± 1.44	534 ± 64.2	654 ± 44.08†	24.14 ± 5.88*
CON	40.03 ± 1.3	50.00 ± 0.49†	25.32 ± 0.49†	671 ± 4.28	763 ± 17.62	13.93 ± 13.32	634 ± 28.02	704 ± 19.76†	11.50 ± 4.23

	BODY COMPOSITION			Repeat 300 Yrd Shuttle (sec)		
	% Body Fat			Pre-Training		
	Pre-Training	Post-Training	Change	Sprint 1	Sprint 2	Change
TM	33.33 ± 3.76	32.65 ± 3.85◊	-0.68 ± 0.30◊	72.23 ± 3.62	78.72 ± 6.04	6.49 ± 2.77
CON	27.48 ± 1.80	25.68 ± 1.75†	-1.80 ± 0.59	73.11 ± 2.97	77.03 ± 3.15	3.92 ± 0.93
	Lean Mass (g)			Post-Training		
	Pre-Training	Post-Training	% Change	Sprint 1	Sprint 2	Change
TM	50230.50 ± 5087.42	51011.25 ± 5454.00	1.39 ± 1.05	71.14 ± 4.66	71.79 ± 3.66†	0.66 ± 1.41
CON	51931.50 ± 3850.59	53138.00 ± 3537.24†	2.52 ± 1.03	67.62 ± 1.48†	70.32 ± 1.54†	2.70 ± 0.21*

	PULMONARY FUNCTION								
	FVC (L.)			FEV1 (L.)			MVV (L.)		
	Pre-Training	Post-Training	% Change	Pre-Training	Post-Training	% Change	Pre-Training	Post-Training	% Change
TM	4.46 ± 0.60	4.58 ± 0.56	3.11 ± 1.72	3.80 ± 0.46	3.87 ± 0.45	1.96 ± 2.48	168.00 ± 17.89	172.25 ± 19.24	2.48 ± 3.83
CON	6.04 ± 0.45	6.10 ± 0.06	1.31 ± 1.08	4.84 ± 0.38	4.78 ± 0.45	-1.53 ± 1.69	188.75 ± 16.77	200.75 ± 18.70◊	6.34 ± 3.39

Data are means ± SEM. † different from pre-training within group (p< 0.05); ◊ non-significant trend from pre-training within group (p<0.10); * non-significant trend for difference from CON group (p<0.10).

CONCLUSION: Preliminary data indicate that training w/ the ETM does not enhance either aerobic or anaerobic endurance beyond standard training and may produce adaptations that are less favorable in comparison. However, under conditions of restricted breathing (i.e. GXT performed wearing the ETM), the TM group showed greater improvement. While the ETM may not provide benefits to those whose breathing is not typically restricted, further study is required to determine if there may be adaptive benefits for those who typically perform under restricted breathing conditions. **Data collection is ongoing with final data (n=24) to be presented at the time of conference.

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170   Board #11   May 30 9:30 AM - 11:00 AM

Exercise Mode Reduces Photoplethysmography Measured Heart Rate Validity

J. Luke Pryor, Jeremy Hudson, Alexis Zazueta, Reyoot Berry, Breanna Hernandez, Scott S. Sailor. *California State University, Fresno, Fresno, CA.*
(No relevant relationships reported)

The validity of photoplethysmography-measured heart rate (PPG-HR) during exercise with varying degrees of upper extremity movement is unknown. **PURPOSE**: To assess the concurrent validity of three popular, commercially available PPG-HR monitors during exercises requiring varying amounts of upper extremity movement. **METHODS**: Twenty-one subjects (11 women and 10 men; mean±SD: age=24±4y, height=1.71±0.06m, body fat=19.4±6.5%) donned PPG-HR devices at the forearm, wrist, and ear canal and researchers applied the 12-lead electrocardiogram (ECG; criterion standard). HR data were collected during 4 minutes each of treadmill exercise, cycling, rowing, and calisthenics. Exercise intensity progressively increased each minute from 9, 12, 15, to 19 on Borg's 6-20 ratings of perceived exertion scale during each exercise mode. Calisthenics consisted of one minute of each of the following: body weight step-ups, jumping jacks, lunges, and burpees. Three minutes rest was given between exercise modes. PPG-HR and ECG devices were time synced with raw device data logged approximately every 5 seconds using a commercially available cellular application. Lin's concordance correlation coefficients (r_c) and Bland-Altman plots with 95% limits of agreement and mean bias characterized validity. **RESULTS**: Modes with less arm movement such as cycling (wrist r_c = 0.68, forearm r_c = 0.87, ear canal r_c = 0.39) and treadmill exercise (wrist r_c = 0.77, forearm r_c = 0.91, ear canal r_c = 0.42) produced relatively higher agreement with the ECG than exercise modes with greater arm movement such as rowing (wrist r_c = 0.13, forearm r_c = 0.56, ear canal r_c = 0.18) and calisthenics (wrist r_c = 0.03, forearm r_c = 0.84, ear canal r_c = 0.01). Combining all exercise modes, mean bias was low in the forearm device (-5 bpm) and high for the wrist (15 bpm), and ear canal (-38 bpm) devices. The limits of agreement (device - ECG) fell between -35 to 25, -40 to 70, and -103 to 27 bpm for the forearm, wrist, and ear canal devices, respectively. In all three devices, HR data fell outside of these limits of agreement at all exercise intensities. **CONCLUSIONS**: Variable validity of PPG-HR devices was observed across all exercise intensities. Exercise modes with greater upper extremity movement (rowing, calisthenics) further diminished PPG-HR validity.

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171   Board #12   May 30 9:30 AM - 11:00 AM

Changes in Vascular Function of Female University Students at Different Types of Walking

Peizhen Zhang[1], Xiangrong Shi, FACSM[2]. [1]*Beijing Sport University, Beijing, China.* [2]*UNT Health Science Center, Fort Worth, TX.*
(No relevant relationships reported)

PURPOSE: To reveal effect of different types of walking on vascular function of female university students at the same amount of exercise. **METHODS**: Thirty normal weight female university students (age: 20.9±1.5years) participated in the study. They were randomly divided into two groups (IW group and CW group). There were fifteen female students in each group. Each group did exercise at the intensity of 65% heart rate reserve. CW(continuous walking) group walked continuously for 30 minutes without rest. IW(intermittent walking) group had 3-minute rest between two 15-minute walking. The blood pressure, heart rate, pulse wave velocity (PWV) and ankle brachial index (ABI) were determined before exercise. After exercise above indexes were recorded every 5 minutes till 30 minutes. **RESULTS**: 30 minutes after intermittent walking, the blood pressure(SBP: 99.8±6.8 vs 104.8±7.5mmHg, DBP: 59.8±6.1 vs 65.3±9.9mmHg) and heart rate(62.1±7.6 vs 68.2±3.9bpm) of IW group decreased significantly compared with pre-exercise(P<0.05). 5 minutes(891.2±86.3 vs 1006.9±71.5cm/s) and 30 minutes (933.4±72.2 vs 1006.9±71.5cm/s) after intermittent walking, PWV of IW group declined significantly compared with pre-exercise(P<0.05). 30 minutes after continuous walking, the blood pressure(SBP: 100.8±4.8 vs 108.4±8.2mmHg, DBP: 59.6±6.1 vs 64.7±5.0mmHg) and heart rate(65.3±11.4 vs 70.3±9.7bpm) of CW group descended significantly compared with pre-exercise(P<0.05). 5 minutes and 30 minutes after continuous walking, PWV(978.1±93.8 vs 1012.5±91.5cm/s) and ABI(0.96±0.09 vs 1.04±0.08) of CW group decreased significantly compared with pre-exercise(P<0.05). 5 minutes after exercise, the SBP(109.0±7.9 vs 116.8±6.1mmHg) and DBP(61.2±6.2 vs 63.4±5.7mmHg) of CW group were significantly lower than those of IW group. **CONCLUSIONS**: Both intermittent walking and continuous walking do good to lower blood pressure and heart rate, ameliorate arterial stiffness and improve vascular elasticity of female university students. Continuous walking has better effect on improvement of blood pressure and ankle brachial index compared with intermittent walking, which contribute to reduce risk of lower extremity arterial stenosis. All those improvement are beneficial to prevent cardiovascular disease in early life.

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172   Board #13   May 30 9:30 AM - 11:00 AM

Comparing the Effects of Yoga and Meditative Relaxation on Blood Pressure Among College Age Students

Stephanie M. Otto, Riley Viner, Nathanael R. Otto, Mitchell Feske. *Gustavus Adolphus College, St. Peter, MN.*
(No relevant relationships reported)

Blood pressure (BP) is an important ACSM risk factor when assessing cardiovascular health. Yoga practice addresses both movement related benefits for BP and also benefits related to an activation of the parasympathetic nervous system through the use of breath and meditation. Meditative relaxation emphasizes parasympathetic nervous system activation but does not include the movement component. **PURPOSE:** The purpose of this study was to compare the effects of yoga and meditative relaxation on BP among college students. **METHODS:** Sixty-seven men and women with an average age of 19.88 (±1.75) years participated. Participants were enrolled in a 13-week yoga (n = 35), meditative relaxation (n = 18), or a control group course (n = 14). BP was measured at the beginning and end of the 13-week semester. Participants were grouped based on hypertension classification. The ACSM hypertension guidelines were used to place participants in either a high or low hypertension group. A two-way ANOVA analysis ($p < .05$) was used to determine group differences by hypertension class on change in systolic and diastolic BP. **RESULTS:** Forty-four participants were placed in the low hypertension group (systolic below 140mmHg and diastolic below 90mmHg) and 23 participants were placed in the high hypertension group (systolic at or above 140 mmHg and/or diastolic at or above 90mmHg). Among the participants in the high hypertension group, independent sample t-test showed a significant drop in both systolic, $t(65) = 4.62$, $p = .00$, and diastolic, $t(65) = 2.78$, $p = .00$, BP across both

exercise groups and the control group. Furthermore, a significant interaction between hypertension class and group was found for diastolic BP, $F (2, 2,537) = 3.59$, $p = .034$ but not for systolic BP. When the data was analyzed separately by hypertension class, a one-way ANOVA no longer showed significant group differences among either hypertension class. **CONCLUSION:** Among this sample, high hypertensive participants significantly decreased both systolic and diastolic BP by the end of a 13-week academic semester. However, there was no significant difference in BP change between yoga, meditative relaxation, and the control group. Continued research is needed to uncover potential benefits for students engaging in movement and meditation courses over the course of an academic semester.

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173   Board #14   May 30 9:30 AM - 11:00 AM

Physical Activity or Body Composition for Heart Health & Heart Rate Variability

Karen K. Dennis, Alex M. Wolfe, Samantha Ward. *Illinois State University, Normal, IL.* (Sponsor: Dale D. Brown, FACSM)

(No relevant relationships reported)

Previous research has established a relationship between physical activity (PA), sleep efficiency (S%) and heart rate variability (HRV). Our previous studies (Wolfe and Dennis, 2016) have further established this relationship, with significant findings when separating PA by intensity (Dennis and Wolfe, 2016). **Purpose:** The purpose of the current study was to further investigate the relationship between PA and HRV. Specifically the primary aim of the study was to investigate the difference between BMI, PA and HRV. **Methods:** Nineteen subjects (20 ± 1 yr.) from a Division I University volunteered for the study. All subjects voluntarily signed an informed consent and completed anthropometric measures including height, weight and BMI. Subjects were then fitted with a BodyMedia SenseWear Armband to assess PA and sleep efficiency for the duration of one week (7days). Upon returning the device, each subject had HRV assessed (CardioSoft software), utilizing a 12-lead EKG by assessing standard deviation of the mean R-R intervals (SDANN). Subjects were classified as "Normal" or "Overweight" according to their BMI and t-tests were utilized to compare the two groups. **Results:** Our results show that the "Overweight" category (mean BMI = 26.6 kg/m²) had fewer steps (79, 060) when compared to the "Normal" BMI category (mean BMI = 21.6 kg/m², steps 81,212). Our results also show that the "Overweight" category had a lower HRV score when compared to the "Normal" category. However, the results of the t-tests showed no statistical difference ($p < .05$) between the two groups. **Conclusion:** While there was no statistically significant relationship between BMI and HRV, based on the results of the current study and by previous results (Wolfe & Dennis, 2016; Dennis & Wolfe, 2016) PA and PA intensity appear to have a larger impact on HRV rather than weight status. In terms of improving health, increasing PA should be the focus of college aged adults rather than reducing weight status.

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174   Board #15   May 30 9:30 AM - 11:00 AM

The Impact of Ballet and Modern Dance Performance on Cardiac Autonomic Function in Collegiate Dancers

Rohan C. Edmonds[1], Meaghan C. Wood[2], Patricia Fehling, FACSM[2], Sarah DiPasquale[2]. *[1]Creighton University, Omaha, NE. [2]Skidmore College, Saratoga Springs, NY.* (Sponsor: Patricia Fehling, FACSM)

(No relevant relationships reported)

Heart rate (HR) variability (HRV) is a useful tool for assessing cardiac autonomic function and identifying potential training maladaptation in athletic populations, but has yet to be investigated in ballet or modern dance populations. As such, HRV may be able to provide valuable insight into the preparedness of dancers and the demands of performance in a collegiate dance population.
PURPOSE: The purpose of the study was to examine acute fluctuations in cardiac autonomic function in a cohort of collegiate dancers over an intensive modern and ballet concert weekend.
METHODS: Female collegiate dancers (n=29, age=20.0+1.1 years) were monitored leading up to and following a dance performance. Along with HR, analysis of HRV focused on the square root of the mean squared differences of the successive RR intervals (RMSSD). Magnitude based inferences (MBI) with effect sizes (ES) were used to identify the practical significance of changes during the Winter Dance Concert. The Recovery-Stress Questionnaire for Athletes (RESTQ-Sport) measured the frequency of stress of dancers.
RESULTS: Mean HR was likely higher at the first (76.5±2.1bpm, 92/8/0, ES=0.35) and second (75.6±1.8bpm, 94/6/0, ES=0.33) pre-show recordings compared to baseline (69.8±1.7bpm). In contrast, RMSSD was most likely lower at the first (0/0/100, ES=-0.61) and second (0/0/100, ES=-0.58) pre-show recordings compared to baseline. Both HR and RMSSD returned to baseline values at the post-show recording. Additionally, as per the RESTQ-Sport dancers reported feeling increasingly stressed and lacking energy going into the performances, as well as significantly higher feelings of fatigue after the weekend of performances when compared to baseline values.
CONCLUSIONS: Dancers responded to concert performances in a comparable manner to other athletic populations approaching intense competition, exhibiting

decreased parasympathetic activity, while returning to baseline values within 24 hours of their performance. This is indicative of ideal preparation and recovery from the weekend dance performances.

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175   Board #16   May 30 9:30 AM - 11:00 AM

Daily HRV Monitoring During Resistance Training Program in a Collegiate Athlete

Clifton J. Holmes, Michael R. Esco, FACSM. *University of Alabama, Tuscaloosa, AL.*

(No relevant relationships reported)

PURPOSE: Examine the relationship between total work (TW) and HRV in a collegiate athlete during an 18-week resistance training program.
METHODS: The program consisted of three 60-90 minute full-body exercise sessions per week with at least 24-hours of rest between each session. Daily 55-sec HRV measurements were taken immediately after waking using the ithlete™ smartphone application and the pulse-wave finger sensor. TW was a combination of total volume (TV) and total load (TL). TV was calculated from sets multiplied by reps of all exercises and TL was the sum of weight lifted in all exercises. HRV was separated into the weekly mean (HRV_M) and the coefficient of variation (HRV_{CV}).
RESULTS: No statistically significant correlations were found between HRV_M and TW, TL, or TV ($r = -.002$, $p = .993$; $r = -.273$, $p = .273$; $r = 0.39$, $p = .879$) but statistically significant correlations were found between HRV_{CV} and TW, TL, and TV ($r = .525$, $p = .030$; $r = -.559$, $p = 0.020$; $r = .705$, $p = .002$, respectively). A step-wise regression showed non-significant partial correlations for TW (-.232, $p = .388$) and TL (-.323, $p = -.232$).
CONCLUSIONS: No statistically significant correlations were found with HRV_M. However, statistically significant correlations were found between HRV_{CV} and TW, TL, and TV, with TV being the most important determinant. This study demonstrates that as intensity of resistance training increases or decreases from session to session through the manipulation of volume and load, HRV_{CV} increases or decreases proportionally, directly or inversely.

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176   Board #17   May 30 9:30 AM - 11:00 AM

Heart Rate Variability in Marathon Runners During Steady State Exercise and a Graded Exercise Test

Christopher J. Lundstrom, Timothy J. Houghton, Kelsey Sutter, George R. Biltz. *University of Minnesota, Minneapolis, MN.* (Sponsor: Dr. Eric Snyder, FACSM)

(No relevant relationships reported)

Heart rate variability (HRV) analysis offers insight into health status, where greater HRV is associated with better cardiovascular function. Unlike most HRV techniques, which require stationarity of data (e.g., rest), detrended fluctuation analysis (DFA) does not. However, DFA may require a larger data set for reliable results. DFA captures both short- (DFAα1) and long-term fluctuations (DFAα2). A reliable technique to measure HRV using a brief, submaximal exercise session could serve as a simple method of assessing health and adaptability. **PURPOSE:** To compare HRV using DFA during a 3-min steady state (SS) run versus a longer graded exercise test (GXT). **METHODS:** Forty recreational runners (21.1 ± 1.6 years, 27f) completed a 2-mile (3.218-km) time trial (TT) prior to, and after 18 weeks of training for a 42.2-km marathon. Subjects performed a SS run at 75% of TT velocity for 6 min followed by an incremental GXT. Paired samples t tests were used to compare pre- and post-DFA measures, TT, and VO2max, and to compare DFA scores for the final 3 min of SS with the full GXT. Delta scores were calculated for all variables. Correlations between the changes were assessed using Pearson's r. **RESULTS:** When comparing SS and GXT, post-DFAα1 and α2 and pre-DFAα1 were different. ($p \le 0.001$). During SS, DFAα1 decreased from pre- to post-testing (0.947 ± 0.248, 0.835 ± 0.261; $p \le 0.018$) whereas DFAα2 did not change: (1.224 ± 0.188, 1.291 ± 0.207; p = 0.150). For the full GXT, neither DFAα1 or DFAα2 changed with training. Subjects improved in TT (15.5 ± 2.0, 14.3 ± 1.6; $p \le 0.001$) and VO2max (50.4 ± 7.2, 52.7 ± 7.0; p = 0.002). DFA scores for SS and GXT were significantly correlated (r = 0.59 to 0.70, $p \le 0.001$) with the exception of the DFAα2 post-test (r = 0.25, p = 0.122). The changes from pre- to post-test during SS and GXT were correlated (DFAα1: r = 0.60, $p \le 0.001$; DFAα2: r = 0.32, p = 0.044). **CONCLUSION:** DFAα1 during SS decreased with training, indicating increased short-term HRV. While SS and GXT yielded different DFA scores, the correlations between the scores during SS and GXT and the correlations between the changes suggest that the SS data captures information related to the larger data set. Further research is needed to determine whether the differences between SS and GXT scores are due to the smaller data set or the higher exercise intensity during GXT.

177   Board #18   May 30 9:30 AM - 11:00 AM

Leukocyte and Lactate Responses to Different Modes of Exercise at the Same Target Heart Rate

Pearl Law, Fadia Haddad, Frank P. Zaldivar, Annamarie Stehli, Sebastian Piombo, Shlomit Radom-Aizik. *UC Irvine, Irvine, CA.* (Sponsor: Barket Falk, FACSM)
(No relevant relationships reported)

Heart Rate (HR) is widely used for exercise intensity prescriptions and/or studies of exercise training. It is often assumed that exercising at a given HR results in similar metabolic stress, regardless of the mode of exercise. **PURPOSE:** To gauge the leukocyte and lactate responses following a submaximal exercise at an equivalent target HR on cycle ergometer (CE) and treadmill (TM). **METHODS:** Six healthy male adults (25.4 ± 3.2 y.o) completed 4 laboratory visits. Participants performed a progressive exercise test to exhaustion on CE and TM. On subsequent separate days, in a randomized order, participants performed a 30-min constant exercise challenge at 70% HR reserve (HRR) on CE or TM. Borg's Rating of Perceived Exertion (RPE) was recorded every 5 min. Blood was drawn before and immediately after the 30-min exercise. Paired t-test was used to evaluate within-person differences (before/after exercise) & between modes. Due to the small sample size, effect sizes were also calculated. **RESULTS:** We successfully "clamped" HR during the exercise in CE and TM (CE, 154.8 ± 0.7; TM 156.8 ± 0.8 bpm). During the first 10 minutes, all participants perceived the CE challenge as more strenuous compared to the TM (RPE; 13.9 ± 0.1 vs. 11.3 ± 0.4), with no significant difference between modes during the last 10-min (11.7 ± 0.5 vs. 12.5 ± 0.0). Immediately following the exercise, lactate was greater in CE (5.9 ± 1.4 mmol/L) vs. TM (3.1 ± 1.3, p =.032). Leukocytes were significantly elevated (p<.003) immediately after exercise for both CE and TM, with no difference between exercise modes (monocytes; CE 53.3 %, TM 62.5%, granulocytes; CE 33.5%, TM 42.7%, lymphocytes; CE 118.7%, TM 76.9%). However, a moderate effect size (d= .486) was seen for lymphocytes, with a greater increase in CE. **CONCLUSION:** Lactate response was lower on TM while leukocyte response was generally similar. The smaller lactate increase on TM may reflect lower reliance on anaerobic metabolism when using a larger muscle mass and/or greater lactate clearance by upper body muscles. The similar leukocyte response may reflect the fact that in both modes metabolic stress was moderate. HR is not sufficient in and of itself to fully assess the metabolic stress associated with a given mode of exercise. Supported by NIH P01HD-048721 & PERC Systems Biology Fund

178   Board #19   May 30 9:30 AM - 11:00 AM

Effects of Off-Season Training on In-Season Training Load and Time Spent in Heart Rate Zones

Jason A. Melnyk, Kimberly Kostelis. *Central Connecticut State University, New Britain, CT.* (Sponsor: Sean Walsh, FACSM)
(No relevant relationships reported)

Maximizing training in and out of season is essential for player development in college soccer. Maintaining and improving aerobic performance has been shown to be successful using high-intensity interval training (HIIT) and vigorous endurance exercise (END). Utilizing HIIT can be as much as half the time commitment, which among Division III who have limited contact time, becomes crucial for success of programs. **PURPOSE**: To compare the effects of two off season endurance-training protocols on Training Load (TL), as well as time spent in Heart Rate Zone (HRZ) during in season training. **METHODS**: During off seasons, players (N=19) were randomly assigned to either HIIT or END. The HIIT group performed five maximal 30-sec sprints with 4.5 minutes of recovery, twice per week, and the END group completed a 40-min run at 80% heart-rate reserve twice weekly. VO_{2max} was estimated pre vs post of the 5 week training intervention. Once athletes were in season, data was collected using Polar Team2 system for 6 sessions. TL and time in each of the 5 HRZs were recorded from 50% to 100% HR_{max}, in 10% increments. **RESULTS:** During off season, both groups significantly improved their VO_{2max} estimated by the Beep test; however, there was no significance between groups. When examining TL and HRZ during in season training, there were also no significant differences (p>0.05) among groups. Nevertheless, average TL for athletes in the HIIT group (190.27±41.92) was higher than athletes in the END group (180.29±60.70). Additionally, when examining HRZ, athletes in the HIIT group spent a larger percentage of time (39.70%) in 80% HRZ or higher as compared to the END group (35.72%). **CONCLUSIONS**: Soccer players may improve aerobic performance irrespective of training method thus saving significant time during self-directed off season training among Division III athletes . In-season analysis indicated neither training type impacted TL; however, the HIIT group spent on average an hour more in the 80-100% HRZ.

179   Board #20   May 30 9:30 AM - 11:00 AM

Resistive-based Walking Training For Individuals With Poststroke Hemiparesis

Christopher P. Hurt, Marcas M. Bamman, FACSM, Tara Pearce, Sarah dos Anjos, Jutaluk Kongsuk, David A. Brown. *University of Alabama at Birmingham, Birmingham, AL.* (Sponsor: Marcas M Bamman, FACSM)
(No relevant relationships reported)

Individuals poststroke exhibit reduced walking economy compared to age-matched nonimpaired individuals. Typical aerobic training-based walking programs may not improve economy.
PURPOSE:
This abstract describes the feasibility of applying backward directed resistive forces to individuals poststroke walking at their comfortable speed, at a vigorous level of aerobic intensity, within a novel treadmill environment.
METHODS:
We are reporting on two participants (49±9 yrs, >6 months post CVA) who have completed the resistive walk training within this ongoing pilot RCT (NCT03174392). Individuals visited the lab 3 days a week for 8 weeks and accumulated 30 minutes of walking per training session. The training bouts were broken up into 5-minute increments, if needed, and resistive force was added until a training intensity of at least 60% heart rate reserve was achieved. Resistive forces were provided by a novel exercise training device that delivered a constant backward-directed pulling force at the level of the center of mass. Participants did not use handrails while training, however they wore a safety harness to ensure safety. Comfortable walk speed, 6-minute walk, and the Functional Gait Assessment (FGA) were completed along with net gait economy, pre-and post-training. Average standing VO_2 consumption was subtracted from the final three minutes of a six-minute walking trial at the same speed pre- and post-assessment.
RESULTS:
One individual began walking against a constant 19 N resistive force and progressed to 57N. Walking economy improved 11.5% with a marginal change in walking speed, however this individual increased their 6-minute walk distance 10% while improving their FGA score by 33%. The other individual progressed from 33 N to 85 N of continuous force. A 37% increase in economy occurred upon completion of the training with marginal changes in comfortable walking speed and a 34% improvement in 6-minute walk distance along with an 11% increase in FGA.
CONCLUSION:
This preliminary data suggests that using horizontal resistive forces to generate an aerobic level of training during walking is a feasible approach to exercise training of individuals poststroke and may result in improved gait economy, balance, ability to sustain higher work at their comfortable speed, and endurance.

180   Board #21   May 30 9:30 AM - 11:00 AM

Cardiovascular Risk Markers in Firefighters: A Longitudinal Study

Steven Martin, Rachel Atchison, Kory Sealy, Kalen Johnson, Alison McGuire, Jason Lytle, John Green, FACSM, Stephen Crouse, FACSM. *Texas A&M University, College Station, TX.* (Sponsor: Stephen F. Crouse, FACSM)
(No relevant relationships reported)

Purpose: To investigate changes in certain cardiovascular risk markers over an eight year period for a group of firefighters (n =52). Subjects were full time firefighters employed by a moderate-to-large municipality. **Methods:** As part of an annual physical exam, firefighters underwent evaluation of several cardiovascular risk factors including body weight, a graded exercise test (GXT; Bruce protocol), body composition (through DEXA), and fasting bloodwork. Maximal oxygen uptake (VO2max) was estimated using the Foster equation and functional aerobic impairment (FAI) was computed using both age predicted norms and the Foster equation estimation of VO2max. Resting systolic blood pressure (RSBP) and resting diastolic blood pressure (RDBP) were measured before the start of the GXT protocol. Blood analysis was performed by a College of American Pathologists-accredited laboratory. All blood samples were analyzed for total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and glucose (GLU). **Results**: A repeated measures analysis of variance was used to analyze the data. Significant negative changes across the eight-year assessment period occurred in all dependent variables measured. **Conclusion**: In general, these data suggest a negative trend in certain cardiovascular risk markers for a group of local firefighters over time. These findings support the need for required health and fitness programs for firefighting personnel.

A-40   Free Communication/Poster - **Cycling**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

WEDNESDAY, MAY 30, 2018

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181   Board #22   May 30 9:30 AM - 11:00 AM

Training Impulses And The Relation With Performance Improvement: Not That Straightforward

Kobe M. Vermeire, Gilles Vandewiele, Jan Bourgois, Jan Boone. *Ghent University, Ghent, Belgium.*
(No relevant relationships reported)

Purpose: To assess the relation between training load and performance improvement in a homogeneous group with a differentiated training programme.
Methods: Training data from 11 recreational cyclists (aged 38.5 ± 5.9 yr) were collected during a 12-week training period. Before and after the training period, subjects underwent a laboratory incremental exercise test with lactate measurements. Baseline metrics were the aerobic lactate threshold (ALT), the anaerobic lactate threshold (ANLT) and the maximum power output (MPO). Internal training load was calculated using individualized TRIMP (iTRIMP), Lucia TRIMP (LuTRIMP), Banister TRIMP (bTRIMP) and Edwards TRIMP (eTRIMP). The distribution of training load was calculated as the time in zone 1 (Z1), zone 2 (Z2) and zone 3 (Z3), being the zone below the ALT, between ALT and ANLT and the zone above ANLT respectively.
Results: 353 training sessions were analysed. All metrics improved ($p < 0.01$) from baseline to posttest (ALT from 161.4 W $\pm$ 20.8 to 179.4 W $\pm$ 25.6; ANLT from 221.6 W $\pm$ 25.8 to 240.4 W $\pm$ 25.0 and MPO from 273.5 W $\pm$ 23.7 to 290.9 W $\pm$ 26.0) All TRIMP calculations correlated very highly with one another (r= $0.88 - 0.99$, $p <$ 0.01). No significant correlations ($p < 0.05$) were found between the mean weekly TRIMP, for every calculated method, and the improvement in fitness variables. When looking at the distribution of training time, total minutes in Z2 correlated largely with the progression in the ANLT ($r = -0.63$, $p = 0.02$). The percentage of time trained in Z1 correlated with progress in MPO ($r = 0.58$, $p = 0.03$), percentage in Z2 correlated negatively with MPO ($r = -0.74$, $p < 0.01$) and percentage in Z3 shows a relation with the progress in ANLT ($r = 0.56$, $p = 0.04$). When combining the percentage and total time in each of the training zones in a regression analysis, there is a stronger relation with the improvement in ALT ($r = 0.29$), in ANLT($r = 0.74$) and MPO ($r = 0.81$).
Conclusion: Directly relating training impulses with training progression should be done with caution. Distribution of training time over the intensity zones should always be accounted for. It is improbable that one metric could directly relate to the overall progression of an athlete.

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182   Board #23   May 30 9:30 AM - 11:00 AM

Indoor Cycling Energy Expenditure: Does Sequence Matter?

Cristina Cortis[1], Carl Foster, FACSM[2], Mich Cook[2], Scott T. Doberstein[2], Cordial Gillette[2], John P. Porcari, FACSM[2]. *[1]University of Cassino and Lazio Meridionale, Cassino, Italy. [2]University of Wisconsin-La Crosse, La Crosse, WI.*
(No relevant relationships reported)

Although during cycling class intensity is modified by changing interval intensity sequencing, it has not been established whether intensity order can alter physiological and perceptual responses within a workout. **PURPOSE:** To determine the effects of interval intensity sequencing on energy expenditure, physiological markers, and perceptual responses during indoor cycling. **METHODS:** 10 males (20.0 ± 0.8 yr) and 8 females (21.3 ± 2.7 yr) completed four cycle ergometer sessions. They performed 3 randomly ordered interval bouts (random intervals-RI, ascending intervals-AI, and descending intervals-DI) including three 3-minute work bouts at workloads corresponding to 50%, 75%, and 100% of peak power output (PPO) and three 3-minute recovery periods at 25% PPO. Heart rate (HR) and oxygen consumption (VO_2) were measured and expressed as percentages of maximal HR (%HRmax) and VO_2 (%VO_2max). Energy expenditure was considered for both the work bout (EE) and for the 5-minute recovery period (EE Rec). Session RPE (sRPE) and Exercise Enjoyment Scale (EES) were recorded. **RESULTS:** No significant differences were found for %HRmax (RI: 73.3 ± 6.1%; AI: 72.1 ± 4.9%; DI: 71.8 ± 4.5%), %VO_2max (RI: 51.8 ± 4.6%; AI: 51.4 ± 3.9%; DI: 51.3 ± 4.5%), EE (RI: 277.5 ± 39.9; AI: 275.8 ± 39.4; DI: 274.9 ± 42.1 kcal), EES (RI: 4.9 ± 1.0; AI: 5.3 ± 1.1; DI: 4.9 ± 0.9), and sRPE (RI: 4.9 ± 1.0; AI: 5.3 ± 1.1; DI: 4.9 ± 0.9). EE Rec was significantly ($p<0.005$) lower after DI (11.9 ± 3.2 kcal) with respect to RI (13.2 ± 2.5 kcal) and AI (13.3 ± 2.5 kcal). **CONCLUSIONS:** Although lower EE are observed during the recovery period in DI, interval intensity sequencing does not effect overall energy expenditure, physiological markers, and perceptual responses during cycling. This suggests that group cycling instructors can vary workout structure to promote adherence and maintain enjoyability, while achieving the same EE.

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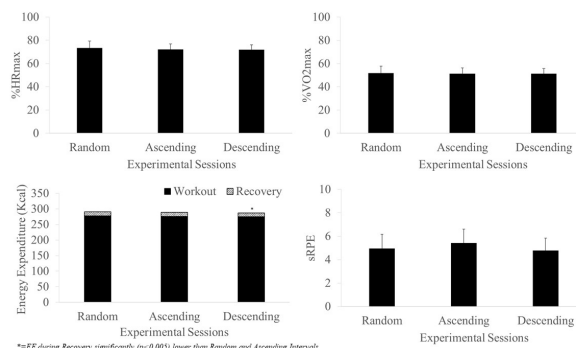
*=EE during Recovery significantly (p<0.005) lower than Random and Ascending Intervals

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183   Board #24   May 30 9:30 AM - 11:00 AM

Comparison of Three Lactate Threshold Determination Methods in Trained Cyclists and in Non-Cyclists

Lisa Ferguson-Stegall[1], Rachael Nelson[1], Mallory Wirth[1], Anthony Wolfe[2]. *[1]Hamline University, Saint Paul, MN. [2]University of Texas at Austin, Austin, TX.* (Sponsor: Hirofumi Tanaka, FACSM)
(No relevant relationships reported)

While lactate threshold (LT) is a common laboratory test and is often used to design training plans and monitor fitness changes, there is no consensus as to which determination method should be used. Three of the most common are the break point (BREAK), 1 mmol.L^{-1} over baseline (+1 mmol), and reaching 4 mmol.L^{-1} (onset of blood lactate accumulation, OBLA). Currently, it is not clear if different determination methods could yield varying results in different populations. **PURPOSE:** We compared 3 most commonly used LT methods in trained cyclists and in athletes (soccer players) who were not accustomed to cycling exercise. We hypothesized that the BREAK and +1 mmol methods would yield similar results in both populations. **METHODS:** LT data were analyzed from 41 athletes [18 trained cyclists (15 males [m], 3 females [f]) and 23 female soccer players]. Tests were performed on a cycle ergometer using 5 min stages starting at 70 W (m)/50 W (f). Work rates were increased by 25 W (m)/15 W (f) for the first 3-4 stages, and by 15 W (m)/10 W (f) for the last 2-3 stages. Blood samples were obtained in the last min of each stage, and blood lactate was analyzed using a Lactate Plus device. For determinations of LT, 3 trained investigators independently analyzed the plots. **RESULTS**: In cyclists, LTs using BREAK and +1 mmol (247 ± 48 W vs. 250 ± 50 W, $p=0.52$) were not different but were significantly lower than that obtained with OBLA (270 ± 54 W). Correlational analyses indicate that LT using BREAK and +1 mmol were strongly related (R=0.99). Associations were strong between +1 mmol and OBLA (R=0.96) and between BREAK and OBLA (R=0.96). In non-cyclists, LTs obtained with all 3 methods were significantly different (BREAK: 125 ± 13 W; +1 mmol: 130 ± 11 W; OBLA, 134 ± 13 W; all $p<0.04$), although BREAK and +1 mmol were strongly associated (R=0.98). The associations between different LT methods were much weaker in non-cyclists (1 mmol and OBLA: R=0.90; BREAK and OBLA: R=0.85) compared with cyclists. **CONCLUSIONS**: Break point and +1 mmol.L^{-1} methods yield comparable results in trained cyclists but not in non-cyclists. Caution should be used when interpreting LT results obtained from different determination methods.

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184   Board #25   May 30 9:30 AM - 11:00 AM

Assessing The Ability Of The Wattbike Cycle Ergometer To Predict Maximal Oxygen Consumption

Nicholas J. Hanson[1], Erin E. Kishman[1], Kyle D. DeRosia[1], Sarah C. Martinez[1], Sangwoo Lee[1], Cory M. Scheadler[2], Michael G. Miller[1]. *[1]Western Michigan University, Kalamazoo, MI. [2]Northern Kentucky University, Highland Heights, KY.*
(No relevant relationships reported)

The Wattbike is an electromagnetically and air-braked cycle ergometer that has been used for talent identification and elite development by British Cycling. It is paired with advanced software that includes a 3-min aerobic test meant to provide maximum minute power (MMP) and predict maximal oxygen consumption (VO_2peak). **PURPOSE**: To investigate the accuracy of the prediction by the Wattbike, and to determine the ability of the 3-min test to elicit a true VO_2peak. **METHODS**: This study included 13 cyclists (3 women, 10 men) with varying degrees of experience, a mean$\pm$SD age of 29.2 ± 10.0 years, height of 178.7 ± 8.3 cm, and mass of 75.1 ± 12.5 kg. At the first lab visit, a 10-min self-paced VO_2peak test (SPV) was performed. For the second visit, they were asked to complete a warm-up followed by the 3-min

test. The goal of the 3-min test, as stated in the manufacturer's instructional video, is to maintain as high of a power output as possible for three full minutes without a drop in performance. Subjects were shown the video, so that they were fully aware of the protocol and requirements. They were free to alter pedal cadence and resistance throughout the test. A metabolic cart was used to collect expired gases. 15-breath moving averages were calculated and the maximal value for each variable was used for analysis [VO_2, respiratory exchange ratio (RER) and ventilation (V_E)]. A one-way repeated-measures ANOVA was used to compare the VO_2peak (in ml·kg^{-1}·min^{-1}) given by the Wattbike to the values provided by the metabolic cart for the SPV and the 3-min test. Dependent t-tests were used to compare the heart rate (HR), V_E and RER between the two tests. To determine if the tests were truly maximal, the following criteria were used: HR within 10 bpm of apHR_{max} or RER of $\geq$1.10. **RESULTS**: There was no difference (p=.367) between the Wattbike-predicted VO_2peak (54.3±9.3) and the values provided by the metabolic cart during either test (3-min: 52.5±8.7, SPV: 54.0±9.7). There was a higher HR and lower RER in the SPV compared to the 3-min test (184.7±10.6 vs 180.9±6.3 bpm; p=.027 and 1.19±.06 vs. 1.29±.10; p=.001). There was no difference in V_E between tests (p=.474). The MMP for the 3-min test was 323.8±71.7 W. **CONCLUSIONS**: These results show that the Wattbike 3-min test elicited a VO_2peak value similar to that of the SPV, and it was able to successfully predict VO_2peak.

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185   Board #26   May 30 9:30 AM - 11:00 AM
Validity and Reliability of the Lode Excalibur Sport Cycle Ergometer for the Wingate Anaerobic Test

William R. Lunn. *Southern Connecticut State University, New Haven, CT.* (Sponsor: Robert Axtell, FACSM)
(No relevant relationships reported)

The Wingate Anaerobic Test (WanT) has been used extensively for decades for lower-exremity anaerobic power determination in various populations. While multiple devices are advertised with WAnT capability, reliability and validity data are less available. **PURPOSE:** To determine if the Lode Excalibur Sport cycle ergometer (Groningen, Netherlands) is a reliable and valid instrument to conduct the 30-s WAnT compared to the Monark 894e Peak Bike (Vansbro, Sweden). **METHODS:** Recreationally active men with no history of cardiovascular disease or exercise impairment (n=33; 20.5 ± 2.6 y; 1.8 ± 0.1 m; 79.8 ± 10.2 kg) were recruited. Following familiarization to the WAnT, participants completed four (4) 30-s WAnTs within 2 weeks: two on the Lode (torque factor of 0.7) and two on the Monark (resistance = 0.075 kg·kg body mass^{-1}). Time of day, pre-test nutrition, and geometric fit on the cycle were duplicated for each test. Peak power (PP), mean power (MP), minimum power (MinP), and fatigue index (FI) were measured. Pearson's correlation coefficients, inter-day correlation coefficients (ICC), and one-way MANOVA were used to determine reliability and validity. Error rate was set at $p<0.05$. **RESULTS:** Reliability by ICC with 95% CI for Monark and Lode, respectively, was excellent to good for PP (0.96 (0.93-0.98), 0.91 (0.81-0.95)); MP (0.99 (0.98-0.99), 0.95 (0.91-0.98)); MinP (0.89 (0.78-0.95), 0.91 (0.81-0.95)); and moderate to excellent for FI (0.84 (0.67-0.92), 0.78 (0.52-0.89)). Correlation was strong for PP ($r = 0.87$; $p<0.001$), MP ($r = 0.90$; $p<0.001$), MinP ($r = 0.78$; $p<0.001$), and moderate for FI ($r = 0.59$; $p = 0.001$). However, Lode PP and FI were significantly less than Monark (10.7 ± 1.0 vs. 12.4 ± 1.9 W·kg^{-1}, respectively; $F(1,64) = 21.1$, $p<0.001$) and 41.7 ± 1.6 vs. 62.1 ± 1.6 %, respectively; $F(1,64) = 85.1$, $p<0.001$). Lode MinP was significantly greater than Monark (6.2 ± 1.2 vs. 4.6 ± 0.8 W·kg^{-1}, respectively; $F(1,64) = 39.5$, $p<0.001$). There was no significant difference in MP between ergometers. **CONCLUSION:** The Lode Excalibur Sport cycle ergometer reliably provides common WAnT outcomes and correlates well to the Monark 894e Peak Bike. However, the difference in absolute values for PP, MinP, and FI between instruments prevent the use of the Lode ergometer for comparison of WAnT data to normative data generated by the Monark cycle.

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186   Board #27   May 30 9:30 AM - 11:00 AM
Evaluation of Asymmetry in Power Production During Cycling

John W. Farrell III, Daniel Blackwood, Brian Pribble, Rebecca Larson. *University of Oklahoma, Norman, OK.*
(No relevant relationships reported)

Levels of asymmetry have been previously reported during cycling for both force and crank torque. However, these measurements are not currently being used as performance indicators in cycling, leading to a need for the evaluation of asymmetry in power production. **Purpose:** Therefore, the purpose of the current study was to evaluate the presence of asymmetry in power production during cycling. The effects of exercise intensity and cadence selection on asymmetry were also evaluated. **Methods:** 21 subjects, ages 18-45, participated in the study. Subjects were assigned to either a Cycling Experience (CE, n=9) or No Cycling Experience (NCE, n=12) group. All subjects performed three graded exercise test (GXT) using a cycle ergometer on three separate visits at three different cadence zones. Cadence zones consisted of: Self Selected (SS), High (100 to 115 rpm), and Low (55 to 70 rpm). Subjects performed the first GXT at the SS cadence while the cadence for the second and

third was randomly selected. Power output for each lower limb was assessed using a dual power meter. Power output asymmetry was calculated as the absolute difference between limbs at the initial stage (IS), the stage in which the onset of blood lactate accumulation (OBLA) occurred, and at the stage in which peak power output (PPO) occurred. Two way repeated measures ANOVA was used to determine if significant differences existed between groups and conditions. **Results:** Significant group by condition interactions were present. There were no significant differences between cadence selection at IS, OBLA, or PPO (P>0.05). However, significant differences were observed between groups at IS (CE 8.70±15.1 vs. NCE 2.87±2.62), OBLA (CE 9.73±14.3 vs NCE 4.31±3.20), and PPO (CE 12.21±14.4 vs. NCE 5.48±3.57). **Conclusion:** Cadence selection was not significantly related to the level of asymmetry for power output during cycling, but significant differences did exist between the groups for power asymmetry. Cycling performance is closely related to the ability to produce higher power outputs in an efficient manner, so levels of asymmetry in power production could lead to performance decrements. Further research is needed to understand this relationship as well as potential training interventions to reduce levels of asymmetry observed during cycling.

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187   Board #28   May 30 9:30 AM - 11:00 AM
Posture Influence on Recovery Intervals in Sprint Cycling

Deanna Emnott, Lorrie Brilla, FACSM, Harsh Buddhadev, Wren McLaughlin. *Western Washington University, Bellingham, WA.* (Sponsor: Lorrie Brilla, FACSM)
(No relevant relationships reported)

There is a paucity of research on how trunk posture affects recovery during a race or practice immediately between cycling sprints, although there is speculation that posture may influence recovery. This study included 13 competitive male cyclists, with an average of nearly 10 competitions in the past year. Participants completed two 30-s maximal effort sprints on a cycle ergometer followed by two 4-min active recovery intervals at 75 W and the same cadence for each session. Participants assumed one of two trunk posture conditions during the recovery intervals on two separate days. They were randomly assigned to either a flexed thoracic spine position greater than 14° (FC) or a neutral thoracic spine position (NC) on the first testing day and completed the other no less than 48 hours later. Recorded variables included heart rate recovery (HRR), tidal volume (V_T), carbon dioxide output (VCO_2), change in sprint mean power (ΔMP), and change in sprint fatigue index (ΔFI). There were no significant differences between conditions in any of the variables ($p>0.05$). Results of FC versus NC for each variable were: HRR 23.5±0.4 vs. 21.3±5.0 bpm; V_T 3.00±0.51 vs. 3.19±0.54 L; VCO_2 3.28±0.25 vs. 3.26±3.60 L/min; ΔMP -29.7±17.0 vs. -28.8±19.0 W; ΔFI 0.59±0.25 vs. -0.43±1.90 W/s. Using the Cohen's d statistic, there was a small effect of thoracic spine position during recovery on HRR (d=0.33), V_T (d=0.34), and ΔFI (d=0.45) from one sprint to another. However, there was no effect of thoracic position on VCO_2 (d=0.062) or the ΔMP (d=0.051) from sprint to sprint and recovery intervals. There may be little to no benefit to recovery in assuming a more flexed thoracic position between cycling sprints.

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188   Board #29   May 30 9:30 AM - 11:00 AM
Effects Of Cycling Cadence On Physiological Variables

Daniel J. Blackwood, John W. Farrell, III, Rebecca D. Larson. *University of Oklahoma, Norman, OK.* (Sponsor: Christopher Black, FACSM)
(No relevant relationships reported)

The rate of muscular contractions during cycling can be modified by increasing or decreasing pedaling revolutions. The manipulation of cadence (revolutions per minute, rpm) may lead to alterations in the physiological response at a given work rate and cadence selection may affect overall cycling performance. **PURPOSE:** Therefore, the purpose of this study was to assess the relationships between cadence selection and accumulated energy (AE), time to exhaustion (TTE), and VO_2peak. **METHODS:** 20 individuals age 18-45 participated in the current study. Participants were grouped into two groups, cycling experience (CE=8) and no cycling experience (NCE=12).Subjects in both groups each completed 3 graded exercise tests (GXT) at 3 different cadences over the course of 3 visits. The initial GXT (visit 1) was at a self-selected (SS) cadence and the subsequent 2 visits consisted of a GXT at either a Low (55-70 rpm) or High (100-115 rpm) cadence. The cadence for visits 2 and 3 were randomly selected. A two-way repeated measures ANOVA was used to determine if significant differences existed between groups as well as between cadences. **RESULTS:** A significant group by condition interaction was present. Significant group differences existed for AE (CE 196.17 ± 57.95 vs. NCE 100.67 ± 37.00), TTE (CE 1368.67 ± 207.37 vs. NCE 990.11 ± 174.64) and VO_2peak (CE 47.71 ± 8.21 vs. NCE 36.16 ± 4.87). Significant differences were observed between the High and Low cadences for AE (High 135.53 ± 66.14 vs Low 156.28 ± 66.97) and TTE (High 1123.42 ± 285.69 vs. Low 1218.167 ± 254.32). Significant differences were also observed between the High and SS cadences for AE (High 135.53 ± 66.14 vs SS 153.4 ± 66.68) and TTE (High 1123.42 ± 285.69 vs. SS 1196.58 ± 254.28). No significant differences were observed between the Low

and SS cadences for AE and TTE (p > 0.05). No significant differences were observed at the different cadences for VO_2peak. **CONCLUSION:** Cadence selection appears to have a significant effect on TTE and AE, but no effect on VO_2peak. These findings suggest that selecting a higher cadence will lead to earlier development of fatigue and volitional exhaustion compared to that of lower cadences. This indicates that improper cadence selection could have a detrimental effect on cycling performance and should be individualized.

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189   Board #30   May 30 9:30 AM - 11:00 AM

Do High-Intensity Intervals 24hr Prior to a Simulated Cycling Race Enhance 40km Time Trial Performance?

G. Alan Garvick, Edward K. Merritt, R. Andrew Shanely. *Appalachian State University, Boone, NC.*
(No relevant relationships reported)

Previous endurance exercise studies suggest that a high-intensity low-volume taper period improves performance over a low-intensity taper period. However, few, if any, studies have examined different exercise intensities in the two days preceding a race, a period often manipulated during training. **PURPOSE:** To compare performance in a simulated 40km cycling time trial (TT) 24hr after a high-intensity interval - low volume cycling session (HII), commonly described as an "openers," or a low-intensity effort session (LIE). **METHODS:** Eight subjects (6 males/ 2 females, 29.6±4.5 yrs, VO_{2max} 62.3±2.21 ml kg^{-1} min^{-1}) completed two simulated 40km time trials following the familiarization 40km TT (FAM). The FAM trial was completed 5-10 d prior to the first performance trial. Performance trials, HII and LIE, were completed in a random crossover repeated measures design. Subjects rested the day before FAM, HII, and LIE trials to mimic normal pre-race structure. HII consisted of 1hr of cycling (15-min warm up at 63% of FAM power (FAMp)), three 1-min efforts at 150% FAMp separated by 5-min at 63% FAMp, three 30-sec efforts at maximum FAMp separated by 5-min at 63% FAMp, and 15.5-min cool down at 65% FAMp). LIE consisted of 1hr cycling at 35% FAMp. Time to complete the TT, average power, VO_2, respiratory exchange ratio (RER), and rating of perceived exertion (RPE) were measured. **RESULTS:** Neither time to completion nor average power differed between HII and LIE trials (63.2±3.51 min vs. 62.9±4.09 min, p=0.545; 219±36.3 watts vs. 222±38.6 watts, p=0.374). The time taken to reach each 5km interval over the 40km distance did not differ between trials (p=0.362). The pattern of change in VO_2, RER, and RPE did not differ between trials (p=0.775, p=0.281, p=0.508, respectively). **CONCLUSION:** Despite previous reports that high-intensity low-volume taper paradigms improve performance over a low-intensity taper, exercise performance, average power, VO_2, RER, and RPE did not differ in trained cyclists during 40km time trials completed 24hr after HII and LIE sessions.

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190   Board #31   May 30 9:30 AM - 11:00 AM

Novice Cyclists Using Shorter Crank Lengths Produced Greater Power at Same VO_2

Boe M. Burrus[1], Jessie Armendariz[1], Brian M. Moscicki[2].
[1]*Humboldt State University, Arcata, CA.* [2]*Indiana University, Bloomington, IN.* (Sponsor: Vincent J Paolone, FACSM)
(No relevant relationships reported)

Compared to trained runners, novice runners employ lower stride frequencies and shorter stride lengths as they run at lower speeds vs trained runners. Novice cyclists may benefit from a similar paradigm, utilizing shorter crank lengths as an analog to the lower stride frequencies and shorter stride lengths used by novice runners. **PURPOSE:** To determine the impact of short crank arms on novice cyclist's performance and comfort during a bout of moderate intensity cycling. **METHODS:** A total of 14 male novice cyclists (25.9 ± 6.9 yrs.) were included in the current study. Subjects completed an incremental cycle test to determine VO_{2peak}. Experimental trials were performed in a randomized counterbalanced format. The experimental trials consisted of 30 min cycling bouts at 60% of VO_{2peak}, with one session using crank arms set to 175mm (normal length), and the other session the crank arms set to 145mm (short length). Bike fit was replicated for all trials. Repeated Measures ANOVAs were used to compare blood lactate, power output, RPM, HR, RER, V_E, and RPE across experimental trials and time. **RESULTS:** Power output was significantly greater during the short crank arm trial when compared to the normal crank arm trial at 10 min (136.8 ± 8.1 vs. 132.5 ± 7.9 W, $p = 0.012$), 15 min (138.9 ± 8.5 vs. 133.6 ± 7.9 W, $p = 0.002$), 20 min (139.3 ± 8.4 vs. 132.1 ± 8.0 W, $p = 0.002$), 25 min (136.1 ± 8.0 vs. 130.0 ± 8.0 W, $p = 0.002$), and 30 min (134.3 ± 8.1 vs. 128.6 ± 8.0 W, $p = 0.006$) at 60% of VO_{2peak}. All other variables did not differ between crank length trials. **CONCLUSION:** Novice cyclists were able to maintain a higher power output with no increase in physiological measures. The higher power output may be attributed to the slower pedal velocities and more extended hip and knee joints allowing for slower muscle contractions combined with an improved mechanical advantage.

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191   Board #32   May 30 9:30 AM - 11:00 AM

The Influence of Exercise Intensity on Training Load in Professional Cycling.

Teun van Erp[1], Marco Hoozemans[1], Carl Foster, FACSM[2], Jos J. de Koning, FACSM[1]. [1]*Vrije Universiteit, Amsterdam, Netherlands.* [2]*University of Wisconsin, La crosse, WI.*
(No relevant relationships reported)

In elite cycling, a reliable estimation of training load (TL) is highly important for cyclists, trainers and sport scientists. In a recent study, we found that the TL - quantified as kJ spent, sRPE as well as luTRIMP - was proximately 50% higher in racing than in training. Surprisingly, when the difference in TL between racing and training was calculated by the widely used method of TSS, this difference appeared to be 117%.**PURPOSE: :** To investigate whether exercise intensity, expressed as 'intensity factor' (IF) quantified using categories of TSS, differently affects the associations between TL quantified by the kJ spent and TL quantified by sRPE or luTRIMP and TSS.
METHODS: Field data on power output, RPE and heart rate were collected from 21 professional cyclists during 4 consecutive years. 11716 training and racing sessions were categorized into low, middle and high IF based on the tertiles of the entire dataset. IF is defined as the ratio between normalized power during the session and maximal sustainable power for one hour. Regression analyses using generalized estimating equations (GEE) were used to estimate the associations between external TL (kJ spent measured with SRM or Pioneer power cranks) and the calculated internal TL (sRPE, luTRIMP and TSS). If these associations were differently affected by exercise intensity, the regression coefficients of the interaction between internal TL and IF would be different for the association between external TL (kJ spent) and internal TL by SRPE,luTRIMP and TSS.
RESULTS: The IF was statistically different ($p<0.05$) in training compared to racing (0.59±0.03 vs. 0.73±0.03). For sRPE and luTRIMP in association with external TL no significant interactions with IF level were observed ($p = 0.288$ and $p=0.905$, respectively). However, for TSS a significant ($p<0.001$) interaction with IF level was seen
CONCLUSIONS: The results show that exercise intensity has no effect on the association between external TL (kJ spent) and internal TL estimated by sRPE or luTRIMP. However, exercise intensity did significantly affect the association between external TL and internal TL estimated by TSS. External TL is underestimated during low intensity and overestimated during high intensity sessions by TSS, compared to the kJ spent, possibly due to the quadratic influence of IF in the calculation of TL by TSS.

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192   Board #33   May 30 9:30 AM - 11:00 AM

The Physiological and Perceptual Response to Self-, Even- and Variable Paced Cycling Time Trials

Jos J. de Koning, FACSM[1], Tim Veneman[1], Wouter Schallig[1], Maaike Eken[2], Carl Foster, FACSM[3]. [1]*Vrije Universiteit, Amsterdam, Netherlands.* [2]*Stellenbosch University, Tygerberg, South Africa.* [3]*University of Wisconsin - La Crosse, La Crosse, WI.*
(No relevant relationships reported)

During self-paced time trials, cyclists show unconscious non-random fluctuations in power output (PO) up to 10% above and below average. It is unknown what the effect of fluctuations of this magnitude is on physiological variables and rating of perceived exertion (RPE). **PURPOSE:** The aim of this study was to describe the differences in physiological variables and RPE between time trials with a self-paced- and an enforced constant- and fluctuating PO. **METHODS:** Healthy male trained cyclists (N=10) completed three 10-km time trials. First, a self-paced time trial (SELF) was completed. Subsequently, in random order, time trials with an imposed constant (CON) and fluctuating (FLUC) PO were completed with both the same average PO as SELF. During FLUC, PO varied step-wise per kilometer with 10% deviations under and above the average PO. In all trials, RPE, muscle activation and metabolic variables were measured. **RESULTS:** A significant main effect on RPE was found between FLUC and CON (F=10.44, P=0.014). Analysis per kilometer showed that the RPE was significantly lower in FLUC compared to CON in kilometer 4, 5, 8, 9 and 10 (P<0.05). No main effect on RPE was present between SELF and FLUC or SELF and CON. No overall differences in muscle activation and metabolic variables were present between the trials, despite differences per kilometer. **CONCLUSION:** The differences in RPE with absence of overall differences in metabolic variables and muscle fatigue, suggest that the fluctuations in PO provide a psychological rather than a physiological advantage. The fluctuations might cause a shortening of in-race goal setting, since it divides the time trial into several segments. Shorter goal setting is known to be perceived as more feasible and increase motivation.
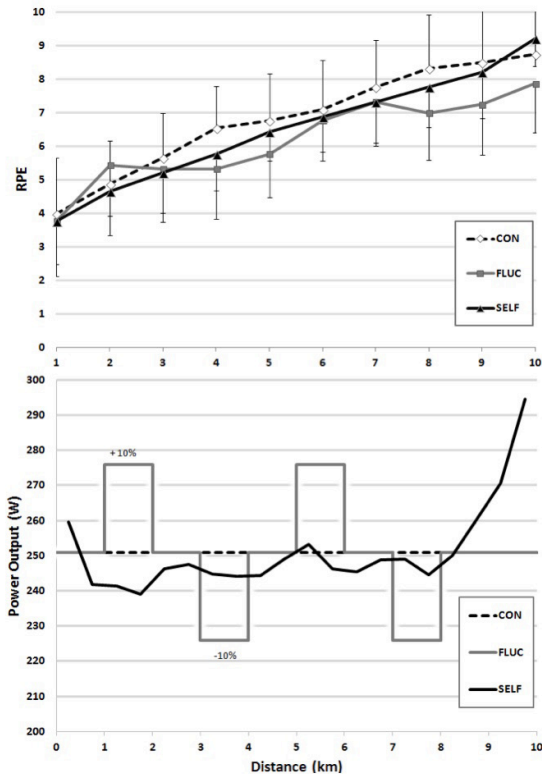
193   Board #34   May 30 9:30 AM - 11:00 AM

Comparison of Incremental Cycling Trial Protocols to Estimate Maximal Oxygen Consumption in Recreationally Trained Cyclists

Erica L. Salhus, James W. Smith, Anthony J. Bull. *Colorado College, Colorado Springs, CO.* (Sponsor: Joan M. Eckerson, FACSM)

(No relevant relationships reported)

Determining maximal oxygen consumption (VO_{2max}) in cyclists typically involves measuring expired respiratory gases during an incremental trial to exhaustion. These methods can be expensive and inaccessible to many recreational cyclists. Therefore, being able to estimate VO_{2max} from the peak power (W_{peak}) attained during an incremental cycling trial (ICT), may provide an easier and less expensive way for these cyclists to estimate their cardiorespiratory fitness. **Purpose:** The study had two aims: 1) to validate the regression equation of Hawley and Noakes (1992) (HNEQ) to predict VO_{2max} from W_{peak} attained during an ICT with a high initial power output (HIPO); and 2) to compare VO_{2max} measured during the ICT with a HIPO to an ICT using a lower initial power output (LIPO). **Methods:** Twelve recreationally trained cyclists (9 males and 3 females; cycling at least 4 d/wk or 6 hr/wk) completed both the HIPO and LIPO trials to measure VO_{2max} and W_{peak}. For the HIPO trial, initial power output (PO) was 2.5 or 3.5 W/kg body mass for females and males, respectively. PO increased by 50 W after 150 s, and 25 W every 150 s thereafter until volitional fatigue. For the LIPO trial, initial PO was 1.5 or 2.0 W/kg body mass for females and males, respectively, and PO increased by 25 W every 120 s until volitional fatigue. During each ICT, expired respiratory gases were measured with a calibrated metabolic measurement system and time to exhaustion was recorded to the nearest second to extrapolate W_{peak}, which was used to estimate VO_{2max} with the HNEQ. **Results:** There was a significant difference ($p<0.001$) between the mean VO_{2max} value measured during the HIPO trial (50.56 ± 7.28 mL/kg/min) and the predicted mean VO_{2max} value estimated from the W_{peak} using the HNEQ (57.46 ± 6.15 mL/kg/min). However, there was no significant difference ($p=0.165$) between the mean VO_{2max} values measured during the HIPO and LIPO trials (50.56 ± 7.28 mL/kg/min and 51.48 ± 6.94 mL/kg/min, respectively). **Conclusions:** This study found that the HNEQ overestimated VO_{2max} in recreationally trained participants. However, because the HIPO and LIPO protocols resulted in VO_{2max} values that were not statistically different, either protocol can be used to determine VO_{2max} in recreationally trained cyclists.

A-41   Free Communication/Poster - **Muscle Dynamics**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

194   Board #35   May 30 9:30 AM - 11:00 AM

Feasibility and Effectiveness of using Electromyography to Track Physical Activity

Joel Ramirez, Stefan Keslacy, Deborah Won, Dominic Defiesta, Christine Dy. *California State University Los Angeles, Los Angeles, CA.*

(No relevant relationships reported)

Fitness tracking devices commonly use accelerometery (ACC) and heart rate (HR) data to quantify physical activity (PA). Inaccurate tracking of PA may occur using ACC during multimodal training (e.g. circuit training), and both HR and ACC may overestimate work performed during upper body exercise or in special populations. **PURPOSE:** Evaluate the effectiveness of using upper body muscle activity (EMG) to track PA during a bout circuit resistance training (CRT) performed by able bodied (AB) and those who have sustained a spinal cord injury (SCI). **METHODS:** N= 5 (3 AB and 2 SCI). First visit, participants performed a graded exercise test to volitional failure on an arm ergometer and analyzed via indirect calorimetry (IC). Second visit, participants performed a circuit resistance training (CRT) bout adapted from a previous protocol developed for persons with SCI. The protocol was three rounds of six resistance exercise (RE) interspersed with arm cycling (AC). A RE consisted of three blocks of 10 reps of arm exercises, performed with a resistance band at a consistent tempo (3,0,3). The first round was a warm-up, the second used a light resistance band (L), and the third a heavy resistance band (H). AC were 2 min blocks performed at 30% of peak power and ≥ 60 rpm. PA during the CRT was quantified via measurements of VO_2, HR, EMG, ACC, and upper body kinematics. **RESULTS:** Kinematics were not significantly different between conditions ($P< 0.05$). Both VO_2 and HR increased in the H condition for AB and SCI ($P< 0.000$). HR was much higher than VO_2. The increase in AB between RE conditions of 198% (L) and 206% (H). In SCI, the increase was 206% for L and 258% H conditions. Estimates of energy expenditure (EE) and METS derived by ACC and IC had similar trends during L in AB (AB by 33% kcal and 44% METS, Whereas SCI had 25% kcal and 140% METS). Switching to a H during RE resulted in an underestimation by ACC in both groups (AB by 74% kcal and 75% METS, SCI by 32% kcal 154% METS). Magnitude of EMG increased during RE with H compared to L. **CONCLUSION:** Early analyses indicate that HR measures tended to overestimate EE for upper body work whereas ACC tended to underestimate work performed with H resistance. EMG better related to cardio-metabolic changes. **SUPPORT:** 2017-18 *Sally Casanova Pre-Doctoral Scholarship.* The D.R.E.A.M Project NIDLRR Project Number: 90IFST0001

195   Board #36   May 30 9:30 AM - 11:00 AM

Electromyography Activity During Aerobic Exercise Using Swiss-ball Compared With Walking.

Toshihiro Wakimoto[1], Tatsuya Saito[1], Tomomi Monri[1], Yoshiyuki Yamanaka[2], Sohachi Fujimoto[2], Toshihiro Takao[2]. *[1]Kawasaki University of Medical Welfare, Kurashiki, Japan. [2]Kawasaki Medical School, Kurashiki, Japan.*

(No relevant relationships reported)

PURPOSE: To clarify the electromyography (EMG) activity of various movement on aerobic exercise using Swiss-ball (SB exercise), we compared the EMG activity between walking and SB exercise.
METHODS: Nine healthy men performed walking and SB exercise. EMG activity, respiratory metabolism and hart rate was measured during SB exercise and walking. During walking subjects walked at 6 km/h on treadmill ergometer. During SB exercise, subjects were sitting on the Swiss-ball and bouncing with upper and lower limb movements. The movements consisted of four patterns of upper and lower limb movements.
RESULTS: The exercise intensity during SB exercise (4.8 ± 0.6 Mets) was nearly identical with walking at 6 km/h (4.5 ± 0.4 Mets). Compared with walking, the EMG activity in biceps fomoris ($46\pm25\%$, $p<0.001$), gastrocnemius ($78\pm37\%$, $p<0.001$) and gluteus maximus ($70\pm29\%$, $p<0.001$) was significantly lower during SB exercise. On the other hand, the EMG activity in rectus abdominis during SB exercise ($198\pm68\%$, $p<0.001$) significantly higher compared with walking. The EMG activity in vastus laterais and latissimus dorsi during SB exercise were nearly identical with walking.
CONCLUSIONS: The exercise intensity was nearly identical during SB exercise and walking at 6km/h. However, the EMG activity during SB exercise was significantly lower in lower limb muscles and significantly higher in rectus abdominis muscle compared with walking.

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Force and Electromyographic Responses during Sustained Isometric Muscle Actions anchored by RPE Values

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(No relevant relationships reported)

PURPOSE: Anchoring exercise intensity with ratings of perceived exertion (RPE) can be used to examine the mechanisms underlying the perception of effort during fatiguing tasks. The purpose of the present study was to examine the fatigue-related patterns of responses for force and electromyographic amplitude (EMG AMP) during sustained isometric, leg extension muscle actions anchored by RPE. **METHODS**: Ten recreationally active men (mean ± SD: 22.9 ± 2.7 yr) performed 3 randomly ordered, sustained submaximal isometric leg extension muscle actions (knee joint = 120°) anchored at RPE values of 2, 5, and 8 (OMNI-RES 10-point scale) to volitional exhaustion or a maximal time limit of 5-min. Maximal voluntary isometric contractions (MVIC) were performed prior to and immediately following each sustained isometric muscle action and bipolar surface EMG signals were recorded from the vastus lateralis muscle during the sustained muscle actions. Linear regression analyses were used to examine the force and EMG AMP vs. time relationships during each sustained isometric muscle action. **RESULTS:** The pretest MVIC values (62.1 ± 14.4, 62.6 ± 14.7, and 63.5 ± 12.7 kg) were highly reliable (ICC= 0.90) and were not significantly (p=0.930) different. The posttest MVICs were significantly (p<0.001) less than pretest for each sustained isometric muscle action. There were significant (p<0.001) differences between all the mean times for the sustained muscle actions (RPE 2 = 300.0 ± 0.0 s; RPE 5 = 202.0 ± 95.5 s; RPE 8 = 72.7 ± 27.6 s). Furthermore, the percent decline in force decreased (p<0.001) with each increase in RPE (percent decline for RPE 2 = 61.0 ± 18.5%; RPE 5 = 47.4 ± 19.6%; RPE 8 = 24.9 ± 13.2%). For normalized EMG AMP, there were significant negative, linear relationships for RPE=2 (p=0.006) and RPE=5 (p=0.003) vs. time of the sustained isometric leg extension. **CONCLUSION:** For the RPE=2 and RPE=5 trials, EMG AMP and force decreased and, therefore, were dissociated from RPE. At RPE=8, however, EMG AMP was unchanged, but force decreased. Thus, EMG AMP tracked RPE, but was dissociated from force. Together, these findings suggested that the perception of effort during sustained, submaximal isometric leg extension muscle actions were not mediated by fatigue-related changes in force or EMG AMP.

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A Comparison of Muscle Unit Activation during Biceps Curl Exercise at 40, 60, 80 and 100% of 1 Repetition Maximum

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(No relevant relationships reported)

The optimal intensity of resistance training exercise is subject to ongoing debate. There is universal agreement that electromyography (EMG) is an excellent index of motor unit (MU) activation or recruitment. The amount of EMG activity can infer the relative intensity of the exercise as compared to a maximal voluntary contraction (MVC) of a specific muscle, performing a specific exercise within one specific individual. **Purpose:** To determine the magnitude of muscle fiber recruitment (activation) of the Bicep Brachii during various loading of the muscle (40, 60, 80, and 100% of 1 RM) during bicep curl (BC) exercise performed to momentary muscular fatigue (MMF), 12 subjects (age 22.5±1.0 yr, ht. 169.4 cm±11.1 cm, body mass 75.3 kg±17.5 kg, 7♀) with resistance training experience, volunteered. **Methods:** A familiarization trial on a selectorized BC machine was performed and the 1 RM was titrated for each subject. In addition, a maximal voluntary contraction (MVC) was obtained for the BC exercise against an immovable load on the same selectorized machine. MU recruitment was estimated by EMG. All subjects adhered to a 3-1-3-1 sec repetition duration during all trials. All trials were randomly assigned and terminated at MMF. **Results:** Statistical analysis by ANOVA (p<.05) with repeated measures was applied to these data. Percent MVC for the concentric portion of the final repetition were 62.5±27.8, 71.7±24.0, 72.8±18.4, and 79.6 ±18.0 at 40, 60, 80, and 100% 1RM, respectively, with NSD among 60, 80 and 100%1RM. With the exception of the 40% trial, all trials revealed similar peak MU recruitment, despite different loading. The recruitment of ~70% of MVC at MMF may, in part, be attributed to the level of resistance training of the subject's and their ability to activate MU's. **Conclusion:** The size principle of MU recruitment is supported, in that peak recruitment of motor units can be accomplished at any workload greater than 60% 1 RM, provided MMF is achieved. Intensity is best defined by the final repetition, as opposed to the initial repetition (i.e. % of 1RM).

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The Effect Of Using A Weightlifting Belt On Muscle Activation During A Conventional Deadlift

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(No relevant relationships reported)

The use of weightlifting belts for free weight training and competition is commonplace. Theoretically, the use of the belt in conjunction with a simultaneous valsalva maneuver provides additional support to the spine by facilitating increased stabilizing pressure inside the abdominal cavity. This is accomplished by isometric contraction of the core muscles in the abdominal wall and lower back with support from the belt. Generally lifts with 5-15% greater loading are reported when wearing a belt. **Purpose:** The purpose of this study was to determine the magnitude of motor unit activation in the biceps femoris (BF), gastrocnemius (G), and trapezius (T) during a conventional deadlift (DL) wearing a weightlifting belt (B) or without a belt (NB). **Methods:** 10 subjects with resistance training experience (age 22.2 ± 0.78, ht. 170.43 ± 11.19 cm, and body mass 81.72 ± 21.69 kg, 6♀) volunteered to perform a familiarization trial of the conventional DL technique of three repetitions at 70% of their self-reported one repetition maximum (1RM). A maximal voluntary contraction (MVC) was obtained while subjects exerted a maximal force against an immovable load at approximately 35% DL ROM. After safe lifting form was confirmed, a 1RM was titrated and randomized trials of B and NB were performed to momentary muscular fatigue (MMF) at 80% of subject's 1RM with a minimum of 30 minutes between trials. MU recruitment was estimated by EMG. All subjects adhered to a 3-1-3-1 sec repetition duration and terminated the lift at MMF on the concentric phase. **Results:** Statistical analysis by dependent t test was applied to these data and revealed no significant difference(p>.05) between trials with motor unit activation for BF of 98.0% and 93.7%, for G of 92.2% and 80.7%, and for T of 72.3% and 71.0%, for B and NB trials, respectively. **Conclusion:** The use of a properly aligned and fitted weight-lifting belt did not yield a significant difference in muscle activation between the (B) and (NB) trials for the tested muscle groups while performing the conventional DL. Thus, a weight lifting belt may augment the lifter's perception, but it does not enhance or detract from motor unit activation.

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Comparison of EMG Muscle Activity and Turn Times Using Orthosis and Stock Insoles During Skiing

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(No relevant relationships reported)

New alpine ski boots are generally sold with generic, foam rubber stock insoles which may lead to over-pronation of the foot due to a lack of subtalar support. The use of stock insoles may result in inefficient movements of the foot and reduced transfer of force throughout the turn cycle. A flexible orthosis insole is designed to provide support of the foot and while still allowing for the rotation of subtalar joints which may improve the transfer of force from the foot to the boot to the ski edge. PURPOSE. The aim was to compare the EMG activity of the tibialis anterior (TA), peroneus longus (PL), and gastrocnemius (GA) muscles and turn times when skiing using heat molded, flexible orthosis insoles (OI) and stock insoles (SI). METHODS. Following IRB approval, five elite skiers (including 3 former national champions) skied two runs on a 13 brush-gate course with a 22° pitch. Each skier was asked to ski consistently for two trials, one trial with OI and one trial with SI. The SI were specific to the given boot company of the skier. Brush gates were set at a diagonal distance of 12 m. Surface EMG activity was processed by RMS. Turn times were assessed with a motion sensor attached to the ski boot. Data analysis utilized a 1-way ANOVA for comparison of EMG activity and time per turn. RESULTS. EMG activity for the TA and PL were significantly lower in the OI trial compared to the SI trial: 3.80 ± 1.28 mV vs. 4.26 ± 1.23 mV (p=.04) and 2.50 ± 0.59 mV vs. 2.80 ± 1.29 mV (p=.01), respectively. There was no statistical difference between insoles for GA activity: 1.81 ± 0.38 mV vs. 2.01 ± 0.7 mV (p=.09) for OI and SI. Average time per turn was significantly faster for OI than SI: 1.038 ± 0.012 sec vs. 1.058 ± 0.024 sec (p=.03). CONCLUSION. Although the thickness is similar to the SI, structure in the OI under the subtalar joints may provide more support of the foot allowing for greater transfer of force to the ski. EMG data from TA and PL activity would indicate more efficient force transfer with OI. These muscles are critical in stabilizing the ankle and allowing for foot eversion during the edge transfer and steering phases of the turn. Time per turn was significantly lower with the OI, up to 0.02 sec/turn. With 45-60 gates per run, the OI could have a significant impact on overall performance since placings in a ski race are often separated by fractions of a second.

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Knee Joint-Specific Eccentric Utilization Ratio Determines Lower-Extremity Stretch-Shortening Cycle Function During Countermovement Jumps

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(No relevant relationships reported)

The Eccentric Utilization Ratio (EUR) is an indicator of lower-extremity stretch-shortening cycle function in power athletes. Joint-specific EUR's have not been established, and their contributions to whole-body EUR are currently not known. Determining joint-specific EUR's and their contribution to whole-body EUR would help expand the understanding of the neuromuscular function and biomechanics of jumping exercises and provide insights for the program design process. **PURPOSE:** To determine joint-specific EURs and their associations with whole-body EUR. **METHODS:** Nine college track and field and soccer athletes (Height: 175 ± 15 cm, Weight: 71 ± 20 kg) participated in this study. All athletes performed three squat (SJ) and countermovement (CMJ) jumps. During all jumps, kinematic and kinetic data were obtained from 14 reflective markers (Plug-in-Gait marker set) and with two force plates, respectively. Hip, knee, and ankle joint powers of the right leg were calculated with inverse dynamics methods. In addition, jump heights were calculated from pelvis markers during each jump. EUR's (CMJ/SJ [unitless]) were calculated from the three-trial average peak joint powers of the hip, knee, and ankle joint (joint-specific EUR) and from jump heights (whole-body EUR) of the CMJ and SJ. Joint-specific EUR's were compared with a one-way ANOVA. Joint-specific EUR's were then correlated to whole-body EUR with simple linear regressions. **RESULTS:** Joint-specific EUR's were 1.04±0.18, 1.15±0.25, and 1.05±0.18 for the hip, knee, and ankle joint, respectively. Joint-specific EUR's did not differ across joints. Whole-body EUR was 1.11±0.70. The Pearson correlation coefficients (r) between joint-specific EUR's of the hip, knee, and ankle joint and whole-body EUR were 0.10 (p = 0.80), 0.70 (p = 0.01), and 0.50 (p = 0.17), respectively. **CONCLUSIONS:** The stretch-shortening cycle function of the knee joint appears to be the primary determinant of whole-body stretch-shortening cycle performance, while the ankle and hip joints do not appear to contribute much at all.

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Neural And Muscular Alterations Of The Plantar Flexors In Middle-aged Women

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(No relevant relationships reported)

It has been recently shown that while walking, old males produced significantly less power of the plantar flexors than young males. Additionally, old males have lower absolute and relative RTD of the plantar flexors, along with smaller pennation angle, but no differences in muscle size, when compared to young men. It is of interest if similar trends are seen from young to middle age in women. **PURPOSE**: Compare muscle structure and neuromuscular function of the plantar flexors in young and middle-aged women. **METHODS**: Twenty two middle-aged (years: 54 ± 6) and eight young women (years: 22 ± 2) volunteered to participate in this study. This study involved 2 sessions. During the 1st session, *In vivo* muscle architecture measurements were made using a B-mode real-time ultrasound scanner. Muscle thickness and pennation angle was examined in the gastrocnemius medialis (GM) and gastrocnemius lateralis (GL) muscles. During the 2nd session, participants completed maximal voluntary isometric contractions (MVIC) of the plantar flexor muscles on a dynamometer. Single electrical stimuli were applied over tibial nerve in the popliteal fossa to elicit twitch torque during the MVIC and upon relaxation (approximately 2 s) following the MVIC to assess voluntary activation [VA = (1-superimposed twitch/ resting twitch) x 100]. Maximal torque and rate of torque development were calculated and normalized by weight. Independent samples t-tests were used to examine any differences between the young and middle-aged women. Statistical significance was set at an alpha of p < 0.05. **RESULTS**: There were no differences in MVIC strength (128 ± 63 vs. 107 ± 30 Nm) or VA (96 ± 8.6 vs. 92 ± 10 %) between young and middle-aged women, however, rate of torque development trended towards being greater in the young women (626 ± 310 vs. 462 ± 150 Nm/s, p = 0.06). Additionally, no differences were noted between muscular size, however, pennation angle of the GM was significantly greater in the young women (25.8 ± 2.5 vs. 23.6 ± 2.4 degrees, p = 0.038). **CONCLUSION**: While maximal strength of the plantar flexors are maintained in middle-aged women, there were signs of a loss in the rate of torque development, and significant changes in pennation angle of the GM muscle.

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Comparison Of Electromyographical Signal Analyses For Estimating Lactate Threshold

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(No relevant relationships reported)

The relationship between the lactate and electromyographical (EMG) thresholds have previously been established via graded exercising testing during cycling. Currently, no published literature exists comparing the most appropriate and efficient filtering methods of EMG analyses to estimate the workload at which lactate threshold (LT) occurs. **PURPOSE**: The purpose of this investigation was to evaluate and compare EMG transformations and time windows to predict LT. **METHODS**: Participants (n=14) completed an incremental, maximal exercise test on a cycle ergometer until exhaustion. Blood lactate was measured every minute, while EMG was recorded continuously at the site of the vastus lateralis. EMG signaling was then transformed and filtered using two time-segment windows (i.e., 10 and 60 seconds), as well as three signal conversions (i.e., root mean square, smoothing, and peak amplitude averaging). **RESULTS**: Results indicated no mean differences between the EMG thresholds, for any of the filtering methods or time-segment windows, when compared to the LT criterion. Significant moderate correlations were seen when comparing the lactate and EMG time-curves ranging from 0.69 - 0.79. Root mean square and Smoothing filters accurately indicated LT in 10 out of 14 participants; whereas peak amplitude averaging indicated LT for 11 out of 14 participants. **CONCLUSIONS**: EMG may be a useful tool to estimate the work rate associated with LT. Averaging EMG over a minute of time and continual 10-second recordings demonstrate comparable readings and allow an easier application of EMG threshold in the field.

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Are Upper Body Muscle Activations Different In Various Type Of Push-up Exercise?

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(No relevant relationships reported)

Push-up exercises are widely used as a recommended home-based strengthening exercise for the upper body. Very little has been published on push-ups and the activation of upper limb major muscles in different hand positions using EMG. More research is needed to explain the workload done by Triceps Brachial (TB), Pectoral Major (PM) and Anterior Deltoid (AD). **PURPOSE**: The aim of this study is to measure the EMG signals of TB, PM and AD while performing push-ups in two different hand positions. **METHODS**: 50 African American subjects were recruited to perform push-ups on two separate occasions. The 2 different hand positions were dictated by the index or pinky alignment with the spine position. Hands were spread by shoulder length. The mean of peak EMG signals to exhaustion were analyzed. A non-parametric Kruskal-Wallis H test was applied and followed by Wilcoxon Signed-Rank test as the post hoc paired difference test. A Bonferroni correction of p=0.01 was applied which was derived from p=0.05/2. **RESULTS**: Significant differences were found in all muscles with a greater activation using the index finger position in the TB muscle. Males experienced a significantly greater activation in all muscles compared to females. **CONCLUSIONS**: Higher muscle activation of TB implies that the training effect of TB may be higher in the above-mentioned hand position. Future studies should address the increase in muscle strength in in-home setting especially in minorities.

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Changes in Bilateral Hand Force After 30 Minutes of Climbing in Elite Level Rock Climbers

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(No relevant relationships reported)

Rock climbing is a sport that requires finger flexor strength and endurance to maintain isometric contractions during an ascent. It has been shown that climbers have higher finger flexion strength and endurance than the general population at the proximal interphalangeal joint (PIP). What is unclear, however, is if years of training and conditioning have caused these adaptations to occur bilaterally in both the dominant (D) and non-dominant (ND) arms of elite level rock climbers. It is essential for climbers to have equal, bilateral finger flexor strength and endurance capacity as rock climbing stresses both sides of the body. Weakness on one side may result in a fall or failure to complete a route. **PURPOSE**: To analyze change in average force production in D and ND finger flexors of elite-level rock climbers over the course of 30 min of climbing. **METHODS:** 8 elite-level (age: 29.4 ± 4.7 y, climbing experience: 11.1 ±

5.2 y, mean project grade: 9.7 ± 0.3 UIAA) rock climber's D and ND finger flexor strength was tested using a mounted force transducer. A 20-sec isometric contraction was performed with the arm fixed at 90° elbow flexion and 120° of horizontal shoulder abduction. Subjects were given two warm up contractions on each hand before the 20-sec MVIC. Subjects then climbed on a treadwall for six 5-min intervals. Total climbing time was 30 min. The treadwall rotated at 6 m/min with a 6° overhang. The isometric force assessment was repeated at the end of each interval and kept to less than 3 min to prevent recovery. Force data were analyzed by removing the first and last 10% of the contraction and averaging the remaining 16 sec. Data were expressed both in absolute (N) and as a percentage of the initial MVIC trial (relative). A paired t-test was used to compare the pre-MVIC to the MVIC at 30 min. **RESULTS:** No statistical differences were found for change in absolute force between D (29.1 ± 26.1 N) and ND (41.5 ± 63.6 N) hands or in relative force between D (8.05 ± 7.5%) and ND (12.09 ± 11.7%) hand. Mean change in force relative to BW after 30 min of climbing: D (0.44 ± 0.39 N/kg BW), ND (0.62 ± 0.96 N/kg BW). **CONCLUSION:** Elite-level rock climbers do not show a bilateral deficit between their D and ND hands typically seen in other sports. This could be due to years of symmetrical training and the stresses that are applied to both limbs while rock climbing.

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Effects Of Postactivation Potentiation On Subsequent 40-yard Sprint Performance In 16- To 23-year-old Male Athletes

Cody Yates[1], Peter J. Chomentowski[1], Mark Flury[1], Steven M. Howell[1], Anthony Deldin[2], Frank R. Wojan[1], Jamal Roper[1], Jeremy Armstrong[3]. [1]Northern Illinois University, DeKalb, IL. [2]Loyola University Chicago, Chicago, IL. [3]XCEL Sport Science & Fitness, Nicholasville, KY.
(No relevant relationships reported)

Postactivation potentiation (PAP) is a physiological adaptation which enables the muscles' contractile properties to optimally perform. PAP is engendered through pre-performance conditioning activities, such as parallel back squats performed prior to a vertical jump test. **PURPOSE:** The purpose of this study was to determine the effects of postactivation potentiation on subsequent 40-yard sprint performance in 16- to 23-year-old male athletes, specifically, the effects of hexagonal bar deadlifts (HBD) and weighted sled sprints (WSS) as PAP-loading protocols. **METHODS:** Thirty-one male subjects (age, 16.9 ± 1.4 years; height, 180.2 ± 6.2 cm; weight 83.4 ± 19.2 kg) participated in this study. Testing sessions included two different visits, a control trial and a PAP-loading protocol trial separated by ~48-hours, counterbalanced, allowing each subject to act as his own control. The HBD (n = 8) group performed four sets of HBD as the PAP-loading protocol, using body weight (BW) to calculate estimated one repetition max (1RM). The WSS (n = 23) group performed four sets of WSS for 15-yards, using WSS loads of 25%, and 50% BW. Both PAP-loading protocols were followed by a 6-minute rest period and concluded with two laser-timed 40-yard sprint performances. Control trials for both groups consisted of identical time intervals as the PAP trial, with active movement utilized instead of the PAP-loading protocol. **RESULTS:** The PAP trials had faster average 40-yard sprint times (5.35 ± 0.44 s) compared to the control trials (5.39 ± 0.39 s) for all subjects. The average difference for the PAP trials (-0.04 ± 0.10) was statistically significant (p = 0.029). However, there was statistical significance (p = 0.035) between PAP-loading groups, with WSS being the only group to improve in sprint time for the PAP trial. The WSS group improved in 40-yard sprint time for the PAP trial (5.33 ± 0.45 s) compared to the control trial (5.40 ± 0.41 s) with a PAP difference of -0.06 ± 0.10 s for 40-yard sprint time. **CONCLUSION:** The use of a PAP-loading protocol enhances 40-yard sprint performance, with the use of WSS proving to generate faster sprint times compared to the HBD.
Table 2: Average Control Trial (Trial A) vs Average PAP Trial (Trial X) (mean ± SD)
Figure 3: Average control trial (trial A) vs average PAP trial (trial X)

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Altered Arginase Activity Following Ischemic Stroke: The Role Of Metabolic Syndrome

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(No relevant relationships reported)

Animal models of human pathology are important to elucidate the underlying pathophysiological mechanisms and examine novel interventions with stroke. However, there is on-going controversy surrounding the validity of rodent models in inflammation mediated diseases. A number of successful rodent models have failed to translate the findings into clinical research. Epidemiological studies suggest the metabolic syndrome (MetS) is strongly associated with poor stroke outcomes. Our laboratory has demonstrated altered plasma arginase 1 (*ARG1*) expression in stroke patients. A*RG1 has an important role* in immune system regulation and is correlated with stroke outcome. However, how ARG activity is regulated after the stroke in a rodent model of stroke and if metabolic syndrome affects these processes are not well understood. **PURPOSE**: The purpose of this study was to determine plasma ARG activity pre, and at 4hrs and 24 hrs post-stroke in lean (LZR) and obese (OZR, a model of metabolic syndrome) zucker rats. We hypothesized that OZR have altered ARG1 activity compared to LZR after the stroke. **METHODS**:
Stroke was induced by middle cerebral artery occlusion (MCAO) for 60 min in LZR and OZR. Laser Doppler flowmetry was used to detect regional cerebral blood flow during occlusion and reperfusion. Venous blood samples were drawn from rat rail vein before MCAO, 4 and 24 hrs post-MCAO. Plasma was isolated, and ARG activity was measured by enzyme linked immunosorbent assay.
RESULTS:In the OZR, ARG activity (Unit/L: ± SD) decreased (p<0.05) from pre (31.4±6.9 unit/L) - to 24hrs (20.6±4.9 unit/L) post-stroke in the OZR. No differences were noted at 4hrs post-stroke (24.3±5.1 unit/L). In contrast, no significant differences were noted in ARG activity pre and up to 24hrs post-stroke in the LZR. However, LZR generally presented with lower ARG activity levels than OZR.
CONCLUSIONS:These data suggest that ARG response in OZR appears to be different compared to LZR after experimental ischemic stroke insults. Further studies, a more stratified time course and biomarkers analysis of specific "inflammatory phase" of stroke in specific populations, are urgently required.

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Exercise Intensity Reduces Circulating Annexin V-CD105 Microparticles in Adults With Prediabetes

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(No relevant relationships reported)

PURPOSE: Microparticles (MPs) derived from platelets, leukocytes and endothelial cells are important players in cardiovascular disease (CVD) risk. Exercise is established to reduce CVD risk, but no study has tested the effect of exercise intensity on various subtypes of MP in people with prediabetes. We tested the hypothesis that short-term interval (INT) training would reduce MP subtypes vs. continuous (CONT) exercise. **METHODS**: Eighteen obese adults (age: 63.8±1.5yrs BMI: 31.0±1.3 kg/m²) were screened for prediabetes using ADA criteria (75g OGTT and/or HbA_{1c}). Subjects were randomized to INT (n=10, 3 min intervals at 90% and 50% HR_{peak}) or CONT (n=8, 70% HR_{peak}) training for 12 supervised sessions over 2 wks for 60 min/d. Fitness (VO_2peak) and weight (kg) were assessed and arterial stiffness (augmentation index; AI) calculated using total AUC during a 75g OGTT. Total MPs, platelet MPs (CD31^{+}/CD41^{+}), endothelial MPs (CD105, CD31^{-}/ CD41^{+}) and leukocyte MPs (CD45^{+}/CD41^{-}) were analyzed from fresh plasma via imaging flow cytometry pre-/post- intervention. **RESULTS**: Our interventions had no effect on weight loss but INT exercise increased VO_2peak (*P*=0.04) and reduced fasted AI (trend: *P*=0.08) compared with CONT training. While our intervention had no effect on platelet or leukocyte MPs, INT exercise decreased Annexin V- endothelial MP CD105 (1.6±0.2 vs. 1.4±0.2 count) compared with CONT training (1.2±0.2 vs. 1.8±0.1 count; *P*=0.04). Increased VO_2peak correlated with decreased Annexin V+ CD105 endothelial MPs (r=-0.60, *P*=0.01). **CONCLUSION**: Exercise intensity decreases endothelial derived MPs through possibly a cardiovascular fitness related mechanism, independent of weight loss.

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Differential Cardiac Protein Expression of Mice Exposed to Postnatal Undernutrition.

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(No relevant relationships reported)

PURPOSE: Evidence shows humans who suffered poor nutrition during early postnatal life have altered cardiovascular development and increased likelihood for chronic disease during adulthood. Several studies have shown using an animal model that inadequate nutrient intake during early life causes changes in cardiomyocyte nucleation, maturation, and function. Protein expression differences as a result of early life undernutrition has yet to be studied and protein networks remain unidentified. **METHODS:** All experiments were conducted according to IACUC at Michigan State University. FVB mouse dams were fed either a semi-purified control (CON: 20% protein), or a low-protein (LP) isocaloric diet (PUN: 8% protein) beginning 1 week before mating. LP females produce 15-20% less milk thus; pups nursed by LP females experience a global nutrient deficit. Following birth, pups were reorganized to 8 pups/ female. After birth, day 1 (PN1) until day 21 (PN21) the PUN nursed and received milk from females fed the LP diet, the CON mice nursed from females being fed the 20% protein diet. At PN21 the hearts were collected from the CON and PUN mice and cardiac tissue was frozen in liquid nitrogen. Two-dimensional differential in-gel electrophoresis (2D DIGE), is a 2 step method of extracting proteins from the hearts of CON and PUN. Proteins are separated according to the electrochemical charge and weight. An ANOVA compared protein differences between diet (CON vs. PUN) and gender (male vs. female) using Decyder Protein identification software(standardized log abundance). **RESULTS:** 37 statistically significant proteins were identified from 2D DIGE. Over-expressed PUN proteins (134% greater abundance than CON) included polymerase I transcript release factor, Fetuin, and $Ca2^+$activated K^+ channels. CON over-expressed proteins included cyclin-dependent kinase inhibitor (114% greater abundance), and Alpha-1 type IV collagen (90% greater abundance). **CONCLUSION:** Identified proteins allow for a proposed mechanism that may explain the cellular change in the heart following undernutrition in early life and the associated increase for cardiovascular disease (CVD) in adulthood. Physical activity may serve as a positive countermeasure to contest the increased likelihood for CVD in adulthood.

209　Board #50　May 30 11:00 AM - 12:30 PM

The Effects of Calcitonin Gene-Related Peptide on Heart Function

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(No relevant relationships reported)

Calcitonin Gene-Related Peptide (CGRP) is a 37-amino acid peptide produced by peripheral and central neurons. It is found in a variety of organs and systems, regulating important functions in the target tissues. The αCGRP isoform is present in sensory neurons and it has been suggested to play a role in preventing hypertension, pulmonary hypertension, and ultimately acting as a potent vasodilator, improving blood flow distribution and wound healing. Studies have shown that exercise increases the levels of CGRP in skeletal and cardiac muscle cells. Studies in our laboratory suggest that CGRP may increase neurotrophic factor production by cultured cardiac cells (HL-1) in a dose depend manner, especially Glial Cell Line-Derived Neurotrophic Factor (GDNF). Finally, additional studies in our laboratory suggest that CGRP may reduce contraction rate of cultured Hl-1 cells. **PURPOSE:** To determine the effect of CGRP on heart contractility in frogs. **METHODS:** 12 frogs were divided into 4 groups. Three treatment groups received different concentrations of CGRP (40nMol, 100nMol, and 400nMol) in frog ringer's solution. A control group was treated with only frog ringer's solution. All frogs underwent autopsies to expose their hearts and each heart was connected to a PowerLab data acquisition system, which for collection of electrocardiogram, force of contraction, and heart rate using LabChart software. One-way ANOVA with Tukey post hoc were performed to determine statistical significance. **RESULTS:** Our results show that CGRP decreases force of contraction in all treatment groups when compared to the control group (Control: +9.20%; 40nM of GGRP: -38.35%; 100nM of CGRP: -34.29%; 400nM of CGRP: -33.10%; P<0.05). In addition, only 400nM of CGRP could, significantly, reduce the heart rate (Control: +3.32%; 400nM of CGRP: -24.01%; P<0.05). Finally, treatment with CGRP did not alter ECG (PQRST) curves in any of the treatment groups. **CONCLUSIONS:** Treatment with CGRP reduces force of contraction (in all treated groups) and reduces heart rate (400nM) without altering the ECG in frogs.

210　Board #51　May 30 11:00 AM - 12:30 PM

Quantitative Analysis of Mitochondrial Morphology Under Different Fluid Shear Stress Conditions

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(No relevant relationships reported)

Exercise-mediated changes in the pattern of fluid shear stress affect the activation or quiescent status of vascular endothelial cells. Mitochondria are dynamic organelles constantly changing their shapes in response to intracellular metabolic demand and environmental cues. Recent studies suggest that mitochondrial morphology is closely related to their metabolic function with respect to cellular stress response. **PURPOSE** The purpose of this study was to investigate effects of different patterns of fluid shear stress on intracellular mitochondrial distribution and mitochondrial morphology. **METHODS** Primary human umbilical vein endothelial cells were grown and seeded to 0.2 μ-slides and stained for mitochondria using MitoTracker Red FM™ (200 nM). When a monolayer was formed, cells in each slide were exposed to either Static (STT), unidirectional laminar (LSS), and oscillatory (OSS) shear stress using parallel chamber flow apparatus. Temperature was maintained at 37°C, and pH and oxygen levels were maintained in a 95% air / 5% CO_2 humidified incubation chamber. Live-cell imaging was performed using a 63x oil lens with an epifluorescence inverted microscope. The number of cells in each mitochondrial morphological category (fragmented, short tubes, tubular, fused, or elongated) was counted based on aspect ratio (AR) and form factor (FF) scores. **RESULTS** At baseline, mitochondria represented evenly distributed tubular shape. Following a 15-minute exposure to either LSS (20 dynes/ cm^2) or OSS (±4 dynes/cm^2), mitochondrial morphology was not significantly altered. However, when exposed to prolonged LSS (up to 90 min), the mitochondria gradually changed their shape to short and fragmented structures and translocated to the cell periphery. Furthermore, 1-hour post-LSS, we observed more cells containing elongated mitochondrial networks. Conversely, at 1-hour post-OSS, mitochondria tend to be more fragmented and localized in the perinuclear region. Potential underlying mitochondrial fusion/fission event mechanisms will be discussed. **CONCLUSION** Data suggest that different types of fluid shear stress lead to a distinct mitochondrial morphological response, which may reflect different metabolic demands depending on the flow pattern.

211　Board #52　May 30 11:00 AM - 12:30 PM

Does High Human Serum MG53 Level Associate with Better Cardiorespiratory Function?

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(No relevant relationships reported)

Ischemia reperfusion (IR) induces increased serum MG53 level, and intravenous injection of rh-MG53 protein can ameliorate the damage from cardiac stress. However, the association between human serum MG53 level and cardiorespiratory function haven't been studied yet. **PURPOSE**: To investigate the association between the endogenous human serum MG53 level and cardiorespiratory function. **METHODS**: Sixteen healthy male volunteers (23.1±2.9 yrs, 169.5±6.0 cm in height, 63.2±5.9 kg in weight, 12.2±3.1% in %FAT, 53.2±5.4 ml/min/kg in VO_{2max}) signed informed consent and participated in this study. Each individual performed two VO_{2max} tests on cycle ergometer, and they had 7 wks of regular camp training between the two tests. Fasting blood samples were drawn before each VO_{2max} test, and serum MG53 was measured by ELISA. **RESULTS**: Serum MG53 levels showed big difference among individuals, therefore, three levels of MG53 were divided, they are Low serum MG53 group (0.60±0.45 ng/ml) (L), Medium serum MG53 group (2.08±0.75 ng/ml) (M) and High serum MG53 group (4.23±1.80 ng/ml) (H). We found red blood cell count (RBC) (4.98±0.22 vs 4.65±0.31 *10^{12}/L, p<0.01), hemoglobin (Hb) (155.3±7.6 vs 141. 5±8.1 g/L, p<0.01), and hematocrit (HCT) (46.6±2.1 vs 43.1±2.6%, p<0.01) were higher in M than in L. Moreover, we found that ventilation threshold (VT) was higher in H than in L (47.5±6.5 vs 38.6±3.9 ml/min/kg, p<0.01) and higher than in M (47.5±6.5 vs 42.5±2.8 ml/min/kg, p<0.05). Similarly, we found H had higher VO_{2max} than L (59.6±4.7 vs 51.6±6.7 ml/min/kg, p<0.05) and higher workload at VT than L (13.2±3.7 vs 11.1±1.7 Watts, p<0.05). The RBC (5.20±0.18 vs 4.65±0.31 *10^{12}/L, p<0.01), Hb (158.8±4.2 vs 141. 5±8.1 g/L, p<0.01), and HCT (47.4±1.5 vs 43.1±2.6%, p<0.01) were also higher in H than in L. Correlation analysis demonstrated that VO_{2max} (r=0.43, p<0.05), workload at VT (r=0.41, p<0.05), RBC (r=0.53, p<0.01), Hb (r=0.57, p<0.01) and HCT (r=0.47, p<0.01) are positively correlated with Serum MG53. **CONCLUSIONS**: It predicted that human serum MG53 level might be positively correlated with cardiorespiratory fitness.

212   Board #53   May 30 11:00 AM - 12:30 PM

The Effects Of Prohibitin1 On The Content And Synthesis Activity Of F0f1-atpase And Mitochondrial Function In C2c12 Cells

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(No relevant relationships reported)

In the eukaryotic cells ATP synthesis is closely related to the structural and functional integrity of mitochondria. F0F1-ATP synthase participates in oxidative phosphorylation and ATP production.The effect of Prohibitin1(PHB1) on mitochondrial function and F0F1-ATP synthase expression and activity is largely unclear.**PURPOSE:**To investigate the effect of PHB1 on the Oxygen Consumption Rate(OCR),oxidative stress(ROS) and ATP production in C2C12 cells.The influence of PHB1 on the content and activity of F0F1-ATPase was also examined.**METHODS:**The PHB1 overexpression and the RNA-interfered vector are inserted into the adenoviral vector by the phb1 overexpression sequence and the interfering sequence.Intracellular fluorescence distribution was detected by fluorescence inverse phase microscope.The efficiency of PHB1 transfection was determined by flow cytometry. The content of PHB1 was determined by Western blot.The expression of F0F1-ATPase was measured by qPCR.F0F1-ATPase activity was detected using a mitochondrial respiratory chain complex V activity kit.ATP content was detected by a kit.The changes of OCR was assessed by a XF cell mitochondrial stress detection kit.**RESULTS:**The complex V activity and the mRNA level of FOF1-ATPase were significantly increased in the PHB1 over-expression C2C12 cells.Compared with the control group, the activity of complex V in PHB1 overexpression group increased by 226%(p<0.01),whereas it was significantly decreased in PHB1 RNA-interfered cells. Cells with low PHB1 activity showed lower complex V activity(-193%, p<0.01),whereas ATP content,OCR were significantly increased in PHB1 over-expression cells.Compared with the control group,the ATP content of PHB1 over-expression group was increased by 80%(p<0.01),but it was decreased in the low-PHB1 RNA group(-21%, p<0.01).ROS production was lowered in PHB1 over-expression cells(-74%, p<0.01) compared with control,but it was increased in the low-pHB1 RNA cells(104%, p<0.01). **CONCLUSION:**The over-expression of PHB1 can increase the content and activity of F0F1-ATP synthase,ATP production and improve energy metabolism in C2C12 cells. Over-expression of PHB1 can also reduce ROS production,suggesting that PHB1 may be involved in stabilizing mitochondrial structure.

A-43   Free Communication/Poster - Age-Dependent Physiology

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

213   Board #54   May 30 11:00 AM - 12:30 PM

Identifying the Onset of Frailty

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(No relevant relationships reported)

PURPOSE: Frailty is a clinical syndrome associated with adverse health outcomes in older adults. Currently, there is a great need to identify interventions to prevent or delay the onset as well as decrease the burden of frailty symptoms. Identifying the onset of frailty is one of the first steps in developing effective interventions. Therefore, the purpose of this study was to determine the onset of frailty using the mouse frailty index.
METHODS: Male C57BL/6J (n=32) were purchased at 12 months of age. At 14 months of age, the mice were subjected to a frailty assessment that included 5 criteria: loss of body weight, weakness (grip strength), slow walking speed (Rota-rod), low activity level (voluntary wheel running) and poor endurance (treadmill test). Mice repeated these tests every 3 months throughout their lifespan. The designated cutoff point for each frailty criterion was determined from data collected at 14 months of age and was set at 1.5 SD below the mean. If a mouse had three of the criteria scores below the cutoff points, the mouse was identified as frail, while a mouse with two criteria scores was identified as mildly frail.
RESULTS: Prevalence of frailty increased across the lifespan of the mice, with 75% of the 35 month old mice identified as frail. The survival rate at 35 months of age was 25% of the original cohort. The onset of frailty occurred at 23 months of age (88% survival) while mice 17 months of age (94% survival) were considered mildly frail. Mildly frail mice fell below the cutoff points for endurance and walking speed, whereas the frail mice fell below the cutoff points for endurance, walking speed, and activity levels. Although endurance, walking speed, and activity levels were the

criterion identified in the frail mice, all criteria included in the frailty assessment decreased across the lifespan of mice. Reductions were observed in body weight (5.3%), strength (18.9%) endurance (51.1%), walking speed (31.4%), and activity levels (89.9%). A progression from mildly frail to frail to mortality was observed; in that, mildly frail mice at 17 months of age were frail by 23 months and died at 26 months.
CONCLUSIONS: Taken together, the onset of frailty occurs early in the lifespan and is associated with negative outcomes in mice. It provides the framework to develop interventions for preventing or delaying the frailty.

214   Board #55   May 30 11:00 AM - 12:30 PM

Dynapenia And Low Skeletal Muscle Mass In Older-aged Women

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(No relevant relationships reported)

Low skeletal muscle mass (LSMM) is associated with strength loss and disability. Epidemiological findings suggest that LSMM and dynapenia are associated with both mortality and physical disability. The association of muscle mass loss and dynapenia is still controversial.
PURPOSE: This study aimed to examine the association between dynapenia and LSMM defined by several operational definitions in older-aged women
METHODS: We evaluated 107 women aged 65 o more years from the western of México. A whole body DXA scanning (Hologic QDR 4500) was performed to evaluate the body composition. The indicators and cut points used to diagnose LSMM were: 1) appendicular lean soft tissue absolute kilograms (ALSTKG) ≤15.02; 2) appendicular lean soft tissue corrected by body mass index (ALST/BMI) <0.512, both according to The Foundation for National Institutes of Health Sarcopenia Project (FNHISP); and 3) appendicular lean soft tissue corrected by squared height (ALST/HT[2]) ≤5.45 as stablished by The European Working Group on Sarcopenia in Older People (EWGSPOP). The criteria of dynapenia was a maximum isometric strength (MIS) of the hand and forearm muscles equal or lower the 20 kg evaluated by handgrip dynamometry (Jamar Handgrip Dynamometer).
RESULTS: Overall prevalence of dynapenia was 71.3%. The prevalences of LSMM and their respective prevalence of dynapenia are showed in Table 1. The probability for dynapenia was significant for women with LSMM defined by ALSTKG and ALST/BMI. No statistical probability was observed with ALST/HT[2]
CONCLUSIONS: We observed a high prevalence in both loss of muscle mass and dynapenia in our sample. Prevalence of dynapenia is higher in women with LSMM defined by FNHISP criteria. Our findings suggest that several indicators should be taken in consideration in order to properly assess the impact of LSMM

Table 1. Dynapenia in older-aged female adults with LSMM.				
LSMM criteria	Prevalence of LSMM	Prevalence of dynapenia	Odds ratio	95% CI
ALSTKG	60.75	84.62	5.5*	2.2 to 13.6
ALST/BMI	38.32	90.24	6.4*	2.0 to 20.1
ALST/HT[2]	42.06	77.78	1.8	0.8 to 4.3
* p<0.05				

215   Board #56   May 30 11:00 AM - 12:30 PM

Comparison of Growth in Children Undergoing Three Different ACL Reconstructions

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(No relevant relationships reported)

Three surgical procedures aim to minimize the risk of physeal damage in children undergoing ACL reconstruction. They include: transphyseal (TP), physeal sparing (PS), and a partial physeal sparing procedure with an all epiphyseal tibial tunnel and graft placement in the 'over-the-top' position (OT). **PURPOSE:** The purpose of this study was to address the lack of understanding concerning tunnel migration due to growth in skeletally immature patients following ACL reconstructions. Sequential, post-surgical radiographs were used to quantify changes in tunnel positioning and to assess the rate of migration between these surgical techniques. **METHODS:** Anterior-posterior and lateral follow-up radiographs were retrospectively obtained for 31 skeletally immature patients (average age = 13.1 yrs) placed in three groups: TP (n=17, average age=13.8 yrs), PS (n=6, average age=11.9 ys), or OT (n=8, average age=12.7 yrs). Along with measuring tunnel angle, length, and width, a two-dimensional grid system was superimposed over the films to assess changes in tunnel position and

location over time. ANOVA analysis compared mean values of all measurements at six and twelve months as interpolated time points. **RESULTS:** The rates of migration of several variables of tunnel position were measured at up to two mm per month. Among 53 variables, only one variable, the vertical rate of change of the femoral tunnel aperture, showed significant difference in both PS and OT groups in comparison to the TP group (0.22 and 0.33 vs. 0.85mm, p<0.0497). The mean values of the measured variables demonstrated few differences to a level of statistical significance as well. Both PS and OT groups demonstrated significant reduction of tibial tunnel width (7.88 and 6.93 vs. 10.58, p=0.0001) and medial condyle radius (13.86 and 14.73 vs. 16.35mm, p<0.0499) compared to the TP group. **CONCLUSION:** Given only several significant differences in rates of migration, despite 53 variables being measured, this implies ACL reconstruction technique did not significantly affect the migration of tunnel positioning. Overall, this suggests uniform post-operative growth, which supports the notion that TP, PS, and OT procedures are similarly successful in allowing growth around the knee following ACL reconstruction in skeletally immature patients.

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216   Board #57   May 30 11:00 AM - 12:30 PM

Age Associated Muscle Strength Loss During A Single Bout of Eccentric Contractions in Mice

Christopher Rawdon, Christopher Ingalls. *Georgia State University, Atlanta, GA.*
(No relevant relationships reported)

The magnitude of strength deficits during recovery from eccentric contraction-induced muscle injury is generally greater in old compared with adult mice. However, less is known about age-related differences in the progression of developed eccentric force deficits during the eccentric contraction bout. **Purpose:** To determine if there are age-related differences in the 1) peak isometric torque deficits immediately after 150 eccentric contractions and 2) developed eccentric torque during the course of 150 contractions in female mice. **Methods:** Isometric tetanic torque output from anterior crural muscles [tibialis anterior (TA) and extensor digitorum longus (EDL)] was measured before and immediately after a single bout of 150 eccentric contractions (from -19° ankle dorsiflexion to 19° plantarflexion at 2000°/s) in anesthetized female adult (6 months of age; n=10) and old (21 months of age; n=7) mice. Developed eccentric torque was measured during the 1st, 50th, 100th, and 150th contractions, and is determined by the difference in the initial eccentric and peak eccentric torques. **Results:** Although older female mice weighed more than adults (30.7 ± 1.4g vs 24.1 ± 0.4g), there were no age-related differences in the weights of the TA (old= 41.2 ± 1.1g; adult= 40.1 ± 0.7g) and EDL (old= 10.0 ± 0.6g; adult= 9.6 ± 0.4g) muscles, or isometric tetanic torque before injury (old= 2.5 ± 0.1 NŸmm; adult= 2.4 ± 0.1 NŸmm) and peak eccentric torque of the 1st contraction (old= 4.1 ± 0.2 NŸmm; adult= 4.4 ± 0.2 NŸmm). However, older female mice experienced less isometric torque deficits after the injury than adult mice (old=-40.7 ± 1.1%; adult=-46.6 ± 1.1%), but had similar developed eccentric contraction deficits after 50 (old=-25.3 ± 2.7%; adult=-21.4 ± 3.0%), 100 (old=-26.6 ± 4.4%; adult=-26.2 ± 2.8%) and 150 (old=-30.2 ± 4.6%; adult=-30.8 ± 2.9%) contractions. The deficit in developed torque for the 150th eccentric contraction was significantly less than the isometric torque deficits after the injury for adults and old mice. **Conclusion:** Compared with adults, older female mice experienced less isometric and similar eccentric torque deficits associated with a single bout of eccentric contractions.

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Fatigue Resistance To Eccentric Contractions In Older Adults

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(No relevant relationships reported)

PURPOSE: Aging is associated with a loss in skeletal muscle force producing capacity. However, there is evidence that old muscle is more resistant to fatiguing isometric muscle contractions than young muscle. It is unknown if age-related fatigue resistance occurs with eccentric (lengthening) contractions (EC). The purpose of this study was to test the hypothesis that skeletal muscle of older adults is more resistant to fatigue induced by EC relative to muscle of young individuals. **METHODS**: 10 young (22.7 ± 2.25 yrs) and 8 physically active old (70.9 ± 7.5 yrs) subjects completed 30 sets of 10 repetitions on a Biodex dynamometer, and torque, power, and work were measured. Between each set of 10 reps, there was a one minute rest period. **RESULTS**: There were no significant differences between young and old for anthropometric measures. Likewise, the total amount of functional work (young: 44.2 ± 13.1 vs old: 47.6 ± 10.6 kJ), average torque (young: 50148±13011 vs old: 54450±11507 N*m) and average power output (28105±6985 vs old: 30825±5405 watts) that was completed during the bout of ECs was similar between groups. However, as hypothesized, the rate of functional decline (fatigue) was greater in the young relative to the old throughout the 30 sets of ECs for average work (p=0.038) and power output (p=0.024), but not average torque (p=0.63) as indicated by a group x time interaction. **CONCLUSIONS**: Consistent with other studies, we show that, contrary to isometric force production, eccentric force production is preserved in old muscle. Furthermore, older subjects

demonstrated significantly greater fatigue resistance through the eccentric exercise session than did the young subjects. High-force EC may be an ideal exercise for maintaining muscle mass in older individuals given the higher force production, and preservation of functional capacity when compared to shortening contractions.

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218   Board #59   May 30 11:00 AM - 12:30 PM

Loss of Lean Mass Increases Risk for Postural Hypotension in Older Men and Women

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(No relevant relationships reported)

At the cellular level, muscle provides a reservoir for body fluids to maintain fluid volume and blood pressure, so older adults may be at risk for hypotension due to loss of muscle with age. **PURPOSE:** To evaluate lean mass, hydration, and postural blood pressure in adults ≥ 65 years of age. **METHODS:** Older men (n=17) and women (n=30) completed two measurements of lean mass and hydration using multi-frequency bioelectrical impedance, and postural blood pressure lying, sitting, and standing. Day 1 was mid-day in a euhydrated state. Day 2 was the next morning, within 30 minutes of waking, in a fasted state. All were grouped for analysis by lean mass relative to height, using Lean Mass Index cut points of **Low** (women <14.9 kg/m²; men <18.7 kg/m²) and **Normal** (women ≥14.9 kg/m²; men ≥18.7 kg/m²). **RESULTS:** On Day 1, the **Low** group had lower *relative lean mass* (men 17.1 ± 0.4 vs. 20.2 ± 0.3 kg/m²; women 13.5 ± 0.2 vs. 16.5 ± 0.3 kg/m²; $p < 0.001$), *absolute lean mass* (men 55.7 ± 2.1 vs. 66.7 ± 1.8 kg; women 34.8 ± 0.9 vs. 44.3 ± 0.9 kg; $p < 0.01$), *hydration* (total body water: men 44.9 ± 1.0 vs. 51.1 ± 1.0 L; women 30.3 ± 0.5 vs. 36.1 ± 0.6 L; $p < 0.001$), and *fluid volume* (extracellular water: men 19.0 ± 0.4 vs. 22.2 ± 0.5L; women 14.4 ± 0.2 vs.17.2 ± 0.3 L; $p < 0.001$) compared to the **Normal** group. Overnight (Day 2), both groups lost similar amounts of total body water (-0.83 ± 0.13 L; $p < 0.001$), extracellular water remained stable (0.01 ± 0.4 L), and the **Low** group preferentially lost more intramuscular water (-1.0 ± 0.8 vs. -0.4 ± 0.07 L). During postural changes from *lying to standing* the **Low** group had greater drops in systolic blood pressure (Day 1: -8.43 ± 2.8 vs. +2.29 ± 2.3 mmHg; $p < 0.01$; Day 2: -16.83 ± 2.7 vs. -2.83 ± 3.1 mmHg, $p < 0.01$). By comparison, diastolic blood pressure was more stable and compensated for postural changes from *lying to standing* in the **Normal** group, but not in the **Low** group (Day 1: **Low** +0.52 ± 1.7 vs. **Normal** +6.75 ± 1.4 mmHg, $p < 0.01$; Day 2: **Low** +0.35 ± 1.9 vs. **Normal** +5.58 ± 1.6 mmHg, $p < 0.01$). **CONCLUSION:** Loss of muscle with age is accompanied by loss of hydration and fluid volume that manifests as lower and less stable blood pressure. In fact, the severe drop in systolic blood pressure observed on Day 2 in the **Low** group approximates the criteria for diagnosis of orthostatic hypotension. Based on these data, loss of muscle increases risk for postural hypotension in older men and women.

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219   Board #60   May 30 11:00 AM - 12:30 PM

Impact of Nitrite Therapy on Change in Steady State Submaximal Exercise in Older

Kelly Allsup[1], Rachel Eleazu[2], Nancy W. Glynn[3], Jessica M. Shultz[2], James Kostra, Jr.[2], Ross Arena, FACSM[4], Daniel E. Forman[2]. *[1]VA Pittsburgh Healthcare System, Pittsburgh, PA. [2]University of Pittsburgh/ VA Pittsburgh Healthcare System, Pittsburgh, PA. [3]University of Pittsburgh, Pittsburgh, PA. [4]University of Illinois at Chicago, Chicago, IL.* (Sponsor: Ross Arena, FACSM)
(No relevant relationships reported)

Purpose: The population of older adults is growing, with increasing prevalence of detrimental geriatric risks, particularly sedentariness and downstream risks of cardiovascular disease, disability, and frailty. Nitrate therapy may enable physiological efficiency such that oxygen demands for submaximal workloads are reduced, and daily activity more easily tolerated. We explored the impact of chronic oral nitrite therapy in a cohort of older healthy adults. Nitrites (40 mg) were administered as capsules 3 times daily over one month. Changes in oxygen uptake (VO_2) during steady state walking in association with rate of perceived exertion (RPE [10-20 scale]) were analyzed. **Methods:** 9 adults (5 male, 4 female) aged ≥70 (mean 77.7±6.3 years, range 70-88) were studied. Functional capacity was assessed at baseline and 4 weeks based on steady state VO_2 and RPE during a 5 minute treadmill walk (1.5 mph). **Results:** Steady state VO_2 decreased significantly in the older adults using nitrite therapy (**Table 1**). RPE also trended downward.

	Pre	Post	Change	P-Value
Steady state VO2 (mlO2•kg-1•min-1)	13.29±4.14	11.27±2.75	2.02±2.75	0.029
Peak RPE	7.66±1.32	7±1.8	1±0	0.23

Conclusion: This promising pilot work in older adults showed that chronic nitrite was well-tolerated and was associated with increased walking efficiency. Further study is needed to better understand the impact on physical activity and health in this large and growing patient demographic.

Abstracts were prepared by the authors and printed as submitted.

A-44   Free Communication/Poster - **Bone and Connective Tissue**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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220   Board #61   May 30 11:00 AM - 12:30 PM

Circulating Irisin Levels And Bone Strength In Korean Adults

Jong Whan Choi, Jae Seung Chang, Jung Soo Lim, In Deok Kong. *Yonsei Univ. Wonju College of Medicine, Wonju, Korea, Republic of.*

(No relevant relationships reported)

PURPOSE: The aim of the study was to investigate the association of serum irisin concentrations with bone strength in Korean adults.
METHODS: We evaluated the osteoporotic and sarcopenic risk factors and circulating irisin levels of 472 adults (307 women) aged 19-89 years. Bone status was assessed using a calcaneal quantitative ultrasound method. Appendicular lean mass (ALM) was measured by bioelectrical impedance analysis and muscle function was evaluated by handgrip strength (HS) test. Serum irisin level was measured with ELISA methods. Sarcopenia and pre-sarcopenia were determined by the presence of muscle atrophy (ALM/height^2 < 7.0 kg/m^2 in men, and < 5.7 kg/m^2 in women) and/or weakness (HS < 26 kg in men and < 18 kg in women), respectively. Subjects were classified into four groups according to sex and quartiles of irisin levels.
RESULTS: As expected, the prevalence of those with sarcopenia tended to increase in the lowest quartile of irisin, whereas bone stiffness index (BSI) was significantly higher in the highest quartile of circulating irisin compared to the lowest one (93.6 ± 16.9 vs 81.7 ± 13.9 in men and 79.7 ± 18.1 vs. 71.6 ± 13.3, all for $p < 0.05$). Moreover, serum irisin levels had positive linear correlation with BSI in both sexes ($r = 0.1441$ in men and $r = 0.1438$ in women, all for $p < 0.05$).
CONCLUSIONS: Our results suggest that circulating irisin is associated with bone strength as well as sarcopenia in Korean subjects. Further investigations are needed to clarify the role of irisin as a mediator of bone-muscle unit.

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221   Board #62   May 30 11:00 AM - 12:30 PM

Bone HealthAmongFemale Collegiate Athletes Participating in Loading and Active Loading Sports

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(No relevant relationships reported)

PURPOSE: Collegiate athletics are known to affect body composition, strength, and bone characteristics. However, it is unknown which sport is most beneficial for increased bone mineral density (BMD). To compare the BMD of female collegiate athletes (n=102) who compete in impact loading sports; ice hockey players (HP; n=24), cheerleading (CH; n=22), and ballet dancers (BD; N=10) to female athletes in active loading sports; synchronized swimmers (SS; n=20), and sedentary controls (SC; N = 26).
METHODS: Participants underwent a total body, lumbar spine and femoral neck iDXA scan to evaluate BMD. Participants aged 20.5 ±1.8 years and weighed 61.3 ±9.8kg. ANCOVA compared BMD of the femoral neck, greater trochanter, total femoral, and lumbar spine (L1-L4) by sport while controlling for age.
RESULTS: HP had the most regular menstrual cycles (83%), followed by SS (75%), SC (65%), CH (64%). BD had the least regular cycles (50%) and many were oligomenorrheic. BD and HP had a significantly higher BMD in the femoral neck and greater trochanter as compared to all other groups ($p \leq 0.05$; $p \leq 0.001$). However, HP had significantly higher total femoral BMD than CH, SS and SC. BD demonstrated higher femoral BMD compared to CH, SS and SC ($p \leq 0.01$). Analysis of the BMD in the lumbar spine revealed that HP and BD had significantly higher BMD as compared to the SS and SC (1.14±0.12g/cm^2). Furthermore, there was no statistical difference between BD and the CH. However, CH had higher lumbar spine BMD than the SS and the SC ($p \leq 0.00$) (Table 1).
CONCLUSION: Although, ballet is an aesthetic sport as compared to hockey, both offer superior benefits to bone health than cheerleading, synchronized swimming, and being sedentary. The high prevalence of menstrual irregularity in the ballet dancers did not appear to negatively influence BMD. These results suggest that monitoring bone health in female athletes participating in low impact sports should be a priority.
Table 1: BMD by Sport Type

	Weight (kg)	Femoral Neck (g/cm2)	Greater Trochanter (g/cm2)	Total Femur (g/cm2)	Lumbar Spine (g/cm2)
Hockey	68.3 (±7.8)	1.21 (±0.14)	1.0 (±0.11)	1.21 (±0.11)	1.31 (±0.13)
Ballet	55.7 (±5.5)	1.17 (±0.15)	0.9 (±0.94)	1.1 (±0.11)	1.22 (±0.16)
Cheerleading	60 (±9.7)	1.06 (±0.17)	0.83 (±0.11)	1.04 (±0.14)	1.25 (±0.12)
Synchronized Swimming	61.7 (±8.3)	1.06 (± 0.13)	0.80 (±0.12)	1.04 (±0.13)	1.16 (±0.12)
Sedentary Controls	57 (±10.7)	1.0 (±0.13)	0.78 (±0.10)	1.01 (±0.11)	1.14 (±0.12)

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Weight Gain, not Simple Resumption of Menses, Improves Bone Metabolism in Amenorrheic Exercising Women

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(No relevant relationships reported)

PURPOSE: To assess if menstrual resumption or weight gain contributed to improved bone metabolism during a nutrition intervention in amenorrheic exercising women.
METHODS: Amenorrheic exercising women (n=27, 18-25 yr) were recruited for a 12mo intervention to assess the impact of increased caloric intake on menstrual and bone health. Body weight and serum markers of bone formation (P1NP) and resorption (CTX) were measured at baseline (BL) and the time of menstrual resumption (n=15) or study completion if participants did not resume menses (n=12, range 5-49 wks) (post). Bone balance (BB) at BL and post was calculated as the multiple of median of formation (MoMf=[P1NP]/median[P1NP]$_{OV}$) divided by resorption (MoMr=[CTX]/ median[CTX]$_{OV}$) with an ovulatory control group serving as the reference (OV). Two-way ANOVA determined if change in MoMf, MoMr, and BB were related to menstrual resumption or weight gain. Women were classified as gaining ≥1 kg (Wt+) or not (Wt-). Menstrual resumption was defined simply as the occurrence of a single menses. **RESULTS**: 12/15 women resumed menses and 16/27 women gained ≥1 kg during the study. Average weight change was +2.6 kg in Wt+ and -0.1 kg in Wt-. There was a main effect of weight on BB change (p=0.007), indicating that women in Wt+ experienced increased BB (1.03 to 1.23) whereas women in Wt- experienced decreased BB (1.16 to 0.97). There was an interaction effect of resumption and weight on MoMf (p=0.027), such that the largest decrease in MoMf (1.4 to 1.1) occurred in women who neither resumed nor gained weight. There were no main or interactive effects of resumption and weight on MoMr, though MoMr decreased in Wt+ (1.25 to 1.15) and increased in Wt- (1.34 to 1.43). There were no differences in the proportion of women who resumed menses in Wt+ (10/16) vs. Wt- (5/11) (χ2=0.767, p=0.381).
CONCLUSIONS: Weight gain of ≥1 kg improved bone balance to favor bone formation. The occurrence of a single menses did improve bone metabolism. The change in bone formation depended on both menstrual resumption and weight gain. Our findings suggest that a single occurrence of menses is unlikely to coincide with enhanced estrogenic status necessary to improve bone health; weight gain, indicative of improved energy, may be a more robust predictor of bone health in amenorrheic exercising women. Supported by US DoD (PR054531)

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The Effects Of A Single Bout Exercise On Rankl Pathway, Cytokines And Bone Turnover Markers In College Women

JIYEON KIM[1], HYOJIN KIM[2], GIWON KIM[2], SUKHO LEE[1], DONGHO PARK[3], SEOKKI MIN[4], Changsun KIM[2]. *[1]TEXAS A&M- San Antonio, San Antonio, TX. [2]Dongduk Women's University, Seoul, Korea, Republic of. [3]Inha University, Incheon, Korea, Republic of. [4]Korea Institute of Sport Science, Seoul, Korea, Republic of.*

(No relevant relationships reported)

PURPOSE: Exercise is well known to play a positive role in bone metabolism, but few studies have examined changes in exercise intensity relative to receptor activator of nuclear factor-kappaB ligand (RANKL)/ Osteoprotegerin (OPG) factors that regulate osteoclastogenesis. The objective of this study was to investigate the changes of RANKL pathway factors, cytokines, and bone turnover markers by applying moderate intensity and high intensity exercise.**METHODS**: Ten female collegiate students (21.8±2.4yrs) completed two exercise sessions 1) moderate intensity exercise (60% VO2max) and 2) high intensity exercise (80% VO2max) with seven days interval. Calorie outputs of two exercise sessions were matched (250 kcal). Blood

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samples were collected before, immediately after, and 90 min after exercise and were analyzed for serum levels of RANKL pathway (RANKL, OPG), cytokines (IL-6; Interleukin 6 and TNF-α; Tumor necrosis factor-alpha), and bone turnover markers (osteocalcin, CTx; collagen type 1 cross-linked C-telopeptide, Vitamin D). **RESULTS**: As a result, there was no significant time x group interaction effect for RANKL pathway, cytokines, and bone turnover markers (N.S.). A significant time effect was observed for TNF-α (F=26.185, p=.001) but, post-hoc analysis showed no significant effects. A significant group effect was observed for CTx (F=11.386, p=.006) but, post-hoc analysis showed no significant effects. However, significant correlation was found among RANKL pathway, cytokines, and bone turnover markers. It was found that TNF-α had a positive correlations with RANKL (r=.685, p=.000) and OPG (r=.244, p=.021). In addition, study shows that Vitamin D had a negative correlation with RANKL(r=-.323, p=.004) and OPG(r=-.278, p=.008), and had a positive correlation with OPG / RANKL ratio(r=.252, p=.026). **CONCLUSIONS**: This results suggest that a single bout of exercise used in current study may not enough to induce changes in RANKL pathway, cytokines, and bone turnover markers in 20s women with maximal bone mass. We also found that TNF-α and vitamin D have positive and negative relationship with RANKL and OPG respectively. Supported by NRF Grant 2015S1A5A2A01011501.

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224   Board #65   May 30 11:00 AM - 12:30 PM

Influences Of Alcohol Consumption, Physical Activity, And Body Composition On Areal Bone Mineral Density In Korean College-aged Female Students

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to investigate the most important factor among alcohol consumption, physical activity, and body composition that affect aBMD in healthy college-aged female students. **MOTHODS:** One hundred thirteen college females (21.9 ± 1.8 years; 161.8 ± 5.2 cm; 53.2 ± 6.0 kg) were recruited from the Universities in Seoul and Gyeonggi areas, South Korea. The aBMD of L1-L4 and non-dominant side of proximal femur (TH; total hip, FN; femoral neck) were measured using Dual Energy X-ray Absorptiometry. The alcohol consumption was determined by the frequency and amount of alcohol intake during the past 12 months using self-reported questionnaires (less than once per month, n=45; 2-4 times per month, n=53; 2-3 times per week, n=15). The total bone-specific physical activity (tBPAQ, average of past and current BPAQ) score was used to obtain a comprehensive account of lifetime physical activity related to bone health. A qualified research analyzed all values using an online BPAQ calculator (www.fithdysign.com/BPAQ/). The X-scan plus II (Hospital body Composition Analyzer, Jawon Medical Korea) was used to measure height (cm), weight (kg), fat free mass (FFM, kg), and % body fat. **RESULTS:** Spearman's correlation showed no significant relationships between the frequency of alcohol intake and aBMD of L1-L4 and TH and FN at non-dominant side of femur (p>0.05). But there were positive correlations between FFM and aBMD of L1-L4 (r=0.410, p<0.001), TH (r=0.415, p<0.001) and FN (r=0.395, p<0.001). Also, positive relationships were found between %body fat and aBMD of L1-L4 (r=0.205, p<0.05), TH (r=0.302, p<0.01) and FN (r=0.282, p<0.01). The tBPAQ scores were positively related to aBMD of TH (r=0.299, p<0.01) and FN (0.292, p<0.01), but not found in L1-L4 (p>0.05). **CONCLUSION:** The most positive influential factor affecting healthy aBMD was FFM in college-aged female students, compared to %body fat and tBPAQ. Our study found that alcohol consumption did not affect aBMD variables and further studies are needed to determine its relations to aBMD in this population. Our findings suggest that maintaining healthy body composition would be the key for healthy bones in young college-aged females.

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225   Board #66   May 30 11:00 AM - 12:30 PM

Sex-specific Mediation Of Physical Activity's Effects On The Muscle-bone Unit In Active Young Adults.

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(No relevant relationships reported)

Moderate-to-vigorous intensity physical activity (MVPA) promotes bone mineral accrual on periosteal surfaces. These adaptations are thought to largely result from mechanical forces applied to bones by contracting muscles. **PURPOSE:** To understand the pathway through which mechanical forces optimize cortical bone, we sought to identify the serial multiple mediation pathway through which measures of muscle mass and force interact with cortical bone during MVPA, in sex-specific models. **METHODS:** Time performing MVPA was assessed over 7 days in young adults (n=147, 19.7 ± 0.7 yo, 52.4% female) using an Actigraph GT3X+ accelerometer. Cortical diaphyseal bone was assessed via peripheral quantitative computed tomography at the mid-tibia. Muscular strength of the knee extensors via

Biodex isokinetic dynamometry was used to represent the mechanical forces applied to the tibia and thigh lean mass was assessed via dual-energy x-ray absorptiometry. **RESULTS:** Participants exceeded recommended levels of MVPA (89.14 ± 27.29 minutes/day), with males performing 40.9% more vigorous intensity activity relative to females (p<.05). Males absolute knee extension force, force relative to lean mass, and thigh lean mass were greater than females (59.9%, 16.1%, and 37.0%, respectively, all p<.05). In combined-sex models, controlling for tibia length and age, the effect of MVPA on strength strain index (pSSI) was completely mediated through two discrete pathways: 1) thigh lean mass (Coeff. = 1.11, LLCI .48, ULCI 1.96), and 2) thigh lean mass and knee extensor force in sequence (Coeff. = .26, LLCI .08, ULCI .65). However, in sex-specific models the effect of MVPA on pSSI was mediated through thigh lean mass in females (Coeff. = .95, LLCI .18, ULCI 2.18) and knee extensor force in males (Coeff. = .78, LLCI .04, ULCI 2.02). Bootstrapped confidence intervals confirmed these mediation pathways for measures of cortical structure but not density. **CONCLUSION:** The effect of MVPA on cortical structure in young adults appears to be mediated through a muscle mass, potentially paracrine, pathway, as well as through mechanical forces. Sex-specific pathways suggest that muscle force is influential in males but not females. These findings highlight potentially novel avenues for the sex-specific promotion of bone accrual.

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Bone Mineral Content/Density And Muscle Strength In Young Women From Different Racial/Ethnic Backgrounds - A Pilot Study

JAPNEET KAUR, EDUARDO D.S. FREITAS, RYAN M. MILLER, AARON D. HEISHMAN, DEBRA A. BEMBEN, FACSM, MICHAEL G. BEMBEN, FACSM. UNIVERSITY OF OKLAHOMA, NORMAN, OK. (Sponsor: MICHAEL G. BEMBEN, FACSM)
(No relevant relationships reported)

Race/ethnicity is a major factor influencing both bone mass and muscle mass (bone free lean mass - BFLM) since muscular forces can enhance bone strength by applying mechanical stress to the skeleton. **Purpose:** To examine group mean differences and the relationships between bone mineral content (BMC) and density (BMD) to BFLM and muscle strength in young women from different racial/ethnic backgrounds. **Methods:** Twenty-seven young women aged 18-30 years self-identified themselves as Caucasian (Cau; n=6), South-Asian (SA; n=6), East-Asian (EA; n=4), Hispanic (His; n=6), and African-American (AA; n=5). Body composition (fat, BFLM, and BMC) and total and regional BMD were measured using Dual Energy X-Ray Absorptiometry, while jump test, leg press, and bilateral isokinetic strength testing of knee flexors/ extensors were used to quantify lower limb muscle strength and power. International Physical Activity Questionnaire (IPAQ) classified women into low, moderate or high levels of physical activity. Ethnic differences in each outcome variable were determined using one-way ANOVA, while Pearson correlation coefficients quantified relationships between variables. Statistical significance was set at p < 0.05. **Results:** Based on the entire sample (n=27), both total body BMD and BMC had significant positive relationships with total BFLM (r=0.78 and 0.87 respectively). Based on ethnicity, AA women had significantly higher total body and hip (left and right) BMC than His. Although non-significant, total BFLM values were highest for AA and lowest for EA and SA (47.7±9.6 kg vs. 37.9±5.5 kg and 37.8±5.5 kg respectively; p=0.08). Analysis of the entire sample revealed a significant positive relationship between MET minutes/week and total BFLM (r=0.45). As per IPAQ scores, highly active women had significantly lower percent body fat compared to moderately active women (26% ± 6% vs. 38% ± 7%; p=0.001). Finally, average muscular power (watts; W) during flexion at 60 deg/sec was significantly higher for Cau compared to EA and SA (54.98±18.74 W vs. 30.76±7.6 W and 27.7±9.0 W respectively; p=0.01). **Conclusion:** These findings suggest that BMC and BMD are significantly related to total BFLM, and that BMC varies across the ethnic groups, however, further data collection and analyses will validate the current findings.

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Gender Differences in Mechanical Properties of the Achilles Tendon: Longitudinal Response to Heavy Loading Exercise

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(No relevant relationships reported)

Gender differences have been observed in the mechanical properties of the Achilles tendon, helping to explain the increased risk of injury in males. However, the response and recovery of tendon mechanics to heavy loading exercise, as well as gender dependent responses, are not well understood. **PURPOSE:** Compare Achilles tendon mechanical properties between males and females prior to, immediately after, and 60-minutes following a heavy loading exercise. **METHODS:** 17 female (age: 24.0 ± 3.9yrs; height: 167.4 ± 6.9cm; mass: 64.9 ± 8.5kg) and 18 male (age: 23.9 ±

2.4yrs; height: 179.2 ± 5.09cm; mass: 78.4 ± 8.7kg), recreationally active individuals volunteered. Isokinetic dynamometry and diagnostic ultrasound were used to assess levels of Achilles tendon stiffness (N/mm), stress (MPa), and Young's modulus (MPa) prior to 100 successive calf raises using a Smith machine at 20% body mass. Outcomes were reassessed immediately, and 60-minutes post-exercise. Separate 2x3 (gender x time) repeated measures analyses of variances and Bonferroni post-hoc comparisons were used to assess differences in males and females on each outcome across the three time points. **RESULTS:** Females exhibited less Achilles tendon stiffness (baseline: 146.8 ± 76.0; immediate: 127.8 ± 52.6; 60min: 137.7 ± 56.6), stress (baseline: 25.4 ± 14.3; immediate: 22.0 ± 12.9; 60min: 23.0 ± 12.8), and modulus (baseline: 211.9 ± 138.7; immediate: 182.8 ± 99.6; 60min: 194.4 ± 99.3) compared to males (stiffness - baseline: 206.5 ± 113.5; immediate: 164.1 ± 69.8; 60min: 180.8 ± 73.7; stress - baseline: 36.2 ± 14.8; immediate: 32.3 ± 12.1; 60min: 34.4 ± 13.5; modulus - baseline: 257.7 ± 112.1; immediate: 233.3 ± 125.0; 60min: 246.7 ± 91.9; P ≤ 0.05). Both genders responded to high loading exercise similarly, with immediate decreases in outcomes from baseline to immediately post-exercise, and restoration of outcomes by 60min (P ≤ 0.05). **CONCLUSION:** Females demonstrate less Achilles tendon stiffness, stress and modulus compared to males, however both genders respond to heavy loading exercise similarly. This indicates that baseline differences in tendon properties, and not distinctive responses to loading, may help to explain the disparity in injury risk. Future research should examine tendon properties in response to loading in patients with Achilles tendinopathy.

A-45   Free Communication/Poster - **Anterior Cruciate Ligament Injury**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

228   Board #69   May 30 11:00 AM - 12:30 PM
Neuromuscular Changes During Return To Play After ACL Surgery In Elite Soccer Players

Frantisek Zahalka[1], Tomas Maly[1], Dai Sugimoto[2], Lucia Mala[1], Lee Cabell[3], Arnold Baca[4]. [1]Charles University, FPES, Prague, Czech Republic. [2]Boston Children's Hospital, Boston, MA. [3]Arkansas Tech University, Russellville, AR. [4]University of Vienna, Vienna, Austria.
(No relevant relationships reported)

Anterior Cruciate Ligament (ACL) tear is major concern.in soccer. Although ACL reconstruction and its postoperative rehabilitation are successfully performed, knee instability and neuromuscular control deficits are often prevalent at the time of return to play process.
PURPOSE: To investigate effect of postoperative rehabilitation protocol on postural control (PC) changes in three time points following ACL reconstruction in male soccer players.
METHODS: National level male soccer players (n = 16, age 24.7±3.9 years) volunteered in the study. Players performed postoperative rehabilitation protocol that had emphasis on enhancing postural stability (PS), muscular strength, and limb symmetry 6 times per week for 23 weeks. Static pressure measurements were obtained on a platform Footscan (RSscan International, Belgium). The following tests of PS were taken: bilateral narrow standing position (BS) with 2 levels of vision (eyes open and closed) for 30 seconds and single leg standing (SS) position test on injured and non-injured leg for 60 seconds. The tests were performed: (a) postoperatively, before rehabilitative intervention, five months (b), and 10 months (c) following ACL reconstruction. Mixed-design RM ANOVA, Bonferroni's *post hoc* tests and partial eta square (η_p^2) were used for statistical assessment. **RESULTS:** The main factor (Time) revealed significant effect on PC both for BS ($F_{2,60}$ = 56.39; $p<.01$, η_p^2 = .65) and SS ($F_{2,60}$ = 40.37; $p<.01$, η_p^2 = .57). Post-hoc test revealed significant improvement of PC improvement after intervention (BSa = 151.34±8.41 mm, BSb =127.00±6.56 mm, $p<.01$) as well as follow-up effect (BSb =127.00±6.56 mm, BSc =109.63±6.18 mm, $p<.01$). We found a significant interaction effect between observed factors (Time*Leg) within observed time ($F_{2,60}$ = 24.81; $p<.01$, η_p^2 = .45). Participants significantly improved PC on injured leg (SSa = 1748.63±78.81 mm, SSb = 1281.75±62.70 mm, p<.01); however, postural control SSb was non-significant compared to SSc (p>.05).
CONCLUSION: The postoperative rehabilitation protocol demonstrated favorable PC improvements following ACL reconstruction in elite male soccer players. Also, our findings indicated importance of continuous rehabilitation after 5 months following ACL reconstruction in order to eliminate asymmetry in PC.

229   Board #70   May 30 11:00 AM - 12:30 PM
Quadriceps Function Does Not Differ Between Subjects With ACL Reconstruction With Impulsive Vs. Normal Loading

Jonathan Goodwin, Chris Johnston, Brian Pietrosimone, FACSM, Troy Blackburn. University of North Carolina at Chapel Hill, Chapel Hill, NC.
(No relevant relationships reported)

Individuals with anterior cruciate ligament reconstruction (ACLR) are at a significant greater risk of knee osteoarthritis (OA). The heelstrike transient (HST) during gait is indicative of impulsive/high-rate loading, which has been implicated in cartilage degradation and knee OA development. The quadriceps attenuates loading during gait, and quadriceps dysfunction following ACLR may contribute to impulsive loading and knee OA risk. **Purpose:** To determine the differences in quadriceps function between impulsive loaders and non-impulsive loaders during walking gait.
Methods: Forty-five volunteers with unilateral ACLR participated in this study (32F, 20±3 years old, 71±19 kg, 1.7±0.1 m, 23±15 [range 7-58] months post-ACLR). Quadriceps function in the ACLR limb was quantified during maximal isometric contraction at 90° of knee flexion via the peak torque, rate of torque development (RTD) from 20% to 80% of the interval from onset to peak torque, RTD from onset to 100 ms, and RTD from 100ms to 200ms. All values were normalized to body mass. Gait biomechanics were assessed during overground walking at a self-selected pace. A trial was classified as possessing a HST if the ratio of the vertical ground reaction force peak immediately following heelstrike to the impending local minimum exceeded 1.2. Subjects were classified as "Impulsive" loaders if a HST was identified in at least 3 of 5 of trials. Independent t-tests and correlations were utilized for the analysis.
Results: 31% of the subjects were identified as Impulsive loaders. However, there were no significant differences between Impulsive and Normal loaders for $RTD_{20-80\%}$ (0.41±0.46 vs. 0.42±0.44, p=0.96), $RTD_{0-100ms}$ (2.9±1.9 vs. 3.5±2.6, p=0.41), $RTD_{100-200ms}$ (2.5±1.4 vs. 2.3±1.5, p=0.62), or peak torque (2.2±0.7vs. 2.3±0.7, p=0.45). There were no significant correlations between the %trials with HST and the quadriceps function indices (r=-0.043-0.172, p=0.258-0.952).
Conclusion: Roughly 1/3 of our subjects were identified as Impulsive loaders. This statistic mirrors the risk of knee OA development (~30%) in the first decade following ACLR. Our data suggest that this relationship is not associated with quadriceps function. Future research is necessary to determine the role of the HST in knee OA development and the factors that contribute to its presence.

230   Board #71   May 30 11:00 AM - 12:30 PM
Interlimb Asymmetries Post ACL Reconstruction During Sprints

Jamie Kronenberg[1], Nicole Veltri[1], Danielle Pasquale[1], Joshua M. Tome[1], Patrick McKeon[1], Kathy J. Simpson[2], Rumit S. Kakar[1]. [1]Ithaca College, Ithaca, NY. [2]Universiy of Georgia, Athens, GA.
(No relevant relationships reported)

Purpose: ACL reconstruction (ACLR) after a complete ACL tear is aimed at restoration of the mechanics of the limb. After reconstruction, neuromuscular mechanics of the lower extremities (LE) may change asymmetrically. Since the ACL is comprised of inert tissue, it has lower adaptability under stress. Abnormal force distribution between the LE joints of ACLR can increase the risk for a secondary tear while running. The purpose of this study is to use 2-Dimesional (2D) motion analysis to assess limb asymmetries in individuals with ACLR during sprints. **Methods**: 6 ACLR (4 females, 2 males, age 19-24, 1-5 yrs post-surgery)& 6 BMI-matched controls (MC) participated. Participants ran at a maximum (MAX) self-selected speed/sprint for 30s on a treadmill. 2D data were recorded via Apple iPads and analyzed via Kinovea© for max joint angular displacements (AngDisp: max flexion to extension) at the hip, knee and ankle in the sagittal plane. AngDisp were compared between groups using Kruskal-Wallis H Test. Limb symmetry indices (LSI) were calculated (Involved/Healthy *100) for participants and compared between ACLR and MC. **Results**: No statistically significant differences in AngDisp between the groups were observed (p=.281,.676,.895;χ²=2.538,.784,.222) for the hip, knee and ankle respectively. LSI values (85>X>115%) are clinical indicators of asymmetry between limbs. LSI values showed clinically significant differences at the ankle in ACLR group (84%) but not in MC (87%). There were no clinically significant differences in LSI at the hip or knee (92-94%). **Conclusions**: Neuromuscular deficits have been reported up to 2 years post-op. These deficits are usually not visible without use of 3D motion analysis. In the absence of advanced technology, common neuromuscular deficits can be missed, leading to earlier termination of rehabilitation and possibly leading to a secondary tear (reinjury rate: 23%). Although there were minimal asymmetries reported on LSI, detailed 3D analysis might be essential to understand the quality of the running mechanics or any possible neuromechanical deficits to help prevent any secondary ACL tear.

231   Board #72   May 30 11:00 AM - 12:30 PM

Quadriceps Strength and Landing Symmetry Following ACL Reconstruction

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(No relevant relationships reported)

PURPOSE: Quadriceps strength asymmetry is common following anterior cruciate ligament reconstruction (ACLR). However, quadriceps strength symmetry may not reflect symmetry in other tasks such as a landing. The purpose of this study was to 1) examine the relationship between quadriceps strength symmetry and landing symmetry and 2) to compare landing mechanics between limbs of individuals with ACLR. **METHODS: :** Quadriceps strength and landing biomechanics were assessed in 46 individuals with primary unilateral ACL reconstruction (34 females, age=22.0±2.8 years, height=1.70±.09m, mass=71.9±16.1kg, IKDC=86.1±9.3). Participants completed 3 drop jump landings from a 30cm height located at a distance of 50% of their height onto 2 force plates. Quadriceps strength was assessed via isometric (peak and rate of torque development (RTD)) and isokinetic knee extension at 60°, 180°, and 240°/second. Limb symmetry index (LSI) was calculated as the ratio of the involved divided by the uninvolved limb for strength and landing biomechanics (knee flexion angle (KFA) (at ground contact, peak, and excursion), peak external knee flexion moment (KFM), and vertical ground reaction force (GRF)). Pearson correlation was used to assess the relationship between quadriceps LSIs and KFM and GRF LSIs. Spearman rho was used to examine the relationship between quadriceps LSIs and KFA LSIs. Paired samples t-tests were used to compare dependent variables between limbs (α=0.05). **RESULTS**: Isometric strength LSI (r=0.30, p=0.05) and RTD LSI (r=0.37, p=0.01) were associated with KFM LSI. Isometric strength LSI (rho=0.34, p=0.02) and isokinetic strength LSI at 60° (rho=0.40, p=0.01) and 180° (rho=0.31, p=0.05) were associated with knee flexion excursion LSI. Isokinetic strength at 180° (r=0.39, p=0.01) was associated with GRF LSI. Uninvolved limbs had greater GRF (2.48±0.77 vs. 2.23±0.69 BW, p=0.034) and KFM (0.17±0.04 vs. 0.14±0.04 %BW*height, p<0.001) compared to involved limbs. **CONCLUSIONS**: ACLR limbs had smaller GRF and KFM compared to uninvolved limbs. This may indicate a compensatory strategy to underload the involved limb during landing. The weak correlations between quadriceps strength LSI and landing LSI may indicate that other factors such as impaired neuromuscular control or fear of re-injury influence landing symmetry.

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232   Board #73   May 30 11:00 AM - 12:30 PM

Quality Of Semitendinosus Tendon Regeneration As A Function Of Time Post-ACL Reconstruction

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(No relevant relationships reported)

Evidence exists of the semitendinosus tendon (ST) physically regenerating following harvest for ACL reconstruction. However, the quality of regenerated tissue, indicated by elastic modulus, is not well understood. The time-dependency of this regeneration is also important post-ACL reconstruction as the hamstring muscle group is inherently protective of the ACL. **PURPOSE**: Assess the quality of ST regeneration, as measured with shear modulus, as a function of time post-ACL reconstruction with comparisons to healthy controls. **METHODS**: Ultrasound Shear Wave Elastography determined shear modulus of the ST tendon on 10 ACL reconstructed individuals (age: 21.6±1.6 years, height: 171.6±8.5cm, mass: 71.4±7.1kg, Tegner scale: 5.9±1.0) and 10 healthy individuals (age: 20.6±2.0 years old, height: 173.4±9.3cm, mass: 71.6±13.0kg, Tegner scale: 5.6±1.1). Time since ST harvest averaged 4.3 years (range: 0.75-12.6 years) and all individuals were since cleared to return to play by their physician. While prone with the knee at full extension and relaxed, three ultrasound images (AIXPLORER, Supersonic Imagine S.A., France) were acquired of the distal ST tendon. Linear regression analysis determined the relationship between ST tendon shear modulus vs. time since tendon harvest. 99% confidence interval (CI) determined the range of tendon compliance in healthy subjects and served as comparison to ACL reconstructed subjects. **RESULTS**: The relationship between the shear modulus vs. time since ST harvest was R²=0.57 (p=0.012). 3 subjects under 2 years post-reconstruction had low shear modulus of ~100kPa or less. The 99% CI of the healthy tendons was 374-590kPa, and only 1 of the 10 reconstructed subjects reached this range. **CONCLUSIONS**: Despite these preliminary data supporting long-term time-dependent regeneration, ST quality is highly variable indicating other factors influence this regeneration post-ACL reconstruction. Low shear modulus has an effect on muscle function, which may alter the knee load leading to the early development of knee OA. Future research is needed to assess the clinical importance of regeneration quality post-harvest in order to establish interventions facilitating early material property recovery.

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233   Board #74   May 30 11:00 AM - 12:30 PM

Greater Loading Rates during Gait are Associated with Knee Symptoms 1.5 Years Following ACL Reconstruction

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(No relevant relationships reported)

Previous studies indicate that females with an anterior cruciate ligament reconstruction (ACLR) demonstrate higher vertical ground reaction force loading rates (vGRF-LR) on the ACLR limb compared to the contralateral limb, as well as matched limbs of uninjured controls. There is conflicting evidence concerning whether greater ACLR limb loading is linked to the onset of posttraumatic osteoarthritis and worse clinical outcomes. **PURPOSE**: Determine the association between instantaneous vGRF-LR in ACLR and contralateral limbs and clinically-relevant knee symptoms (CRKS) in females > 1.5 years post unilateral ACLR. **METHODS**: Twenty-eight females were included in this study (21.07±2.71 years old, 23.8±4.21kg/m² body mass index, 55.14±34.69 [range 20-161] months post-ACLR. vGRF-LR was collected as participants walked barefoot at a self-selected speed over two force plates embedded in a 6m walkway. Instantaneous vGRF-LR (i.e. peak of the 1st time derivative) was extracted from the first 50% of stance phase and normalized to bodyweight (BW/s) for the injured limb. CRKS were determined using previously defined Knee Injury and Osteoarthritis Outcomes Score (KOOS) criteria (Quality of Life ≤ 87.5 and 2 of the following: Pain ≤ 86.1; Symptoms ≤ 85.7; Activities of Daily Living≤ 86.8; Sports and Recreation ≤ 85.0). A Receiver Operator Characteristic (ROC) curve was constructed to establish the accuracy of vGRF-LR to identify individuals with CRKS. If a significant area under the ROC curve (AUC) was determined (i.e. AUC 95% confidence intervals [CI] did not cross 0.5), we identified the cutoff value that maximized sensitivity and specificity. Lastly, odds ratios were calculated to demonstrate the association between reaching the vGRF-LR cutoff score and reporting CRKS. **RESULTS**: ACLR limb vGRF-LR was highly accurate in identifying those with CRKS (AUC = 0.77; 0.57-0.97). Participants with a vGRF-LR ≥ 53.23 BW/s on the ACLR limb were 18.00x (1.83-177.15) more likely to report CRKS. **CONCLUSIONS**: Greater vGRF-LR is associated with worse clinical outcomes in females >1.5 years post ACLR, which is contrary to previous data collected at earlier time points post-ACLR. When considered in the context of previous work, the current findings suggest that time post-ACLR may influence the association between joint loading and CRKS.

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234   Board #75   May 30 11:00 AM - 12:30 PM

Biomechanical Evaluation Of Landing Maneuvers In Soccer Players With An Anterior Cruciate Ligament Reconstruction

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(No relevant relationships reported)

Altered landing has been reported in individuals with an ACL reconstruction (ACLR). However, no study has evaluated landing biomechanics during soccer-specific landing tasks in soccer players with an ACLR. **PURPOSE:** To evaluate landing biomechanics in soccer players following ACLR during planned and unplanned landing tasks compared with healthy soccer players. **METHODS:** Eighteen soccer players with an ACLR (age, 26.11 ± 3.95 years; height, 1.70 ± 0.09 m; weight, 68.15 ± 9.64 kg, BMI, 23.52 ± 2.69 kg/m², time since surgery, 5 ± 3.30 years) and 18 healthy soccer players (age, 25.83 ± 3.51 years; height, 1.66 ± 0.05 m; weight, 66.88 ± 10.37 kg, BMI, 24.09 ± 3.73 kg/m²) participated in the study. Planned landing included jumping forward and landing on the force plates, whereas unplanned landing included jumping forward to head a soccer ball and landing on the force plates. Participants performed 4 trials of each landing task. The outcome measures were peak flexion angles and extension moments of the hip, knee, and ankle joints, peak pressure, and electromyography activity of gluteus maximus, quadriceps, hamstrings, and gastrocnemius muscles. A 2×2 ANOVA (landing × group) was performed for each measure. **RESULTS:** A significant landing × group interaction was found only for knee flexion angles ($F_{1,34} = 11.26$, p = 0.002). Follow-up comparisons showed that the ACL group landed with greater knee flexion during planned landing compared with unplanned landing (p < 0.001). Significant main effects of landing (regardless of group) were found. The unplanned landing showed decreased hip flexion ($F_{1,34} = 48.55$, p < 0.001), decreased knee flexion ($F_{1,34} = 40.58$, p < 0.001), decreased hip extension moments ($F_{1,34} = 6.82$, p < 0.013), decreased knee extension moments ($F_{1,34} = 27.18$, p < 0.001),

and decreased peak pressure ($F_{1,34}$ = 20.98, p < 0.001). Also, a significant main effect for group (regardless of landing) for gastrocnemius muscle was found showing that the ACL group landed with reduced gastrocnemius activity ($F_{1,34}$ = 11.27, p = 0.002).

CONCLUSION: Unplanned landing showed greater injury predisposing factors compared with planned landing. The ACL group showed nearly similar landing biomechanics to the control group during both landing tasks. However, the ACL group used a protective landing strategy by reducing gastrocnemius activity.

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235   Board #76   May 30 11:00 AM - 12:30 PM

Lesser Mechanical Loading During Walking Gait Associates with Worse Proteoglycan Density 6 months Following Anterior Cruciate Ligament Reconstruction

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(No relevant relationships reported)

Optimal mechanical loading is necessary to decrease the risk of posttraumatic osteoarthritis (PTOA) following anterior cruciate ligament reconstruction (ACLR) and lesser mechanical loading early following ACLR may increase the risk for PTOA onset. T1ρ magnetic resonance imaging (MRI) has been used to measure cartilage composition at early time points following ACLR.
PURPOSE: To determine the association between proteoglycan density of femoral cartilage derived from T1ρ MRI relaxation times and peak vertical ground reaction force (vGRF) and instantaneous vGRF loading rate (vGRF-LR) during walking gait 6 months following ACLR.
METHODS: Twenty-nine individuals (52% female, BMI = 24±3 kg/m²) with a unilateral patellar-tendon autograft ACLR participated in this study. Five trials of walking gait at self-selected speed were performed 6 months following ACLR. Peak vGRF and instantaneous vGRF-LR were extracted from the first 50% of the stance phase in both limbs. T1ρ relaxation times were calculated for articular cartilage in the medial and lateral condyles (MFC & LFC) by fitting a monoexponential model. The weight bearing MFC and LFC cartilage was manually segmented into posterior, central, and anterior regions of interest (ROI) based on the location of the meniscus in the sagittal plane. Affine and deformable registration techniques were used to register the ACLR limb to the uninjured limb. Inter-limb mean T1ρ relaxation time ratios (RTR = ACLR limb / uninjured limb) were calculated for each ROI. Separate, stepwise linear regressions were used to determine the unique associations between vGRF outcomes and T1ρ RTR in each ROI after accounting for walking speed and meniscal injury (ΔR²; P≤ 0.05).
RESULTS: In the ACLR limb, lesser vGRF during gait was associated with lesser proteoglycan density in the posterior (ΔR²=0.22, P=0.02) and central LFC (ΔR²=0.22, P=0.02), as well as the posterior (ΔR²=0.12, P=0.05) and central MFC (ΔR²=0.21, P=0.01). vGRF-LR in the ACLR limb and all vGRF outcomes in the contralateral limb did not significantly associate with T1ρ RTR for any ROI.
CONCLUSIONS: Individuals with lesser vGRF in the ACLR limb presented with T1ρ MRI findings consistent with deteriorating cartilage health. Understanding how loading affects joint health is critical to developing interventions to delay PTOA onset.

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236   Board #77   May 30 11:00 AM - 12:30 PM

Assessment of Torsional Knee Stiffness in Individuals Following Anterior Cruciate Ligament Reconstruction During Running

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(No relevant relationships reported)

Purpose: To determine torsional knee stiffness in individuals with anterior cruciate ligament reconstruction (ACLR) during running, which has previously been speculated upon but not yet assessed.
Methods: 17 individuals with ACLR (19 ± 5.2 years, 16 F, 22.6 ± 2.4 kg/m², 6.4 ± 0.5 months post-surgery) and 17 control subjects (23 ± 1.5 years, 16 F, 22.7 ± 2.1 kg/m²) participated. Instrumented gait analysis was used to obtain knee angles and moments during running. Stiffness was calculated as the ratio of change in knee extensor moment to knee flexion angle over the period of initial contact (IC) to peak knee flexion angle (P1) as well as the first 60 ms after IC (P2). Isometric knee extension strength was also tested. An independent two-sample t-test (α = 0.05) was used to compare stiffness between groups. The Pearson correlation coefficient (r) was used to quantify the relationship between stiffness and peak knee extensor torque (KET), and between stiffness and knee extensor rate of torque development (RTD).

Results: Torsional knee stiffness was significantly greater in the surgery limb compared to the control limb during P1 (p = 0.049) and P2 (p = 0.0057). No correlation was found between stiffness and peak KET (r = 0.04), or between stiffness and knee extensor RTD (r = 0.088).
Conclusion: Individuals with ACLR had greater knee stiffness in running compared to control subjects but it is unknown whether this difference was present before, or resulted after injury. Increased stiffness has been suggested as a risk factor for developing osteoarthritis, which is known to be prevalent in this population. Based on the lack of correlation between strength and stiffness, increased stiffness observed in the ACLR group is likely an issue of control but further scrutiny is needed.

	Surgery limb	Contralateral limb	Control limb	p-value	
				Surgery/ Contralateral	Surgery/ Control
Stiffness P1 (Nm x N⁻¹ x m⁻¹/°)	0.058 ± 0.026	0.062 ± 0.029	0.044 ± 0.007	0.51	0.049
Stiffness P2 (Nm x N⁻¹ x m⁻¹/°)	0.079 ± 0.056	0.063 ± 0.037	0.034 ± 0.019	0.22	0.0057
Peak knee extensor moment (Nm x N⁻¹ x m⁻¹)	0.78 ± 0.31	1.43 ± 0.23	1.10 ± 0.19	< 0.001	< 0.001
Knee flexion excursion (°)	22 ± 7	30 ± 7	32 ± 6	< 0.001	< 0.001

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237   Board #78   May 30 11:00 AM - 12:30 PM

Quadriceps Force Steadiness following Anterior Cruciate Ligament Reconstruction during a Maximum Voluntary Isometric Contraction

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(No relevant relationships reported)

One of the repercussions of an ACL tear and subsequent reconstruction (ACLR) is a period of protracted quadriceps muscle weakness. While total force output is an important measure, the quality of this force, represented by quadriceps force steadiness (QFS), has been rarely investigated. Steadier force production implies smaller and/ or less frequent force fluctuations, which may signal better control and efficiency. Additionally, QFS studies have centered on submaximal contractions. While this is valuable, athletes need to be able to safely and efficiently load the knee during maximal effort situations such as jumping and cutting.
Purpose: To quantify the degree of asymmetrical QFS and strength between healthy and ACLR limbs during maximum voluntary isometric contractions (MVIC).
Methods: Seventy-two subjects who had an ACLR (38F, 20.2 ± 5.9 years old) underwent isometric strength testing six months post-surgery. Each subject completed five quadriceps MVIC's for five seconds each on both legs. The torque-time curves were analyzed using MATLAB code. In order to quantify the steadiness, the plateau region of the torque-time curve was first extracted utilizing force derivative cutoffs to define the outer boundaries. A 2nd order polynomial was fit onto the extracted curve to represent an "ideal" force output response (uniform concavity) that was consistent but subject-specific. The outcome variable (error from the "ideal" curve) was normalized to the force magnitude at each point (discrete normalization) and expressed as a percentage. A paired two sample t-test was used to assess differences between limbs (p<0.05).
Results: There was a significant difference in both QFS and mean strength between the ACLR and non-reconstructed limb respectively at 0.91 ± 0.51% and 0.73 ± 0.31% (p<0.001), as well as mean torque of 114.4 ± 41.8 Nm and 194.4 ± 56.3 Nm (41% deficit), respectively (p<0.001).
Conclusion: The results show a significant disparity in an ACLR knee in both quadriceps strength and QFS in comparison to a healthy knee. The lack of steadiness is a result of more frequent and/or higher magnitude force fluctuations over the loading phase. We speculate that these fluctuations results in a hindered ability to control the quadriceps which may lead to an increased injury risk and decreased performance.

238   Board #79   May 30 11:00 AM - 12:30 PM

Differences In Electrocortical Activity Between ACL-reconstructed Patients And Healthy Controls During A Force-Reproduction Task

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(No relevant relationships reported)

Changes in cortical activity are hypothesized to be related to the high incidence of ACL re-ruptures. Presumably, these differences are a result of the loss of somatosensory signals of the ligament and changes in nociceptor activity due to pain and swelling. **PURPOSE:** To investigate the differences in electrocortical activity between patients with an ACL-reconstruction and healthy controls. **METHODS**: 12 patients one year post ACL-reconstruction and 12 healthy controls were compared during the execution of functional hop tests and a force-reproduction task (without visual feedback and with visual disruption) at biomechanical function (force reproduction and EMG (Root-Mean-Square)) and electrocortical activity using a EEG power analysis (Alpha-1, Alpha-2, Beta-1 and Theta-activity frequency bands were determined). Between-group differences and differences between the study condition without visual feedback and the study condition with visual disruption were examined. **RESULTS**: No differences in functional outcomes and biomechanical function (p≥0.194) exist between ACL reconstructed patients and healthy controls. However, ACL reconstructed patients showed a significant higher Theta-power in the parietal cortex (p≤0.038) and pre-frontal cortex (F8, p=0.038) compared to healthy controls during force reproduction without visual feedback. Visual disruption leads to higher power values at Fz (Alpha-1: p=0.050, Beta-1: p=0.010, Theta: p=0.050), F8 (Beta-1: p=0.034), P3 (Alpha-1: p=0.023, Beta-1: p=0.002, Theta: p=0.034), P4 (Alpha-2: p=0.041, Beta-1: p=0.019) and P7 (Alpha-2: p=0.006) in the healthy control group, while in the ACL reconstructed group only Alpha-2 power at T4 was significantly higher (p=0.050). **CONCLUSIONS**: Differences in electrocortical activity seem to be present in patients one year after ACL-reconstruction, while patients in both groups tended to be equal in terms of biomechanical function. In line with previous research of Baumeister et al. (2011) ACL reconstructed patients probably more rely on their visual system for an adequate planning and control of motion. This could be a compensation mechanism for the loss of sensory input out of the affected ACL and could be a point of therapeutic entry in the prevention of re-ruptures in the future.

239   Board #80   May 30 11:00 AM - 12:30 PM

Examining the Relationships Between the Mode of Quadriceps Contraction and Clinical Outcomes After ACL Reconstruction

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(No relevant relationships reported)

Quadriceps strength is a useful clinical predictor of physical function and patient reported outcomes after anterior cruciate ligament reconstruction (ACLR). However, it remains unknown which mode of muscle contraction (isometric, concentric or eccentric) is most important for optimal physical and patient reported recovery, creating uncertainty amongst clinicians as to the most ideal strength assessment tool. **PURPOSE:** Examine the association between the mode of quadriceps muscle contraction (isometric, concentric and eccentric) and functional performance and patient reported outcomes. **METHODS:** Ten individuals with history of unilateral ACLR volunteered (22.4±1.95yrs; 1.66±0.08m; 65.62±12.10kg; years from surgery, 5.88±1.86yrs). Peak concentric and eccentric quadriceps force production at 60°/s and peak isometric force production with the knee positioned at 90° were assessed via an isokinetic dynamometer and normalized to body mass. Objective clinical hop tests were evaluated for maximal distance during the single leg hop for distance (SLHD), cross-over hop (CH) and triple hop (TrH). Patient reported outcomes were assessed using the International Knee Documentation Committee (IKDC) form. Association between quadriceps strength outcomes and all functional and patient reported outcomes were assessed using Pearson product moment correlations. **RESULTS:** Peak concentric strength was only associated with maximal TrH distance (mean±SD; 1.90±0.57Nm/kg, 4.61±0.67m; r=0.723, P=0.018). Peak eccentric strength was only associated with maximal SLHD (2.82±0.78Nm/kg, 1.41±0.19m; r=0.680, P=0.044). Peak isometric strength was associated with maximal CH distance (3.06±0.59Nm/kg, 4.35±0.70m; r=0.696, p=0.025) and IKDC (84.94±9.92; r=0.803, P=0.005). **CONCLUSION:** No single mode of quadriceps contraction was associated with all clinical outcome measures. Hence, a multimodal approach to strength re-training and evaluation may be important for the development of proper quadriceps function and progression of optimal clinical outcomes. Clinicians should consider adding a multimodal strength program during ACLR rehabilitation to promote positive outcomes across a variety of clinical measures.

240   Board #81   May 30 11:00 AM - 12:30 PM

Dynamic Knee Orthosis System for Females with Anterior Cruciate Ligament Injuries

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(No relevant relationships reported)

PURPOSE: Anterior Cruciate ligament (ACL) injuries are one of the most common athletic injuries with greater prevalence in females. Knee orthoses are often prescribed post-injury for conservative management or post-surgery knee stabilization. The goal was to design and evaluate a lightweight and aesthetically more acceptable Dynamic Knee Orthosis System (DKOS) as a pair of close-fitting leggings with hinges and a detachable dynamic belt on the waist for females with an ACL injury. **METHODS:** Ten healthy females (right dominant; age: 21.5 ± 1.8 yrs; height: 1.7 ± .05m; weight: 64.1 ± 6.9 kg, leggings size medium) participated. Four test tasks (running, single hop, triple hop, drop landing) commonly used as return to sport clinical tests post ACL injury were performed with new design (C1), commercially brace (C2) and no brace conditions (C3: sports shorts, C4: leggings only). Mixed model analysis and least-squares means were employed to estimate and predict the difference of joint positions and moments (Vicon, 120Hz) in sagittal plane for lower extremity. **RESULTS:** Decreased knee flexion angle during running (C1: 29.43 ± 4.22º, C2: 23.78 ± 4.22º, effect size ES: 0.74) and drop landing (C1: 61.60 ± 4.22º, C2: 50.87 ± 4.21º, ES: 1.41) with C1 compared to C2 was observed. Also, greater knee flexion moment was observed during running (C1: 75.48 ± 7.64 Nm/kg, C2: 59.98 ± 7.65 Nm/kg, ES: 1.94), triple hop (C1: 78.21 ± 7.77 Nm/kg, C2: 68.23 ± 7.72 Nm/kg, ES: 1.23) and drop landing (C1: 74.77 ± 7.64 Nm/kg, C2: 63.55 ± 7.63 Nm/kg, ES: 1.41). **CONCLUSION:** C1 increased peak knee flexion angles during test tasks, but did not decrease anterior-posterior tibial translation compared to C2. Increased knee flexion and knee moments with C1, could potentially help increase the shock absorption, thus reducing the risk of re-injury. A possible reason for improved knee joint range of motion with C1 is that flexible materials of the leggings (instead of non-stretchable neoprene materials of C2) had less restraints on quadriceps muscles. The proposed leggings, therefore, may be used for rehabilitation with a focus on increasing ROM and facilitating quadriceps:hamstring neuromuscular coordination. Future research aimed at ergonomical designs that can promote safe activity while attenuating A-P translations is warranted.

A-46   Free Communication/Poster - **Running Biomechanics**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

241   Board #82   May 30 11:00 AM - 12:30 PM

Relationship Between Knee Valgus Asymmetry During Running And Side-Step Cutting Mechanics in Female Lacrosse Players.

Bhushan Thakkar, Jenna Kostiuk, Kathryn Harrison, Jacqueline Morgan, Gregory Crosswell, D.S. BLAISE WILLIAMS, III, FACSM. *Virginia Commonwealth University, RICHMOND, VA.* (Sponsor: D.S. Blaise Williams III, FACSM)
(No relevant relationships reported)

PURPOSE: Female athletes have a greater incidence of Anterior Cruciate Ligament (ACL) injuries than their male counterparts. Noncontact injuries are primarily responsible for ACL injuries in female lacrosse players. Side-step cutting (SSC) maneuvers are a common injury mechanism and it involves sudden changes in direction with acceleration or deceleration of the body. Dynamic knee valgus (KV) is an important biomechanical risk factor for ACL injuries during running and SSC but the relationship between KV asymmetry during running and kinetics related to ACL injury during SSC has not been identified. The purpose of this study was to compare ACL loading kinetics during SSC in female lacrosse players with symmetrical and asymmetrical KV during running. **METHODS**: Twenty-seven healthy female lacrosse athletes were classified in two groups (asymmetric: n=13 and symmetric: n=14) based on dynamic KV Symmetry Angle during a 3D analysis of running on an instrumented treadmill. Peak vertical ground reaction force (VGRF) and knee abduction moment (KABM) of the right limb were measured during right SSC to 45 degrees. Comparisons were made between the two groups for VGRF and KABM using Student's t-test(α=0.05). **RESULTS**: The asymmetric group had significantly higher VGRF (2.42±0.73 vs. 2.18±0.36*BW, p=0.01) and KABM (-0.82±0.35 vs. -0.80±0.6 Nm/kg, p=0.003) during SSC.

CONCLUSIONS: There is a suggestive relationship between KVA asymmetry during running and the magnitude of VGRF, KABM during SSC. Imbalances in knee kinematics during running could potentially be used as a screening tool to detect abnormal ACL loading kinetics during dynamic tasks like SSC.

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242   Board #83   May 30 11:00 AM - 12:30 PM

Sex and Speed Influence Joint Moment Impulses During Running

Herman J. Feller, Christa M. Wille, Bryan C. Heiderscheit, Mikel R. Stiffler-Joachim. *University of Wisconsin-Madison, Madison, WI.*

(No relevant relationships reported)

Following lower extremity surgery, athletes demonstrate altered running mechanics particularly with regard to lower extremity joint moment impulses. The effect of speed and sex on joint impulses, even among healthy individuals, has not been investigated and describing these effects may facilitate more appropriate comparisons between injured and healthy athletes. **PURPOSE**: To determine the influence of sex and speed on hip extensor (H_{EXT}), knee extensor (K_{EXT}), and ankle plantarflexor (A_{PF}) moment impulses during running. **METHODS**: Whole body kinematics and ground reaction forces were collected for 99 NCAA Division I collegiate athletes (52 males) during treadmill running at 2.68, 3.35, and 4.47 m/s. Athletes were healthy at time of testing and had no history of lower extremity surgery. H_{EXT}, K_{EXT}, and A_{PF} were calculated during each stance phase and averaged across strides. Joint moment impulses for the right limb were compared between sex and speed using 2-way repeated measures ANOVAs. **RESULTS**: A significant sex by speed interaction (p < .01) for K_{EXT} was observed. Females exhibited greater K_{EXT} than males at all speeds (mean difference range, 6.8 to 15.2%). Among females, K_{EXT} decreased significantly at each speed (-.21 ± .05 Nms/kg, -.21 ± .04 Nms/kg, -.19 ± .03 Nms/kg at 2.68, 3.35, and 4.47m/s, respectively; p ≤ .04), while there were no significant speed effects among males (p ≥ .19). No significant interactions (p ≥ .08) were present for H_{EXT} or A_{PF}, though there were significant sex and speed main effects. Females demonstrated smaller H_{EXT} and A_{PF} than males (mean difference, 20.2% and 14.6% for H_{EXT} and A_{PF} respectively, p < .01). Across sexes, H_{EXT} increased significantly with speed (p < .01). A_{PF} at 4.47 m/s was significantly lower than all other speeds (-.39 ± .05 Nms/kg, -.39 ± .05 Nms/kg, -.38 ± .05 Nms/kg at 2.68, 3.35, and 4.47m/s, respectively; p < .01). **CONCLUSIONS**: Both sex and speed must be considered when evaluating the relative contribution of the hip, knee, and ankle during running. Females demonstrate greater KEXT than men at the same running speed but smaller HEXT and APF, indicating an increased reliance on the knee joint. As running speed increases, males increase demand at the hip while maintaining a constant demand at the knee, while females shift demands away from the knee and primarily toward the hip.

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Do Selective Pressures on Pelvic Dimensions Influence Risk of Running Injury Development?

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(No relevant relationships reported)

Sex differences in endurance running may be attributed to selective pressures on pelvic dimensions imposed by birth requirements. However, Warrener et al. (2015) found that pelvic width did not have a significant effect on locomotor economy. However, a wider pelvis in females may explain higher rates of running related overuse injury (RROI). Physical activity (PA) during development is a confounding factor rarely considered when assessing injury risk; however early engagement in PA may be protective for RROI. PURPOSE: To determine whether pelvic dimensions and age PA began are risk factors for RROI. METHODS: 28 female and 17 male recreational runners were analyzed (Age: 32.0 ± 10.3 yrs; BMI: 22.4 ± 2.6 kg/m^2). Pelvic width was measured as the distance between iliac crest markers during a 3D standing calibration trial. Femoral angle was measured as the inverse tangent of the vertical distance between the ASIS and lateral knee markers divided by the horizontal distance. Lifetime PA and running history were recorded by questionnaire. Univariate statistics assessed differences between genders and between those who had and had not sustained a RROI. Stepwise logistic regression was used to determine predictors of pelvic width, femoral angle, and incidence of RROI (α = 0.15). Variables included in all models were age, BMI, years running, weekly mileage at enrollment, and age subject began meeting current ACSM PA guidelines, as well as pelvic width and femoral angle for RROI model only. RESULTS: No differences between genders were detected for any variable (P>0.05). Uninjured subjects began meeting PA guidelines at older ages vs. injured subjects (U: 10.3 ± 7.3 yrs; I: 8.2 ± 3.5 yrs, P<0.01). Pelvic width normalized by femur length was greater in injured vs. uninjured runners (U: 82.3 ± 11.6 mm; I: 82.6 ± 5.4 mm, P<0.01). Femoral angle was not different between injured vs. uninjured groups (P>0.05). The model identified femoral angle (P=0.147) and age PA began (P=0.115) as predictors for RROI development (P<0.15). Current mileage was a predictor for total number of

running injuries (P=0.018). CONCLUSION: Age PA began and femoral angle may be risk factors for RROI. Weekly running mileage may amplify anatomical risk factors for RROI.

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The Effect of Real-Time Feedback on Vertical Oscillation and Running Economy

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(No relevant relationships reported)

PURPOSE: Investigate whether real-time feedback could reduce vertical oscillation and improve running economy. **METHODS:** 6 male and 4 female collegiate cross country runners completed two 12 minute steady state, submaximal (mean RER = 0.87) treadmill trials one of which involved receiving real-time feedback on vertical oscillation with the instruction to reduce the displayed value. Breath-by-breath VO_2 data was averaged over the last minute of the trial and expressed as kcal·kg^{-1}·km^{-1}. Vertical oscillation data was averaged over the entire trial. Repeated-measures ANOVAs were applied to VO_2 and vertical oscillation data to test for significant effects of real-time feedback. **RESULTS:** Real-time feedback reduced vertical oscillation (10.04 ± 1.99 cm vs. 8.78 ± 2.03 cm, p = .008), but did not improve running economy (1.10 ± 0.09 kcal·kg^{-1}·km^{-1} vs. 1.07 ± 0.10 kcal·kg^{-1}·km^{-1}, p = .072). **CONCLUSION:** Reduction in vertical oscillation did not produce an improvement in the economy of trained runners.

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Dynamic Hip Strength and Footfall Patterns in Competitive Distance Runners

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(No relevant relationships reported)

PURPOSE: Foot strike pattern during running can contribute to lower extremity overuse injuries such as stress fracture, potentially due to high loading rates (LR). However, adopting a forefoot strike (FF) may require additional lower extremity strength due to the greater demand placed on the gluteal muscles compared to a rearfoot strike. The purpose of this study was to determine the association between hip extensor strength, foot strike pattern, and LR. It was hypothesized that greater hip extensor strength would be associated with a FF pattern, and a lower LR. **METHODS**: 23 uninjured, collegiate distance runners (91% male, age=21.9±2.5 years, height=1.77±0.06 m, mass=64.15±6.6 kg, running volume=82.55±17.45 km/week) who were resistance trained were recruited for this study. Hip extensor strength was assessed via maximal voluntary isometric contractions (MVIC) on an isokinetic dynamometer and 1-repetition maximum back squat (1RM BS). LR and foot strike index (FSI) were assessed during 5 overground running trials at the participant's preferred training pace. FSI was calculated as the distance (m) between the center of pressure and location of the calcaneal marker at initial contact relative to the participant's foot length (m). The highest MVIC peak torque (PT; N/kg) and 1RM BS, median FSI, and average LR (body weight/second) of the 5 trials were used for analysis. Spearman Rho and partial correlations were used to determine relationships between dependent variables. **RESULTS**: Greater 1RM BS was associated with a larger FSI (rho=0.499, p=0.018). Greater FSI was associated with lesser LR (rho=-0.494, p=0.017). Greater 1RM BS and lesser LR were not significantly associated (r=-0.394, p=0.077). PT was not associated with FSI or LR. **CONCLUSIONS**: Runners with greater 1RM BS land in a more FF position and with lower LR. These findings emphasize the contribution of hip extensor strength to running mechanics, and justify the selection of the back squat for runners.

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The Effect of Fatigue on Impact Forces and Pressure Distribution During an Incremental Run

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(No relevant relationships reported)

Background: Repetitive high impact forces are linked to increased bone-to-bone stresses that, over time, may exceed the repair and remodeling process of the bone structure. Running through fatigue is a condition that may exacerbate this phenomenon; however, research that has examined the effect of fatigue on impact forces during running is equivocal. **Purpose:** To investigate the effect of a high-intensity fatiguing run on impact forces and pressure distribution while running at various speeds. **Methods:** Four male college students (age = 20.8±1yr; weight =80.7±9kg; height = 175±4cm) were asked to complete an incremental run of five 30-second stages at speeds that ranged from 20% below to 40% above their self-

selected pace. Subsequently, they performed a graded exercise test to exhaustion followed by a second incremental run. Pressure insoles placed in the shoe of the subject's dominant leg recorded ground reaction forces and pressure distribution of the foot before and after the fatigue protocol. **Results:** A two-way repeated ANOVA (time x speed) showed that there was a main effect of speed for most independent variables, while there was a main effect of fatigue (p=0.04) only for pressure at the lateral part of the shoe. Post hoc analysis revealed that the peak impact force and pressure (total, forefoot, heel, medial and lateral side of the foot) were significantly greater at higher running speeds. In addition, there was a tendency for a shift in pressure distribution from the medial to the lateral side of the foot with increased speeds. **Conclusion:** These preliminary findings suggest that peak impact force was not affected by fatigue. However, running at faster speeds placed more stress on the foot, as shown by both the impact forces and pressure, which may predispose runners to injury.

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Association Between Tibial Acceleration and Vertical Loadrates in Runners of All Footstrike Patterns

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(No relevant relationships reported)

Abstract
Running injuries have been associated with increased vertical loadrates, measured with forceplates. Tibial acceleration, which can be measured in the field with wearable technology, has been suggested as a surrogate for loadrates. However, the validity of this assumption is unknown.
Purpose: To determine the correlation between vertical and resultant loadrates to vertical and resultant tibial acceleration across footstrike patterns (FSP) in runners.
Methods: Participants: 169 runners (74 F, 95 M; age: 38.66±13.08 yrs) presenting at a running injury clinic. This included 25 forefoot strike (FFS), 17 midfoot strike (MFS) and 127 rearfoot strike (RFS). Participants ran on an instrumented treadmill (average speed 2.52±0.25 m/s), with a tri-axial accelerometer attached at the left distal medial tibia. Only subjects running with pain <3/10 on a VAS pain scale during the treadmill run were included. Vertical average, vertical instantaneous and resultant instantaneous loadrates (VALR, VILR and RILR) and peak vertical and resultant tibial accelerations (VTA, RTA) were averaged for 8 consecutive left steps. Correlation coefficients (r) were calculated between tibial accelerations and loadrates.
Results: All tibial accelerations were significantly correlated across all loadrates with the exception of RTA with VILR for FFS (Table 1). Specifically, VTA was strongly correlated with all loadrates ($r \geq 0.66$). RTA was also strongly correlated with both loadrates for RFS and MFS, but only moderately correlated with loadrates for FFS ($r \leq 0.47$).
Conclusion: The strong correlation between VTA and all loadrates (VALR, VILR, RILR) across all FSP, suggests that vertical tibial acceleration is a reliable surrogate for loadrates.

	FSP	VALR r	VALR p-value	VILR r	VILR p-value	RILR r	RILR p-value
VTA	FFS	0.82	<0.001	0.69	<0.001	0.70	<0.001
	MFS	0.74	<0.001	0.73	<0.001	0.73	<0.001
	RFS	0.66	<0.001	0.66	<0.001	0.67	<0.001
	All	0.72	<0.001	0.72	<0.001	0.72	<0.001
RTA	FFS	0.47	0.018	0.37	0.068	0.41	0.042
	MFS	0.63	0.007	0.66	0.004	0.68	0.002
	RFS	0.67	<0.001	0.67	<0.001	0.68	<0.001
	All	0.39	<0.001	0.43	<0.001	0.45	<0.001

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Increased Foot And Tibial Angles at Footstrike Decrease Vertical Loadrates in Runners

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(No relevant relationships reported)

High vertical loadrates are a risk factor for running injuries. Overstriding is thought to increase loadrates, and is indicated by increased foot and tibial angles at footstrike. However, the relationship between landing alignment and loadrates has not been well established.
PURPOSE: To investigate the association between sagittal plane foot angle (FA) and tibial angle (TA) to vertical loadrates in both healthy and injured forefoot (FFS) and rearfoot strike (RFS) runners.
METHODS: This is an ongoing study with 52 healthy runners (35 RFS, 17 FFS) and 24 injured runners (14 RFS, 10 FFS) for a total of 76 runners (51 M, 25 F; age: 34.3±11.4 yrs). Vertical average loadrate (VALR) and vertical instantaneous loadrate (VILR) were obtained while running at 2.68 m/s on an instrumented treadmill. All runners reported 0/10 pain during the assessment. Sagittal plane FA and TA at footstrike were measured from video recording using an open-source program. Positive FA designated RFS. Positive TA defined as ankle anterior to knee. Correlation coefficients (r) were computed for FA and TA with VALR and VILR ($p \leq 0.05$; trend: $p \leq 0.10$).
RESULTS: <u>Healthy RFS</u> - FA and TA were negatively correlated with VALR and VILR. <u>Injured RFS</u> - Trend toward negative correlation between TA and both VALR and VILR. <u>Healthy FFS</u> - TA was negatively correlated with both loadrates. <u>Injured FFS</u> - No significant correlations.
CONCLUSION: In contrast to current thought, preliminary results suggest that increasing FA and TA at footstrike are associated with decreasing vertical loadrates. This relationship was strongest for the FA of healthy RFS runners and weakest for the FA of both healthy and injured FFS runners.

		FA vs VALR r	m	p	FA vs VILR r	m	p	TA vs VALR r	m	p	TA vs VILR r	m	p
RFS	healthy	-0.71	-4.92	<0.001*	-0.72	-5.46	<0.001*	-0.44	-4.65	0.008*	-0.43	-4.99	0.010*
	injured	-0.44	-3.53	0.12	-0.42	-3.86	0.13	-0.51	-5.84	0.06	-0.46	-6.03	0.10
FFS	healthy	-0.17	-0.88	0.51	-0.22	-1.36	0.41	-0.53	-2.90	0.027*	-0.50	-3.31	0.043*
	injured	-0.17	-0.32	0.64	-0.31	-0.74	0.38	-0.10	-0.28	0.79	-0.34	-1.23	0.34

rearfoot strike (RFS); forefoot strike (FFS); foot angle (FA); tibial angle (TA); vertical average loading rate (VALR); vertical instantaneous loading rate (VILR); correlation coefficient (r); slope (m); p-value (p).

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Increased Resisted Sprinting Load Decreases Bilateral Asymmetry in Sprinting Kinetics

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(No relevant relationships reported)

Sprinting performance is affected by technical and kinetic symmetry of the lower limbs. Sprint training against resistance may affect kinematics if the load is too great, and thus negatively impact performance. Although information exists regarding the effect of sprinting resistance on kinematics, little is known regarding its effect on bilateral sprinting kinetics or their symmetry. Further, because kinematic differences exist at various stages of a sprint (i.e., acceleration, peak velocity), it may also be more appropriate to assess the symmetry of sprinting kinetics separately in stages.
PURPOSE: To investigate the effect of resisted sprinting load on the bilateral kinetics across a 40-m sprint. **METHODS** Following a standardized warm-up, 16 male, collegiate rugby players (21.2±1.7 yrs; 89.5±16.4 kg; 178.4±6.7 cm) completed 3 maximal, 40-m resisted sprint trials while tethered to a robotic resistance device. The first two sprints (S1 and S2) were performed against minimal resistance (1-kg) with S1 being used as a familiarization trial. The final sprint (S3) used 15-kg of resistance. During S2 and S3, peak and average power (P_{PK} and P_{AVG}), velocity (V_{PK} and V_{AVG}), force (F_{PK} and F_{AVG}), and peak rate of force development (RFD) were recorded for each leg and used to calculate bilateral percent differences (%DIFF). Paired-samples t-tests were performed to compare S2 and S3 during the first 5 sprinting strides (SPR5), from start to peak velocity (SPR-V_{PK}), and the total sprint (SPR_{TOT}) for each sprinting kinetic variable. **RESULTS**: A greater (p<0.05) number of strides to reach V_{PK} (4.2±4.1 strides) and complete SPR_{TOT} (13.2±3.2 strides) were observed during S3. Additionally, S3 reduced %DIFF in F_{PK} and RFD during SPR5 (F_{PK}: -8.1±10.3%; RFD: -8.9±10.9%), SPR-V_{PK} (F_{PK}: -6.6±5.9%; RFD: -7.2±8.6%), and SPR_{TOT} (F_{PK}: -6.6±5.4%; RFD: -6.9±8.4%). Significant (p<0.05) reductions in %DIFF during S3 were not observed for

F_{AVG} until after SPR5 (SPR-V_{PK}: -2.7±3.7%; SPR_{TOT}: -3.4±4.9%) and not until SPR_{TOT} for P_{PK} (-13.1±19.1%). In contrast, S3 only produced a reduction in %DIFF for P_{AVG} at SPR5 (-7.0±9.2%, p=0.014). **CONCLUSION**: Applying resistance during a 40-m sprint reduces the acute bilateral asymmetries observed in sprinting kinetic measures. Resisted sprint training may reduce bilateral sprinting kinetic asymmetries.

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Muscle Activation Characteristics of the Posterior Oblique Sling System in High and Low Economy Runners

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(No relevant relationships reported)

Sling systems are chains of global muscles and their innervating fascia that facilitate sequential muscle patterns and rotational lumbo-pelvic stability during movement. During running, sling systems promote a reciprocal gait pattern between the upper and lower extremities. The Posterior Oblique Sling (POS) connects the latissimus dorsi (LD) and contralateral gluteus maximus (GM) through the thoracolumbar fascia and provides a pathway for mechanical transmission between the pelvis and trunk during running. **PURPOSE:** To examine muscle activation patterns of the POS as they differ between high (HI) and low (LO) economy runners at different running speeds. **METHODS:** Recreational runners (11M, 14F, height 1.73 ± .07m, mass 70.3 ± 11.7 kg, age 28.6 ± 5.1 y) completed a running economy test and were classified as HI (n = 15) or LO (n = 10) based on published normative data. On a separate testing day, runners completed overground running trials at a 10K race pace (10K) and long slow distance training pace (LSD). There were no differences between groups in running paces. Muscle activation patterns of the POS were measured using electromyography. Mixed design ANOVAs were conducted to determine differences among paces and economy groups in muscle onset time (ON), muscle offset time (OFF), peak amplitude (AMP), time of peak AMP (PEAK), and root mean square (RMS). **RESULTS:** A significant interaction was seen in GM PEAK ($F_{(1,23)}$ = 6.8, p = .016) where PEAK occurs later in the gait cycle during LSD in LO (4.6% HI vs. 9.3% LO). A significant interaction was seen in LD OFF ($F_{(1,23)}$ = 4.7, p = .04) where LO displayed a significantly longer activation time of the LD during LSD compared to 10K. Higher AMP and RMS were seen in GM (AMP: $F_{(1,23)}$ = 4.8, p = .039; RMS: $F_{(1,23)}$ = 11.1, p = .003) and LD (AMP: $F_{(1,23)}$ = 21.0, p < .001 ; RMS: $F_{(1,23)}$ = 26.6, p < .001) during 10K compared to LSD. **CONCLUSION:** Muscles in the POS work in a defined sequential pattern throughout the gait cycle with significant variability at different speeds and between HI and LO runners.

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Trunk Kinematics Comparison During Self-selected Treadmill Jogging Between Age Groups

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(No relevant relationships reported)

PURPOSE: Differences in gait parameters during walking and running with advancing age have been reported, though little is understood of the effects of age on intra-trunk motions during running. Research has shown that spinal mobility, decreases with advancing age; however, the impact on running activities is less known. Knowledge of normative ROM of different trunk segments during running can be essential in prescribing safe physical activities and for rehabilitation. Purpose was to compare trunk ROM in the transverse plane during shod running at a self-selected speed. **METHODS**: Two adult groups, *young* (YA: n = 20; 21- 40yr; 33.2 ± 4.8yr) & *middle-age* (MA: n = 22; 41- 65yr; 54.7 ± 7.8yr), participated (mass = 68.9 ± 15.4, 69.5 ± 12.0 kg; height = 1.7 ± 0.1, 1.7 ± 0.3m; moderate to vigorous physical activity = 7.0 ± 3.4, 9.0 ± 1.0 hr/wk). 3D motion capture (8-cameras, Vicon, 120Hz) during participant running at self-selected speed (speed = 2.8 ± 0.3, 2.6 ± 0.4m/s) and maximal trunk rotation was performed. Relative angles between adjacent trunk segments (UP: C7-T8; MID: T9- T12; LOW: L1- L5) and pelvis (PEL) were calculated and averaged over 10 strides. ROM in running as a percentage of total available ROM (MANOVA) from the rotation trials were compared between groups using MANCOVA ($p<0.05$, running speed = covariate) **RESULTS**: No group differences were reported ROM in maximum rotation task (F (3,38) = 1.852, p = .15, Power = .44) or in running (F(3,37) = 2.182, p = .107, Power= .51). YA ran faster than MA (2.8 ± 0.3, 2.6 ± 0.4m/s, p = .04). **CONCLUSIONS**: Results depict no significant trunk movement differences for running or total ROM between age groups in the transverse plane. Literature claims decreasing spinal ROM with age, but this data shows advancing age to not be a significant factor affecting trunk rotational ROM necessary to run safely at self-selected speeds. A potential explanation is our participants being healthy, active

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individuals and may not exhibit the structural spinal changes that we expect with advancing age as those expected in a sedentary population. Alternately, running trials at self-selected speeds may not be fast enough to elicit potential age-related changes. The overall lack of differences in trunk movement during running could support the safety and efficacy of running at self-selected paces with advancing age.

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IMU Based Foot Strike Classification Algorithm For Real-time Feedback And Research Purposes In Running

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(No relevant relationships reported)

Footstrike patterns (FSP) were studied to use for feedback purposes in gait retraining and in relation to the development of running injuries. Differentiation between both legs might provide insights in the unilateral nature of injury development. Inertial Measurement Units (IMUs) have proven useful to assess running mechanics in the field. Foot angular velocity at the instant foot strike occurs can be used to classify FSP. IMU based systems could serve as a tool in gait retraining to provide real-time feedback on FSP and are easily scalable to larger populations like RCTs. **PURPOSE:**To classify and investigate inter- and intra-individual differences in FSP between the left and right foot on a treadmill, using an angular velocity based algorithm. **METHODS:**Data was collected as part of a larger study. Data of 5 healthy experienced runners (5 M, age 27.3 +/- 5.9 yrs; height 181.8 +/- 5.7 cm; weight 71.3 +/- 4.8 kg) were used to confirm that runners had different strike patterns at 3.9 m/s on a treadmill. Sagittal plane foot angular velocity was measured using IMUs (240Hz). The maximum angular velocity (maxAV) prior to and the minimum (minAV) after initial contact were used to classify FSP as either a rear foot strike (RFS, maxAV<4, minAV<-8 rad/s), a mid foot strike (MFS, maxAV<4, minAV>-8 rad/s) or fore foot strike (FFS, maxRT>4, minRT>-8 rad/s). For each participant, 50 steps were used to calculate the 95% confidence regions for the left foot, right foot and the grouped data of both feet. **RESULTS:**Two runners showed a FFS, one runner a MFS and two runners a RFS.(Fig 1) The 95% confidence regions of the left and right leg show no overlap for S01, S04 and S05. **CONCLUSIONS:**The angular velocity based algorithm identified the FSP of two runners as RFS, one as MFS and two as FFS. Subtle intra-individual differences in angular velocity did not affect the overall classification, but could be of interest to tailor feedback in gait retraining and investigate the unilateral nature of injury development.
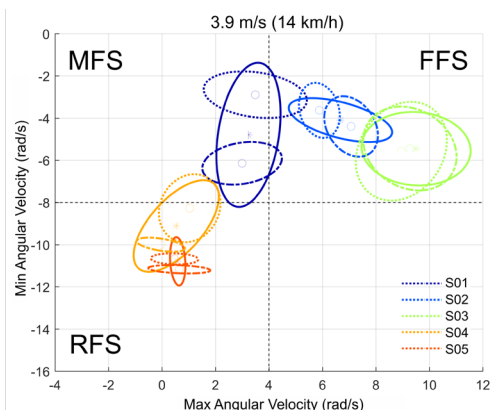

Figure 1 *The minimum and maximum sagittal angular velocity of the foot at initial contact for five runners with a rear foot (red), mid foot (blue) and fore foot (green) strike for their left (. . .) and right (---) foot and the grouped average of both feet (solid). Circles indicate the 95% confidence region.*

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Influences Of Direction Of Locomotion And Body Weight Support On Metabolic Costs During Running

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(No relevant relationships reported)

Manipulations of direction of locomotion and body weight support (BWS) may influence running mechanics. However, the influences of direction of locomotion

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and BWS on metabolic costs during running still await clarification. **PURPOSE**: To investigate metabolic costs during backward and forward running at different BWS conditions. **METHODS**: Nine subjects (40.9 ± 14.4 years) completed backward running and forward running on a lower body positive pressure treadmill at their mode-specific preferred running speed (PS) for 0%BWS, 20%BWS, and 50%BWS conditions. Oxygen uptake, heart rate (HR), rating of perceived exertion (RPE), and stride frequency (SF) were measured. Oxygen uptake, HR, RPE, PS, and SF were analyzed using a 2 (running directions) x 3 (BWS conditions) repeated measures analysis of variance (α = 0.05). **RESULTS**: HR, RPE, PS, and SF were not influenced by the interaction of direction and BWS (P>0.05). HR and RPE were not different between directions (P>0.05) but were different between BWS conditions (P<0.05). Specifically, HR and RPE during backward and forward running were lower with increasing BWS. Additionally, oxygen uptake was influenced by the interaction of direction and BWS (P<0.01). Oxygen uptake during running at 50%BWS was significantly lower than when running at 0%BWS, regardless of direction of locomotion (e.g., 36.9 ± 7.0 ml/kg/min and 27.5 ± 7.1 ml/kg/min for 0%BWS and 50%BWS during forward running, respectively, P<0.001). However, oxygen uptake was not significantly different between directions, regardless of BWS (P>0.05). Furthermore, PS and SF were different between directions (P<0.01) and between BWS conditions (P<0.05). Specifically, PS was higher and SF was lower during backward and forward running with increasing BWS. PS during backward running was 29%~42% lower than that of forward running. SF during backward running was 7%~12% higher than that of forward running. **CONCLUSIONS**: These observations demonstrate that a change in direction of locomotion may not influence metabolic costs and RPE during running at given BWS conditions, although PS and SF were different between backward and forward running. Furthermore, our observations indicate that a change in BWS influences metabolic costs, RPE, PS, and SF for both backward and forward running. Supported by JSPS Grant Number 16K01663.

A-47   Free Communication/Poster - **Interventions and Health Promotion**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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254   Board #95   May 30 9:30 AM - 11:00 AM
The Influence of Activity Trackers on Physical Activity, Cardiorespiratory Endurance, Body Composition, and Exercise Motivation

Michael A. Smith[1], Melissa Powers[2], Larissa Boyd[2], Thomas Hancock[2]. [1]*University of Oklahoma, Norman, OK.* [2]*University of Central Oklahoma, Edmond, OK.*
(No relevant relationships reported)

PURPOSE: The purpose of this research was to examine the influence of activity trackers on physical activity (PA), cardiorespiratory endurance (CRE), body fat percentage (BF%), and exercise motivation. **METHODS:** Forty-eight healthy volunteer participants ages 18-72 who did not achieve more than 3000 metabolic equivalent of task minutes (METmin) per week of physical activity (PA) were recruited to participate in a 12-week walking intervention. Participants were given the International Physical Activity Questionnaire (IPAQ), exercise motivation inventory (EMI-2) survey, tested for anthropometric measures, and tested for CRE at baseline and final testing. Participants were divided into an activity tracker group and a control group. **RESULTS:** Thirty-four participants (female = 29, male = 5) completed the full 12-week study. Analyses revealed no significant differences between the treatment and control groups for PA, CRE, BF%, or motivation from baseline to final testing. There were significant improvements in PA measured by the IPAQ for both groups from baseline ($M = 1042.71$ METmin, $SD = 882.57$) to final testing ($M = 3499.35$ METmin, $SD = 2931.34$), $F_{(2, 64)} = 17.374$, $p = .000$; however, step counts did not improve for either group from baseline to final testing. Mean difference in step counts were 1,897 steps and 1,614 steps for the testing and control groups respectively. There were significant improvements in CRE for both groups from baseline to final testing (Mean difference = 2.24 ml 0_2/kg·min^{-1}), $F_{(1, 29)} = 13.016$, $p = .001$. **CONCLUSIONS:** Analyses revealed that the walking program may have been effective for improving PA and CRE, but that activity trackers did not provide any additional benefits. The conclusion is that activity trackers alone may not be an effective tool for the improvement of PA, CRE, BF%, or motivation.

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255   Board #96   May 30 9:30 AM - 11:00 AM
Lifestyle Behaviors and Muscular Strength in Young Adults

Henry Piascik, Kristofer S. Wisniewski, Gabrielle M. Brennan, Sara D. Dieterich, Patricia Fitzgerald, Maura J. Jergerski, Stephen LoRusso, Baruch Vainshelboim. *Saint Francis University, Loretto, PA.*
(No relevant relationships reported)

Lifestyle Behaviors and Muscular Strength in Young Adults
Henry Piascik, Kristofer S. Wisniewski, Gabrielle M. Brennan Sara D. Dieterich, Patricia Fitzgerald, Maura L. Jegerski, Stephen LoRusso, Baruch Vainshelboim. Saint Francis University, Loretto, PA.
Sedentary lifestyle behaviors and poor muscular strength are associated with morbidity and mortality and are important determinants of general health. The association between those is less known in young population, given that assessing muscular strength is challenging in most clinical settings. **Purpose:** To assess the association between lifestyle behaviors and muscular strength in a pilot cohort of young adults. **Methods:** Ninety-four participants (20.2 ± 1.6 years, 46 men, 48 women) were assessed for self-reported physical activity and sitting time [Global Physical Activity Questionnaire (GPAQ)] and strength tests (isometric deadlift, 1RM bench press and 1RM leg press). Pearson's correlations were analyzed between the variables. **Results:** Means of the sample were as follows: sitting time (M: 5.7 ± 2.7 hours/day, W: 6.8 ± 2.8 hours/day), physical activity (M: 10,977.6 ± 11,068.3 MET-min/week, W: 7,181.9 ± 4,481 MET-min/week) isometric deadlift [M:229±106 (kg), W:96±26 (kg)], 1RM Bench Press [M:85±21(kg), W:39±9 (kg)] and 1RM Leg Press (M:210±106 (kg), W:153±43 (kg)]. Moderate correlations were found between physical activity and 1RM bench press (r=0.45, p=0.01) and 1RM leg press (r=0.39, p=0.027) in women subjects only. **Conclusions:** Self-reported physical activity is associated with upper and lower body strength in women, suggesting the GPAQ as relatively reliable tool for muscular strength evaluation in young female population. However, future studies are needed to confirm these results.

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256   Board #97   May 30 9:30 AM - 11:00 AM
Increasing Physical Activity In Office Workers - An RCT Of Treadmill Workstations.

Frida Bergman, Viktoria Wahlström, Patrik Wennberg, Carl-Johan Boraxbekk, Ann Sörlin, Fredrik Öhberg, Tommy Olsson. *Umeå university, Umeå, Sweden.*
(No relevant relationships reported)

PURPOSE
Our primary hypothesis was that an intervention with treadmill workstations would increase time spent walking. Secondary hypotheses were a decrease in time spent sitting with a concomitant increase in time spent standing and in light intensity physical activity (LPA) leading to positive effects on body measurements and body composition.
METHODS
The intervention group received a treadmill workstation at their office desk during 13 months. Daily time spent sitting, standing and walking and number of steps was measured with activPAL®. Daily time in LPA and MVPA was measured with Actigraph®. Body weight, BMI and waist circumference were measured according to standardized protocols. Dual X-ray Absorptiometry was used to estimate body composition. Mixed models was used for the statistical analysis, with group, day of week (weekday/ weekend), time point and gender as fixed effects and age as a covariate. p<0.05 was considered significant.
RESULTS
Eighty participants were included. The intervention group significantly increased their time spent walking at all follow-ups, with a difference at 13 months of 22 minutes (p<0.01) and 1645 steps per day (p<0.05), respectively, versus controls. Concomitantly, they decreased their MVPA with 13 minutes per day (p<0.001) at weekdays at 13 months versus baseline. We also found a decrease in LPA with 19 minutes per day (p<0.05), and of 17 minutes per day for MVPA (p<0.001) at 13 months versus baseline at weekends.
The control group increased their time spent sitting with 25 minutes per day (p<0.05) and decreased the time spent standing with 35 minutes per day at weekdays (p<0.001) compared to baseline. There was also a decrease in LPA with 14 minutes per day (p<0.01) and in MVPA with 6 minutes per day (p<0.01) versus baseline during weekdays, with a decrease in sitting time with 36 minutes (p<0.05) at weekends. There were no significant changes in body measurements or body composition.
CONCLUSION
It is possible to increase daily walking time by introducing treadmill workstations at offices. A decreased MVPA within the intervention group may contribute to lack of effects on body measurements and body composition. It is therefore important that future interventions aim at both reducing sedentary time as well as increasing, or at least remaining, MVPA levels.

257   Board #98   May 30 9:30 AM - 11:00 AM

Effects Of Two Exercise Programs On The Values Of Cholesterol And Triglycerides In A Group Of Obese Adults In The Northern Center Of Mexico

Daniel Carranza-Bautista.[1], Marco A. Enriquez Martinez[2], Raúl Lomas Acosta[3], Julia Janeth Rosales Mares[4], Carlos Enríquez Martínez[5], Christopher Gonzalez Sandoval[4], Pedro Jimenez Alarcón[4], Valeria Vital Cruz[4], Carlos Menchaca Valdez.[6], Javier Martinez Pinedo[7]. [1]Universidad Autónoma de Nuevo León., San Nicolás de los Garza, Nuevo León, Mexico. [2]Benemerita Escuela Normal Manuel Avila Camacho., Zacatecas., Mexico. [3]Secretaria de Educación Coahuila., Saltillo, Coahuila, Mexico. [4]Secretaria de Educación Zacatecas, Zacatecas, Mexico. [5]En Forma Wellnes Lab., Guadalupe, Zacatecas, Mexico. [6]Benemerita Escuela Normal Manuel Avila Camacho., Zacatecas, Mexico. [7]Salud de Acero, Fresnillo, Zacatecas, Mexico.

(No relevant relationships reported)

BACKGROUND: According to the World Health Organization (2016) cardiovascular diseases are the main cause of death in the world population. In Mexico it represents 54% of the total deaths, considering an approximate of 100,000 annual deaths, in subjects with ages ranging from 45 years and older, with a higher prevalence in men than in women. Several studies showed the benefits of practicing physical activity reducing risk factors with a minimum of 60 minutes per day. **PURPOSE**: To assess the effects of an exercise program on the values of cholesterol and triglycerides in a group of adults with obesity in the northern center of Mexico. **METHODS**:This pre-post study was conducted in two fitness centers. 60 subjects (52 ± 2 years), 33 women and 27 men during 16 weeks. Subjects were randomly divided into three groups of twenty. Control group without intervention. Outdoor Group, a program with a frequency of 5 days per week and a duration of 60 minutes in outdoor cardio activities. Fitness Group a program of physical conditioning of strength and resistance with a frequency of 5 days per week and a duration of each session of 90 minutes. The lipid profile was measured in blood plasma. **RESULTS**: The main results showed after comparing both measurements that total cholesterol values decreased into OG (p=0.003) and a significant decrease in FG (p<0.001). The women of the FG showed a significant decrease in triglyceride values (p=0.008). **CONCLUSIONS**:Cardiovascular risk seems to be regulated by gender and by type of program. Both the outdoor exercise program and the fitness program show evidence of improvements in health. Into future research we recomend to increase the number of subjects and include other endocrine and metabolic variables.

258   Board #99   May 30 9:30 AM - 11:00 AM

Fitness Trackers and Motivational Interviewing: Effects on Body Composition in Chronic Low Back Pain

Kathryn J. Southard, Laura D. Ellingson, Jeni E. Lansing, Maria Perez, Greg J. Welk, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Dr. Greg Welk, FACSM)

(No relevant relationships reported)

PURPOSE: Individuals with low back pain (LBP) are encouraged to stay active to manage symptoms and maintain function. However, promoting physical activity and sustained weight loss has proven to be challenging. This study demonstrated the effects of using a consumer fitness tracker (FT) alone or in combination with motivational interviewing (MI) on changes in body composition in patients with chronic LBP. **METHODS:** Participants (N=57; 51% female; mean age: 43.5 ± 10.1) were randomly assigned to receive a FT alone, (FT; N=16) or in combination with MI, (FTMI; N=17) or a waitlist control condition (WLC; N=19) for 12 weeks. FT and FTMI received monthly phone calls to discuss satisfaction with the tracker. Participants in FTMI also discussed motivation for change and self-selected goals during calls. WLC participants were advised to maintain current activity-related behaviors. Height was measured at baseline using a stadiometer, and body composition was assessed pre and post intervention via Inbody 720 Body Composition Analyzer (N=52). Group differences for weight, BMI, and body fat percent (BFP) were analyzed using ANOVA and effect size calculations (Cohen's d). **RESULTS:** There were no group differences in outcome measures at baseline. Following the intervention both treatment groups lost non-significant amounts of weight (p=0.33) while WLC maintained their weight (FTMI: 88.5 ± 24.3 vs 87.7 ± 23.5, FT: 86.9 ± 17.2 vs 85.6 ± 16.3, WLC: 78.9 ± 15.8 vs 78.8 ± 15.4 kg). Effect size calculations demonstrated a moderate difference between both treatment groups and WLC for weight loss post-intervention (d=0.45, 0.43). Following the intervention both treatment groups also showed non-significant decreases in BMI and BFP compared to WLC (BMI p=0.48; BFP: p=0.51). Effect size calculations demonstrated a small difference for BFP between treatment groups post-intervention (d=0.19, 0.23), as well as small and moderate differences for BMI between the FTMI, FT, and WLC (d=0.21, 0.46).

CONCLUSION: These preliminary data provide support for facilitated health coaching methods such as FTMI. Results show the independent use of a FT can also have small benefits. Additional work is needed to determine the optimal dose and intervention strategies for patients with LBP.

259   Board #100   May 30 9:30 AM - 11:00 AM

Changes in Body Composition Following a 6-Month Standing Workstation Intervention

Cara G. Daniels, Monisha Maharjan, Kyler Daugherty, Jacilyn Olson, Melissa Powers, Larissa Boyd. *The University of Central Oklahoma, Edmond, OK.*

(No relevant relationships reported)

Prolonged sedentary behavior may be associated with mortality and other health risks. Research shows a correlation between adiposity and uninterrupted sedentary time, supporting efforts for increasing workplace activity. **PURPOSE:** To determine if body composition changed following a 6-month intervention using sit-to-stand workstations (STS). **METHODS:** Participants included staff and faculty members of the University of Central Oklahoma. Participants (*N*=31) were randomly assigned to a treatment group (TG; *n*=16) and a control group (CG; *n*=15). IG participants given a STS and instructed to stand at least 2 hours in a day during work hours. Dual-energy X-ray Absorptiometry (DXA) was used to determine total mass (lbs.), fat mass (lbs.), lean mass (lbs.), body fat (%), and bone mineral density (g/cm^2) at baseline and 6 months of the intervention. A repeated-measures ANOVA was used to analyze data. **RESULTS:** No significant differences between or within groups were found (*p*>.05). Effect sizes were minimal. Small improvements occurred in all variables in the intervention group, but only for lean mass in the control group. **CONCLUSIONS:** Standing for at least 2 h/d may provide modest benefits to body composition. Future research should examine changes over a longer treatment time. This project was funded by the University of Central Oklahoma, Research and Sponsored Programs office

260   Board #101   May 30 9:30 AM - 11:00 AM

Effects of Exercise Referral Schemes on Physical Activity Levels

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(No relevant relationships reported)

Exercise referral schemes are clinical exercise interventions used in non-clinical settings throughout the UK, and are intended to improve physical activity (PA) levels and health conditions of medically referred individuals. At present, the literature reviewing the impact of exercise referral schemes on PA levels, well-being, and quality of life is inconsistent.
PURPOSE: To determine if exercise referral schemes positively influence PA levels in a large cohort of of individuals throughout England.
METHODS: Data were obtained from 7412 participants (Female N= 4965 [49.96, +/- 14.37y., Male N=2447 [53.15, +/- 14.75 y.) referred from hospitals (N=605), medical centres (N=406), outreach (N=353) and GP surgeries (N= 6048) to fourteen exercise referral schemes located across England. The participants' self-reported MET/minutes per week were calculated at the start and end of the scheme to determine whether the clinical exercise intervention had any impact on participants' PA levels. Scheme lengths were either 6 (N=1749) or 12 weeks (N= 5663) in duration and situated in leisure environments. PA programmes consisted of both aerobic and resistance training tailored to the individual. A paired samples t-test was conducted to determine if a statistically significant difference existed between pre- and post scheme PA levels.
RESULTS: METS/minutes per week were combined for both the 6- and 12-week groups. There was a statistically significant increase of 290.9 MET/mins per week from pre- to post-scheme for the participants (Pre= 856.1, +/- 1278 MET/min/week, 95% CI [827, 885) to Post= 1147 +/- 1801 MET/min/week; t(7411) = -34.18, p<0.001, 95% CI [1475, 1509), with a pairwise correlation of 0.367.
CONCLUSIONS: This is one of the larger samples to study PA levels in UK adults after completion of an exercise referral scheme. The results showed a significant pre-post increase in MET/min/week, although sustainability of this change is not known. Long-term follow up of participants, including a comparison group and deeper analysis of other health behaviors, is to be conducted to support the initial findings.

261   Board #102   May 30 9:30 AM - 11:00 AM

A Worksite Intervention Program for Obese Sedentary Women

Joan A. Cebrick-Grossman. *The University of Scranton, Scranton, PA.*

(No relevant relationships reported)

Workers spend a quarter of their lifetime, and up to half of their waking adult lives, at work or commuting. The sedentary aspects of work have been associated with increased health risks. Workplace health promotion programs are the ideal locations for impacting health behaviors. **PURPOSE:** To compare the effects of short duration, high intensity internal training (HIIT) and traditional walking or increased steps on anthropometric, body composition and body weight changes over a 12-week period. **METHODS:** Subjects (N=11) were obese, sedentary female volunteers, assigned into one of two exercise groups. Both groups increased their exercise and steps up to 5 days/week for 12 weeks monitored via an activity tracker, a Movband™. The resistance group (N=5) (42.9$\pm$8.1yr; 197.4$\pm$22.6lb body wt; BMI=33.8$\pm$2.2 kg/m^2; mean$\pm$ SD) exercised for (15.0$\pm$3.5 min) which consisted of eight different routines: upper and lower extremity, 2 cardio segments, 2 total body, yoga and abdominal exercises. The step group (N=7) (48.4$\pm$9.6yr; 192.7$\pm$22.6lb body wt; BMI=32.1$\pm$1.9 kg/m^2; mean$\pm$ SD) increased their steps up to 10,000 for 12 weeks. Relative (%) body fat was measured via DEXA scan, along with five anthropometric measurements prior to and after 12 weeks. Independent samples t tests probed for significant differences at the p<0.05 level. Values are expressed as mean$\pm$standard deviation. **RESULTS:** No significant changes were determined between the resistance and step groups for the pre-post anthropometric measurements: biceps, waist, abdomen, hips and thigh (13.5$\pm$1.3,13.1$\pm$1.3 vs. 12.5$\pm$0.8,12.2$\pm$0.9; 36.0$\pm$3.1,35.4$\pm$2.1 vs. 35.0$\pm$2.1, 34.6$\pm$2.2; 42.1$\pm$1.5,41.4$\pm$2.7 vs. 41.0$\pm$2.2,41.0$\pm$2.7; 45.6$\pm$1.9,44.9$\pm$2.0 vs. 44.6$\pm$2.7,44.0$\pm$3.0; 25.0$\pm$1.4,24.8$\pm$1.7 vs.24.4$\pm$1.5, 24.2$\pm$1.5 in, respectively). Pre-post relative fat measurements and body weight changes were not significantly different between the resistance and step groups (45.3$\pm$1.8, 44.2$\pm$1.2 vs. 45.8$\pm$4.4, 45.5$\pm$3.5 %fat; 197.4$\pm$22.7, 198.0$\pm$21.6 vs.192.7$\pm$22.6, 192.6$\pm$28.2 lb, respectively). **CONCLUSION:** This work is suggestive that there are no differences between the mode of exercise, short duration HIIT exercise compared to increased steps regarding anthropometric measures, relative percent fat and body weight over a 12-week period.

262   Board #103   May 30 9:30 AM - 11:00 AM

Dose Knowledge of Physical Activity Recommendations Change After a Physical Activity Intervention?

Katrina D. DuBose, FACSM, Deirdre Dlugonski. *East Carolina University, Greenville, NC.*

(No relevant relationships reported)

DOES KNOWLEDGE OF PHYSICAL ACTIVITY RECOMMENDATIONS CHANGE AFTER A PHYSICAL ACTIVITY INTERVENTION?
K.D. DuBose, FACSM, & D. Dlugonski. Dept. of Kinesiology, East Carolina University, Greenville, NC 27858
Purpose: To determine if a physical activity (PA) intervention improved parent's knowledge of adult and child PA recommendations. **Methods**: Twenty-six parents participated in an 8-week PA intervention with their 1 – 5 year old child. The parents were randomly placed into an intervention (n=19) or control (n=7) group. As part of the intervention, parents received information about adult and child PA recommendations. Knowledge of PA recommendations for adults and children was assessed through questionnaires pre- and post-intervention. **Results**: On average, the parents were 35$\pm$6.0 years of age and were overweight (29.2$\pm$7.7kg/m^2). The majority were Caucasian, women, had at least a college education, and worked outside of the house. Among all parents, 61% had not heard of the PA recommendations. Further, 54% and 96% did not know the moderate and vigorous PA recommendations for adults. Regarding children's PA recommendations, 62% and 81% of parents did not know the appropriate amount of PA for children <5 years old and $\geq$ 6 years, respectively. The knowledge of these PA recommendations did not differ by group status at baseline p>.05. There was a 15% - 18% increase in the percentage of intervention group participants who increased knowledge of adult PA recommendations and a 11 – 33% increase for knowledge of child PA recommendations. In contrast, there was no change in the control group. These findings were not statistically significant. **Conclusions**: Overall parents do not know either adult or children's PA recommendations. A short PA intervention can improve parent's knowledge of PA recommendations. Understanding the knowledge of parents before an intervention could be useful to deliver appropriate content during the intervention period.
Character count (without spaces): 1494 max: 2,000

263   Board #104   May 30 9:30 AM - 11:00 AM

Effects Of Two Consecutive 4 Month-a-year Training Program On Metabolic Syndrome And Vo$_2$Max Evolution

Felix Morales-Palomo, Miguel Ramirez-Jimenez, Juan Fernando Ortega, Ricardo Mora-Rodriguez. *UCLM, Toledo, Spain.*

(No relevant relationships reported)

Cross sectional data reveal that individuals with high cardiorespiratory fitness (i.e., CRF assessed by VO$_2$max) have lower prevalence of metabolic syndrome (i.e., MetS; Hassinen et al., 2010). However, there is a scarcity of exercise-training intervention trials with serial measures of CRF to confirm that exercise training reduces MetS through increases in CRF. We recently found that two consecutive years of 4-month aerobic interval training are required to chronically improve MetS (Morales-Palomo et al., 2017).
PURPOSE: To determine the chronic effects of two consecutive 4 months-a-year training program on the relationship between increased CRF and reduced MetS continuous z score-(Z-MetS). **METHODS:** Using a repeated-measures, randomized control design, MetS subjects were allocated to either a training group (TRAIN; n=20) or a control group (CONT; n=22) that remained sedentary. TRAIN extended for 4 months every year (November-mid-March) consisting in 3 sessions per week of aerobic interval training (Mora-Rodriguez et al., 2014). At baseline and after 7 months of the last training program, VO$_2$max, Z-MetS, 10 yrs atherosclerotic cardiovascular disease risk index (ASCVD) and medicine use were assessed. **RESULTS:** From a similar level at baseline, VO$_2$max increased by 1.31$\pm$0.96 mL$\cdot$kg$\cdot$min^{-1} after 2 yrs in TRAIN (9%; P=0.05) being 12% higher than CONT (P=0.05). Z-MetS decrease after 2 yrs in TRAIN (0.48$\pm$0.12 to 0.24$\pm$0.10; P=0.033) but remained unaltered in the CONT. ASCVD did not change in TRAIN but worsen in the CONT group after 2 yrs (7.8$\pm$1.3% to 10.4$\pm$1.9%; p=0.004). The correlation between the changes in VO$_2$max and Z-MetS was significant for the TRAIN group (r=-0.571; P=0.013; r^2=33%). After 2 yrs, a higher percentage of subjects in the CONT group in comparison to the TRAIN used cholesterol lowering medicine (45 vs 15%) and two medicines (45 vs 20%) in comparison to the TRAIN group. **CONCLUSION:** Two consecutive years of a 4-month intense aerobic exercise program raises CRF in association with a reduction in Z-MetS. The amount of variance in the reduction in Z-MetS that could be explained by the increase in VO$_2$max is 32% which suggest that exercise could be an important clinical non-pharmacological treatment to reduce the progression of MetS and the concomitant cardiovascular risk.

264   Board #105   May 30 9:30 AM - 11:00 AM

Exercise Intervention with Lifestyle Improves Mental Health and Decreases Morbid Thoughts

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(No relevant relationships reported)

PURPOSE: Morbid thoughts can increase risk of self-harm or harm to others. We assessed the impact that exercise may have on mental health before and after an educational program.
METHODS: Trained facilitators ran an 8-week mental health educational program. Participants met once a week for 8 weeks for a 2-hour program. A mental health test was applied at baseline and at the end. It measured emotional intelligence (EQ), depression based on DSM-5 [The Diagnostic and Statistical Manual of Mental Disorders Volume 5] criteria, demographics, and patient history including the question "Are you thinking about death often or considering harming yourself or others." and exercise patterns. Minimum exercise was defined as 30 to 45 minutes of exercise at least 4 times a week. Patients were educated on healthy behaviors. **RESULTS**:N=5997 participants finished the program and were included in the study. Mean age 52.3 SD 15.1, n=4209 (71%) were females and n=5106 (85.1%) were Caucasian. At baseline those that meet the exercise minimum n=2121, had an EQ of 102.8, SD 15.4. n=851 (40%) of these participants had no depression, n=385 (18%) mild depression, n=634 (30%) moderate depression, and n=251 (12%) severe depression. At baseline those that did not meet the exercise minimum n=3876, had an EQ of 99, SD 14.8. n=899 (23%) had no depression, n=569 (15%) had mild depression, n=1407 (36%) had moderate depression, and n=1001 (26%) had severe depression. At baseline the n=2121 that had a regular exercise program, of that group, 27.6% had some degree of morbid thoughts and had a mean depression of 9.7 (mild), SD 7.1. N=3876 did not have a regular exercise program at baseline, of those, 34.5% had some degree of morbid thoughts and mean depression of 13.4 (moderate) SD 7.4.
By the end of the 8-weeks, n=3284 had a regular exercise program, from that group 11.3% had some degree of morbid thoughts and a mean depression of 5.4 (none), SD 5.3. N=2713 at the end did not established an exercise program, that group 16.3% had some degree of morbid thoughts and a mean depression of 7.8 (mild), SD 6.3.
CONCLUSIONS:

It seems that exercise decreases severity of depression and morbid thoughts, even at baseline. The educational program seems to benefit exercising and non-exercising participants but those that established the regular exercise improved the most.

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265   Board #106   May 30 9:30 AM - 11:00 AM

The Effect of Early Life Undernutrition on Voluntary Physical Activity in Mice.

Eric C. Leszczynski, Ashley N. Triplett, David P. Ferguson.
Michigan State University, East Lansing, MI.
(No relevant relationships reported)

The Effect of Early Life Undernutrition on Voluntary Physical Activity in Mice.
Eric C. Leszczynski, Ashley N. Triplett, David P. Ferguson
Michigan State University, East Lansing, MI
Regular physical activity reduces the risk of cardiovascular disease, Type II diabetes, and metabolic syndrome. Perinatal undernutrition has been shown to program the development of chronic disease. **PURPOSE:** To determine if early life undernutrition influenced frequency and duration of wheel running (measure of physical activity) in mice during adulthood. **METHODS:** Using a cross-fostering model, pups were undernourished during gestation (GUN, N= 8) or during lactation (PUN, N= 8) by feeding FVB mothers a low protein diet (8% protein) causing growth restriction. The control group (CON, N= 7) was fed a normal protein diet (20% protein) throughout gestation and lactation. At 21 days of age, all pups were weaned and fed a control diet. At PN45, mice were then individually housed in cages with free-moving running wheels which recorded number of spins per day (Columbus Instruments). Average spins per day were calculated on days 5 and 6 for three weeks, and a two-way ANOVA was run comparing the main effects of diet and gender on average wheel spins. **RESULTS**: There was a significant difference between GUN mice (29535.625 ± 296 spins·day^{-1}), CON (22988.7 ± 296 spins·day^{-1}) and PUN (19667.5 ± 274 spins·day^{-1}) (p<0.05). There were no significant differences between male and female groups. **CONCLUSIONS**: Based on the data, postnatal undernutrition elicits an impairment in physical activity engagement. Thus, the developmental processes that occur during this time period are suspected to program adult physical activity level.

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266   Board #107   May 30 9:30 AM - 11:00 AM

Squatting With Elastic Bands Facilitates More Weight Used And Time Under Muscle Tension

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(No relevant relationships reported)

In has been shown that the variable resistance associated with elastic band training improves strength and several other outcomes. However, the efficacy of combining elastic bands (EB) with traditional resistance exercises is not well understood. **PURPOSE:** To evaluate performance (kg used and number of repetitions) during the squat exercise using free weights (FW) versus FW with EB applied with tension at the sticking point (50 degrees of knee flexion). **METHODS:** Twenty healthy, physically active men (25.5±4.7 yr) with resistance training experience performed four squat conditions on a Smith Machine in random order: (A) 10 maximum repetitions (RM) with FW; (B) 10RM with CLX EB added at the stand-up position (SUP) with the weight of 10RMFW; (C) number of repetitions with CLX EB added at the SUP using the weight of 10RMFW; (D) number of repetitions with CLX EB added at 50 degrees of knee flexion prior to the SUP using the weight of 10RMFW. Goniometer, tactile markers, and metronome were used to standardized range of motion and pace of movement. The eccentric phase was performed at a pace of 2 sec with a 1 sec pause before the concentric phase performed with maximum velocity. A validated bascule was used to measure kg. Friedman test identified differences between conditions and Wilcoxon signed-rank tests examined where differences occurred. **RESULTS:** Condition D employed more (p<0.05) weight than the other conditions (+24.70%). Conditions C and D performed more RM than the other conditions (8.4 and 3.45, respectively) with significant differences between conditions 3 and 4. **CONCLUSIONS:** Performing resistance exercises with EB increased the kg employed and time under muscle tension. This could be because EB provide an additional element of variable tension that changes through the range of motion. Combining EB with traditional weight training exercises may enhance the training effect.

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Effect Of Kinesitherapy And Massage To Injury Skeletal Muscle Repair'S Histomorphology And C-reactive Protein

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(No relevant relationships reported)

Abstract
Purpose: This project is based on mice acute blunt contusion model. And we use muscle histomorphology and C-reactive protein as observation targets. Hope our research result can help improving fitness enthusiasts' health knowledge level and offer choice to injury rehabilitation method.
Method: Project chooses 60 adult male healthy SD mice(360±22.7g) and use self-made tool to hit mice's right tibialis anterior muscle. After that we use randomization separate 60 mice into 4 groups, each group follow its own recovery plan. Collecting injury and health tibialis anterior muscle specimens after injury 2 day, 5 day, 8 day, 12 day, 16 day. Using HE staining method deal with muscle samples and observe its histomorphology. Using ELISA to measure the CRP level in serum. The result shows us inflammation level and span.
Result: (1) Regular Observation: These symptoms are vanishing in 6th day of massage group, 8th day of massage with kinesitherapy group, 10th day of kinesitherapy group, 16th day of spontaneous recovery group.
(2) Histological Observation: Mice acute blunt contusion model can cause all mice right tibialis anterior muscle construction destroy, muscle fiber break and increase interval. After each groups' therapy, tibialis anterior muscle's form repaired within several days.
(3) C-reactive protein: Massage Therapy Group, Kinesitherapy Group and Massage Therapy with Kinesitherapy Group C-reactive protein level back to normal time and degree compare with Spontaneous Recovery Group have showing significant different($p < 0.05$). Massage Therapy Group C-reactive protein level back to normal time and degree compare with Kinesitherapy Group and Massage Therapy with Kinesitherapy Group have show significant different($p < 0.05$).
Conclusion: Kinesitherapy and massage therapy can enhance muscle strength, correct injury skeletal muscle arrangement, tissue construction completion. Meanwhile, improve muscle microenvironment, reduce inflammatory cells infiltration and accelerate inflammatory cells elimination, decrease cellular stress response which come from muscle fibers degradation and shorten reaction span. In conclusion, kinesitherapy and massage therapy is the most efficiency rehabilitation therapy in skeletal muscle injury acute stage.

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Changes In Cortisol Levels With An Aquatic Resistance Workout Versus A Weight Workout

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(No relevant relationships reported)

Aquatic resistance training could be an effective type of strength training. However, the response of cortisol to aquatic exercise versus training with traditional weights has not been determined. **PURPOSE:** To compare the response of cortisol during similar resistance training protocols performed in an aquatic medium versus traditional weights. **METHODS:** 8 healthy, physically active males (24.8 ± 2.6 yr) with resistance training experience performed two conditions in random order: (a) 6 sets of horizontal shoulder ab/adduction and flexion/extension of both the shoulder and the elbow with a flat paddle-type device (782 cm^2 of projected frontal area) in each hand; and (b) 3 sets of exercises performed with dumbbells: (i) standing horizontal shoulder abduction, (ii) horizontal shoulder adduction, and (iii) shoulder flexion; and with pulley: (iv) standing pull-over, (v) biceps curl, and (vi) elbow extension. Rest between sets was 1-2 min. Aquatic exercises were performed at a pace that permitted the maximum number of repetitions in 15 sec. Weight exercises were performed with a load that permitted the same number of repetitions as the corresponding aquatic exercise pace. Cortisol blood samples were obtained from an antecubital vein in basal status, immediately after finishing each workout, and after 60 min of rest (60REST). **RESULTS:** Basal cortisol was 22.83±6.67 ng/ml. Post-workout and 60REST values were: (i) aquatic: 26.71±5.73 and 24.02±10.17 ng/ml, respectively; (ii) weights: 24.29±8.12 and 18.96 ± 6.45 ng/ml, respectively. There were significant (p<0.05) differences in cortisol levels following both workouts compared to basal values ($\chi2(4)=8.800$). There was also a significant increase in cortisol immediately after the aquatic workout compared to weights (Z=-1.820) and a significant decrease in cortisol between post- workout and 60REST with weights (Z=-2.240). **CONCLUSIONS:** Cortisol levels were higher immediately and 60 min after the aquatic workout compared to weights. The higher cortisol level

and the slower pace of recuperation could indicate that this type of aquatic training provokes a higher intensity. This could be due to the higher stabilization needed to maintain postural control in the water.

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A Call for Physical Activity Guidelines to Be Established in Equatorial Africa

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(No relevant relationships reported)

Current guidelines recommend adults perform a minimum of 30-60 minutes of moderate-intensity physical activity (PA) at least 5 days a week or vigorous PA on at least 3 days. Throughout Equatorial Africa, these recommendations are largely unmet and unknown. Among adults in rural areas, rates of sedentary behavior are reported to be 65-72%; in urban areas, where supplies are more accessible, 78-80% of men and women are sedentary. Geographic prevalence of metabolic syndrome reflects this with a 5-fold increase in urban populations. Currently, data are limited on how much PA should be prescribed to reduce the incidence of illness and physical suffering in Equatorial African populations. **PURPOSE:** To evaluate the effect of PA on health outcomes among Ugandan men and women. **METHODS:** The Uganda National Household Survey gathered data from a random sample of Ugandan homes between 2012 and 2013. Variables related to PA were limited; we used "hours spent gathering firewood" and "hours spent collecting water" as representations of daily activity. Dependent variables were whether subjects experienced an injury in the last 30 days, the number of days they reported "suffering" from illness or injury during that period, and the number of times they had to cease activity owing to illness or injury. Linear regressions tested the effect of PA on physical health outcomes. **RESULTS:** Across the total sample, more hours spent gathering firewood (p<0.001) and more hours spent collecting water (p<0.001) each individually associated with reduced frequency of suffering and the number of times subjects had to stop activity owing to illness or injury. Time spent gathering firewood (p=0.328), water (p=0.346), or both (p=0.982) had no relationship with the incidence of injury in the last 30 days; the implication is that illness associates more strongly with PA than does injury. As subjects performed more PA, they reported less suffering and less obstruction of daily tasks. **CONCLUSION:** These data offer a modest indication that PA and health are inextricable: increased engagement in activity corresponds to better health and less suffering. Owing to these preliminary associations and the lack of comprehensive data, there is a demonstrable need for governmental guidelines for PA and potentially the establishment of a Ugandan College of Sports Medicine.

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Does Joint-angle Specificity After Short-term Isometric Strength Training Have A Neural Basis?

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(No relevant relationships reported)

The functional adaptations to isometric RT have been found to different between, and highly specific to, the type of contractions performed e.g. explosive vs sustained contractions. However, it is unknown if isometric resistance training combining sustained contractions and brief explosive contraction (EC) increases both explosive and maximum strength, and if the strength gains would be specific to the training angle (joint angle specificity) explained by neural drive specific to the training angle. PURPOSE: The primary aim of the present study was to investigate if a short-term intervention of isometric RT, with brief EC and sustained maximum voluntary contractions (MVC), increased both maximum and explosive strength. The second aim was to investigate the joint angle specificity of adaptations in strength and neural drive. METHOD: Twenty-two healthy males completed 4 weeks of either RT (RT group; n=13; 22 ± 3 years; 1.78 ± 0.07 m; 73 ± 7 kg) or habitual activity (CON group n=9; 23 ± 3 y; 1.79 ± 0.08 m; 75 ± 8 kg). All training sessions were performed isometrically (65° knee joint angle where 0° is full knee extension; 14 sessions) performing unilateral knee extension EC [3x10 repetitions (~1s)] followed by MVC [3×6 repetitions (3s)]. Isometric pre- and post-training measurements of torque were made at five different joint angles (35°, 50°, 65°, 80° and 95°) during: MVC; EC and evoked twitch contractions. Surface electromyography (EMG) amplitude measurements from the quadriceps femoris during voluntary contractions were normalised to maximum peak-to-peak compound muscle action potential.RESULTS: Changes in MVT were higher for RT than CON at the training angle (65°; P=0.001) and the two more extended angles (35° and 50°; P≤0.047). Normalized EMG at MVT increased more, or had a tendency to increase more, for RT vs CON at these same angles (50°, P=0.023; 35° and 65°, P≥0.073). Explosive torque, EMG during EC and twitch contractions did not show time x group interactions (P≥0.123).CONCLUSION: Resistance training with brief EC and sustained MVC increased MVT and associated neural drive, but

did not increase explosive strength or neural drive during the explosive phase of contraction. We also found angle specific changes in neural drive that appeared to underpin the joint angle specificity of MVT improvements after isometric RT.

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Effects Of A Smartphone-based Intervention On Adults' Physical Activity, Self-efficacy, And Enjoyment

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(No relevant relationships reported)

PURPOSE: Smartphone applications provide an opportunity for implementing physical activity (PA) interventions remotely. However, little research has been published to date on their effects. The purpose of the study was to test the effectiveness of *efitbuddy,* a theory-based PA smartphone application, on young adults' PA and motivational beliefs through a four-week intervention.
METHODS: A quasi-experimental design with control group was used to examine the effects of *efitbuddy* on participants' PA. 274 college students (167 females, mean age = 19.35±2.09 years) attended baseline and posttests and change scores were computed for each dependent variable (DV). After the baseline test, participants in the intervention group (n=187) downloaded *Efitbuddy* and used it daily for four weeks. *Efitbuddy was* a smartphone application developed to promote individual's PA and included four behavior change techniques such as self-monitoring, setting goals, and provision of general health information. PA participation, self-efficacy, and exercise enjoyment were selected as the DVs of the study. A Pearson's correlation analysis was employed on the raw data to examine if the data were suitable for multivariate analyses. The results displayed moderate linear relationships between the pretest and posttest scores on three DVs. Therefore a 2 (group) x 2 (time) x 2 (gender) Multivariate Analysis of Variance (MANOVA) was conducted to examine the differences in the dependent variables. Wilk's lambda was used to decide the statistical significance of the multivariate model.
RESULTS: There were no multivariate statistically significant interactions for Group x Time x Gender (Wilks's $\Lambda = 0.996$, $F_{(6, 269)} = 0.687$, P = 0.560), for Time x Gender (Wilks's $\Lambda = 0.003$, $F_{(6, 269)} = 0.508$, P = 0.677), and for Group x Time (Wilks's $\Lambda = 1$, $F_{(6, 269)} = 0.008$, P = 0.999). However, the results from the MANOVA yielded a significant interaction for Gender x Group (Wilks's $\Lambda = 0.985$ $F_{(6, 269)} = 2.720$, P = 0.044).
CONCLUSIONS: The results of the study demonstrate that *efitbuddy* has limited influence on young adults' PA through a four-week period of time usage. These results echo previous studies exploring the relationship between smartphone applications and PA behaviors and more research is warranted for longer intervention with more vigorous engagement of usage.

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Cardiometabolic Effects of a Randomized Workplace Cycling Intervention

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(No relevant relationships reported)

In laboratory settings, replacing sitting with cycling improves cardiometabolic risk factors. However, changes to risk factors following a cycling intervention in the workplace have yet to be examined. **PURPOSE:** To quantify how a compact, stationary cycling device used in a sedentary workplace affects cardiometabolic risk factors. **METHODS:** Twenty-one inactive to recreationally active office workers who sat at work ≥6 h·d⁻¹ visited the laboratory for baseline physiological measurements (resting blood pressure, blood lipid profile, VO2max, body composition, and 2-h oral glucose tolerance test). Participants were assigned to a 4-week intervention (n=12) or a 4-week control period (n=9). At the end of the control period, participants in the control group repeated the baseline physiological measurements and then began the workplace intervention. During the workplace intervention, participants were instructed to use the cycling device a minimum of 15 min·h⁻¹ which would result in a total use of ≥2 h·d⁻¹ during the workday. Following the 4-week intervention period, the physiological measurements were repeated. **RESULTS:** Participants averaged 1.73±0.47 h·d⁻¹ of cycling during the intervention with no changes in actigraphy monitored non-cycling physical activity. Four weeks of the workplace intervention increased VO2max (2.07±0.44 to 2.17±0.44 L·min⁻¹), end of VO2max test power output (166.3±42.2 to 176.6±46.1 W), and HDL cholesterol (1.09±0.17 to 1.17±0.24 mmol·L⁻¹). **CONCLUSIONS**: A compact stationary cycling device incorporated into a sedentary workplace improves some cardiometabolic risk factors in 4 weeks with no compensatory decrease in non-cycling physical activity. Therefore, compact cycling devices are a feasible intervention for a sedentary workplace.

This efficacy trial can inform the design of future randomized controlled trials aimed to modify lifestyle behaviors to decrease the proportion of women gaining excessive weight during pregnancy in a larger, more diverse pregnant population.

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Effects Of A 12-month Community-based Exercise Program In Men And Women With Non-communicable Diseases.

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(No relevant relationships reported)

INTRODUCTION: Non-communicable diseases represent a significant threat to human health and well-being, and carry significant implications including decreased quality of life and decreased physical functioning. The aim of this study was to evaluate the effects of attendance to a 12 month community-based chronic disease exercise rehabilitation program on measures of physical activity (PA) sedentary behaviour (SB) and physical function and to compare the results of those who attended regularly vs non-regular attenders.
METHODS: Participants (56.3% male; age (mean ± SD) 64.8 ± 0.5 yr) with coronary artery disease, (n=119); chronic obstructive pulmonary disease, (n=101); peripheral arterial disease, (n=53); or type 2 diabetes, (n=43) were referred by a physician to a community-based chronic disease exercise rehabilitation program. Standard anthropometrics, timed sit-to-stand (STS), hand-grip, sit-and-reach test (SAR) and performance during a 6-min time trial (6MTT), PA and SB were measured at induction to the community-based chronic disease exercise rehabilitation program and after 12 months. Results are presented as mean ± SD. Attenders were classified as those who attended at least one class per week for 12 months.
RESULTS: At baseline, attenders had significantly more favourable measures of BMI, hip circumference, STS and 6 MTT, significantly higher stepping hours, min of moderate/vigorous PA (MVPA) and step count, and spent significantly less time in SB > 90 min than non-attendees. Using baseline values as covariates, there was a significant difference in stepping hours, minutes of MVPA, step counts and BMI between attenders and non-attenders at 12 months. There was no significant difference at baseline for the number of sedentary bouts < 20 min, weight (kg), waist circumference and SAR. However, all values were significantly different between attenders and non-attenders at 12 months.
CONCLUSIONS: Participants who attended chronic disease exercise rehabilitation program a minimum of one day per week for 12 months had significantly greater improvements in MVPA, SB and physical functioning than non-attenders.

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Efficacy Trial Of A Behavioral Lifestyle Intervention To Promote Appropriate Gestational Weight Gain

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(No relevant relationships reported)

Appropriate gestational weight gain (GWG) is an important, modifiable risk factor in both maternal and fetal health; however, the majority of women in the United States exceed Institute of Medicine (IOM) weight gain recommendations. A need exists to identify effective strategies targeting lifestyle behaviors (e.g. diet and physical activity (PA)) to encourage healthy GWG. **Purpose**: The study examines the efficacy of a counseling-based lifestyle intervention designed to promote appropriate GWG and reduce post-partum weight retention. **Methods**: Participants were randomized to intervention (INT; n = 23) or to a usual care (UC; n = 24) group between 8-14 weeks gestation. To encourage appropriate weight gain during pregnancy, the INT group received at least six one-on-one counseling sessions over approximately 30 weeks. Counseling was based on principles of Motivational Interviewing (MI) and was delivered by a Registered Dietitian Nutritionist. INT participants were given a commercially available fitness tracker and an individualized meal plan. Stated goals for INT participants were to accumulate ≥10000 steps per day and eat 45% of total calories from carbohydrates. GWG, PA (steps/day and minutes of moderate and vigorous PA (MVPA), and diet quality (Healthy Eating Index-2010 (HEI)) were assessed at baseline, 26-28 weeks and 34-36 weeks gestation; weight retention was measured at two-months postpartum. **Results**: The proportion of INT women that met the 2009 IOM GWG guidelines was significantly greater than UC (60.8% vs. 25.0%, OR: 4.67 CI: 1.3-16.2; p = 0.019). INT PA increased from baseline to 26-28 weeks gestation (steps/day: 6661 ± 1737 vs. 8603 ± 3062; >30-min bouts: 41.4 ± 88.6 vs. 81.3 ± 73.7; both p<0.01) and was significantly greater at 26-28 weeks gestation compared to UC (steps/day: 6629 ± 2322; >30-min bouts of MVPA: 28.4 ± 55.8; both p<0.01). INT group HEI improved from baseline to 26-28 weeks gestation (61.2 ± 10.5 vs. 70.6 ± 12.8; p<0.01). In the INT group, 36.4% were at or below pre-pregnancy weight at two-months postpartum compared to 12.5% of UC (p = 0.05). **Conclusions**:

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Baseline Body Composition Affects Exercise Training Outcomes: Results from Diabetic and Athletic Populations

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(No relevant relationships reported)

When adults initiate an exercise prescription, approximately 51% do so with a declared goal of weight loss. Decreasing adiposity correlates with disease risk reduction and, in some sport contexts, improved performance. However, exercise adherence is typically poor; within 6 months of engagement, expected attrition exceeds 50%. Those who fail to sustain the practice commonly report being discouraged by a lack of progress. Thus, it is important to identify and understand the variables that influence the rate of fat loss at the onset of an exercise program. **PURPOSE**: To evaluate predictors of body composition improvement among diverse exercising populations. **METHODS:** We enrolled subjects from two distinct populations: older diabetic patients with no history of exercise (n=67) and college-aged rugby athletes (n=12). Each population underwent baseline testing to assess body fat percent (BF%) prior to and following a period of exercise. The diabetic population performed structured, supervised exercise for 10 weeks; the athletic population performed unsupervised, unstructured exercise for 4 weeks. Multiple linear regression analyses, holding other explanatory variables constant, tested predictors of BF% change. **RESULTS:** At baseline, the diabetic patients were 68.3 ± 10.7 years of age, had a body mass index (BMI) of 32.3 ± 6.7 kg/m², and 39.3 ± 6.9% body fat. The rugby athletes were 19.6 ± 2.0 years of age, had a BMI of 25.2 ± 2.8 kg/m², and 13.4 ± 4.3% body fat. Among diabetic patients, controlling for potential confounders, each additional point of baseline BF% predicted a 0.18-point reduction in BF% at post-test (p=0.010; 95% CI: -0.32 to -0.05); the overall model was significant (R²=0.395; p=0.002). Among rugby athletes, controlling for potential confounders, each additional point of baseline BF% predicted a 0.33-point reduction in post-test BF% (p=0.042; 95% CI: -0.65 to -0.02). **CONCLUSION:** Among exercising diabetic and athletic populations, higher baseline BF% corresponded to greater improvements in body composition throughout the exercise intervention. Among athletic populations, this may mean more rapid improvements in sport performance; for diabetic populations, this may lead to greater improvements in glycemic control.

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Blood Flow RestrictionTraining and Functional Improvements in a Single Subject with Parkinson Disease

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(No relevant relationships reported)

Blood flow restriction (BFR) applied with pressure cuffs to an active muscle, during low intensity exercise, produces muscle hypertrophy and strength gains equivalent to traditional high intensity resistance training. Previous research has shown the positive effects of BFR during gait training on younger and older adults. However, the effectiveness of BFR on subjects with Parkinson Disease (PD) and Restless Leg Syndrome (RLS) has not been investigated.**PURPOSE**:The purpose of this study was to determine the effects of BFR on a subject with PD in regards to functional improvements and safety.
METHODS: A single subject, B-A design was used. The subject was a 65 year old male diagnosed with PD and RLS for 7 years. Baseline data were measured on day one. The intervention (Phase B) consisted of 5, 2-minute bouts of exercise with lower extremity BFR cuffs interspersed with 1 minute rest, 3 times a week for 6 weeks, at 0 grade incline, and speed of 50 meters/min. The pressure increased from the initial 120 mmHg to 160 mmHg at the end of the phase B as per the subject's tolerance. A 4 week baseline phase (A) without the BFR intervention followed phase B. **RESULTS**: The outcome measures which were measured every 2 weeks over the 10 weeks included: Timed Up and Go Test (TUG), 6-Minute Walk Test (6MWT), 30-Second Chair Stand Test (30-sCST) and the Restless Leg Syndrome Questionnaire (RLS).The subject's TUG, 6MWT, 30-sCST scores steadily improved every 2 weeks during the 6 week intervention phase and steadily declined when the intervention was removed during the second 4 week baseline phase according to visual inspection of the graphed data points. The patient's RLS also improved during the intervention phase and steadily worsened again during the second baseline phase.

CONCLUSIONS: The subject enjoyed and tolerated the intervention well without any adverse effects. The results of this single subject design were that BFR training can produce significant functional improvements, reduce restless leg syndrome symptoms and can be safely utilized with a patient with PD.

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A Knowledge Based Intervention on Health and Physical Activity Knowledge and Behavior in Hispanic College Students

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(No relevant relationships reported)

PURPOSE: To investigate the effects of an intervention on Hispanic college students' basic health, healthy eating, and physical activity (PA) related knowledge and behaviors.
METHODS: Fifty-two (52) Hispanic college students (age= 24.16 ± 3.54) volunteered to participate in the study. Each subject read and signed the consent form prior to any measurements to take place. Demographic and anthropometric data including age, race, gender, major, height, weight, resting heart rate (RHR), blood pressure (BP), body composition (BC), waist (WC) and hip circumference (HC) were collected. Subjects completed The Food and Drug Administration's (FDA) Health and Diet Survey (modified). They were randomly assigned to a control (CG) or an intervention (IG) group. IG received a pamphlet containing general health knowledge and guidelines about healthy eating and physical activity behaviors. After 4-5 weeks, both CG and IG visited the lab second time for post measurements. Godin's (2011) Leisure-Time Exercise Questionnaire was used to quantify pre/post PA.
RESULTS: There was a trend for group*time interaction for DBP (p=0.09). The IG experienced a greater decrease in DBP. Both groups experienced similar changes in knowledge on BMI (p<0.01), amount of PA (p<0.04), and RHR (p<0.04) with time. A trend for group*time interaction was also reported on RHR (p=0.097). A significant interaction was found for students' knowledge on the effects of trans fatty acid on heart disease (p<0.02). The IG became significantly more knowledgeable compared to the CG. There was a time main effect (p<0.05) and group*time interaction (p<0.05) for the knowledge regarding the role of saturated fat on heart disease.
CONCLUSIONS: Findings of the study showed that many college students lack or have misconceptions about common health related knowledge. Findings also indicated that simple methods such as providing pamphlets may be effective enough to increase students' knowledge. Future studies should investigate the long-term effects of pamphlets and other simple educational strategies on retention of knowledge and behavioral change. In addition, since new technologies might be more appealing to young college students, the effectiveness of various new tech tools can also be used to increase the level of health related knowledge and behavioral changes.

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The Moderating Effect of Baseline Depression and Age on the Efficacy of an Exercise Intervention on Preventing Postpartum Depression and Stress

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(No relevant relationships reported)

PURPOSE: Support for the efficacy of exercise interventions on preventing postpartum depression is mixed. Therefore, it is important to examine potential moderating variables. The purpose of this study was to examine the moderating effect of age and baseline depressive symptoms on the effect of exercise on preventing postpartum depression and stress. **METHODS:** Participants were low active participants (n=450; average age = 30.7 years) who had a history of depression and participated in a trial examining the efficacy of exercise on preventing postpartum depression and stress (variables assessed at 6 and 9 months). Participants were randomly assigned to: 1) 6-month telephone-based exercise intervention (2) 6-month telephone-based wellness/support intervention or (3) usual care. **RESULTS:** Most participants were married (75%), had at least some college (93%), and were Caucasian (73%). There were between-group differences in baseline age (p=.01) and depressive symptoms (p=.03), so these variables were included as covariates in the models. Using generalized estimating equations (for binary depression outcome) and quantile regression (for depressive symptoms and perceived stress) we explored potential moderators of the association between exercise and outcomes (treatment assignment was controlled). Among older participants (based on a median of 30.5 years), greater exercise was associated with lower median stress at 9 months controlling for baseline (b=-4.74, SE=1.69, p=.005). Effects were not significant among younger participants. Among younger participants, lower exercise was associated with greater odds of depression at 6 months (OR=7.87, 95% CI:1.35-15.69). Finally, among those with higher depressive symptoms at baseline, exercise was significantly associated with

reductions in stress at 9 months (b=-4.00, SE=1.55, p=.01) and depression at 6 months (OR=3.41, 95% CI: 1.00-13.54). Among those with lower depressive symptoms at baseline, exercise was associated with greater reductions in depressive symptoms at 6 months (b=-1.13, SE=.57, p=.05). **CONCLUSIONS:** Low exercise levels appears to be a risk factor for depression among young postpartum women. Regarding stress, unlike older postpartum women, younger postpartum women may need strategies in addition to exercise for preventing stress.

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The Acute Effect of a Single Yoga Lesson on Mood and Stress among College Students

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(No relevant relationships reported)

PURPOSE: Yoga is an exercise mode that has gained popularity across the world over the years due to its physical and mental benefits (e.g., flexibility, relaxation, calmness). This study examined the acute effect of one yoga lesson on college students' mood (both positive mood and negative mood) and cortisol level.**METHODS**:The study took place in a prestigious university in Beijing, China. The sample consisted of 192 students (Mean age = 19.76) enrolled in two types of physical activity courses offered at the university: yoga class (n = 98) or health-related fitness class (control group: n = 94). Both courses were 90 minutes long and taught by experienced physical education teachers following two separate lesson plans. The Chinese version of the Positive and Negative Affect Schedule Scale (PANAS; Watson, Clark, & Tellegen, 1988) was used to measure positive (e.g., mindfulness, resilience, self-esteem) and negative mood (e.g., self-criticism, self-correction). Saliva was collected to determine cortisol level which measures stress. The two measures were administered to students in both groups before and then after taking the physical activity classes. Multivariate analysis of variance was conducted to determine the time (pre- vs post-test), group (yoga vs fitness groups), and time x group interaction effects for mood and stress. **RESULTS**:The results demonstrated that students in both groups showed increase in positive mood (mindfulness, resilience, and self-esteem) and decrease in negative mood (self-criticism, self-correction) as a result of taking the respective physical activity lessons. However, compared to those in the fitness group, students in the yoga group showed significantly greater increase in mindfulness (yoga group: $\Delta M = .64$; fitness group: $\Delta M = .31$; $F_{1,190} = 4.08$, $p < .05$) and greater decrease in stress (yoga group: $\Delta M = -.70$; fitness group: $\Delta M = -.35$; $F_{1,190} = 5.96$, $p = .02$).**CONCLUSIONS**:This study confirmed the positive effect of physical activity classes on mood and stress. Furthermore, compared to the fitness lesson, the yoga lesson demonstrated greater effect on mindfulness and stress. This set of findings are meaningful to college students' mental health. Taking one single physical activity lesson, especially yoga, can help students be mindful of behaviors and manage stress.

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Effects Of A 12-week Structured Exercise Intervention On Cholesterol

Brett Staniland[1], Jorge Lopez-Fernandez[1], Isabel Sanchez[2], Tamara Iturriaga[2], Maria Ayuso[2], Elizabeth Horton[1], Lou Atkinson[3], Steve Mann[4], Gary Liguori, FACSM[5], Alfonso Jimenez[1]. [1]Coventry University, Coventry, United Kingdom. [2]GOFit Lab, Madrid, Spain. [3]Aston University, Birmingham, United Kingdom. [4]ukactive Research Institute, London, United Kingdom. [5]University of Rhode Island, Kingston, RI.
(No relevant relationships reported)

Intro: The total cholesterol profile includes high and low-density lipoprotein, both of which contribute to cardiovascular disease (CVD) risk. This direct relationship between dyslipidaemia and CVD can be modified by increasing physical activity (PA), and a reduction in total cholesterol of 10.0 mg/dL has shown to reduce incidence of heart disease by up to 54% in adults. **PURPOSE:** Compare a structured exercise programme to usual exercise for the effects on total cholesterol in healthy, sedentary adults.
METHODS: Members (54 males, age 43.3±8.5 y. and 20 females, age 42.9±7.6 y.) of GOFit gym, Vallehermoso, Madrid, who had been absent for at least 60 days, were recruited and randomly grouped as control [CON=20], free gym use [FREE=20], and combined structured exercise [COMB=34], for a 12-week intervention. All participants were categorized as "at risk" according to ACSM Risk Stratification Screening Questionnaire. CON were instructed to continue usual at-home habits; FREE were given free roam of the gym and exercised 2-3 days/week; COMB completed a programme of aerobic exercise, resistance training and flexibility training 2-3 days/ week and also wore a physical activity tracking device. Cholesterol was obtained via the Accutrend Plus, and levels were compared pre and post intervention.
RESULTS: Twenty one participants (28%) completed the study, (CON=6, FREE=6, COMB=9). Paired t-tests showed a significant decrease in total cholesterol for all groups; CON: -8.5 mg/dL (pre=208.5±13.11, post=200±19.4, *p*=0.048), FREE:

-27.2 mg/dL (pre=207.5±32.86, post=180.3±23.29, p=0.027), COMB: -21.7 mg/dL (pre=219.8±33.84, post=198.1±25.85mg/dL, p=0.018). ANOVA showed no significant difference between exercise groups post intervention (p=0.680), although the COMB group showed the largest absolute improvement in cholesterol.

CONCLUSIONS: Programmes of aerobic exercise, resistance and flexibility training for 12-weeks are effective in improving cholesterol levels in healthy, sedentary adults. The exercise intervention used here was shown to be effective, but no better than other exercise options or controls. A larger sample should be used in future research to indicated if combined, structured exercise is more effective at lowering cholesterol levels.

281　Board #122　May 30 9:30 AM - 11:00 AM

The Influence Of Non-exercise Physical Activity During Aerobic Exercise On Cardiometabolic Risk Factors

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(No relevant relationships reported)

PURPOSE: To determine the impact of changes in non-exercise physical activity on changes in cardiometabolic risk factors in participants performing aerobic exercise training.

METHODS: Obese adults (N=25) were randomized to an aerobic training group or an aerobic training and increasing non-exercise physical activity group. Both groups performed supervised aerobic training (50%-75% VO$_2$ max) for 24 weeks at a dose of 12 kcals per kg per week. Non-exercise physical activity (total steps, minutes in low, moderate to vigorous [MVPA] physical activity) was quantified during the entire intervention using Fitbit One accelerometers (removed during supervised exercise sessions). Cardiometabolic assessments included lipids, glucose, insulin, 2-hour glucose/insulin from an oral glucose tolerance test, fitness, and body composition measures (% body fat, weight, and waist circumference). Linear regression models were run with change in the cardiometabolic variable as the dependent variable and baseline value, age, race, sex, supervised exercise time, adherence to exercise dose, change in non-exercise physical activity variables (change in total steps, minutes in light intensity and minutes in MVPA) as predictor variables.

RESULTS: Change in total steps was a significant predictor for change in weight (r^2= 0.17, p=0.04), percent weight loss (r^2= 0.18, p=0.03), waist circumference (r^2=0.31, p=0.004), triglycerides (r^2= 0.30, p=0.01) and relative fitness (r^2= 0.19, p=0.03). Change in total steps approached significance as a predictor for absolute fitness (p=0.052) and body fat (p=0.059). Change in minutes in low intensity was a significant predictor of the change in 2-hour glucose (r^2= 0.20, p=0.03). Change in MVPA was not associated with change in any cardiometabolic variables (all ps>0.05). Change in non-exercise physical activity did not predict changes in glucose, insulin, 2-hour insulin, low density lipoprotein, high density lipoprotein, total cholesterol, or lean mass levels (all ps>0.05).

CONCLUSIONS: Change in non-exercise physical activity outside of aerobic training was associated with changes in several cardiometabolic variables. Increasing total steps or minutes in low intensity may represent a clinical target to maximize the health benefits of aerobic exercise training in obese adults.

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Video Conferencing Based Health Coaching is Effective for Inducing Weight Loss and Improving Metabolic Markers

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(No relevant relationships reported)

Most health coaching (HC) interventions have been delivered through telephone, web-based chatting, or face-to-face instruction. Despite the potentially positive impact of group-based HC by video conferencing (VC) on weight loss and metabolic health, individualized VC sessions have not been studied. **PURPOSE:** To assess changes in physical activity, body mass, metabolic markers (fasting blood, insulin, glucose, hemoglobin A1c [HbA1c], and HOMA-IR), in obese adults. **METHODS:** Thirty adults (body mass index [BMI] ≥30 kg/m²) were randomly assigned to three groups video conferencing group (VC), in person (IP) group, or a control group (CG), n=10 per group). Participants received a wireless body weight scale and step-tracking accelerometer watch (Withings, Inc., Cambridge, MA, USA) to synch with their personal smartphones and apps. Participants assigned to VC and IP groups received weekly HC individualized based on data uploaded over the 12-week intervention.

Steps/day and body weight loss were analyzed via analyses of covariance (ANCOVA). Between-group ANOVAs analyzed pre-and post-intervention changes in weight (kg), blood glucose, insulin, HbA1c, and HOMA-IR. **RESULTS:** Mean weight loss and percent weight loss (%) was greater (*p*≤.05) for VC (8.23±4.5kg; 7.7%) than IP (3.4±2.6kg; 3.4%) and CG (2.9±3.9kg; 3.3%) respectively. Steps/day were significantly higher in VC than IP at week 4 only and VC was significantly higher than CG at weeks 6, 8, 9, and 11 (*p*≤.05). No within- or between-group differences were found for glucose, insulin, or HbA1C. HOMA-IR decreased for VC only (*p*≤.05).No between-group differences were found for any metabolic markers. However, there was a within-group decrease for HOMA-IR (p≤.05) for VC. **CONCLUSION**: Our innovative, multidisciplinary, telemedicine health coaching delivered through VC led to more favorable changes in weight loss, physical activity (steps/day), and HOMA-IR than in-person or no health coaching. VC may be an economical approach to improve health and promote behavior change in obese adults. Future studies using VC health coaching in group and individualized formats, and for other population subgroups, are needed to investigate impacts of weight loss on other health outcomes. Supported by NIH Grant 8UL1GM118979-02.

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Effects Of Accumulated Short-bout Exercise On Obesity Index: A Meta-analysis

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(No relevant relationships reported)

Recent exercise guidelines allow individuals to perform accumulated short-bout exercise throughout the day rather than a continuous long-bout of activity. The guidelines may make it easier for individuals to comply with recommended amounts of physical activity. However, the effect of accumulated short-bout exercise on reducing the obesity index is uncertain. **PURPOSE:** To determine the effect of accumulated short-bout exercise on the obesity index. **METHODS:** A systematic literature search (key terms: short-bout, accumulated, exercise, obesity) was conducted of electronic databases (PubMed, PsycINFO, CINAHL, Cochran Library) to identify relevant studies. Studies were included if they met the following criteria: (1) at least one group had short-bout exercise intervention; and (2) obesity index [e.g., Body Mass Index (BMI), waist circumference (WC), body fat percentage, etc.] was measured at pre- and post-intervention. The mean and standard deviation of obesity index change scores (the difference between pre- and post-intervention) were extracted to calculate effect sizes (ESs). A random effects model was used to provide an overall ES and 95% confidence interval (CI). Moderator analyses were conducted to evaluate the effects of exercise days/week (e.g., < 5 times, ≥ 5 times), total exercise mins/week [e.g., < 150 mins/w, ≥ 150 mins/w, 100 to 200 mins/w (incremental increase)], and intervention length (e.g., ≤ 10 wks, 11 to 20 wks, > 20 wks) on overall ES. Heterogeneity was evaluated using Cochran's Q statistic. ES calculation and moderator analyses were conducted using Comprehensive Meta Analysis (Version 2.2).**RESULTS:** The searches yielded 2,535 articles. After initial screening of titles and abstracts, 159 potentially relevant studies were reviewed in full, 17 studies were included, and 51 ESs were calculated. Overall mean ES was significant [ES = 0.47 (near medium), CI = 0.34, 0.59]. Moderator analyses indicated that the mean ES was influenced by the three moderator variables: exercise days/week, $Q_{between}$ (Q_b) = 4.54, df = 1, *p* = .033; total exercise mins/week, Q_b = 9.61, df = 2, *p* = .008; intervention length, Q_b = 7.662, df = 2, *p* = .022. **CONCLUSION:** In this meta-analysis, there is sufficient evidence to conclude the accumulated short-bout exercise is effective in reducing obesity index among adults.

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A Weekly Structured Physical Activity Program Enhances Short-term Retention Of Middle-aged Adult Fitness Centre Users

Jorge Lopez-Fernandez[1], Brett Staniland[1], Isabel Sanchez[2], Tamara Iturriaga[2], Maria Ayuso[2], Elizabeth Horton[1], Steven Mann[3], Gary Liguori, FACSM[4], Lou Atkinson[5], Alfonso Jimenez[1]. [1]Coventry University, Coventry, United Kingdom. [2]GO fit LAB, Madrid, Spain. [3]ukactive Research Institute, London, United Kingdom. [4]University of Rhode Island, Kingston, RI. [5]Aston University, Birmingham, United Kingdom.

(No relevant relationships reported)

A weekly structured physical activity program enhances short-term retention of middle-aged adult fitness centre users

Lopez-Fernandez, J., Staniland, B., Sanchez, I., Iturriaga, T., Ayuso, M., Horton, E., Mann, S., Liguori, G., Atkinson, L., Jimenez, A.

Fitness centres can play a key role in addressing physical inactivity, yet several studies reveal low retention rate in fitness centres. Few centres, however, use a structured approach by providing a weekly physical activity (PA) program meeting ACSM guidelines.

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Purpose: To assess attendance and retention rates in inactive middle-aged adults of a fitness centre between a traditional PA plan and a structured PA program meeting ACSM guidelines.

Methodology: Eighty inactive middle-aged adults (44.32 ± 6.99 years; 77.89 ± 19.22 kg; 158.75 ± 36.08 cm) from a Spanish fitness centre voluntarily enrolled in this study. Participants were randomly assigned to two groups (Free Exercise [FE = 40]; Structured Program [SP = 40]) and proved to be inactive through IPAQ short version. Participants completed baseline measures including body composition, VO2 max, cholesterol, triglycerides, blood glucose, flexibility, and muscular strength. During the ensuing 12 weeks, weekly attendance of both the FE and SP groups were tracked, with both groups initially agreeing to exercise 2-3 days per week for at least 20 sessions. FE group was introduced to trainers of the fitness centre and informed of group exercise sessions available. SP group received a structured program based on ACSM guidelines for PA.

Results:
No baseline differences (p>0.05) existed between groups for age, body composition, VO2 max, haematocrit, flexibility, and muscular strength. A total of 13 participants (16%) never attend the initial assessment, and only 20 members (25%) attended 20 days or more (FE=5 [12.5%]; SP=15 [37.5%]). Members of SP group attended more total days (15.73 ± 8.19) than FE group (7.79 ± 8.62) during the 12 weeks (+7.93 days; p<0.001; ES = 0.945; IC: 3.83 – 12.04).

Conclusion: Inactive adults receiving a structured PA program attended more days compared to those enjoying 'free' exercise, however, overall retention rate was still low for all participants. This pilot data shows the potential benefit of fitness centres providing structured daily programs to enhance retention.

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Exercise Training in 'at Risk' Black and White Women: A Comparative Cohort Analysis

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(No relevant relationships reported)

PURPOSE: Although African Americans are more likely to die of a myocardial infarction than any other racial group, few data are available regarding the impact of exercise interventions in 'at risk' black women as compared with their white counterparts. **METHODS**: Women ≥18 years without known cardiovascular disease with ≥1 coronary risk factor were enrolled in a community-based exercise program ≥3 days per/week for ≥30 min/session for 6 months. Exercise training intensity ~50–80% of functional capacity, using estimated heart rate (HR) and/or rating of perceived exertion (RPE) as the primary intensity modulators. Pre-versus post conditioning quality of life (QOL) assessments (depression [PHQ-9] and level of daytime sleepiness), dietary fat intake, Duke Activity Status Index (DASI score), changes in cardiovascular efficiency (systolic/diastolic blood pressure [SBP/DBP], HR, RPE during a standardized submaximal workload), and anthropometric measures, including body weight, body mass index (BMI), and waist circumference, were evaluated. **RESULTS**: Of 556 volunteers, 143 were excluded, leaving 413 women (222 white, 191 black; mean $\pm$ SD age = 61 ± 9) who met compliance criteria. Both groups demonstrated significant ($P <0.05$) post-conditioning decreases in BMI, waist circumference, resting SBP/DBP, total and low density lipoprotein cholesterol, reductions in HR, SBP/DBP, and RPE at a fixed submaximal workload, and in fat screener, depression, and sleep scores. DASI scores increased significantly ($P <0.0001$) for both groups, signifying increases in self-reported functional capacity. Women presenting with mild-to-moderate depression symptoms (n = 108) demonstrated the greatest decrease in PHQ-9 scores, averaging 8.9 and 3.5 at baseline and follow-up, respectively. Although 87 women (21%) experienced a musculoskeletal injury during the program, there were no exercise-related cardiovascular events. **CONCLUSION**: A progressive moderate-to-vigorous exercise intervention without preliminary exercise testing elicited comparable improvements in risk factors, anthropometric and QOL measures, and cardiovascular efficiency in 'at risk' black and white women. These adaptations were achieved at exercise levels *below* those recommended by contemporary Physical Activity Guidelines.

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Association Between Stage Of Behavior Change With Cardiovascular Risk, Perception Of Health And Quality Of Life Among Professionals From Health Institutions

Amauri dos Santos, João Pedro da Silva Júnior, Victor Keihan Rodrigues Matsudo. *CELAFISCS, Sao Paulo, Brazil.*
(No relevant relationships reported)

Purpose: To analyze the factors associated to the stage of behavior change among professionals from health institutions. Methods: The sample consisted of 1036 professionals (241 male and 794 female). The dependent variable was the irregularly active group of the behavioral stage questionnaire (proposed by Prochaska, 1988). The independent variables were: gender, age, BMI, waist circumference, presence

of diseases, health perception and quality of life. Statistical analysis: Binary Logistic Regression (Odds Ratio (OR) and its respective 95% CI confidence intervals) were used to associate the study variables. Results: The factors associated with irregularly active behavior change were: gender, BMI, circumference of the abdomen, presence of disease, health perception and quality of life. On the other hand, age not associated with the stage of irregularly active behavior change, see table below. Conclusion: The irregularly active group presented a greater chance of being obese, having a cardiovascular risk, a negative health perception and a poorer quality of life.

Factors associated with irregularly active stages of behavior change (Pre-Contemplative, Contemplative, Preparation)			
Variable	Significant	OR	IC 95%
Sex			
Female		1	
Male	< .38	.73	(.51-.98)
Age (years)			
(15-24)		1	
(25-39)	.87	.87	(.50-1.79)
(40-59)	.66	.66	(.64-2.00)
(> 60)	.70	.72	(.58-.19)
IMC			
Eutrophic		1	
Overweight	< .001	1.6	(.19-2.34)
Obese	< .001	1.9	(1.37-2.90)
Abdomen Circumference			
(M < 94 cm e F < 80 cm)		1	
(M > 94 cm e F > 80 cm)	< .001	1,8	(1.35-2.59)
Presence of Disease			
No		1	
Yes	< .001	1.6	(1.23-2.17)
Health Perception			
Positive		1	
Negative	< .001	2.6	(1.74-4.02)
Quality of Life			
High		1	
Low	< .001	3.2	(1.80-5.95)
M =Male ; F =Female; cm = Centimeters			

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Experimental Investigation of Exercise-Related, Perceived Hedonic Responses to Preferred Versus Imposed Media Content

Emily Frith, Paul D. Loprinzi, 38655. *University of Mississippi, Oxford, MS.*
(No relevant relationships reported)

PURPOSE: We evaluated the differential influence of preferred versus imposed media selections on distinct hedonic responses to an acute bout of treadmill walking, which has yet to be investigated in the literature. **METHODS**: Twenty university students were recruited for this [160 person-visit] laboratory experiment, which employed a within-subject, counter-balanced design. Participants were exposed to eight experimental conditions, including 1) Exercise Only, 2) Texting Only, 3) Preferred Phone Call, 4) Imposed Phone Call, 5) Preferred Music Playlist 6) Imposed Music Playlist, 7) Preferred Video and 8) Imposed Video. During each visit (except Texting Only), participants completed a 10-minute bout of walking on the treadmill at a self-selected pace. Walking speed was identical for all experimental conditions. Before, at the midpoint of exercise, and post-exercise, participants completed the Feeling Scale (FS) and the Felt Arousal Scale (FAS) to measure acute hedonic responses. The Affective Circumplex Scale was administered pre-exercise and post-exercise. **RESULTS**: Statistically significant pre-post enhanced valence scores were observed for happy (Imposed Call: P=0.05; Preferred Music: P=0.02; Imposed Video: P=0.03), excited (Exercise Only: P=0.001; Preferred Video: P=0.01; Imposed Video: P=0.03), sad (Preferred Music: P=0.05), anxious (Exercise Only: P=0.05; Preferred Video: P=0.01), and fatigue (Exercise Only: P=0.03; Imposed Video: P=0.002). For the FS all change scores statistically significantly increased from pre-to-mid and pre-to-post (p<.05). **CONCLUSIONS**: This experiment provides strong evidence that entertaining media platforms substantively influence acute hedonic responses to exercise. Future work should explore social media strategies to promote long-term exercise adherence.

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The Glutathione Redox Status And Total Antioxidant Responses To Supervised Physical Exercises In Metabolic Syndrome

Roberto C. Burini, FACSM, Fernando Moreto, Hugo T. Kano, Okesley Teixeira, Camila R. Correa. *Sao Paulo State University (UNESP) - Botucatu Medical School, Botucatu, Brazil.*
(No relevant relationships reported)

PURPOSE: The major components of Metabolic Syndrome(MetS) are often associated with inflammation, decreased insulin sensitivity and impaired endothelial function, suggesting failure in the anti-oxidant defenses.
OBJECTIVE: To investigate the lipoperoxidation(MDA) , total antioxidant performance(TAP), and glutathione-redox state in MetS patients under a lifestyle-modification program(LiSM).
METHODS: From the 112 subjects participating in the ongoing longitudinal project "Move for Health" (2009-2012) 57 attended the 20wk LiSM with nutritional counseling and combined aerobic (3 times/wk) and resistance (2 times/wk) exercises. They all had anthropometric, clinical, dietary quality(HEI), cardiorespiratory fitness (CRF) and plasma-biochemistry data. Plasma hydrophilic TAP was measured by an antioxidant assay. Plasma malondialdehyde (MDA), total and oxidized (GSSG) glutathione were measured by HPLC. Reduced (GSH) glutathione was estimated. Statistical Analysis Software (SAS version 9.1.3, SAS Institute, USA) was used for $p<0.05$ significance.
RESULTS: The sample was predominantly composed by females (72%), under 65 yrs old (55±8 yrs), 65% obese, 59% taking medications and 33% smoking. Primary outcomes after LiSM were the decreasing of MetS by 33% (27% to 18%), BMI, WC and body fat and the increasing of HEI, CRF, HDL-C, GSH and plasma TAP. However, only subjects without MetS increased HDL-c, TAP and GSH and decreased GSSG/GSH ratio. After LiSM, subjects TAP–responsive (≥3%) differed from the non-responsive (≤3%) by presenting increased values of CRF, HDL-c and uric acid and decreased SBP. Additionally, The TAP-responsive group increased GSH and decreased GSSG as well as the GSSG/GSH ratio. In the presence of MetS the TAP responsiveness to LiSM was associated with decreasing WC, glucose and MDA whereas, in the absence of MetS, the TAP responsiveness to LiSM was positively influenced by the increased HDL-c and GSH. The multiple-adjusted regression analysis showed GSH as influencing factor for plasma TAP changes, in the presence and absence of MetS. However, only the decreased GSSG discriminated the non-MetS subjects.
CONCLUSION: LiSM decreased MetS and increased TAP and GSH however, only GSSG discriminated MetS in a 20-wk LiSM intervention.

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The Wearable Technological Device as a Means of Physical Activity Monitoring

Alissa Underhill. *Olivet Nazarene University, Bourbonnais, IL.*
(No relevant relationships reported)

PURPOSE: To assess the use of a wearable technological device for the increase in attainment of physical activity (PA) with the goal of preventing Type II Diabetes Mellitus (T2DM) through weight loss. The Fitbit offers an advantage to other activity trackers when used for study purposes, in that it can provide continuous measurement of PA across the entire study period.
METHODS: Men and women over the age of 40, and at risk for prediabetes, were recruited. The study period was four months in length, with an initial four weeks of baseline PA testing, followed by 12 weeks of lifestyle intervention. Individualized PA goals were set. PA monitoring was very successful. Participants averaged 72 days of PA tracking with 46% of participants reaching the maximal number of days (77). The Fitbit Flex measures steps, minutes sedentary, minutes lightly active, minutes fairly active, minutes very active, and total active minutes.
RESULTS: Participants (N = 13) were aged 65.03 (SD = 8.3) years. At baseline, participants were performing 220.8 (SD = 249.0) minutes per week of moderate intensity PA. Participants increased moderate intensity PA to 243.3 (SD = 198.8) minutes per week. At baseline, participants were accumulating 7511.6 steps/day (SD = 3271.2) increasing to 8177.6 steps/day (SD = 3078.9) taken during the three month intervention. No statistical significance was found. A Pearson CC (0.598) showed there was a positive trend with minutes of moderate-to-vigorous activity and weight loss. 36% of the variants of weight loss was influenced by minutes of PA. Compliance to wearing the Fitbit was very good with 93.1% of the weeks having data tracked for at least ≥ 6 days/week. Wear time was corroborated by Fitbit data, which showed of the 1415 tracked days, only 9.3% days recorded were of less than 2000 steps. Barriers to technology were low and 100% of participants strongly agreed that continuous monitoring of weight and PA encouraged them to make healthy lifestyle changes.
CONCLUSIONS: Of particular importance was that 46% of participants initially self-reported that they were physically active for more than 150 minutes per week, which shows many people underestimate their actual PA. Continuous monitoring of PA through wearable technology can be a useful modality aiding in weight loss.

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The Physiological Assessment and Analysis of the Physical Demand of Riding a Snowmobile

Tania J. Pereira. *University of Guelph, Guelph, ON, Canada.*
(Sponsor: Lawrence Spriet, FACSM)
(No relevant relationships reported)

Physical activity (PA) is widely regarded as an essential component for maintaining health, yet there are subsets of the population that remain insufficiently active. This issue can be exacerbated in the winter due to decreased daylight hours, high precipitation and low temperature, thus some individuals are less likely to engage in PA. In cold climates, snowmobiling is a popular recreational activity, and could offer a potential solution for increasing PA time to the recommended ACSM standards; predicated on the fact that it is an activity that is sufficiently intense to stimulate health benefit. PURPOSE: To measure the physical demands and activity patterns of a typical snowmobile ride in habitual snowmobile riders (n=44). METHODS: The physical demand of an average ride, and requisite tasks, were quantified using ambulatory oxygen consumption and pre/post strength and power assessments. Aerobic demand was compared to a graded exercise test (GXT) on a cycle ergometer to determine exercise intensity. RESULTS: A "representative" ride (30 ±17 min) involved a mean aerobic demand of 17.5 ± 6.6 ml/kg/min or 49 ± 20 % of VO₂max (5 METS), which compares to traditional forms of physical activity. During the ride, the VO₂ values ranged from a mean minimum of 7.1 ± 3.0 ml/kg/min to a mean maximum of 32.5 ± 12.4 ml/kg/min. Muscular strength decreased 6% for maximal hand grip (p<0.001) and a similar magnitude for vertical jump, but the latter change was not significant. This immediate decrement in strength demonstrates snowmobiling to be an activity that requires significant upper body work. The mean VO₂ while specifically freeing a stuck snowmobile was 27± 9.7 ml/kg/min (7-8 METS), indicating that riders were working at 77 ± 28% of their VO₂max. CONCLUSIONS: Snowmobiling is an activity which falls into the moderate to vigorous intensity activity range that is typically associated with health benefits. A typical ride involves both aerobically based and muscular strength components as shown by a moderately demanding riding VO₂ and strength decrements Based on the observed values, snowmobiling is of a sufficient PA intensity to stimulate changes in health and fitness. Funding support from Mitacs and The Canadian Council of Snowmobile Organizations.

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Randomized Trial Of Amino Acid Mixture Combined With Physical Activity Promotion In Overweight Adults

Keisuke Ueda[1], Hiroyuki Sasai[2], Takehiko Tsujimoto[3], Chiaki Sanbongi[1], Shuji Ikegami[1], Hiroyuki Kobayashi[4], Yoshio Nakata[4]. *[1]Meiji Co., Ltd., Odawara, Japan. [2]The University of Tokyo, Meguro, Japan. [3]Shimane University, Matsue, Japan. [4]University of Tsukuba, Tsukuba, Japan.*
Reported Relationships: K. Ueda: Salary; Meiji Co., Ltd..

PURPOSE: The purpose of this study was to test the efficacy of arginine, alanine, and phenylalanine mixture (A-mix) ingestion at 1,500 mg/day in combination with the promotion of physical activity for abdominal fat reduction in overweight adults. METHODS: A placebo-controlled, double-blind, parallel-group, randomized trial for 12 weeks combined with a 4-week follow-up period was conducted at a single center in Minato-ku, Tokyo, Japan, between December 2016 and May 2017. The data were examined between June and August 2017. The study participants were 200 overweight adults within the age of 20-64 years old. The participants were randomly assigned to the A-mix or a placebo group, and were administered 500-mL test beverage containing 1,500 mg or 0 mg of A-mix, respectively, for 12 weeks. All participants endeavored to maintain a physically active lifestyle between week 0 and week 12 through monthly sessions of physical activity. The primary endpoints were the 12-week changes in the abdominal total, subcutaneous, and visceral fat areas, as assessed by computed tomography. RESULTS: Of the 200 enrolled participants, 199 (99%) accomplished the 12-week intervention and 4-week follow-up period. The per-protocol-based analysis for 194 participants demonstrated that the abdominal total fat area decreased significantly in the A-mix group compared with that of the placebo group (difference, 10.0 cm²; 95% confidence interval, 0.4-19.6 cm²; $P = 0.041$). Comparable outcomes were acquired for the abdominal subcutaneous fat area (difference, 7.4 cm²; 95% confidence interval, 0.1-14.7 cm²; $P = 0.047$). No study-related unfavorable events occurred. CONCLUSIONS: A-mix supplementation in combination with physical activity promotion facilitated abdominal fat reduction in overweight adults. This trial was based on a collaborative research agreement between the University of Tsukuba Faculty of Medicine and Meiji Co., Ltd. K.U., C.S., and S.I. are employees of Meiji Co., Ltd.

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Validity Of Adhesive Worn Actigraph GT3X+ Accelerrometer

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(No relevant relationships reported)

PURPOSE: The ActiGraph GT3x+ activity monitor (ActiGraph, Pensacola, FL) is typically worn with a belt around the waist, ankle, or wrist. Due to low compliance and observations of discomfort with belt-worn accelerometers, this study examines the validity of wearing the ActiGraph directly on the hip using an adhesive patch.
METHODS: Eleven participants (Age: 22 ± 1, BMI: 24.2 ± 4.2) wore two ActiGraphs for four days; one on a waist belt and the other attached using a Tegaderm-Film adhesive (3M Medical, Maplewood, MN). Data gathered from accelerometers were uploaded to the ActiLife software. Wear-time of both devices was validated with participants' daily activity logs. Tri-axial motion data were then analyzed using a paired samples t-test.
RESULTS: Strong correlations were found on motion axes 1,2, and 3 (r= 0.946, 0.955, and 0.905, respectively, p <.001 for all).
CONCLUSIONS: When using ActiGraph GT3x+ accelerometer, adhesive worn devices may be a valid alternative to traditional belt-worn devices.

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Changes in Perceived Importance of Physical Activity and Nutrition for Health Following (S)Partners Intervention

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(No relevant relationships reported)

Physical activity (PA) and nutrition are important components to prevent or reduce risk of cardiovascular disease (CVD) in youth. School-based programs designed to promote nutrition and PA behaviors have shown some success in improving these health behaviors and overall health status. A factor related to adopting nutrition and PA behaviors is an individual's perceived importance of the behavior on health. PURPOSE: To determine whether perceived importance of PA and nutrition improves better in 5th grade students participating in a multi-level school and web-based Nutrition and PA intervention versus students receiving lessons alone (active comparison). METHODS: Pre- and post-data were collected from 1060 students from 14 schools in Michigan, from 2008 - 2015 who participated in the (S)Partners intervention (n=810; 8 lessons, web modules, and college mentors); or an active comparison (n=250; 8 lessons only). Participants completed a self-report survey on perceived importance of PA and nutrition in relation to health (4 Point Likert scale). RESULTS: Repeated measures ANOVA results revealed that there were no between-group differences or interaction in perception of importance of both PA (Mean(SD): Spartners pre = 2.32(0.74) and post = 2.48(0.66) vs Active pre = 2.19(0.72) and post = 2.38(0.72)), and nutrition (Mean(SD): Spartners pre = 2.26(0.78) and post = 2.37(0.73) vs Active pre = 2.10(0.80) and post = 2.31(0.71)) in relation to health, however both groups increased over time in both measures (p <.001 for time). CONCLUSION: Both groups improved their perception of the importance of health benefits regarding PA and nutrition. Future analysis will be conducted on this data to determine how improvements in perception of the benefit of nutrition and PA behaviors contribute to adopting or maintaining nutrition and PA behaviors throughout life.

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Weight Status Differences In Light-intensity Physical Activity Increases From A Workplace Behavioral Intervention

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(No relevant relationships reported)

Purpose: Workplace intervention targeting reductions in sedentary time and increases in light-intensity physical activity (LPA) may be effective at increasing LPA, especially among overweight and obese individuals, who may find it challenging to achieve recommended levels of moderate-vigorous physical activity. This study examined increases in LPA following 3 months participation in a workplace-based intervention targeting changes in sedentary and LPA time.

Methods: Data for this secondary analysis came from the Stand & Move at Work group-randomized worksite intervention trial conducted in 24 worksites throughout the Minneapolis-St. Paul, MN and Phoenix, AZ metropolitan areas. Recruitment began in January 2016. LPA was measured at baseline and 3 months (12 and 24 month data collections are ongoing) by activPAL accelerometers. Height and weight were measured at baseline by trained staff. Linear mixed models using an unstructured working correlation examined the association of BMI category with baseline work time LPA participation, all day LPA participation, and change in work time LPA participation from baseline to 3 months.

Results: **Light intensity physical activity associated with BMI category**

Baseline Total LPA:	β(SE)	p
BMI Category		
BMI <25	13.63 (2.80)	<0.01
25 ≥ BMI <30	7.77 (2.74)	<0.01
BMI ≥30	ref	ref
Baseline work time LPA:		
BMI Category		
BMI <25	3.05 (1.44)	0.04
25 ≥ BMI <30	2.39 (1.41)	0.09
BMI ≥30	ref	ref
Change in LPA from baseline to 3 months		
BMI Category		
BMI <25	1.06 (1.44)	0.46
25 ≥ BMI <30	2.62 (1.43)	0.07
BMI ≥30	ref	ref

All models adjusted for age, gender, race, marital status, and education level and study arm

Conclusion: These findings show that while LPA differed significantly by weight status at baseline, change in LPA was not significant. A worksite sedentary and LPA intervention may be effective for individuals across BMI category. Future worksite health interventions including those that target health behaviors such as diet and/or physical activity, weight management, and stress reduction should seek to examine potential differential effects by weight status.

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Understanding Patient Experiences with Healthcare Providers and Exercise Promotion

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(No relevant relationships reported)

Purpose: Obesity-related diseases and disorders are the second leading cause of preventable death. The promotion of exercise from healthcare providers has been shown to significantly increase physical activity levels of patients. Prescribing exercise and referring patients to qualified exercise professionals has been identified as an opportunity to reduce the current rate of obesity. In order to use exercise as a form of medicine, it is recommended that physical activity counseling be a part of every wellness visit and that health care providers become active in counseling and referring patients to properly educated and certified professionals for exercise. The purpose of this study was to describe the type of information patients currently receive about regular exercise from primary healthcare providers (PHPs). Method: An exploratory descriptive study was conducted in an attempt to understand patient experiences with their healthcare providers regarding exercise promotion. Two dichotomous questions and one open-ended response were used to determine the nature of PHPs' recommendations regarding participation in regular exercise and the qualifications of fitness professionals to support those efforts. Results: The sample consisted of 459 adult females representing three calculated BMI categories. 63.4% of participants indicated their PHPs recommended they engage in regular exercise to support improved health. Through content analysis of open-ended responses of PHPs' exercise recommendations, six distinctive categories representing types of recommended exercise (e.g., endurance training, group exercise) were identified. Of the participants indicating that their PHP's recommendations included engaging in regular exercise, 100% received no information about qualified fitness professionals to guide their exercise efforts. Conclusions: While patients are being encouraged by PHPs to engage in exercise for improved health, the information being offered is limited to the type of exercise in which they should engage. No information is being provided to help patients identify a qualified exercise professionals to support and guide their efforts to use exercise as a means of improving their health.

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Does Squat Depth and Width Influence Hip and Knee Joint Moments?

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(No relevant relationships reported)

Squats are a popular closed-chain exercise that can benefit strength, power, balance, and range of motion. Proper squat technique includes varying depths and widths. **Purpose:** This study investigated sagittal plane knee and hip moments during 9 different squat variations. **Methods:** 10 healthy, college-aged adults (7 female, 3 male, mass = 67.4 ± 10.7 kg; height = 1.68 ± 0.08 m) performed body-weight squats at 3 widths (standard (shoulder width), wide (150% of shoulder width), and widest (200% of shoulder width)) and 3 squat depths (shallow (55 degree knee flexion), parallel (90 degree knee flexion), and deep (125 degree knee flexion)). Anthropometric, marker coordinate, and force data were combined to calculate peak hip and knee moments during the eccentric (downward) and concentric (upward) phases of the squat. 2x3 ANOVAs were used to evaluate the effect of squat depth and width on peak hip and knee eccentric and concentric moments. **Results:** Generally, concentric and eccentric hip and knee moments increased with greater squat depth and decreased with greater squat width. At the deep depth, the eccentric moments for the wide and widest stance widths were significantly less when compared to the standard width at the knee (standard = 1.23 ± 0.29 Nm/kg, wide = 1.09 ± 0.21 Nm/kg, widest = 0.98 ± 0.15 Nm/kg; $p < 0.01$) and at the hip (standard = 0.99 ± 0.21 Nm/kg, wide = 0.89 ± 0.19 Nm/kg, widest = 0.78 ± 0.17 Nm/kg; $p < 0.001$). At the parallel depth, the eccentric hip moment for the widest stance width (0.78 ± 0.13 Nm/kg) was significantly less than the eccentric hip moment for the standard (0.94 ± 0.18 Nm/kg) and wide stance widths (0.90 ± 0.14 Nm/kg; $p < 0.01$). The knee concentric moment for the deep depth was significantly less at the widest stance width (1.07 ± 0.20 Nm/kg) when compared to the wide (1.19 ± 0.21 Nm/kg) and standard stance widths (1.30 ± 0.28 Nm/kg; $p < 0.01$). **Conclusions:** Squat depth and stance width influence hip and knee joint moments, and both should be considered when performing a squat. If deep squats are used to increase lower-extremity muscle activation and overall work, increasing stance width will reduce sagittal plane hip and knee moments and possibly joint loads. Further research is needed to investigate other methods of reducing lower-extremity joint load while exercising.

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Feasibility of Progressive Resistance Training in Retired Mexican Women with Ostearthritis

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(No relevant relationships reported)

Resistance training has been avoided in Osteoarthritis (OA) patients due to concern about exacerbation of pain, joint inflammation, rupture of tendons, popliteal cysts or joint capsules. Resistance exercise interventions have been shown to be beneficial in older adults, but there are few reports of the effect of this type of training in the Mexican context. **PURPOSE:** The feminization of aging is the background for the proposal to evaluate the feasibility of a progressive muscle strength training for retired women with OA. **METHODS:** Sedentary women from a private seniors club aged between 55 and 76 years old and under stable medication participated in the protocol study. The experimental group (n = 7) attended a 10-week progressive resistance program of low to moderate intensity (30-60% RM), with three weekly sessions of 60 minutes. The sequence of activities within each session was: warm-up, resistance training, flexibility exercises and cool down. The control group (n = 5) only received a report with the results of their physical tests after each evaluation. Pretest and post-test evaluation were applied.
RESULTS: Twelve retired women completed their participation in the study. The groups were homogeneous at baseline. Improvements were found in the experimental group with better results in gait speed ($t = 2.585$, $p < .05$) and Chair Stand Test ($t = 2.828$, $p < .05$). Handgrip strength and 8-Foot Up and Go Test remained without changes. The control group remained unchanged between measurements ($p > .05$).
CONCLUSIONS: Progressive resistance strength training is feasible and safe in well-controlled OA patients. This training could improve lower limb muscle strength without adverse effects as fatigue or joint pain.

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Clinical Trial To Assess The Effect Of High-intensity Interval, Progressive Resistance Or Concurrent Exercise Protocol On Hormonal Responses In Latin-american Overweight Adults

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(No relevant relationships reported)

PURPOSE: We hypothesized that the concurrent training [high-intensity interval training (4×4 min intervals at 85-95% maximum heart rate [HRmax], interspersed with 4 min of recovery at 75-85% HRmax) + progressive resistance training (12-15 repetitions per set, at 50-70% of one repetition maximum with 60s of recovery)] induces the highest metabolic perturbations and therefore the highest hormonal responses compared to the progressive resistance training and the high-intensity interval training protocol in a cohort of Latin-American overweight adults (age 18-30 years old). **METHODS**: Randomized, parallel-group clinical trial among fifty-one men (23.6±3.5 yr; 83.5±7.8 kg; 28.0±1.9 kg/m2), physical inactivity (i.e. <150 min of moderate-intensity exercise per week for greater than 6 months), with abdominal obesity (waist circumference ≥ 90 cm) or body mass index ≥ 25 and ≤ 30 kg/m2 were randomized to the following 4 groups: high-intensity training (n=14), progressive resistance training (n=12), concurrent training [high-intensity and progressive resistance training (n=13)], or non-exercising control (n=12). Total- and free-testosterone and total-testosterone/cortisol-ratio assessments (all in serum) were determined before (pre) and 1-min post-exercise for each protocol session. **RESULTS**: Decreases in cortisol and total-testosterone/cortisol-ratio levels were observed; −57.08 (95%CI, −36.28 to −77.88; d=2.06) and −0.021 (95%CI, −0.012 to −0.032; d=1.49), respectively in the high-intensity training group. In per-protocol analyses, the combined training group had greater changes in cortisol levels (−54.49, 95%CI, −15.28 to −93.69; d=1.33) and total-testosterone/cortisol-ratio (−0.017, 95%CI, −0.004 to −0.030; d=0.90) vs the high-intensity training group, but not the other interventions. Analyses of covariance revealed no significant change in the total- and free-testosterone between groups over time. **CONCLUSIONS**: The present data indicate a concurrent, or high-intensity training reduced cortisol and total-testosterone/cortisol-ratio levels significantly in physical inactive adults. Further study is required to determine the biological importance of these changes in hormonal responses in overweight men. **TRIAL REGISTRATION:** ClinicalTrials.gov NCT02915913.

299 Board #140 May 30 9:30 AM - 11:00 AM

Volume Of Exercise For Prevention Of Weight Regain (MET POWeR)

Amanda N. Szabo-Reed, Joseph E. Donnelly, FACSM, Richard A. Washburn, FACSM, Debra K. Sullivan, Jeffery J. Honas, Matthew S. Mayo, Ron Krebill, Anna Gorzyca, Jeannine Goetz. *Kansas University Medical Center, Kansas City, KS.*
(No relevant relationships reported)

PURPOSE: There is limited evidence regarding the volume of exercise required to minimize weight regain. The purpose of this trial was to examine the impact of 3 levels of exercise on weight regain subsequent to weight loss in adult men and women. **METHODS:** Overweight/obese adults (n=175 (32 men, 143 women), age= 43 yrs., BMI~32 kg•m²) who lost ≥ 5% of their initial body weight in response to a 3-mo. weight loss intervention which included energy restriction and increased exercise (100 min•wk⁻¹) completed a 12 mo. maintenance intervention. Participants were prescribed a weight maintenance diet (RMR x 1.4), attended biweekly behavioral sessions, and were randomized to one of 3 levels of exercise (150, 225, 300 min•wk⁻¹), with a minimum of 3 sessions•wk⁻¹ under supervision. Exercise min across 12 mos. were obtained from direct observation or heart rate monitors for supervised and unsupervised sessions, respectively.
RESULTS (Table 1): There were no significant differences in the volume of exercise competed during weight loss (0-3 mos.) by randomized group ($p = .32$) or gender ($p = .85$). Average mins of completed exercise were significantly greater in those randomized to 300 min•wk⁻¹ (170 min•wk⁻¹) compared with both the 150 min•wk⁻¹ (147 min•wk⁻¹) or 225 min•wk⁻¹ (120 min•wk⁻¹, $p < .05$) groups. Weight regain across all 3 groups was minimal (<3%); however, there were no significant differences in the magnitude of weight regain by randomized group ($p=.21$) or gender ($p=.37$).
CONCLUSION: These findings suggest that exercise, irrespective of magnitude, is associated with weight loss maintenance.
Table 1.

Weight Loss	Exercise Min (SD)	% Weight Loss (SD)
150- Men (M)	91.3 (11.8)	-10.8 (4.1)
150- Women W)	84.4(15.5)	-9.4 (3.0)
150- Total	85.7 (15.1)	-9.7 (3.3)
225- M	83.5 (31.2)	-10.6 (4.3)
225- W	82.6 (17.2)	-9.1 (2.9)
225- Total	82.7 (20.1)	-9.4 (3.2)
300- M	83.5 (22.0)	-10.3 (3.3)
300- W	80.6 (20.9)	-8.9 (2.6)
300- Total	81.2	-9.2 (2.8)
Weight Maintenance	Mean Exercise Min (SD)	Mean % Regain (SD)
150- M	131.5 (40.2)	1.3 (5.0)
150- W	117(34.1)	1.6 (7.6)
150- Total	119.8 (35.5)	1.2 (7.1)
225- M	137.8 (61.6)	3.3 (8.2)
225- W	149.0 (51.1)	3.5 (6.0)
225- Total	147.0 (52.9)	3.4 (6.3)
300- M	171.7 (54.0)	0.6 (7.0)
300- W	169.0 (67.3)	3.6 (7.5)
300- Total	169.5 (64.8)	3.1 (7.4)

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Preliminary Findings From A Stealth Physical Activity Intervention Targeting Inactive Dog Owners

Katie Becofsky, Brittany Mastellar, Erin Cawley, Rachel Mudway, Connor Saleeba, Alec Shostek. *University of Massachusetts Amherst, Amherst, MA.*

(No relevant relationships reported)

Given that 60 million American households own at least one dog, there is growing interest in promoting dog walking to increase physical activity at the population level. An estimated 40% of dog owners do not walk the dog regularly, providing a large target population for intervention. Dog obedience training could plausibly serve as a stealth physical activity intervention as it aims to strengthen the dog-owner bond, a construct strongly associated with dog walking behavior. **PURPOSE**: To examine changes in dog owners' self-reported dog walking behavior and device-measured moderate-to-vigorous physical activity (MVPA) after completing basic obedience training. **METHODS**: Forty-one healthy but inactive individuals (85% female; mean age=40) who reported walking their dog ≤3 d/wk were randomized to a 6-week basic obedience training class (INT; n=21) or wait list control group (CON; n=20). Participants recorded all dog walking bouts and wore an Actigraph GT3X+ on their right hip for 7d at baseline and 6-weeks. T-tests assessed group differences in self-reported dog walking and device-measured MVPA change scores. **RESULTS**: At baseline, participants reported 48.5±62.7 min/wk of dog walking and averaged 22.0±14.0 min/d of MVPA. Intervention participants that completed post-program assessments (n=17) attended an average 5.6 of 6 training classes. Preliminary analyses of n=31 participants (n=13 INT) with valid Actigraph data (≥4d with ≥8hrs weartime at both time points) found a differential change in self-reported dog walking behavior between groups (+36.1±58.4min/wk versus -26.7±90.3min/wk in INT and CON participants, respectively; p=0.04), but no differential change in MVPA (+7.4±22.2min/d versus +1.6±11.3min/d in INT and CON participants, respectively; p=0.35). **CONCLUSIONS**: In this small pilot study, dog obedience training led to increases in self-reported dog walking behavior but no change in device-measured MVPA as compared to a waitlist control group. There was large variability in both physical activity outcomes measures, so results should be interpreted with caution. This approach should be tested in a larger sample and should specifically target inactive dog owners that intend to or would like to walk the dog regularly but report barriers (rather than owners that do not intend to walk the dog).

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The Effects of Physical Activity on Physical and Mental Health in Stroke Patients

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(No relevant relationships reported)

Purpose: The purpose of this study was to investigate the effects of yoga exercise invention on physical and mental health in stroke patients. **Method:** Sixty-six stroke patients were randomly assigned to the following two groups. Thirty-three patients were in the experimental group (age: 58.30±11.04 yr), another thirty patients were in the control group (age: 60.23±9.59 yr). The experimental group had performed yoga exercise 3 times a week for twelve weeks with each session lasting 60 minutes per day, including warm-up (10 minutes), main exercise (35 minutes) and moderate stretching & meditation (15 minutes), additionally except rehabilitation courses held by the hospital. The control group had not carried out any exercise intervention except rehabilitation courses. The Borg balance scale, Beck depression inventory, quality of sleep, and quality of life were tested before and after yoga exercise intervention. Analysis of covariance (ANCOVA) was applied to examine the difference between experimental and control groups on balance, depression, quality of sleep and quality of life. **Result:** The score of Borg balance scale for stroke patients in the experimental group (↑9.62%) increased significantly compared to that in the control group (↑1.79%) (p<.05). The depression level in the experimental group (↓29.01%) decreased significantly compared to that in the control group (↓3.53%) (p<.05). The score of quality of sleep for stroke patients in the experimental group (↓29.37%) decreased significantly compared to that in the control group (↓4.67%) (p<.05). In addition, the score of quality of life in the experimental group (↑9.59%) increased significantly compared to that in the control group (↓2.18%) (p<.05). **Conclusion:** The result indicated that the yoga exercise intervention could improve the balance, depression levels, quality of sleep, and quality of life in stroke patients. As well as the yoga exercise intervention could be beneficial in physical and mental health for stroke patients.

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Assessing Feasibility of Implementing Exercise is Medicine Referral Program at Tertiary Medical Center

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(No relevant relationships reported)

The benefits of exercise on multiple health parameters has been well established, yet most individuals do not meet the recommended minimum standard of exercise, as defined by the American Heart Association (Garber et al., 2011; Thompson et al., 2003). Data suggests that supervision of exercise by an exercise professional improves exercise adherence, yet most studies and systematic reviews of referral based programs have failed to demonstrate their effectiveness (Garber et al., 2011; Orrow, Kinmonth, Sanderson, & Sutton, 2012; Williams, Hendry, France, Lewis, & Wilkinson, 2007). Exercise is Medicine at The Ohio State University (EIM@OSU) addresses many of the pitfalls of previously studied programs in order to increase patient participation and compliance with regards to exercise standards, and aims to encourage provider utilization of exercise in the prevention and treatment of chronic disease
PURPOSE: To evaluate patient participation and adherence, as well as provider utilization of a unique referral-based exercise program (EIM@OSU).
METHODS: Retrospective review of the EIM@OSU program from July 2015-May 2017 examining patient participation and completion of phase I and phase II of the program, determination of patient facilitators and barriers to participation, and review of provider utilization of the program including barriers and facilitators.
PRELIMINARY DATA: The majority of patients referred to the program (64%) participated in "Level I" of EIM@OSU whereas only 18% participated in "Level II". Only two-thirds of eligible primary care providers referred at least one patient to the program, and out of these providers, only 217 patients were referred to the EIM@OSU program.
CONCLUSION: To further increase patient and provider participation and adherence to the EIM@OSU referral program, facilitators and barriers to adherence need to be evaluated and improved upon.

WEDNESDAY, MAY 30, 2018

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Effects Of 4-week Crossfit Training On Weightlifters' Body Composition

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(No relevant relationships reported)

Effects of 4-week Crossfit training on weightlifters' body composition

Shui-Chang Hsu, Jyun-Ru Chen, Szu-kai Fu, Wei-Chin Tseng, Kuo-Wei Tseng, Chang-Chi Lai Department of Exercise and Health Sciences, University of Taipei, Taipei, Taiwan **Abstract Background:** Crossfit training includes olympic weightlifting, gymnastics, and sprint. Previous studies revealed that crossfit training could increase cardiovascular fitness and decrease body fat, but it lacked crucial evidence for athletes, especially weightlifters. **Purpose:** The aim of this study was to determine the effects of 4-week crossfit training on weightlifters' body composition. **Method:** Eight college weightlifters participated in this study. All subjects were randomly assigned to two groups, which were resistance training group (RT, n = 4), and crossfit training group (CF, = 4). Both groups received training 3 days a week for 4 weeks. Snatch performance and body composition from both groups were measured at week 0 and week 5. **Result:** The result showed that there was no significant difference between two groups in all variables. CF significantly decreased in average rate of force development (RFD) of snatch, but significantly increased isokinetic strength and thigh muscle mass at week 5. RT significantly decreased on average RFD of snatch, but significantly increased body fat at week 5. **Conclusion:** The results showed that muscle mass increased after a 4-week crossfit training, but body fat level did not decrease. Thus, crossfit training is not suggested to be adopted to rapidly lose weight in pre-competitive phase. **Key words:** body composition, high intensity interval training, body fat

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Maternal Aerobic Exercise and DHA Levels During Pregnancy Influences Infant Heart Outcomes

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(No relevant relationships reported)

Infant heart rate(HR) and heart rate variability(HRV) are used to estimate nervous system development and overall well-being of the fetus. Exercise during pregnancy is associated with improved infant HR and HRV. Similarly, DHA supplementation during pregnancy has also been shown to improve infant HR and HRV. However, there has not been any observation of the potential relationship between exercise intervention and maternal DHA levels on Infant HR and HRV. **PURPOSE:** To determine the relationship between maternal exercise and plasma levels of DHA on infant nervous system development, estimated by measures of HR and HRV. **METHODS:** Maternal plasma collected at 16 and 36 weeks of gestation were processed using solid phase extraction and analyzed using liquid chromatography/triple quadrupole mass spectrometry (LC/MS) to measure DHA levels. Samples were analyzed from 3 exercising (>50min aerobic exercise, 3x week) and 2 non-exercising pregnant women; average weekly METs were calculated based on standard MET values for each exercise activity. Infant HR and HRV were measured 1 month after birth. T-tests determined significance between groups; relationships between variables were tested with ANOVA and linear regression. Our p-value is set at 0.05. **RESULTS:** There were no significant differences between groups in infant HR (p=0.35, F=1.208) or 36 week plasma DHA levels (p=0.57, F=0.407). Linear regressions demonstrated negative relationships between Maternal average METs and Infant HR (r2=0.312) and 36 week maternal DHA levels and Infant HR (r2=0.156), as well as positive relationship between average METs and 36 week plasma DHA levels (r2=0.029). Multiple regression analysis of maternal average METs and maternal DHA levels to Infant HR was also determined (R2=0.404). Maternal average METs was the stronger of the predictors for Infant HR. **CONCLUSION:** The current data support the relationship between maternal exercise and DHA levels on infant HR. This is the first study to examine maternal exercise and DHA levels during pregnancy and infant heart outcomes. Further samples will be analyzed to confirm the relationship between maternal exercise, maternal DHA levels and infant outcomes.

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Independent but Not Alone - A Physical Activity Intervention for Military Spouses

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(No relevant relationships reported)

In comparison to the general population, military spouses face additional daily challenges to engaging in self-care behaviors like physical activity (PA). **PURPOSE:** To evaluate the impact of an online intervention specifically designed to address the unique challenges of being a military spouse on spousal PA and mental health. **METHODS:** A 10-week program entitled *Independent but not alone (IBNA)* was developed specifically for this population using information from focus groups and through partnerships with individuals in the health/fitness field that are also military spouses. The intervention consisted of weekly podcasts and team challenges designed to facilitate PA, stress management, and social connection among participants. A total of 119 participants (*M* age = 31.9) for *IBNA* were recruited from Fort Riley (Junction City, KS). Control group participants were recruited from other military bases around the United States. A total of 112 participants (*M* age = 33.1) in the control group received links to existing content on the Operation Live Well website. Data were analyzed using mixed design 2 (group) X 2 (time) repeated measures ANOVAs. **RESULTS:** Participants in both groups reported an increase in total overall PA levels [$F(1,152)$=12.29, p=.001)], including moderate PA [$F(1,152)$=14.98, p<.001)], household PA [$F(1,152)$=15.18, p<.001)], and PA for transport [$F(1,152)$=4.17, p=0.04)]. Participants also reported positive mental health impacts, including reduced feelings of stress [$F(1,149)$=52.38, p<.001)], anxiety [$F(1,150)$=58.29, p<.001)], and depression [$F(1,152)$=56.94, p<.001)]. The only significant difference between the two conditions was that those in the *IBNA* group reported a greater level of vigorous PA [$F(1,152)$=3.98, p=.048)] than those in the control condition. **CONCLUSION:** Despite few significant differences between groups, there were significant individual level improvements in multiple health outcome measures. These findings suggest that there can be a positive impact on the health of military spouses from tailoring a program to their unique challenges. Future interventions with this population should continue to emphasize the importance of prioritizing self-care and show an interest in meeting the needs of spouses that are often overlooked.

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Post-operative Lifestyle Intervention And Markers Of Physical And Mental Health

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(Sponsor: Arlette C. Perry, FACSM)
(No relevant relationships reported)

Physical inactivity is associated with increased cardiometabolic disease risk and reductions in emotional health. Patients recovering from orthopedic surgery of the lower limb often experience pain and functional limitations, that lead to reduced physical activity levels, and weight gain. The inclusion of a post-operative wellness consultation, with exercise and nutrition components, may motivate orthopedic patients to modify behaviors to mitigate the detrimental effects of inactivity following surgery and its associated adverse health effects. **PURPOSE:** The purpose of this study was to evaluate post-operative changes in physical activity, body composition, knee function, pain, and feeling scales as well as the efficacy of a nutrition and exercise consultation targeting the restoration of physical activity levels. **METHODS:** Twelve patients undergoing partial meniscectomy were evaluated by an exercise physiologist 1 week (1W) and 6 weeks (6W) after surgery, and were randomly assigned to a control (CON) or post-surgical consolation (PS) group. The PS received personalized exercise and nutrition recommendations and wore a fitness tracking device to promote adherence. The Lysholm Knee Score (LKS) was administered to assess pain, and the Short Form Health Survey (SF-12) was divided into a mental component summary (MCS) and a physical component summary (PCS). Body mass (BM), percent body fat (PBF), and skeletal muscle mass (SMM) were assessed using a multi-frequency bioelectrical impedance. Repeated measures ANOVAs assessed mean differences in outcome variables between intervention groups at 1W and 6W. **RESULTS:** A significant mean difference in MCS scores were observed ($F_{(1,10)}$ = 8.465, p=0.016, η^2_p =0.458) as MS subjects did not experience the reduction in MCS seen in CON. There were no significant between-group differences in BM (p=0.608), PBF (p=0.804), SMM (p=0.926), LKS (p=0.604), pain (p=0.604), or PCS (p=0.545). **CONCLUSIONS:** The addition of a wellness consultation helping patients pursue active lifestyle behaviors appears to eliminate the expected decline in patients' vitality and emotional well-being in a five-week period after surgery. This effect occurs independent of changes in body mass, body composition, pain, or functional outcomes related to knee surgery.

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Maintenance Of Physical Activity Level And Dissemination Of "Plus Ten" Message In Community-based Group Exercise

Yoshinobu Saito[1], Yuko Oguma[1], Takayuki Tajima[1], Ayumi Tanaka[2], Yayoi Kibayashi[3], Chisato Shiba[3], Motohiko Miyachi[4], Toru Takebayashi[5]. *[1]Keio University, Fujisawa, Japan. [2]Fujisawa City Health and Medical Foundation, Fujisawa, Japan. [3]Keio University, Yokohama, Japan. [4]National Institute of Health and Nutrition, NIBIOHN, Shinjuku-ku, Japan. [5]Keio University, Shinjuku-ku, Japan.*
(No relevant relationships reported)

PURPOSE: We conducted a community-wide intervention to promote physical activity (PA) in Fujisawa, Kanagawa, Japan, since 2013. The intervention involves multilevel strategies, as part of which, community-dwelling elderly groups committed to exercising together were enrolled. This study aimed to assess the effects of community-based group exercises (CBGE) on increase and maintenance of PA level and dissemination of the PA message, as well as improvement of physical fitness. **METHODS**: This study included 148 older adults (mean age: 75.7 years, SD: 6.5 years; women: 66%) in 8 CBGE groups. The original 10-min exercise program (mean intensity: 2.7 METs, Osawa et al. 2015) was introduced to groups voluntarily exercising together at least once a week at a city center or a park in their community. Based on Japanese PA guidelines, we have recommended the individuals perform *"Plus Ten (+10-min of PA per day)"* and disseminate the message to surroundings. In addition, we held group discussions about maintenance and dissemination of CBGE at exchange meetings. Dissemination of *"Plus Ten"* message, total duration of PA (exercise and daily activities) by the questionnaire, and physical fitness tests were assessed at baseline, 6-month, and 1-year follow-up. Statistical analyses included Wilcoxon signed rank test, paired t test and chi-square test. **RESULTS**: We visited each group 5.6 times on average for assessment and follow-up in a year. The group exchange meeting was held 3 times. One year later, 137 (93%) continued CBGE and 11 (7%) dropped out due to health or relocation; 42 joined the group during the year. In neighborhoods, 79% of participants shared *"Plus Ten"* message. The median of total PA time at baseline and 1-year after was 780 and 840 minutes/week, respectively (P=0.118). Significant improvement was observed in the two-step test (1.33 to 1.39, P<0.001) and chair standing test (22.9 to 24.9 times/30 sec, P<0.001). **CONCLUSIONS**: CBGE had high persistence rates, maintenance of PA, and improvement of physical fitness. Dissemination of subjective the PA message from CBGE members can be effective in promoting community-level PA. Supported by the Japan Agency for Medical Research and Development (AMED), MEXT KAKENHI Grant Number JP41023054 and Keio Gijuku Academic Development Funds.

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Body Composition Differences in Trained and Sedentary Individuals Matched for High BMI

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(No relevant relationships reported)

PURPOSE: This study determined whether aerobic training reduces body fat and insulin resistance. We compared body composition in obese insulin-resistant sedentary (OIR), obese insulin-sensitive sedentary (OS), and obese trained (OT) subjects matched for body mass index (BMI). We hypothesized that OT subjects would have less fat, especially visceral fat, and greater fat free mass than the OIR or OS subjects. **METHODS:** We measured body composition by Dual X-ray Absorptiometry (DXA) (n=33: N=11 in each group) in OIR, OS, and OT subjects matched for age, gender and BMI. The OT participants were selected by self-report, with preferential recruitment from running groups and marathon mailing lists. **RESULTS:** Each group was matched for age [Mean ± SE, overall age 31.7±0.9, overall sex distribution (64% female) and overall BMI (31.6 ±0.7)]. Insulin resistance (mean± SE), as measured by the homeostatic model assessment for insulin resistance (HOMA-IR), was higher in the OIR group (3.3 ± 0.2) than the OS (0.9 ± 0.2, p<0.01) or OT (1.6 ± 0.2, p<0.01) groups. Mean body fat percent was highest in the OIR group (43.5% ±1.7) than the OS (37.0 % 2.3, p=0.04) or OT group (34.0 % ± 3.1, p<0.01). The OIR group also had higher mean fat mass in the body (39 kg ± 18.3 vs 30.8 kg± 3.3 p<0.005), android (4.3 kg ± 0.4 vs 2.6 kg ± 0.3 p<0.05) and visceral region (1.3 kg ± 0.1 vs 0.6 kg± 0.08 p<0.005) than the OT group. In contrast, bone mineral content at the level of the total body (2.8 kg ± 0.1 vs 3.2 kg ± 0.1 p<0.05), arms (0.38 kg ± 0.03 vs 0.44 ± 0.02 p<.05), gynoid region (0.27kg ± 0.02 vs 0.33 kg ± 0.02 p<0.05), leg (1.0 kg ± 0.07 vs 1.2 kg ± 0.06 p<0.05) and pelvis (0.36 kg ± 0.02 vs 0.43 kg ±0.02 p<0.05) was lower in the OIR group than the OT group (p<0.05). Lean mass at the level of the arms (6.13 kg ± 0.38 vs 7.04 kg ± 0.64 p<0.01), trunk (23.6 kg ± 1.25 vs 27.5 kg ± 1.7 p<0.001), legs (18.1 kg ± 1.1 vs 21.6 kg ± 1.5 p<0.001) and total body (51.1 kg ± 2.7 vs 59.5 kg ± 3.8 p<0.005) was lower in the OIR group than the OT group. There was no significant difference in mean HOMA-IR or body composition between OS and OT groups. **CONCLUSION:** While matching for age, gender and BMI, obese trained subjects had higher lean mass, bone mineral content and lower fat mass than obese insulin resistant subjects. These findings support the limitations of using BMI to predict body composition, especially in trained subjects.

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Opportunities and Frequency of Jumping Behaviors in Elementary Female Physical Education Students

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(No relevant relationships reported)

Physical activity, specifically jumping, is most effective in promoting bone health. Engaging adolescents in appropriate activity to achieve peak bone mass is critical. Although physical education (PE) programs offer content that would be deemed as bone-strengthening, no research has examined jumping opportunities in physical education. **PURPOSE:** to examine jumping behavior in 4th and 5th grade female PE students. **METHODS:** Thirty-eight 4th or 5th grade female students were randomly observed during PE lessons. The content of the lessons consisted of: tag games, mat ball/kickball, cardio activities and jump roping. Average lesson time was 24 minutes 30 seconds. Five researchers were trained to observe jumping behaviors of adolescents during PE. Jumping was defined as upward vertical movement during which both feet simultaneously and visibly left the ground. Prior to data collection inter-rater reliability was established at .80. Observers recorded all jumping behaviors that occurred during the warm-up, main lesson and cool down. Data were analyzed by lesson content (Jump Rope and Non Jump Roping). **RESULTS:** Descriptive statistics were used to analyze all data. Across all non-jump roping lessons (N = 26) students averaged 15.8 jumps at a rate per minute (rpm) of .6. Students averaged 3.3 jumps during warm-ups, 12 jumps during the main lesson and 0 jumps during the cooldown. Across all jump roping lessons (N = 12) results indicated that students averaged 91.2 jumps at rpm of 3.9. Additionally students averaged 3.9 jumps during warm-ups, 87.3 jumps during the main lesson and 0 jumps during the cool down. **CONCLUSIONS:** Jump roping in PE can provide frequent jumping opportunities. However, non-jump roping lessons provided fewer jumping opportunities. Additionally, PE teachers are not providing jumping opportunities during a warm-up which may be an opportunity if the main lesson does not emphasize jumping. Further research needs to explore the frequency of jumps for health benefits.

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Cardiovascular Risk, Physical Fitness According To Socieconomic Level And Geographical In A National Sample

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(No relevant relationships reported)

9% of school students in Chile have the normal physical fitness standards. Chile presents important socioeconomic and geographical differences. **PURPOSE:** Compare the cardiovascular risk, and physical fitness, according to sex, socioeconomic level and geographical region in a national sample of Chilean school students. **METHODS:** Descriptive cross-sectional study. Sample was composed of 10,381 students, who completed the national physical condition tests (SIMCE-EF). Variables included sociodemographic (sex, socioeconomic level, region), anthropometric indicators (weight, height, waist circumference, BMI). Physical fitness was measured by lower limb strength (vertical jump test), abdominal strength (sit ups), upper limb strength (push ups), and trunk flexibility (sit and reach test), and effort heart rate (Cafra test). The BMI, heart rate (HR) and waist height ratio (WHR) were analyzed as predictors of cardiovascular risk. We use the T-Test, ANOVA Regression and Tukeys Test-Pairwise comparison with level of significance p < 0.01. **RESULTS:** The predictors of cardiovascular risk were (p < 0.01) when compared by region and socioeconomic level. Physical tests was (p < 0.01) in abdominal strength and lower limbs. Sex was (p < 0.01) in WHR and HR. There is an inverse relationship of statistical significance between WHR and HR in sit and reach and push ups. At regional levels, differences were also found to be statistically significant in averages and variances in extreme geographical zones. **CONCLUSION:** The differences found in the predictors of cardiovascular risk could apparently be explained due to the geographical and socioeconomic characteristics of each region. It is suggested that the physical fitness tests should consider the incorporation of variables that directly measure cardiovascular risk in Chilean school students.

WEDNESDAY, MAY 30, 2018

311   Board #152   May 30 9:30 AM - 11:00 AM

Does Physical Activity Programming Influence Health and Wellness Attitudes in a Rural School District?

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(No relevant relationships reported)

PURPOSE: To investigate the impact of a district-wide wellness program on students, parents, and staff in a rural school district. **METHODS**: In this one-group, pretest-posttest design, a high need (45.1% free or reduced lunch) rural school district in southern Colorado (USA; N=13 schools) was awarded a grant to implement physical activity (PA) programming. The wellness team developed a survey consisting of 29 questions on a five-point Likert scale (SA-SD). These questions asked about PA and its importance to the participants (e.g., community support for health and PA, withholding PA as punishment, importance of health and PA for participants, etc.). The survey was provided via email link to parents and staff, and to students in classes, during fall and spring semesters. Intervention activities included various programming and challenges (e.g. Playworks™, Weigh and win™, bike/walk to school/work, Fitbit challenges, etc.). Descriptive statistics were calculated for all variables of interest, and non-parametric tests were used to examine significant differences between fall and spring semesters. **RESULTS**: Surveys of parents indicated no significant improvements in PA variables across semesters. Staff surveys indicated three areas in which the spring survey were significantly worse (healthy eating/active living are important p=.04, free play is important p<.0001, effective to withhold PA as punishment p=.0472), though these findings were not practically meaningful. Student surveys indicated significant positive change in seven areas (healthy eating & active living are important p<.0001, personal health & wellness are important to me p=.001, my school provides opportunities for healthy eating and PA p<.0001, it's acceptable to be withheld from PE/ recess as punishment p=.048, my community provides opportunities for healthy eating and active living p=.0091, how often do brain breaks occur? p=.005, what time of day to brain breaks occur? p=.0133), but the only "healthy eating/active living are important" and "community opportunities for healthy eating/active living" were practically meaningful. **CONCLUSIONS**: PA programming had a mixed influence. Future research should investigate similar phenomena in rural schools to better understand factors related to changes in PA awareness and behaviors.

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The Influence Of Upper Extremity And Whole-body Movements On Energy Expenditure During Active Gaming Movements On Energy Expenditure During Active Gaming

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(No relevant relationships reported)

Active video gaming has recently become an entertaining tool used to exercise and increase energy expenditure. However, the evidence is mixed in regards to whether active gaming alone can facilitate energy expenditure similar to that of moderate intensity exercise, and likely depends on the type of movements elicited during game play. **PURPOSE**: To determine the influence of upper extremity and whole-body movements on energy expenditure during active gaming.
METHODS: Twenty-four healthy adults completed a training session and four experimental sessions. During each experimental session, participants played one of four active video games for two 15-minute periods, including two boxing-type games and two tennis games. During the first period, participants played the games at a self-selected intensity. During the second period, participants were given specific instructions designed to maximize movement during game play (standardized period). A portable pulmonary gas exchange measurement system measured energy expenditure during game play. Participants also wore an accelerometer on the hip to measure full body movement and one on the dominant wrist to measure arm movement. Accelerometry measures included percentage of time spent in whole body moderate to vigorous physical activity (MVPA), whole-body light physical activity, and whole-body sedentary time, as well as the same measures on the arm. Linear regression was used to determine the most important accelerometer variable in predicting energy expenditure (METS) during the self-selected intensity period and the standardized instructions period.
RESULTS: The regression on METS during the self-selected intensity period indicated that the accelerometer data predicted METS ($p<.001$), accounting for 47% of the variance. Whole body MVPA was the only significant variable ($p=.008$, *Beta*=.376), with percentage of time spent in whole body sedentary behavior approaching significance ($p=.052$, *Beta*=-.262). The regression on METS during the standardized period revealed similar results, with percentage of time spent in whole body MVPA the only significant predictor ($p=.021$, *Beta*=.498).

CONCLUSIONS: These results suggest that maximizing whole body MVPA, and not just arm movements, is integral to facilitating energy expenditure during active game play.

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Promoting Physical Activity Via Cooperative Extension

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(No relevant relationships reported)

Purpose: The aim of this study was to evaluate factors associated with physical activity (PA) promotion efforts via the cooperative extension (CE) system.
Methods: Cross-sectional survey distributed to Family and Consumer Science listservs across land grant institutions from all 50 states.
Results: Among responders (N=806), 625 (77.5%) completed ≥ 95% of survey questions and are included in this analysis. Respondents span the age categories of 18-29 (14.4%); 30-39 (18%); 40-49 (19.5%); 50-59 (27.9%); ≥ 60 (20.2%) and have been working with CE for 10.7 ± 9.5 years, and most (64.1%) spend ≥ 20% of their time working with government nutrition assistance education programs (SNAP-Ed and/or EFNEP). Most are county-based (73.2%) and work predominately in rural areas (60.1%). All agree or strongly agree that engaging in PA is important, however, only 40.5% and 50.6% personally meet or exceed the PA recommendations for muscle strengthening or aerobic activity, respectively. Forty-five percent implement PA as part of nutrition education lessons for youth or adult audiences, while 8.3% and 19.8% lead stand-alone youth or adult PA programs, respectively. Nearly 60% are engaged in PA promotion efforts in school and community settings. Only 50.6% have attended trainings related to PA promotion and (43.6%) agree or strongly agree that CE leaders provide support for PA training opportunities. While 63.7% agree or strongly agree that CE leaders endorse PA promotion as a role and responsibility of CE personnel, only 44% and 40% respectively, report PA promotion efforts are a component of outcome and impact reports, or a documented expectation in extension position descriptions.
Conclusions: A majority of CE personnel across the U.S. engage in a variety of PA promotion and programming efforts, but gaps exist in training and administrative support or documentation of these efforts. Trainings to address PA promotion efforts and impact/outcome assessment are needed.

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Integrated Development of Health Promotion Cloud-based Mobile Platform and Application in New Taipei City

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(No relevant relationships reported)

Frailty will increase the risk of disability, reduce the average life expectancy of health. In 2015, the pre-frailty prevalence rate and the frailty prevalence rate from the frailty screening survey of the elderly health check was 48.8% and 13.3% respectively in New Taipei City's 4 rural areas.
PURPOSE: As the result, the mayor declared the launch of the "Fit for Age APP" program in August 2015, which was designed to meet the needs of the pre-elderly and the elderly through the "Frailty and Muscle Strength Test", "Exercise Nutrition Intervention" and "Data Record" orientations to achieve the goal of prevention and reversal of frailty.
METHODS: We aim to develop an entertaining "Fit for Age APP" which includes "Health Assessment", "Sports, Diet and Nutritional Record" and "Health Communication". Furthermore, sports, nutrition, and medical professional teams will undergo the "Backstage Management System" to monitor and give personal feedback timely. We hope the establishment of this multi-functional module and new type health APP not only can improve the use of APP capacity and frequency by the participants.
RESULTS: From August 2015 to the end of December 2015, the promotion, use, and participation of the Fit for Age program were as follows: **(1)**Promotion effectiveness: Activity promotion screenings: 6,588 sessions, the number of propaganda: 303,480 people, the average daily publicity are 43.9 games with 2023.2 person-time. The number of service bases for Fit For Age: There are 1,559 spots, with average a spot per neighborhood. The situation of media exposure of Fit for Age: Facebook, Line and other community media platform: a total of 22, news media exposed (electronic and flat): a total of 148, an average of 1.1 per day. **(2)**The use condition of the "Fit for Age APP": The number of registration up to 31,566 people, the monthly population active utilization ratio: 40%, exercise recording utilization ratio: 23%, nutrition recording utilization ratio: 10%.
CONCLUSION: Through the APP and personal health feedback model, it can enhance personal health knowledge, change personal health attitude, and build self-manage healthy behavior, to achieve the goal of disease prevention and health for all.

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Effect of anAutomatic Physical Activity Detection & Feedback System in PromotingExercise Compliance of a Virtual Trainer Project: A Randomized Control Trial

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(No relevant relationships reported)

With advances in smartphone technology, automatic physical activity (PA) detection and feedback applications that integrate with movement measuring devices (such as smartphone apps and heart rate watches) have become widely available and popularized. However, it is not known whether such automatic systems provide any additional advantage in motivating exercise compliance compared to traditional self-report systems. **Purpose:** To investigate if the integration of an automatic PA detection and feedback system provides any additional advantage in motivating exercise compliance as compared to a traditional self-report PA system. **Method:** We developed a Virtual Trainer (VT) exercise promotion project that encourages exercise compliance via a website and a smartphone application. A total of 119 inactive adults entered a randomized control trial under one of the following three conditions: 1.) VT with a heart rate watch that allows automatic PA detection and feedback, or 2.) VT with self-reported PA record, or 3.) no VT (control) with self-reported PA participation. Exercise compliance data were retrieved from the VT PA record and a PA questionnaire (IPAQ) was collected at pre-, post-, and 3-months after intervention (maintenance). **Results:** All three groups improved PA compliance significantly (p< .01), although a slight drop at maintenance was observed. Two-way repeated measured ANCOVA (age & gender as covariates) found significant time effects (p< .01) but no interaction effect (p> .05). The IPAQ revealed that PA compliance in both VT conditions improved by more than double after intervention. Changes in exercise compliance between the three conditions were not different. **Conclusion:** In a web-based + smartphone app interactive exercise promotion program that promotes self-management of regular exercise training, the inclusion of an automatic physical activity detection and feedback system did not bring additional benefits compared to a traditional self-reported PA recording system.

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Physical Education in the U.S.: Systematic Observations of Physical Activity, Lesson Length, and Class Size

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(No relevant relationships reported)

Obtaining widespread information (i.e., surveillance) on physical education (PE) is important for educators and policy makers to understand programs and make valid judgments to improve policy and practices. Most of the information about PE in the U.S. is derived from self-reports—often from respondents distal to actual lessons. The System for Observing Fitness Instrument Time (SOFIT) has been validated, used since 1989, and recommended as a surveillance tool for PE.
PURPOSE: To locate and synthesize studies that used SOFIT to objectively assess class size, lesson length, and moderate-to-vigorous physical activity (MVPA) during PE in U.S. elementary and secondary schools from 1991-2016.
METHODS: Following PRISMA Guidelines, we searched 10 library databases and located 233 distinct SOFIT records. Of these, 137 full texts were reviewed, resulting in 20 studies eligible for the current analysis. Studies were included if they were (a) conducted in U.S. schools, (b) published in English in peer review journals, (d) assessed MVPA, lesson length, and class size, and if (d) data were not influenced by interventions. All observers were trained to use the SOFIT protocol.
RESULTS: Data were collected during 5,606 PE lessons (3,469 elementary; 2,137 secondary) in 1,239 schools located in 17 states. There was substantial variation for all variables, both within and among the 20 studies. Secondary school lessons were longer (M=40.5 vs. 30.3 min), had more students (M=40.5 vs. 28.2), and provided more MVPA (M=46.5% vs. 38.4% of lesson time). Overall, only 3 studies met the nationally recommended standard for lesson 50% MVPA. Factoring in lesson length, students in these elementary and secondary schools accumulated only 11.6 and 18.8 MVPA min/lesson, respectively. Even with PE daily, accrued weekly MVPA time would be only about half the recommended amount (IOM, 2013). Class size in secondary schools also exceeded recommendations.
CONCLUSIONS: Direct observations of 5,606 PE lessons show elementary and secondary schools are falling short of national recommendations for MVPA and class size. Schools were not selected at random; therefore, a larger on-campus surveillance study is recommended in order to establish an objective database for PE. SOFIT has been validated and widely used and could serve well as a surveillance tool.

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Improving Functional Capacity And Physical Activity Through Education: Two-year Follow-up Of Parqve Study

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(No relevant relationships reported)

PURPOSE: The purpose of present study was to analyze the effects of an educational program emphasizing the regular practice of physical exercise on physical fitness, functional capacity and daily living physical activity levels in patients with knee osteoarthritis (OA).
METHODS: Two hundred and thirty-nine patients (X male and Y female) under treatment for primary or secondary knee OA (degree I to IV in the Kelgreen and Lawrence scale) at the public health system were randomly allocated to educational (EDU; n = 112) or control (CON; n = 127) groups. All subjects of EDU and CON have their physical fitness (six minute walking test (6MWT) and seat-and-reach test), functional capacity (stair climbing test) and daily living physical activity (IPAQ - short version) assessed at baseline (pre), and during 6,12 and 24 months of follow-up.
RESULTS: EDU improved ($P < 0,006$) 6MWT at 6 months (10%), which were maintained at 12 months, and slightly reduced (5%) at 24 months. 6MWT also improved ($P < 0,006$) in CON at 6 months, but it was of lower magnitude (4,5%) and returned to baseline at 12 and 24 months. EDU and CON showed similar improvements ($P < 0.05$) in stair climbing at 6 months (EDU = 13%; CON = 12.3%), which were maintained at 12 and 24 months.EDU also showed an increased prevalence of "actives" and "very actives" subjects, as well as a reduced prevalence of sedentary subjects during follow-up ($P < 0,05$). Although CON also showed an increased prevalence of "very actives" subjects during follow-up, it was lower than that observed in EDU. Flexibility did not change during follow-up in both groups.
CONCLUSIONS: The present results suggest that an educational program promoting the regular practice of physical exercise may be an effective tool for improving physical fitness, functional capacity and daily living physical activity in patients with knee OA.

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Effect Of Exercise In A Desert Environment ("Brown Exercise") On Emotional And Physiological Measures

James W. Navalta, FACSM[1], Nathaniel G. Bodell[1], Elizabeth A. Tanner[2], Charli D. Aguilar[1]. [1]University of Nevada, Las Vegas, Las Vegas, NV. [2]University of North Texas, Denton, TX.
(No relevant relationships reported)

"Green exercise" (in a park or forest) is beneficial to emotional and physiological measures. The US has large desert areas (20% geography) and these regions are currently experiencing the greatest population growth. **PURPOSE:** to determine if exercise in a desert environment ("brown exercise") extends similar benefits as have been reported with green. **METHODS:** Participants (N=10) completed baseline measures (PRE), 30-min seated rest (SIT), and 30-min self-paced walking (WALK) in the following environments: indoor treadmill, outdoor urban environment (near Las Vegas Strip), green (Mt Charleston, NV), brown (Red Rock National Recreation Area, NV), and brown below sea level (Death Valley National Park, CA). Heart rate (HR), systolic blood pressure (SBP) and perceived stress, comfort, and calm were dependent variables. **RESULTS:** After SIT, HR was significantly elevated in urban vs green environments (66±11 vs 57±8 bpm, p=0.05) and significantly greater after WALK in below sea level brown (79±9 bpm) compared to all other conditions (p=0.011). SBP was lower after SIT (116±9) compared to PRE (119±9) and WALK (120±8 mmHg, p=0.05). No differences were reported for calm (p>0.05) but brown returned the highest comfort responses (p=0.02), and green the lowest (p=0.03). Regardless of condition, perceived stress was significantly lower following WALK (13.9±1) than PRE (15.5±1, p=0.002) and SIT (14.8±1, p=0.008). **CONCLUSIONS:** Cardiovascular responses to exercise in a brown below sea level environment (WALK HR higher than all others) can be attributed to significantly further distance walked (p=0.001). While not measured, it is hypothesized that enjoyment of the environment could explain this phenomenon. Comfort scores were the greatest in the environment to which subjects were habituated, and exercise served to significantly reduce perceived stress. Taken together, these data provide evidence that exercise in a brown environment is just as beneficial as that performed in a green environment.

WEDNESDAY, MAY 30, 2018

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Performance In Square Stepping Exercise Is Associated With Working Memory

Soichi Ando[1], Ryota Makino[1], Ryuji Takigawa[1], Koki Yasukawa[1], Masahiro Kokubu[2], Kazunori Sakamoto[3], Shinobu Tsurugano[1], Kazunori Ohkawara[1]. *[1]The University of Electro-Communications, Tokyo, Japan. [2]University of Tsukuba, Ibaraki, Japan. [3]National Institute of Informatics, Tokyo, Japan.*
(No relevant relationships reported)

Square-Stepping Exercise (SSE) program improves cognitive function as well as lower-extremity functional fitness in the elderly. However, it is unclear which aspects of cognitive function are closely associated with performance in SSE. Given that SSE comprises stepping exercise while remembering step pattern, we hypothesized that working memory plays a key role in performance in SSE.
PURPOSE: The purpose of the present study was to test the hypothesis that performance in SSE is associated with working memory. **METHODS:** Sixteen elderly people (10 males and 6 females, age: 72.9 ± 6.3 years, body mass index: 22.1 ± 3.2 kg/m^2) participated in the study. The participants performed a combination of spatial delayed response (SDR) and Go/No-Go (GNG) tasks and SSE. SDR task requires working memory. GNG task requires response inhibition and interference control. The SDR task was graded into three levels of difficulty. Cognitive performance was assessed by reaction time (RT) and accuracy. In SSE, the participants performed multiple directional step patterns on a thin mat partitioned into squares. SSE was graded into five levels of difficulty depending on step pattern. Time to complete SSE was used to assess performance. One-way repeated measures analysis of variance was used for each variable. Pearson correlation analysis was performed to determine the correlation. Data were expressed as mean ± standard deviation. The significance level was set at p < 0.05. **RESULTS:** RT in the SDR task increased with task difficulty (main effect: p < 0.001, level 1: 1.4 ± 0.2 sec, level 2: 1.8 ± 0.3 sec, level 3: 2.2 ± 0.4 sec), while accuracy was not altered. Time to complete SSE also increased with task difficulty (main effect: P < 0.001, level 1: 5.4 ± 0.7 sec, level 2: 8.6 ± 1.4 sec, level 3: 16.7 ± 1.7 sec, level 4: 18.0 ± 3.4 sec). Only eight participants completed SSE at level 5 (26.6 ± 3.4 sec). RT in the SDR task at level 2 was associated with time to complete SSE at level 2 (r = 0.54, p = 0.03). Performance in the GNG task was not associated with time to complete SSE. **CONCLUSION:** The moderate correlation suggests that performance in SSE is associated with working memory. Exercise intervention with square stepping may be particularly effective to improve working memory.

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HealtheSteps Process Evaluation: Exploring Delivery of a Healthy Lifestyle Program from Coach and Participant Perspectives

Wendy Blunt, Dawn P. Gill, Brendan Riggin, Judith Belle Brown, Robert J. Petrella, FACSM. *Western University, London, ON, Canada.*
(No relevant relationships reported)

Health*e*Steps is a 6-month lifestyle program, whereby participants at risk for chronic disease meet bi-monthly with a trained Health*e*Steps coach to set prescriptions in the areas of physical activity, exercise, and healthy eating.
PURPOSE: A process evaluation was conducted alongside a pragmatic randomized controlled trial to explore the acceptability of delivering Health*e*Steps to participants at risk for chronic disease by members of the community working at primary care and health services organizations in Southwestern Ontario.
METHODS: Data for the process evaluation included interviews with trained Health*e*Steps coaches post-program (month 6) and interviews with participants, 6 months post-program (month 12). All coach interviews (n=12) and a purposeful sample of participant interviews (n=13) were analyzed separately. The sample of participant interviews were selected based on maximum variation in terms of site location, age, gender, ethnicity, marital status, education, occupation, body mass index, average daily step count, and self-rated health. Transcripts were read through by the research team; key themes and exemplar quotes to support these themes were then identified and summarized.
RESULTS: Coaches found Health*e*Steps was easy to deliver as the focus was only on three key risk factors for chronic disease. Coaches noted group sessions, ensuring participants had the same coach at every session, and evaluating participant readiness prior to beginning the program, could improve the program for future delivery. Participants spoke positively of their coaches and found the program promoted accountability over their healthy lifestyle changes through tracking progress and step counts on the pedometer, and meeting with their coach. Participant suggestions to improve the program included providing pedometers for participants to continue to monitor physical activity, and providing opportunities for the participants to be accountable to their lifestyle changes long-term, once the formal in-person coaching sessions are complete.

CONCLUSIONS: HealtheSteps is an acceptable program for improving the lifestyle habits of individuals at risk for chronic disease. Moving forward, the suggestions for improving the program delivery do not require significant changes to the program protocol.

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The Relationship Between Usual Care Intervention And Expanded Intervention On Hospital Readmission And Cost Reduction

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(No relevant relationships reported)

Purpose: This fixed meta-analysis examined the role of hospital interventions - both non-physical activity related and prescribed physical activity regimens - in the reduction of hospital readmission and costs in frail older adults with congestive heart failure after an index of stay.
Method: The data were drawn from the randomized control trials (RCT) of Linden & Butterworth (2014), Constantino et al. (2013), and Ekdahl et al. (2015), studies that sought to chronicle the effectiveness of non-physical activity related interventions compared to the usual care provided to Medicare beneficiaries in the United States. In addition, this paper utilizes the results of the Boa Sorte Silva et al. (2017) study, a two-arm RCT design. The Boa Sorte Silva et al. (2017) study utilized prescribed physical activity regimens with a view toward observing any physiological improvements of note in the study's intervention groups, the results of which will assist in furthering the study of the relationship between prescribed exercise regimens and any correlation with reduced risk for hospital readmission and hospital costs. The fixed effect of the meta-analytic comparison interventions provides considerable insight into potential revisions of continuous treatment plans in Medicare and Medicaid beneficiary programs with regard to risk reduction of hospital readmission and decreased costs.
Results: The results highlighted in Diagram 1, from Linden & Butterworth (2014), Constantino et al. (2013), and Ekdahl et al. (2015) demonstrate a correlational fixed effect on the reduction of the risk for hospital readmission within an index of stay in the intervention group compared to the control group receiving usual care and regardless of the type of intervention used. Constantino et al. reported that the treated intervention group had spent $42,317,329 on overall medical expenses compared to the untreated control group that spent $56,781,559 in total within 30-days post discharge of the first readmission (2013). **Conclusions:** If older adults with physical debilities due to congestive heart failure participate in a prescribed physical regimen, the resulting benefits would reduce the degenerative effects of physical debility as compared to non-participants, which would then lead to a reduction in hospital readmissions and costs.

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The Role Healthcare Providers' Physical Activity Levels Have On Barriers To Physical Activity Counseling

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(No relevant relationships reported)

PURPOSE: Because of the link between physical activity and health outcomes, it is important to promote physical activity by prescribing physical activity to patients by healthcare providers. The purpose of this study was to assess healthcare providers' physical activity levels, examine healthcare providers' barriers to counseling physical activity to their patients, and determine if a relationship exists between healthcare providers' physical activity levels and their barriers to physical activity counseling.
METHODS: Providers (N=30; 70% female; 73% Caucasian) completed the International Physical Activity Questionnaire (IPAQ) and a physical activity counseling questionnaire while wearing a pedometer for 7 days
RESULTS: Based on objective measures, **h**ealthcare providers were very active (93%), yet very few knew the physical activity recommendations (7%). Overall the healthcare provider's physical activity level was not related to their physical activity promotion practices. This finding was found when steps per week (r=.12, p=.54), active minutes per week (r=.12, p=.52), and total physical activity minutes from the IPAQ (r=.01, p=.95) were used. The physical activity benefits, identified by the providers, of maintaining health, improving mental health, and attenuates physical declines were positively related with improving activities of daily living and coping with stress (p<.05). Healthcare providers' reported barrier of being unsure what to recommend was positively related with being unsure of the effectiveness of physical activity for patients (p<.05).
CONCLUSIONS: The most pertinent finding from this pilot, exploratory study is that despite only 7% of providers knowing physical activity recommendations, 87% of providers offered some form of physical activity counseling to their patients. Additionally, among this highly active sample of healthcare providers, personal activity habits did not influence physical activity promotion practices with patients. More research is needed to determine if this finding persists among providers who are not as physically active.

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Public Health Impact of a Family-based Pediatric Obesity Treatment Program

Roderick T. Bartee, Paige Wuebben, Kate A. Heelan, FACSM. *University of Nebraska at Kearney, Kearney, NE.* (Sponsor: Kate A. Heelan, FACSM)
(No relevant relationships reported)

Family-based pediatric obesity treatment programs have been shown to be effective in reducing obesity among children (Epstein, 2007). A BMI z-score reduction of 0.10 has been shown to achieve clinically meaningful risk factor reduction (Ford et al., 2010), with a 0.25 reduction to maximize risk reduction. An important aspect of combatting childhood obesity is ensuring programs reach as many children as possible. Public health impact can be calculated by multiplying the reach of an intervention by its efficacy or effectiveness (Glasgow et al., 1999). **PURPOSE:** The purpose of this study was to determine the public health impact of Building Healthy Families (BHF): a 12-week family-based pediatric obesity treatment program in a mid-western community of 30,000. **METHODS:** BHF participants were ages 6-11 years (n=52, age: 9.28 ± 1.59 years) with a BMI ≥ 95th percentile. Participants were measured for mass and stature at baseline and post 12-week intervention for each of nine cohorts. BMI percentile and BMI z-score were calculated based on age and gender. Reach was defined as the number of children eligible for the program divided by those who initiated the program. Effectiveness was represented by change in BMI z-score between baselines and post 12-week intervention. Public health impact was calculated by multiplying the number of participants with a BMI z-score reduction of at least 0.10 divided by the number of children eligible for the program. Calculations were made for reach, effectiveness, and impact for all cohorts combined, and each individual cohort. **RESULTS:** The number of children meeting the eligibility requirements, and passively recruited, was 3,226. A total of 52 children initiated and completed the program for a reach of 1.61%. The overall BMI z-score change was -0.29 ± 0.21. Public health impact was 1.5% suggesting that BHF resulted in clinically meaningful risk reduction for body composition and cardiometabolic health for 1.5% of children ages 6-11 in Kearney, NE. **CONCLUSION:** The BHF program is effective and increasing its reach is an important consideration to maximize its public health impact.

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Physician Characteristics and Hospital Contextual Factors Associated with Physicians' Intention to Provide Exercise Counseling

An-Min Lynn, Jiun-Hau Huang. *National Taiwan University College of Public Health, Taipei, Taiwan.*
(No relevant relationships reported)

PURPOSE: To identify the physician characteristics and hospital contextual factors associated with physicians' intention to provide exercise counseling (EC). **METHODS**: Self-administered anonymous surveys were conducted in 2016 among physicians attending medical conferences. Physician characteristics included gender, age, education level, specialty, seniority, number of patients per clinic, own exercise frequency, and educational training in sports and exercise. Hospital contextual factors included accreditation and access to health education materials and exercise referral measures. EC-related perceptions were also measured using the Theory of Planned Behavior. Physicians' EC intention was evaluated using a 7-point semantic differential scale, from 1 ("very unlikely") to 7 ("very likely"), which was dichotomized into high versus low EC intention using the median as the cutoff. The study protocol was reviewed and approved by the Research Ethics Committee of the National Taiwan University Hospital. Descriptive statistics were examined. Chi-square test, independent sample t-test, and multivariate regression were used to evaluate the relationships of physician characteristics and hospital contextual factors with physicians' intention to provide EC. **RESULTS**: A total of 1,006 responses were received (response rate = 89.1%) and analyzed. Significantly higher EC intention was found to be associated with the following physician characteristics: exercising "3 times or more/week", having "educational training in sports and exercise", having "30 or more patients per clinic", as well as having "positive attitudes", "supportive norms", and "high perceived control" about EC provision. Only one hospital contextual factor (i.e., working in "medical centers") was linked to higher EC intention. The final model passed the Omnibus and Hosmer-Lemeshow tests, showing satisfactory goodness-of-fit, and was able to accurately predict 79.8% of the results. **CONCLUSIONS**: Physicians' intention to provide EC to their patients was primarily influenced by physician characteristics. Despite the clear practical guideline for EC, physicians and medical students could benefit from educational training for EC and lifestyle medicine, leading to their own positive change toward a more active lifestyle.

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Social Support is Associated with Change in Physical Activity Following Bariatric Surgery

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(No relevant relationships reported)

PURPOSE: To examine the association between pre-surgical behavioral constructs and change in pre- to post-surgical physical activity. **METHODS:** Adults (N=83) who had undergone a Roux-en-Y Gastric Bypass (N=46) or Gastric Sleeve (N=37) procedure within the past 2 years (time since surgery = 0.7 ± 0.6 years) were examined. Leisure-time physical activity was assessed with the Paffenbarger Physical Activity Questionnaire at a post-surgery clinic visit, and participants reported on current physical activity and retrospectively reflected on pre-surgical physical activity. Behavioral constructs previously reported to be associated with physical activity in non-surgical populations were also assessed retrospectively. **RESULTS:** Pre- to post-surgery physical activity [median (25th, 75th percentile)] increased from 156.0 (56.0, 600.0) kcal/week to 976.0 (344.0, 1832.0) kcal/week. Bivariate analysis demonstrated that change in physical activity was correlated with pre-surgical behavioral constructs of health-related quality of life (physical function: r=-0.25, p=0.021, energy/fatigue: r=-0.34, p=0.001), perceived psychological benefits of physical activity (r=-0.22, p=0.046), physical activity self-efficacy (r=0.23, p=0.039), exercise enjoyment (r=-0.23, p=0.038), social support (r=0.26, p=0.016), body image (appearance evaluation: r=-0.22, p=0.043, fitness orientation: r=-0.31, p=0.005, health evaluation: r=-0.23, p=0.033, health orientation: r=-0.24, p=0.029) and perceived behavioral control (r=-0.27, p=0.014). These variables were included as independent variables in a step-wise regression analysis, with change in physical activity as the dependent variable, and controlling for pre-surgical physical activity, gender, surgical procedure and time since surgery. Pre-surgical social support from family was the only behavioral construct that was predictive of change in physical activity from pre- to post-surgery (β= -0.482, p<001). **CONCLUSION:** Social support for physical activity prior to bariatric surgery may be an important behavioral construct that influences the increase in post-surgery physical activity. Studies are needed that target this behavioral construct to confirm this influence on physical activity behavior in patients who undergo bariatric surgery.

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Feasibility of Implementing a Healthy Vending Initiative on a Public University Campus

Alexis M. Malmkar, Roderick T. Bartee, Abbey A. Bryce, Kate A. Heelan, FACSM. *University of Nebraska at Kearney, Kearney, NE.*
(No relevant relationships reported)

Vending machines consisting of low-nutrient and high-energy-dense options have been identified as a contributor to weight gain at university campuses (Banna et al., 2017). A Healthy Vending Initiative (HVI) was implemented by a Nebraska Public Health District to encourage public institutions and worksites in rural Nebraska Counties to implement policy to increase access to healthier food options to at least 30% in vending machines. **PURPOSE**: The purpose of this study was to evaluate the feasibility of implementing a Healthy Vending Initiative on a public university campus (enrollment ~7000) in a mid-western community. **METHODS**: Twenty-one vending machines were evaluated using the Nutritional Environment Measures Survey-Vending (NEMS-V). Vending snack items were classified as HEALTHY based on Dietary Guidelines for Americans; ≤ 200 calories per package, $\leq 35\%$ total calories from fat, and $\leq 35\%$ weight from total sugars. Each vending machine was evaluated for percent of items that met guidelines at baseline and after implementing policy and meeting with local vendors, business managers, and administrators advocating to meet the policy guidelines. **RESULTS**: At baseline $20 \pm 3\%$ of vending contents met the guidelines for HEALTHY. Zero snack vending machines met the 30% of HEALTHY food options. After the policy was implemented and vendors and administrators met, only 3 vending machines (15%) met the 30% of HEALTHY food options, but $27 \pm 4\%$ of the food items were considered HEALTHY. **CONCLUSIONS**: Although there was a significant increase (p<0.05) in the percentage of HEALTHY options available in campus vending machines, we were unable to meet the policy of 30% of HEALTHY options in all vending machines. Only 15% of the vending machines on campus met the policy. Working with vendor companies was more challenging than anticipated. For example, the snack vendor communicated that reaching up to 30% of HEALTHY options would not affect revenue, yet an increase of HEALTHY snack items only reached 27%. All stakeholders continue to communicate on possible solutions moving forward. Future research should continue to measure policy implementation and longer-term outcomes including changes in vending purchasing behavior.

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Does Music-Based Cadence Entrainment Alter Metabolic Intensity?

Colleen J. Sands, Scott W. Ducharme, Dylan C. Perry, Elroy J. Aguiar, Christopher C. Moore, Catrine Tudor-Locke, FACSM. *University of Massachusetts Amherst, Amherst, MA.* (Sponsor: Catrine Tudor-Locke, FACSM)

(No relevant relationships reported)

The relationship between cadence (steps/min) and intensity (metabolic equivalents; METs) has been primarily established with controlled treadmill-based studies. It may be possible to use music to shape performance of overground walking cadence and thus prescribe intensity. **PURPOSE:** To evaluate overground walking cadence entrainment to music at different tempos (beats per min; BPM) and its ability to evoke intensity in a predictable manner. **METHODS:** Ten participants (6 men, 4 women; age 22.6±1.9 years, height 172.5±11.8 cm, weight 79.3±18.8 kg) completed six 5-minute walking trials around an oval track (40 m). During three trials, participants listened to a single song and matched their foot strikes to the beat of the music. The song tempo was modulated to 80, 100, and 125 BPM (randomized) using a commercially available app. Participants were outfitted with a portable indirect calorimeter to measure intensity (METs). Cadence during all trials was measured via direct observation (hand tally). Mean absolute percent error (MAPE) was calculated to compare the accuracy of participants' entrainment (prescribed versus actual cadence). A simple linear regression model was used to evaluate the relationship between cadence and intensity. **RESULTS**: Participants successfully entrained to the cadences prescribed by the song tempo, especially at faster speeds (MAPE = 3.85±5.63, 3.12±2.88 and 2.63±2.31 for 80, 100 and 125 BPM, respectively). Increased music tempo was associated with a linear increase in intensity across all trials (y=0.16x - 2.14, r^2=0.63, p<0.001). MET values for 80, 100 and 125 BPM were 3.23±0.44, 3.84±0.59, and 5.27±0.78, respectively. **CONCLUSION**: Participants successfully entrained to the modulated tempo of a single song, and faster music tempos elicited increased intensity. Based on these findings, music entrainment appears to be an effective method for evoking desired cadences during walking. The findings further suggest that music may be selected according to its potential to evoke specific intensities of ambulation. Future studies should examine the relationship between music entrainment and intensity with various song styles.

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Physical Activity and Cardiometabolic Risk in Young Adults: Baseline Results from the Healthy Body Healthy U Trial Young Adults

Melissa A. Napolitano[1], Jessica Whiteley[2], Meghan Mavredes[1], Laura Hayman[2], Jamie Faro[2], Loretta DiPietro, FACSM[1]. *[1]The George Washington University, Washington, DC. [2]University of Massachusetts Boston, Boston, MA.* (Sponsor: Loretta DiPietro, FACSM)

(No relevant relationships reported)

PURPOSE: Evidence supports the importance of physical activity (PA) in reducing cardiometabolic disease (CMD) risk in adulthood. Less information is available about age-related declines in PA in young adulthood and PA-CMD risk associations in this life course period. The purpose is to describe methods/ rationale for the Healthy Body Healthy U (HBHU) clinical trial, which uses digital intervention strategies to promote weight management among young adults. Recruitment strategies and messaging will be discussed, as will baseline data on objectively measured PA and CMD-risk factors (i.e., fasting glucose, HbA1c, blood pressure[BP]). **METHODS**: Young adults (18-35yo) enrolled in HBHU (n=334; % female=80.2%; % non-white=43.1%; M age=23.3±4.4; M BMI=31.2±4.2) completed laboratory assessments (i.e., fasting blood draws and objective PA monitoring analyzed using standard cutpoints). The sample was split into two age groups 18-24.9 yrs ("Younger") and 25-35 yrs ("Older") to examine differences in PA and CMD-risk during these life course periods. **RESULTS**: Accelerometry data revealed participants engaged in 225.0±148.6 min/wk of moderate-to-vigorous (MVPA), 19.2 ± 9.3 hrs/wk of light activity, and were sedentary 52.6±32.0 hrs/wk. Significant MVPA differences were found between Older vs Younger (204.7 vs 247.2 minutes; p<.01) and Obese vs. Overweight participants (196.2 vs 235.8 minutes p < .05); no differences by age nor weight status were found for light or sedentary activity. Older participants were 0.5 times less likely to meet PA Guidelines (95% CI [.31-.82] p < .01), p=ns by weight status. The relationship between type of activity and CMD-risk was examined by age. For the Older group, there were negative correlations between: light activity and blood glucose (r=-0.22) and diastolic BP (r=-0.20); MVPA and glucose (r=-0.21), all p's<.05. For the Younger group, MVPA was associated with systolic BP (r=0.18; p<.01).**CONCLUSIONS**: These preliminary findings indicate there may be particular risk periods within young adulthood associated with age-related declines in PA. PA may play an increasingly important role in cardiometabolic control as at-risk young adults transition throughout the life course. Future research could target age-related declines in PA and focus on increasing light activity to reduce CMD-risk.

A-48 Free Communication/Poster - **Physical Activity and Health**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

329 **Board #170** May 30 9:30 AM - 11:00 AM

Leg Extensor Power And Healthy Aging Are Associated In Older Adults: 10-year Follow-up Study

Mieko Shimada[1], Scott Going[2], Nobuko Hongu[2], Naofumi Yamamoto[3], Yasuo Kimura[4], Naoki Nakagawa[5], Yutaka Yoshitake[6], Hideo Miyazaki[7]. *[1]Chiba Prefectual University of Health Sciences, Chiba, Japan. [2]University of Arizona, Tucson, AZ. [3]Ehime University, Ehime, Japan. [4]Inst. of Fitness & Health Sciences, Tokyo, Japan. [5]Sanno University, Kanagawa, Japan. [6]National Institute of Fitness and Sports in Kanoya, Kagoshima, Japan. [7]Niigata University, Niigata, Japan.*

(No relevant relationships reported)

Aging is associated with a decline in functional fitness, which reduces mobility and impairs quality of life in older adults. **PURPOSE**: The aim of this study was to assess whether functional fitness tests (i.e., hand-grip strength, one-leg standing time with eyes open, step-test, leg extensor power, knee extensor strength) at age 70 years old (baseline) predict fitness at age 80 years old (10 years follow-up). **METHODS**: At baseline, 600 independent community-dwelling older adults (70 years old, 300 males and 300 females) performed functional fitness testing, with yearly testing for ten years thereafter. For this analysis, participants were divided into three groups: G1, performed testing each year for 10 years (n=180, 106 males, 74 females); G2, measured only at the 10-year follow up (n=343, 173 males, 170 females); and G3, deceased by 10-year follow-up (n=80, 60 males, 20 females). Differences in functional fitness at baseline among groups within males and females were determined using one-way univariate analysis of variance (*P*<0.05). **RESULTS**: Leg extensor power was significantly different between survivors and non-survivors (G1 vs. G3, G2 vs. G3) in males (G1: 14.8±3.5 watt/kg wt, G2: 14.6±3.6 watt/kg wt, G3:12.9±3.4 watt/kg wt) and females (G1: 9.1±2.6 watt/kg wt, G2: 9.0±2.6watt/kg wt, G3:7.3±3.3 watt/kg wt). Knee extensor strength was significantly different between survivors and non-survivors (G1 vs. G3, G2 vs. G3) in males (G1: 1.21±0.27kg/kg wt, G2: 1.12±0.34 kg/kg wt, G3:1.09±0.24 kg/kg wt), but not in females. Similarly, one-leg standing time and hand-grip strength at baseline was only significantly different between groups (G1 vs. G3, G2 vs. G3) in males (one-leg standing time, G1: 79.3±42.2 sec., G2: 75.5±43.2 sec., G3: 63.0±45.0 sec.; HG strength, G1: 40.7±5.6 kg, G2: 38.2±5.6 kg, G3: 38.0±5.5kg, respectively). Baseline stepping was significantly different between groups (G1 vs. G3) in females, but not males (G1: 71.1±11.0/10sec., G2: 70.1±13.0/10sec., G3: 64.4±12.7/10 sec.) **CONCLUSIONS**: Assessment of leg extensor power in older males and females may be an important addition to functional fitness assessment designed to predict healthy aging. Future intervention studies designed to improve leg power and its impact on daily activities could elucidate its role in healthy aging.

330 **Board #171** May 30 9:30 AM - 11:00 AM

Physical Activity Moderates The Association Between Depression And Bone Mineral Density In Men: Korea National Health And Nutrition Examination Survey 2008-2011

Hyo Lee[1], Miyoung Lee[2], Eunhyung Cho[3], Jaegyun Jung[2], Jaemyung Kim[2], Muncheong Choi[2]. *[1]Sangmyung University, SEOUL, Korea, Republic of. [2]Kookmin University, SEOUL, Korea, Republic of. [3]Korea Institute of Sport Science, SEOUL, Korea, Republic of.*

(No relevant relationships reported)

PURPOSE: Research shows that depression is a risk factor for other chronic diseases including bone mineral loss in men. Also, there are strong evidences that weight-bearing physical activity may reduce risk for bone mineral loss. This study was purposed to examine whether MVPA and walking modify the association between depression and bone mineral density (BMD) in male adults. **METHODS:** This study analyzed KNHANES 2008-2011, a population-representative sample of noninstitutionalized Korean. Depression was a dichotomous variable regarding whether the individual have ever been diagnosed as depression by a psychiatrist. Physical activity was measured utilizing IPAQ. BMD was measured by DXA from femoral neck and lumbar spine. Age-group specific [19-34 yrs (*n*=408) vs. 35-49 yrs (*n*=607) vs. 50-64 yrs (*n*=580) vs. 65+ yrs (*n*=492)] linear regression analyses adjusting for sampling weight were conducted. Smoking, binge drinking, serum vitamin D level, calcium intake, age, BMI, and socioeconomic status were included as covariates. **RESULTS:** In 19-34 yrs old group, depression was significantly inversely

associated with femoral neck BMD(B=-.11, p=.015) and lumbar spine BMD (B=-.35, p<.001), but MVPA showed significant effect modifications on both femoral neck BMD loss (B=.09, p=.040) and lumbar spine BMD loss (B=.03, p=.007). Also, walking significantly moderated the association between depression and lumbar spine BMD loss in this age group (B=.05, p=.017). In 35-49 yrs old group, depression was significantly inversely associated with femoral neck BMD (B=-.07, p=003), but walking significantly moderated the association (B=.01, p=.029). In other age groups, depression was not significantly associated with BMD. **CONCLUSION:** This study suggests that practitioners should include MVPA and walking in the depression treatment program to prevent comorbidity for bone mineral loss in young adults. Corresponding: Miyoung Lee, mylee@kookmin.ac.kr

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331   Board #172   May 30 9:30 AM - 11:00 AM

Cardiorespiratory Fitness, Different Adiposity Exposures, and Cardiovascular Disease Mortality Risk in Healthy Women

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(No relevant relationships reported)

PURPOSE: We examined the prospective associations among cardiorespiratory fitness (CRF), different adiposity exposures, and cardiovascular disease (CVD) mortality in women. **METHODS:** 19,838 apparently healthy women without history of CVD completed a comprehensive baseline health examination between 1970 and 2013. Clinical measures included body mass index (BMI), waist circumference (WC), waist-to-height ratio (W:HT), percent body fat (%Fat), and CRF quantified as duration of a maximal treadmill exercise test. Women were classified by CRF as low (quintile 1), moderate (quintiles 2-3), and high fit (quintiles 4-5) as well as by standard clinical cut points for adiposity exposures. Hazard ratios (HRs) were computed using Cox regression analysis. **RESULTS:** During a mean follow-up period of 19.2 ± 10.3 years, 391 CVD deaths occurred. Adjusted mortality rates for high, moderate, and low CRF groups were 0.55, 1.28, and 2.0 deaths/10,000 woman-years, respectively (p for trend <.001). Adjusted mortality rates of overweight women within each adiposity exposure were higher when compared with normal-weight women (p<.001). When grouped for joint analyses into CRF x adiposity categories, there was a significant positive trend in CVD mortality across decreasing categories of CRF within each category of W:HT and %Fat, as well as within the normal and overweight BMI categories and the normal WC category (p<.03). CRF was not significantly associated with CVD mortality within the obese BMI or high WC categories. **CONCLUSION:** Higher levels of CRF are associated with lower CVD mortality risk in women, and attenuate the risk of CVD mortality in overweight women. The use of various adiposity measures to estimate CVD mortality risk in women may be misleading unless CRF is also considered. These findings support the 2016 American Heart Association Scientific Statement recommending that CRF measurement or estimation be included in routine clinical practice.

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A Strategy To Reduce The Dropout Rate In A Volunteer-led Community Weight-loss Program

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(No relevant relationships reported)

We implemented a volunteer-led community weight-loss program within the Tsuchiura City (Japan) routine health promotion program in 2015. Although the participants successfully decreased their body weight, there was a relatively high dropout rate. We interviewed a focus group after the intervention, revealing a lack of understanding about the weight-loss program. To address this issue, we planned to increase communication among the participants in the subsequent 2016 trial. **PURPOSE:** The purpose of this study was to compare the degree of weight loss and the dropout rate between the 2 interventions (2015 vs. 2016). **METHODS:** Participants were Tsuchiura residents with a body mass index (BMI) >25 kg/m²: 27 in 2015 (4 men, age 60.7 ± 4.0 years, BMI 29.7 ± 4.0 kg/m²) and 39 in 2016 (9 men, age 57.3 ± 11.0 years, BMI 28.8 ± 3.8 kg/m²). The weight-loss program was led by community volunteers who attended 4 to 5 training sessions (3 hours per session). The program consisted of 8 sessions (2 hour per session) over 3 months. Participants were instructed to maintain a well-balanced low-calorie diet targeting 1680 and 1200 kcal/day for men and women, respectively. In 2016, we added exercises, group activities, and cooking demonstrations to increase communication and deepen participants' understanding of the weight-loss program. **RESULTS:** In 2015, 15 of 27 participants completed the 3-month program (dropout rate, 44.4%); their mean (95% confidence interval) weight loss was 6.7 (4.7–8.6) kg, corresponding to 8.7% of initial body weight. In 2016, 31 of 39 completed the program (dropout rate, 25.8%); their mean weight loss was 5.6 (4.5–6.6) kg, corresponding to 8.0% of initial body weight. A significant difference was found in the dropout rate (44.4% vs 25.8%, P < 0.05).

CONCLUSION: We reduced the dropout rate while obtaining equivalent weight loss by increasing communication among the participants during a volunteer-led community weight-loss program.

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Physical Activity Guideline Attainment and Gender Influence Chronic Disease Risks Among African American College Students

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(No relevant relationships reported)

Chronic disease risk and poor health behaviors, including physical inactivity, are increasing among college students. African American (AA) college students are a vulnerable population given the disproportionate manifestation of chronic disease in AA adults. AA women are particularly high risk given the higher prevalence of chronic diseases among women compared with men.**PURPOSE**: To examine differences in chronic disease risk among AA college students by attainment of physical activity (PA) guidelines and gender.
METHODS: AA college students (N=63; 43 female, 20 male; aged 18.2 ± 1.3 yrs) were recruited for a study examining and intervening on cardiovascular disease risk. Physical assessments and blood marker investigation were collected. Participants also completed self-report surveys: International PA Questionnaire (IPAQ), Perceived Stress Scale (PSS), and Pittsburgh Sleep Quality Index (PSQI). Students were categorized by meeting or not meeting PA guidelines ($\geq$ 150 min/wk). Descriptive statistics, frequencies, and independent samples t-tests were used to describe overall and stratified chronic disease risk profiles.
RESULTS: Overall, students were overweight/obese (54%), had optimal blood profiles, did not attain the PA guidelines for health (54%), were moderately stressed (PSS: 15.1 ± 6.5), had poor sleep quality (PSQI: 5.7 ± 3.1), and failed to meet sleep recommendations (6.5 ± 1.2 hrs/night). Females reported higher perceived stress than males (PSS score 16.7 ± 5.6 vs. 11.5 ± 7.2, p<.01); no other gender-specific differences in physical or blood biomarkers were detected. More males (85%) than females (28%) met PA guidelines. Females who met PA guidelines had significantly lower waist circumference (74.1 vs. 85.7 cm), BMI (23.1 vs. 28.6), and LDL cholesterol (65.1 vs. 74.3 mg/dL), and higher sleep quality (4.8 vs. 6.0) compared with females not meeting PA guidelines (all p <.05). There were no significant differences between males by PA guideline attainment.
CONCLUSIONS:We identified linkages between PA guideline attainment and chronic disease risk in AA college students, which was more meaningful among females. Given the low PA rates among females, additional work is needed to understand strategies for increasing PA among female AA college students.

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The Prevalence of Hypertension in a Population of Former Professional Football Players

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(No relevant relationships reported)

OBJECTIVE: There is substantial data suggesting that former professional football players have considerable cardiovascular disease risk. The objective of this study was to better understand the prevalence of hypertension, a major risk factor for cardiovascular disease, in former professional football players. **DESIGN:** Data including blood pressure, height, and weight were collected from 981 former professional football players between April 2015 and May 2017 during cardiovascular screening events held throughout the U.S. Demographic information was collected from all subjects, including age, race, previous hypertension diagnosis, and treatment. Means were analyzed using one-way ANOVA, Chi square, or paired T-tests where appropriate. **RESULTS:** Pre-hypertension was greatest for former players aged 20-59, with almost 50% of those aged 20-39 pre-hypertensive at screening. Hypertension was greatest in former players aged 60+, with more than 50% of these individuals hypertensive at screening; over 20% of those 20-39 were hypertensive. White former players aged 60+ had the lowest prevalence of pre-hypertension. Hypertension prevalence was only significantly different between age-specific racial groups at age 40-59. The majority of former players had a BMI $\geq$ 30 kg/m², regardless of age; those with normal BMI were least likely to be hypertensive. Over 30% of former players reported previous hypertension diagnosis, with approximately 75% of those diagnosed reporting treatment. Of those former players that reported treatment, most had poorly controlled blood pressure at the time of screening. Of former players that reported no hypertension diagnosis, 41% had elevated blood pressure at screening. Former players aged 30-39 had the highest prevalence of previously undiagnosed elevated blood pressure at screening. **CONCLUSIONS:** Hypertension is a serious concern for former professional football players, even those considered to be younger and at decreased

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risk. This may be related to the high BMI typically associated with these athletes. Blood pressure control in those reporting diagnosis is also a concern, as the majority of those men had high blood pressure at screening.

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Waist Circumference Influences Associations Between Physical Activity And Metabolic Syndrome Risk In College-aged Females

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(No relevant relationships reported)

PURPOSE: Metabolic syndrome (MetS) increases risk for chronic disease with diagnostic criteria including elevated systolic and/or diastolic blood pressure (SBP and DBP, respectively), triglycerides (TRG), glucose (GLU), waist circumference (WC), and reduced HDL-cholesterol (HDL). Although the prevalence of MetS is low among college students, risk factors for this condition are emerging in this population, especially in females. Moderate-to-vigorous physical activity (MVPA) is known to aid in the prevention of MetS risk factors. While WC is a component of MetS, it may also influence the effect of MVPA on other MetS components. Thus, this study aimed to explore the impact of WC on the association between MVPA and MetS risk factors in college-aged females.
METHODS: College-aged females (n = 328; 18.7 ± 1.2 yo) were assessed for MetS risk factors using standard clinical methods with factor presence being defined by the Adult Treatment Panel III criteria. MVPA was measured using accelerometry (NL-1000; 4 valid, 10-h days of wear). Pearson's correlations were used to assess bivariate associations. Linear regression was used to examine whether here was a significant interaction between WC risk factor status and the associations between MVPA and MetS risk factors.
RESULTS: Among those with normal WC (NWC; n = 287), MVPA was significantly associated with SBP ($r = -.228$), DBP ($r = -.216$), TRG ($r = -.140$), GLU ($r = -.129$), WC ($r = -.250$.) and HDL ($r = .199$; all $p <0.05$). Among females with high WC (HWC; n = 41), associations between MVPA and MetS risk factors were similar in magnitude or stronger, and significant for SBP ($r = -.430$), DBP ($r = -.420$), and WC ($r = -.374$; all $p <0.05$). Only the association between MVPA and SBP was significantly different across WC strata, with a stronger association observed among the HWC group ($p < 0.05$).
CONCLUSIONS: As hypothesized, these results suggest that WC moderates the association between MVPA and some MetS risk factors. Future research should aim to explore these associations among a larger sample with more variation in WC.

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The Prevalence of Obesity and Diabetes Mellitus in a Former Professional Football Player Population

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(No relevant relationships reported)

PURPOSE: To provide information on the prevalence of obesity and diabetes mellitus (DM) in former professional football players. **METHODS:** For this cross-sectional study, 1106 former NFL players were sampled between April 2015 and July 2017. Height and weight were used to calculate BMI; blood samples were obtained from fasted subjects for analysis of fasting blood glucose and hemoglobin A1c. Subjects also completed a questionnaire regarding DM diagnosis. Subjects were assessed for obesity and DM status based on BMI, FBG, HbA1c, and questionnaire results, and stratified by age (20-39, 40-59, 60+), primary career playing position (Big, Big Skill, Skill), and race (Black, White, Other). Statistical analyses included 1-way ANOVA and Tukey post hoc analysis when variances were equal, or Dunnett C statistic for heteroscedastic data. T-tests were used to evaluate differences between groups. **RESULTS:** The prevalence of obesity (BMI ≥ 30) for this population was 63.6%, while the overall prevalence of DM and pre-DM was 13.8% and 61.7%, respectively. Prevalence of both DM and self-reported DM diagnosis increased with each 20 year increase in age ($p<0.0001$). There was a significant effect of BMI on DM status, with obese men more than twice as likely to be diabetic (odds ratio 2.375, 95% CI 1.555-3.628). The "Big" position group were more likely to be obese as compared with "Big Skill" or "Skill" ($p<0.0001$). Curiously, there was no difference in the prevalence of DM between any of the 3 position groups. When examined further, "Skill" had the highest prevalence of non-obese diabetics, while "Big" had the lowest ($p=0.0002$), possibly explaining the lack of overall difference in the prevalence of DM between the 3 groups. Although White subjects were older than either Black or Other race subjects, Black subjects had higher BMI and prevalence of obesity than white subjects and, correspondingly, a

greater prevalence of DM. **CONCLUSION**: Although patterns and trends may reflect those commonly observed in the general population, the prevalence of obesity and DM may be higher in this population than typically reported in the general U.S. population. Furthermore, there may be special consideration that must be given to a former player's previous training with regards to his risk of developing diabetes, aside from current age, health, and BMI status.

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Vigorous Intensity Volume, Not Total Volume Of Physical Activity, Predicts Adiposity In Young Adults

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(No relevant relationships reported)

Vigorous intensity volume, not total volume of physical activity, predicts adiposity in young adults.
PURPOSE: To investigate which daily level of physical activity (PA) is the best predictor of adiposity in young adults.
METHODS: Young adults aged 19.8 years (n = 182 females and 147 males) in the Iowa Bone Development Study were examined. PA was objectively measured by the ActiGraph accelerometer and classified into categories of min/d (i.e., sedentary, light, moderate, vigorous, total metabolic equivalent task (MET)) using the Crouter 2-regression model equation. Lean body mass and total body fat (kg) including visceral adipose tissue (VAT, g) were measured by dual energy X-ray absorptiometry. Associations between PA categories and adiposity were analyzed by partial correlation analysis adjusted for height and lean body mass. Multiple linear regression analysis was used to examine the most influential PA exposure for adiposity. All analyses were conducted separately by gender. Significance level was set as $< 0.05*$ or $< 0.01**$.
RESULTS: Body fat was negatively associated with both vigorous PA ($r = -.29**$) and total PA MET time ($r = -.21**$) in males. In females, body fat was negatively related with vigorous PA time ($r = -.24**$), and VAT had significant associations with SED ($r = .18*$) and all PA variables (moderate $r = -.21**$, vigorous $r = -0.21*$, and total METs time $r = -0.22**$) except light PA time. Multiple linear regression analysis indicated that the best predictor for body fat mass (after adjustment for height and lean body mass) was vigorous PA time for females ($\beta = -.142*$, $R^2 = .70$, vigorous PA effect on R^2 for vigorous PA = .02) and males ($\beta = -.216*$, $R^2 = .50$, R^2 for vigorous PA = .04). Other PA exposures including total PA METs time were not significant after vigorous PA entered the model.
CONCLUSION: Vigorous intensity volume of PA, not total volume of PA, is the best predictor of body fat mass in young adults. This result suggests that interventions should focus on running, cycling and other intense physical activities to help young adults maintain a healthy level of adiposity.

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Association Between Physical Activity Level, Body Composition And Muscular Strength Among Health Professional

João Henrique V. Pietri, Amauri dos Santos, João Pedro da Silva Junior, Diana Carolina Gonzalez, Victor Keihan Rodrigues Matsudo. *CELAFISCS, São Paulo, Brazil.*

(No relevant relationships reported)

PURPOSE: To examine the association between physical activity level (PAL), body composition and muscular strength health among health professionals.**METHODS**: Physical activity level (PAL) was determined by pedometer, and steps counting was taken according to Tudor-Locke C et al. 2004. Sample consisted of 68 women and 11 men, with mean age 48.7 ±9.3 years old. A pedometer (DIGI-WALKER/YAMAX) was used in the waist by the participants as soon as they wake up until they go to bed, removing the pedometer in cases involving water activities, during 7 days in a row, including a weekenday.**STATISTICAL ANALYSIS:** The regression linear analysis with 95% Confidence interval for β was determined using SPSS 20.0, and a level of $p<.05$ was taken as significant.**RESULTS:** 33% of participants could be considered sedentary, not reaching at least 5000 steps/day. They presented a mean BMI 31.3 ±6.6 kg/m², and they performed only 3,256 ±1,223 steps per day. The prediction values between physical activity level and the other variables are in the table below. **CONCLUSIONS**: Unfortunately, health professionals from Sao Paulo state are not active enough. Objectively measured of physical activity level was significantly associated with BMI health professionals.

Physical Activity (PAL) Steps/day

N= 79	β	95% Confidence Interval	p
	1	Lower/Upper Bound	
Weight (kg)	- 52.6	-0.131 -105.4	0.051
Height (cm)	-14.6	-116.9 87.7	0.774
BMI (kg/m²)	-190.5	-21.4 - 359.5	0.028
Abdomen circumference (cm)	-11.2	-71.9 49.4	0.709
Fat percentage (%)	- 64.5	-172.7 43.7	0.234
Muscular strength (kg)	7.6	-92.1 107.2	0.879

$P < .05$

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The Influence of Physical Activity on Energy Balance and Resting Metabolic Rate in Adults

Robert Buresh, FACSM[1], Yuri Feito, FACSM[1], Cassie Williamson[1], Brian Kliszczewicz[1], Corrine Ellis[2], Leah Tsui[2], Anna Schlupp[2], Kelsey Shepard[2], Stella Volpe, FACSM[2]. [1]Kennesaw State University, Kennesaw, GA. [2]Drexel University, Philadelphia, PA.
(No relevant relationships reported)

Recent studies have suggested a constrained energy expenditure model, wherein the capacity of physical activity to increase total daily energy expenditure is limited in part by adaptations in resting metabolic rate. **PURPOSE:** To assess the influence of physical activity energy expenditure (PAEE) (quantified with an ActiGraph GT3X+ activity monitor) on energy balance (EBAL) in a cross-sectional study of free-living adults. **METHODS:** 36 women (39.7 ± 14.8 years of age) and 12 men (33.0 ± 13.7 years of age) participated in this study. Height, weight, waist circumference, body composition, and resting metabolic rate were assessed. Participants wore ActiGraph GT3X+ activity monitors and documented dietary intake via food logs and photographs for 5 to 6 consecutive days. **RESULTS:** PAEE was correlated with EBAL ($r = -0.42$, $p < 0.01$). PAEE explained more than 21% of the variance in EBAL when applied using a quadratic model - EBAL = $0.001(PAEE^2) - 3.105(PAEE) + 635.6$ ($p = 0.011$, $r^2 = 0.214$). Increases in PAEE were associated with decreases in EBAL up to approximately 1,100 kcal·day⁻¹, beyond which no further reductions in EBAL were observed. The capacity of PAEE to reduce energy balance may have been limited, in part, by the inverse relationship between PAEE and resting metabolic rate (RMR) ($r = -0.41$, $p < 0.01$). **CONCLUSIONS:** EBAL was reduced by increasing PAEE up to about 1,100 kcal·day⁻¹, beyond which adjustments in RMR may contribute to preventing further reductions in EBAL. These findings support a constrained model of energy expenditure.

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Exercise and Anxiety in Adults with Arthritis and Other Rheumatic Diseases: Support for Evidential Value

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(No relevant relationships reported)

PURPOSE: Determine whether evidential value exists that exercise reduces anxiety in adults with arthritis and other rheumatic diseases (AORD). **METHODS**: Utilizing data derived from a prior meta-analysis of 14 randomized controlled trials that included 926 participants (539 exercise, 387 control) with AORD, a recently developed approach, P-curve was used to determine evidential value by assessing for publication bias and p-hacking. Binomial tests with p values categorized as either low ($p < 0.025$) or high ($p > 0.025$ up to <0.05) were compared. In adults with AORD, evidential value of a true effect of exercise on anxiety was determined using the more robust Stouffer's test to combine results across studies with half p-curve results that were right-skewed (p value <0.05) or results in which both the half and full tests were right skewed (p value <0.10). Binomial and full p-curve tests based on Stouffer's method were also used to determine if evidential value was inadequate or absent when a 33% power test was <0.05 for the full p-curve or the half p-curve and the binomial test was <0.1. Statistical power was calculated by comparing the expected p-curve for each possible value ranging from 5% to 99% and then choosing the power level that results in an expected p-curve most similar to the actual p-curve. To examine the influence of selected studies on p-curve results, findings were also examined by dropping the highest and lowest p-values from the analysis. All analyses were conducted using P-curve, version 4.052. **RESULTS:** The binomial test trended towards evidential value of a true effect regarding the benefits of exercise in adults with AORD ($p = 0.11$) while the more robust Stouffer's test satisfied both conditions for evidential value ($p = 0.002$ for both full and half p-curves). Similarly, binomial ($p = 0.867$) and full p-curve ($p = 0.953$) results did not suggest that evidential value was inadequate or absent. Power analyses suggested a good fit for the observed p-curve. Results were generally robust when the most extreme values were either included or excluded. **CONCLUSIONS:** The lack of observed publication bias and p-hacking provide evidential support for the benefits of exercise on anxiety in adults with AORD.
Supported by NIH grant R01AR061346.

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341   Board #182   May 30 9:30 AM - 11:00 AM

Activity Pacing, Fatigue, Physical Activity And Quality Of Life In Adults With Multiple Sclerosis

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(No relevant relationships reported)

In response to fatigue persons with multiple sclerosis (MS) make several behavioural adaptations, such as resting and limiting activity, sometimes resulting in an unevenly spread activity pattern throughout the day, consisting of short activity peaks followed by long rest periods. These patterns are inefficient and have been linked to increased disability. Activity pacing is a behavioural strategy that is thought to help alter such inefficient patterns, yet little is known about how persons with MS naturally use this strategy to manage fatigue and optimise their daily activities.
PURPOSE: To examine how actively engaged persons with MS are in pacing decisions in daily life and what their perceived difficulty in preventing overactivity is. Also explore relations of this naturalistic pacing behaviour with fatigue, physical activity (PA) and health-related quality of life (HRQoL).
METHODS: 53 persons with MS (median age= 45 ± 10 years) filled in questionnaires on their active engagement in pacing decisions and perceived difficulty in preventing overactivity (5-point Activity Pacing Questionnaire), fatigue (7-point Fatigue Severity Scale), PA (time spent on activities using an adapted SQUASH) and HRQoL (RAND-12) post rehabilitation, collected within the ReSpAct program, a nationwide multi-centre program aimed at stimulating and promoting an active lifestyle in rehabilitation. The relationships between the variables were examined using hierarchical regression models.
RESULTS: Active engagement in pacing decisions and perceived difficulty in preventing overactivity were high ($3.80 \pm .90$ and 4.00 ± 1.50 respectively). Fatigue was moderately severe (5.78 ± 1.44). HRQoL was fairly good (33.02 ± 10.50). Fatigue was related to low HRQoL ($\beta = -.340$; p= .019). No relations were found between active engagement in pacing decisions and fatigue, between active engagement in pacing decisions and PA and between active engagement in pacing decision and HRQoL.
CONCLUSIONS: The lack of associations between pacing and fatigue, PA and HRQoL despite the high engagement in pacing found in this study indicates the varied use of pacing. While some may be using pacing in response to high fatigue, others may be using pacing to optimise their daily activities. Guidance on pacing may lead to successful health outcomes in persons with MS.

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Association Between Sedentary Behavior, Body Composition, Muscular Strength And Quality Of Life Among Health Professionals

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(No relevant relationships reported)

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Objective: to associate sitting time with body composition, muscle strength and quality of life in health professionals. Methods: The sample consisted of 1036 professionals (241 male and 794 female). Sedentary behavior was measured in minutes / day during the week (short IPAQ). Measures included BMI (kg / m2), abdominal circumference (cm), and handgrip (kg). Quality of life was divided into physical, psychological, social, environmental and general domains (WHOQOL-BREF). **Statistical analysis:** Multiple linear regression was used to associate the study variables. **Results:** Factors associated with sitting time comprised: age and the physical, psychological and social domains of quality of life. The percentage of fat, BMI, Abdomen circumference (cm), Muscular strength (kg) and the environmental and general domains were not associated with sitting time as it is shown in the table below. **Conclusion:** In the present sample sitting time during a weekday presented an inverse association with age and the physical, psychological and social domains of quality of life.

WEDNESDAY, MAY 30, 2018

Sitting time during one day of the week (min/day)			
N= 1036	β	95% Confidence Interval	p
	1	Lower/UpperBound	
Age (years)	-.202	-,019 -.010	< . 001
Percentage of fat (%)	.003	-.003 .004	.940
BMI (kg/m²)	.017	-.002 -.00	.620
Abdomen circumference (cm)	.021	-.004 -.007	.528
Muscular strength (kg)	-.006	-.004 -.003	.850
Quality of Life (Physica)	-.064	-.017 -.003	< . 001
Quality of Life (Psychological)	-,081	-.014 -.002	< . 014
Quality of Life (Social)	-.074	-.015 -.001	< . 025
Quality of Life (Environmental)	.034	-.003 -.009	.308
Quality of Life (General)	- .006	-.011 - .000	. 051

343   Board #184   May 30 9:30 AM - 11:00 AM
Examining Relationships Between Pregnancy Symptoms and Gestational Weight Gain

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(No relevant relationships reported)

Self-reported pregnancy symptoms may impact physical activity levels and dietary behaviors, thereby influencing gestational weight gain (GWG). However, little is known about the relationship between symptoms and GWG. **PURPOSE:** To examine the associations among various pregnancy symptoms (fatigue, back pain, pelvic pain, swelling, and nausea) and GWG. **METHODS:** Women who were 14-20 weeks gestation were recruited into a physical activity and nutrition behavioral intervention. At study enrollment, women completed an online survey that assessed various demographic variables, height and pre-pregnancy weight, and the presence (yes/no) of fatigue, back pain, pelvic pain, swelling, and nausea. GWG was calculated by subtracting pre-pregnancy weight from last recorded weight during pregnancy (range: 31-40 weeks gestation). Linear regression analyses were utilized to investigate relationships among individual symptoms and GWG, controlling for gestational age at last weight and pre-pregnancy body mass index (BMI). An alpha level of 0.05 was used to determine statistical significance. **RESULTS:** Participants (n=38) averaged 28.7±4.1 years of age and 18.1±2.5 weeks gestation at enrollment. A majority of women were married (76.3%), college graduates (65.8%), white (86.5%), and employed (84.2%). Pre-pregnancy BMI averaged 27.9±10.4 kg/m², and gestational age at the last recorded weight averaged 35.9±1.6 weeks, with total GWG averaging 30.9±13.3 pounds. Women reporting nausea had significantly greater GWG than those not reporting nausea (p=0.0015). There were no significant relationships between GWG and fatigue (p=0.97), back pain (p=0.19), pelvic pain (p=0.44), or swelling (p=0.98). **CONCLUSION:** Overall, the presence of nausea during early pregnancy was the only significant predictor of GWG. Specifically, women who reported nausea gained significantly more weight than those who did not. Future research should prospectively investigate the mechanisms by which nausea impacts health behaviors (thereby influencing GWG) within larger, more diverse samples. This information could prove to be valuable targets for behavioral interventions seeking to optimize GWG and maternal/child health outcomes.

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Mean Combined Relative Grip Strength and Metabolic Syndrome: 2011-2014 NHANES

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(Sponsor: James R. Churilla, FACSM)
(No relevant relationships reported)

PURPOSE: Examine mean combined relative grip strength (RGS), stratified by gender, according to individual metabolic syndrome (MetS) criterion and in those with MetS using a nationally representative sample of U.S. adults.
METHODS: Data from the 2011-2014 National Health and Nutrition Examination Survey (NHANES) was used to examine mean combined RGS (kg/BMI) in U.S. adults (≥ 18 years of age) according to individual MetS criterion and in those with MetS. Study sample (n=4307) included adults who participated in the muscle strength examination session in the mobile examination center. Cardiometabolic risk factors included elevated waist circumference (WC), elevated blood pressure (BP), elevated triglycerides (TG), impaired fasting glucose (IFG), and reduced high density lipoprotein cholesterol (HDL-C).
RESULTS: Compared to those with desirable values, mean combined RGS was significantly lower in men (p<0.05) with elevated WC (3.61 vs. 2.79 kg/BMI), elevated BP (3.36 vs. 2.83 kg/BMI), elevated TG (3.44 vs. 2.97 kg/BMI), IFG (3.48 vs. 3.05 kg/BMI), reduced HDL-C (3.31 vs. 3.06 kg/BMI), and in those with MetS (3.47 vs. 2.79 kg/BMI), respectively. Similarly, compared to those with desirable values, mean combined RGS was significantly lower in women (p<0.05) with elevated WC (2.47 vs.1.81 kg/BMI), elevated BP (2.14 vs. 1.72 kg/BMI), elevated TG (2.15 vs. 1.79 kg/BMI), IFG (2.18 vs.1.80 kg/BMI), reduced HDL-C (2.11 vs. 1.84 kg/BMI), and in those with MetS (2.19 vs. 1.72 kg/BMI), respectively.
CONCLUSIONS: Mean combined RGS was lower in men and women with increased cardiometabolic risk and in those with MetS.

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Body Composition and Aerobic Capacity in Mexican Police officers

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(No relevant relationships reported)

In Mexico, there are scarce data on body composition and aerobic capacity (maximal oxygen consumption, VO$_2$max) in police officers. Purpose. To describe body composition and VO2max in Mexican police officers. Methods. This was a descriptive study evaluating body composition and VO2max in 494 police officers (426 men and 68 women). Weight, height and waist circumference were measured and body mass index (BMI) calculated. Body composition was evaluated by bioelectrical impedance analysis (BIA), and VO$_2$max was assessed using the modified Taguchi protocol in a cycle ergometer. VO$_2$max was calculated by the formula suggested by ASCM and classified as superior, excellent, good, fair, poor and very poor. Associations between body composition measures and VO$_2$max by BMI categories were evaluated. Results. The general characteristics of police officers are presented in table 1. By BMI, 19.6%, 49.4%, 24.5 and 6.5% were considered normal weight, overweight, obese class-1 and obese class-2, respectively. By BIA, 77.1% had elevated body fat percentage (BF%). By waist circumference, 57.7% are considered obese. In addition, 22.7% of normal weight, 53.3% of overweight, 81.9% of obese class-1 and 93.8% of obese class-2 had poor and very poor VO2max. By BMI categories, VO$_2$max was inversely correlated with waist circumference (r=-0.33, p=0.001), (r=-0.29, p< 0.001), (r=-0.34, p<0.001), and (r=-0.37, p=0.04), while by Body fat mass (r=-0.22, p=0.03), (r=-0.39; p<0.001), (r=-0.36; p< 0.001), and (r=-0.46; p=0.01) in normal weight, overweight, obese class-1, and obese class-2, respectively. Conclusions. A high percentage of police officers were obese or normal weight and elevated abdominal and/or total body adiposity was associated with low aerobic capacity.

Table 1. Subjects characteristics by BMI classification.			
	NORMAL WEIGHT n=97	OVERWEIGHT n=68	OBESITY CLASS 1 n=121	OBESITY CLASS 2 n=31
Age (years)	30.2 ± 7.3*	34.1 ±7.6	35.6 ±7.9	36.7 ±8.8
VO$_{2max}$ (ml/kg*min)	43.8 ± 6.5¨	39.6 ±6.3**	34.3 ± 5.1**	30.1 ± 4.2**
Waist circumference (cm)	82.7 ± 6.7 ¨	93.8 ± 7.3¨	104.7 ± 7.8**	114.7 ± 7.4 ¨
Body fat mass (kg)	13.5 ± 5.6 ¨	20.6 ± 4.2¨	29.4 ± 4.6 ¨	42.1 ± 5.8 ¨

VO$_{2max}$ = maximal oxygen consumption. Data are presented as mean±SD. ANOVA test was used for differences between BMI categories. Bonferroni post-hoc tests were used.
* p< 0.001 vs all groups. ** p< 0.001 all groups are different.

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Trajectories of Stair Climbing Performance for Black and White Midlife Women

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(No relevant relationships reported)

PURPOSE: To identify longitudinal physical performance trajectories in midlife women and factors associated with each, with focus on physical activity and body mass index (BMI). METHODS: Participants were black (n=397) and white (N=416) women (age 42-57) from the Michigan and Chicago sites of the Study of Women's Health Across the Nation (SWAN). A stair climb test (ascend and descend 4 steps, 3 cycles) was performed at up to 10 visits (min 2; max follow-up about 9 years). Growth mixture modeling was used to identify longitudinal trajectories in stair climb completion time. Physical activity was assessed with the Kaiser Physical Activity Survey (KPAS) and BMI was derived from height and weight (all from baseline). Analyses were stratified by race due to racial disparities in physical performance in this cohort and the broader literature.
RESULTS: We identified two distinct trajectories—a group with relatively stable performance over time and one that substantially slowed—for each race. For black women, 92.9% were in the stable group (median baseline 19.0 sec) and had only a small increase in completion time over follow-up. The group who slowed (7.1%) had a median stair test completion time of 27.5 seconds and slowed about 10 sec over follow-up. For white women, 89.8% were in the stable group (median baseline 17.0 sec). The group who slowed (10.2%) was slightly larger compared to black women, though had a median baseline time of 24.0 sec and slowed about 5 sec over follow-up. Those who slowed had higher baseline BMI (black: 39.8 ± 8.6 vs 31.5 ± 7.3; white: 38.2 ± 7.5 vs 28.8 ± 6.6; $p<0.001$ each) and lower baseline KPAS scores (black: 6.2 ± 1.4 vs 7.4 ± 1.8; white 6.7 ± 1.7 vs 8.3 ± 1.7: $p<0.001$ each) compared to those with stable stair climb time.
CONCLUSIONS: The majority of women had stable stair climb times, but those with higher BMI and lower physical activity tended to substantially slow. Identifying physical performance patterns in midlife may be instrumental in the development of tailored, early interventions for those at risk for steep declines in physical function. SWAN has grant support from the National Institutes of Health Grants U01NR004061; U01AG012505, U01AG012535, U01AG012531, U01AG012539, U01AG012546, U01AG012553, U01AG012554, U01AG012495.

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Relationship between Body Composition and Health Behaviors in High and Low Fit College Women

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(No relevant relationships reported)

College-age women exhibit particular susceptibility to establishing health behaviors resulting in unwanted weight gain or chronic dieting. Understanding the relative contribution of health behaviors to body composition could inform targeted interventions to correct unhealthy weight gain or loss. **PURPOSE:** To create a model describing relationships among physical activity (PA), aerobic fitness (VO_{2max}), eating behavior traits and their association with body composition in female college students. **METHODS:** Female students (n = 98) were recruited from a freshmen-level university nutrition class. Percentage body fat (PBF) was assessed by bioimpedance following an overnight-fast. VO_{2max} was estimated from 1.5-mile time trial performance. Dietary energy intake (EI) was determined using 24-hour dietary recalls and PA was assessed by accelerometry. The eating behavior traits drive for thinness (DT), body dissatisfaction (BD) and cognitive dietary restraint (CRD) were assessed using online surveys. Participants were divided into high fitness (HF) and low fitness (LF) groups by median split and path analyses were conducted. **RESULTS:** HF and LF women differed significantly (p < .05) in EI [36.0 ± 11.7 vs 40.2 ± 9.7 kcal/kg FFM], PA [196.4 ± 42.1 vs 173.7 ± 31.6 axial counts], PBF [$23.2\pm5.7\%$ vs $29.3\pm6.2\%$], BMI [21.7 ± 2.1 vs 23.2 ± 3.0 kg/m^2] and VO_{2max} [41.9 ± 2.5 vs 32.8 ± 5.1 mL/kg/min]. Chi-Square [41.94 with 36 df, p value = 0.23] and CFI [0.85] indicate the models provide a reasonable representation of the data. In both groups, PBF positively correlated with BD [HF: 0.355; LF: 0.406] and negatively correlated with VO_{2max} [HF: -0.487; LF: -0.539]. PBF negatively correlated with DT [-0.252] and positively correlated with EI [0.236] in HF only. PA did not correlate significantly with any variables in the models. **CONCLUSION:** In college-age women, aerobic fitness appears to be the strongest predictor of body composition, even after adjusting for low and high fitness. HF individuals demonstrated expected relationships between DT, EI and PBF which were not seen in LF individuals. Although PA differed between HF and LF, it was not associated with other variables, particularly PBF. These results emphasize the importance of fitness and physical activity in producing favorable body composition among college-age women.

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Association of Breakfast Frequency with Lean Body Mass in Healthy Young Subjects: A Cross-Sectional Study

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(No relevant relationships reported)

Skipping breakfast has been reported to decrease daily energy and nutrient intakes. Therefore, skipping breakfast and subsequent negative energy balance can be one of risk factors associated with reduced muscle mass.
PURPOSE: To investigate whether breakfast frequency is associated with lean body mass (LBM) in Japanese collegiate students.
METHODS: A total of 270 healthy young subjects (152 men, 118 women) participated in this study. We collected information on lifestyle (living condition, breakfast frequency, smoking and drinking habits), eating behavior with the Dutch Eating Behavior Questionnaire (DEBQ), sleep quality with the Pittsburgh Sleep Quality Index (PSQI), circadian rhythm type with the Morningness-Eveningness Questionnaire (MEQ), mental state with the Center for Epidemiologic Studies for Depression Scale (CES-D), and physical activity with the International Physical Activity Questionnaire (IPAQ). According to Dietary Reference Intakes for Japanese, the subjects were asked the breakfast frequency in the past one month (excluding consumption of tablets, energy drinks, confectionary, fruits, dairy products, or sweetened beverage alone). LBM in each part of body was assessed using dual-energy X-ray absorptiometry, and then calculated for appendicular LBM (ALBM). We classified the breakfast frequency into 2 categories (1: 0-6 times, 2: everyday) to clarify the importance of daily breakfast consumption for LBM.
RESULTS: Multiple regression analysis showed that having breakfast everyday was positively related to total LBM ($\beta = 0.065$, P = 0.028, $R^2_{adj} = 0.816$) and ALBM ($\beta = 0.075$, P = 0.012, $R^2_{adj} = 0.809$) after adjusting for age, sex, living condition, BMI, DEBQ, PSQI, MEQ, CES-D, and IPAQ scores as variables.
CONCLUSIONS: We demonstrated that breakfast frequency was associated with total LBM and ALBM regardless of possible confounders, such as sex, BMI, and physical activity. This result suggests that skipping breakfast is one of risk factors for lower muscle mass in healthy young population.

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High Intensity Interval Training and Dietary Supplement Use in the Army

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(No relevant relationships reported)

PURPOSE: To establish health and psychosocial profiles of US Army soldiers who engage in high intensity interval training (HIIT) and/or use risky dietary supplements (rDS).
METHODS: Data were from 2014 US Army Global Assessment Tool (n=252K) survey respondents to characterize Soldiers who engaged in HIIT and/or used rDS (i.e., performance-enhancing /weight-loss products) along with demographics, health behaviors (poor sleep, tobacco use, unhealthy eating, hazardous drinking, physical activity), and psychosocial profiles (emotional/social fitness). HIIT and rDS use were dichotomized and multiple logistic regressions were used to determine associated demographics and health behaviors. Continuous psychosocial scores were analyzed with independent t-tests.
RESULTS: 38% of Soldiers did HIIT and 14% took rDS at least once per year. Soldiers who participated in HIIT were 1.56 times more likely to use rDS than those who did not. Soldiers who engaged in HIIT had increased odds of being active duty (OR = 1.47), and were similar along other military/demographic characteristics. Interestingly, HIIT was associated with lower rates of unhealthy behaviors - including poor sleep (OR = 0.78), tobacco use (OR = 0.83), poor eating (OR = 0.62), hazardous drinking (OR = 0.91), and low activity (OR = 0.73) - and with higher emotional (Cohen's d = 0.22) and social (Cohen's d = 0.53) fitness. Soldiers who used rDS had particularly increased odds of being active duty (OR = 1.29) and male (OR = 1.43). In contrast to HIIT, rDS-use was associated with higher rates of poor health behaviors, including poor sleep (OR = 1.38), hazardous drinking (OR = 1.34), and low activity (OR = 1.15). Psychosocial differences by rDS-use were minimal. Next, Soldiers were classified into four groups based on both HIIT (y/n) and rDS-use (y/n). There were no

notable differences between the HIIT+rDS group and the other groups, although the group not participating in HIIT and used rDS had the poorest health behaviors among the groups.
CONCLUSIONS: HIIT is a popular form of exercise and is likely beneficial in moderation. However, Soldiers who engage in HIIT also have increased rates of rDS use, which could increase risk of adverse events. Even though HIIT and rDS are related to one another, they have distinct associations with health behaviors and psychosocial attributes.

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The "Fit But Fat" Concept: A Re-evaluation Of National Health Data

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(No relevant relationships reported)

Data from the National Health and Nutrition Examination Survey (NHANES) have been used to estimate the proportion of US adults who have high, moderate, and low fitness levels by body mass index (BMI) category. These data have also been used to construct categories for fitness. However, these categories are often weighted unevenly to be more inclusive in the moderate and high-fitness categories. **PURPOSE**: To cross-classify adults in the US population by fitness level and BMI, as well as fitness level and body composition, and to calculate the percentage of the population that can be classified as "fit but fat" using tertiles.
METHODS: Three NHANES datasets covering six years (1999-2004) were included in this study, with a total of 6,648 records meeting the eligibility criteria. Fitness and body composition gender and age-specific percentile ranks were determined from norms published by the Cooper Clinic. A pair of matrices were created to report counts, means and standard errors by body composition level versus fitness level and BMI group versus fitness level.
RESULTS: The BMI matrix showed that $32.9 \pm 1.0\%$ of the population was classified as overweight, and $24.9 \pm 0.9\%$ was classified as obese. Further, $9.9 \pm 0.7\%$ and $6.7 \pm 0.5\%$ of the overweight and obese groups respectively, were classified in the top one-third for fitness. The body composition matrix (based on percent body fat) showed that $18.1 \pm 1.0\%$ were categorized in the middle third, and $68.4 \pm 1.3\%$ were categorized in the lowest tertile (high percent body fat). Additionally, $6.6 \pm 0.6\%$ and $21.0 \pm 0.9\%$ of the overweight and obese groups respectively, were classified in the fittest tertile.
CONCLUSIONS: These data support the notion that one can be "fit but fat," but most are not. Further, there is a large discrepancy in defining "fat". Two-thirds of the population was ranked below the 35th percentile in body composition (compared to 57.8% of the population qualifying as overweight or obese), and more of these individuals are of low fitness than in any other fitness category. These data further support the notion that BMI is a misleading classification and utilizing a more robust measure to qualify fatness may be necessary.

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The Impact of Cardiovascular Disease Diagnosis on Physical Activity Behavior

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(No relevant relationships reported)

Meeting physical activity (PA) guidelines ($\geq$675 MET-min/wk) is recommended by WHO in order to attenuate disease progression and incidence of events in patients with cardiovascular disease (CVD) and cardiovascular risk factors (CVRF).
PURPOSE: To investigate whether patients change their PA behavior after the first diagnosis of CVD/CVRF.
METHODS: This study used cross-sectional and prospective study data from the Nijmegen Exercise Study. Participants' PA and cardiovascular health information were collected from baseline and follow-up questionnaires. CVD was defined as myocardial infarction, stroke, heart failure, or angina. CVRF was defined as a diagnosis of hypertension, hypercholesterolemia, diabetes type 2, thrombosis, or atrial fibrillation. Average PA dose (MET-min/wk) was calculated before and after CVD/CVRF diagnosis. PA was categorized based on baseline PA levels; inactive (<675 MET-min/wk), moderately active (675-1350 MET-min/wk), or highly active (>1350 MET-min/wk) groups.
RESULTS: In the cross-sectional study, 432 CVD patients (86% males) and 1541 CVRF patients (68% males) were included. An increase in PA was observed after CVD/CVRF diagnosis for inactive (289 [93-510] to 540 [157-810] MET-min/wk, *P*<.01) and moderately active groups (975 [810-1155] to 1080 [795-1350] MET-min/wk, *P*<.01). In contrast, the highly active group decreased their PA from 2147 [1702-2939] to 1620 [1011-2273] MET-min/wk (*P*<.01). In the prospective study, 53 new cases (76% males) of CVD and 253 (61% males) of CVRF were observed during a 5-year follow-up. After CVD/CVRF diagnosis, the inactive group increased their PA (450 [270-540] to 1020 [405-1689] MET-min/wk, *P*<.01); the moderately active

group maintained their PA (1013 [810-1215] to 990 [731-1530] MET-min/wk, *P*=.09); whereas the highly active group decreased their PA (1978 [1620-2625] to 1650 [1080-2430] MET-min/wk, *P*<.01).
CONCLUSION: Changes in PA behavior appears to be dependent on initial PA dose. Inactive patients may be more motivated to increase their PA dose after CVD/CVRF diagnosis, whereas no changes were found for moderately active patients and a significant decrease in PA dose is observed in highly active patients. These findings demonstrate that personalized exercise prescription may be needed to optimize PA behavior in CVD/CVRF patients.

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Weight Status, Physical Fitness & Health-related Quality Of Life Among Chinese Adolescents

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(No relevant relationships reported)

PURPOSE: The physical fitness on adolescents' health–related quality of life (HRQOL) is an important health issue in China. The purpose of this study was to examine associations between body mass index (BMI), cardiorespiratory fitness (CRF), musculoskeletal fitness (MSF) and HRQOL among Chinese adolescents. **METHODS:** Participants were 10,007 students (boys: 14.14 years±1.79; girls: 14.22 years±1.81) selected from 30 secondary schools in Shandong, China. Weight, height, 1000 m/800 m runs and the standing-long jump were measured to present BMI, CRF and MSF, respectively. HRQOL was measured by the Quality of Life Scale for Children and Adolescents (QLSCA). ANCOVA and multiple regression were employed to analyze the relationships among BMI, CRF and MSF and HRQOL **RESULTS:** BMI and physical fitness variables were partially associated with HRQOL in Chinese adolescents. Only several dimensions in ANCOVA showed a significant difference by BMI in this test. For boys, significant differences were found in physical sense, living convenience, self-satisfaction. For girls, the significant differences were observed only in social activity opportunity. For both boys and girls, the results also showed the higher MSF scores, the higher student partnership scores; the higher CRF scores, the lower scores in teacher and student relationship , and parent and children relationship. The multiple regression analysis demonstrated that BMI was significantly associated with social activity opportunities. For boys, CRF was associated with teacher and student relationship, self-satisfaction . whereas MSF was only associated with physical sense. For girls, CRF was significantly linked with parent and children relationship, learning capacity and attitudes and self-perception, while MSF was associated with self-perception and other factors. **CONCLUSION:** physical activity and physical fitness will be a crucial pathway in enhancing adolescents' HRQOL in China.

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Leisure-time Physical Activity Throughout Adulthood: Implications For All-cause, And Cause-specific Mortality

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(No relevant relationships reported)

PURPOSE: Limited evidence documents the benefits of leisure-time physical activity (LTPA) throughout adulthood on mortality risk. This study modelled LTPA patterns from adolescence into middle-age and their associations with all-cause, CVD, and cancer mortality. **METHODS**: In 1994-96, 315,059 adults (58% males) aged 50-71 yrs enrolled in the NIH-AARP Diet and Health study retrospectively described their participation in LTPA (hours/week) for approximate ages 15, 25, 35 yrs, and 50 yrs. LTPA patterns over these age-periods were modelled using semi-parametric group-based mixture models and 10 LTPA patterns throughout adulthood were identified. Participants were followed for mortality through 2011. Associations between life-course LTPA patterns and mortality were modelled using Cox proportional hazard models [(Hazard Ratios (HR) and 95% CI)] adjusting for age, sex, race, education, smoking, body mass index, and diet. The least active LTPA pattern (0 hrs/wk throughout all age-periods) was used as the referent group.
RESULTS: Over 13.6 yrs of follow-up. a total of 71,377 deaths from all-causes, 22,219 deaths from CVD, and 16,388 deaths from cancer occurred. Compared to those who were consistently inactive throughout adulthood, participants who maintained LTPA participation over time were at lower risk for all-cause, CVD, and cancer mortality. For example, maintaining 7+ hrs/wk resulted in risk reduction of 29% for all-cause [HR: 0.71 (0.68, 0.73)], 24% for CVD [HR: 0.66 (0.62, 0.70)], and 10% for cancer mortality [HR: 0.90 (0.83, 0.97)]. Adults who were inactive at ages 15-35

(~1hr/week) but increased LTPA over time also had consistent reductions in risk for all-cause [HR: 0.65 (0.62, 0.68)], CVD [HR: 0.57 (0.53, 0.61)], and cancer mortality [HR: 0.84 (0.77, 0.92)]. In contrast, adults who reduced LTPA in adulthood had the lowest mortality benefits for all-cause and CVD mortality, and no benefits for cancer mortality.
CONCLUSIONS: Participants who maintained or increased LTPA by their ~50's had the lowest risk for mortality, independent of previous LTPA. LTPA during midlife (i.e., ~50yrs) rather than LTPA early in adulthood (i.e., 15's through 35's) seems to be most important for both all- and cause-specific mortality.

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Physical Activity Declines At Significant Life Events In Young Adults

Jon Miller, Megan Winkler, Mary Christoph, Toben Nelson, Daheia Barr-Anderson, FACSM, Dianne Neumark-Sztainer. *University of Minnesota, Minneapolis, MN.* (Sponsor: Daheia Barr-Anderson, FACSM)
(No relevant relationships reported)

Purpose: Predictable life events like marriage, birth of a child or gaining employment may be opportunities to intervene on health behaviors like physical activity. The purpose of this study was to determine which life events during the transition from adolescence to adulthood are associated with the greatest changes in moderate to vigorous physical activity (MVPA). **Methods**: Adolescent participants in Project EAT (ages 11 to 18 at baseline and 25 to 36 at EAT-IV) were surveyed at four time points, roughly 5 years apart, on whether they had married or divorced, had children, begun or lost employment, begun or ended post-secondary education or left or returned to their parent's home between each wave. Linear regression was used to model the effect of each of these life events on change in self-reported MVPA. Post-hoc four-way decomposition mediation analysis was conducted to examine whether the effect of having a child mediated the effect of getting married on change in MVPA. **Results**: Average reported MVPA declined from 6.5 hours per week at baseline to 4.3 hours per week at EAT-IV. Having a child was associated with a significant decrease in MVPA between waves 2 and 3 (-0.84 hours per week, 95% CI: -1.39 to -0.30) and between waves 3 and 4 (-1.02 hours per week, 95% CI: -1.52 to -0.53). Getting married (-0.99 hours per week, 95% CI: -1.58 to -0.41), moving back in with parents (-1.06 hours per week, 95% CI: -2.06 to -0.07), and leaving parents' home (-1.07 hours per week, 95% CI: -1.97 to -0.17) were associated with significant decreases in MVPA between waves 3 and 4. The proportion of the total effect of getting married on physical activity that was mediated by having a child (proportion mediated: 0.42, 95% CI 0.16 to 0.69) was similar to the proportion of the total effect that was due to interaction with having a child (proportion attributable to interaction: 0.54, 95% CI -0.12 to 1.20). **Conclusion**: There is evidence in this study that physical activity declines both after getting married and after having a child. Interventions to maintain or increase physical activity should be targeted at couples planning to get married or have a child. Pre-marital counselling and pre-natal clinics would be efficient targets for interventions like financial incentives for gym or fitness group memberships.

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Why Do Girls Play? Strength And Competitiveness But Not 2d:4d Ratio Are Predictive Of Retrospective Sport Participation In University Aged Women

Elizabeth Vandenborn, Cayla Wood, Kevin Milne. *The University of Windsor, Windsor, ON, Canada.*
(No relevant relationships reported)

Women continue to participate in sport at a lower rate than males at all ages. Girls who participate in sport gain many advantages (e.g. better bone health, greater cardio-respiratory fitness, better mental health). However, even with programs designed to emphasize participation, some women choose to continue sport participation, while others do not. Given the potential advantages and controversies currently surrounding testosterone and female sport participation, it is possible that this hormone may predispose women toward sport participation.
PURPOSE: To determine if the 2nd to 4th digit ratio (2DR) correlates with sport participation throughout adolescence and young adulthood in women. **METHODS:** A cross-sectional analysis of indirect prenatal androgen concentrations (i.e. 2DR) was obtained from 92 females (aged 18-30y). Participant demographic, anthropometric, behavioural, and retrospective sport participation information were collected on one occasion. **RESULTS:** 2DR was not significantly correlated with total sport participation (r = -0.650, p = 0.538). Secondary analysis revealed significant correlations between sport participation and max hand grip (r=.406, p = 0.000), sport competitiveness (Sport Orientation Questionnaire) (r = 0.475, p = 0.000) and Sport Aggression (Scale of Children's Action Tendencies in Sport) (r = 0.240, p = 0.021). **CONCLUSION:** While 2DR does not, strength and the sport specific behavioural traits of competitiveness and aggression are able to predict retrospective sport participation. However, causality of these relationships could not be determined because some traits are likely strengthened through sport participation and androgens

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have been linked to strength, competitiveness, and aggression. Given that females participate in sport at lower rates than males, and that sport provides multiple social and health advantages, continuing to determine what factors influence female sport participation is necessary.

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356   Board #197   May 30 9:30 AM - 11:00 AM

Demographic, Health Behavior, And Cardiometabolic Risk Factor Profiles In Yoga And Non-yoga Participants: Nhanes 1999-2006

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(No relevant relationships reported)

BACKGROUND: Previous studies have described the demographic and limited disease status characteristics of yoga participants using nationally representative data. However, there is a paucity of population-based data describing the cardiometabolic risk factors of yoga participants in the U.S. PURPOSE: To examine the demographic, health behavior, and cardiometabolic risk factor characteristics of participants who report participating in yoga verses not participating yoga using a nationally representative sample of U.S. adults. METHODS: Study participants were from the 1999-2006 National Health and Nutrition Examination Survey (NHANES) who self-reported participation in yoga (n=171) or no-yoga (n=8,817). Demographic variables included: age, gender, race/ethnicity, and education. Health behaviors included: smoking status, alcohol consumption, and the healthy eating index. Cardiometabolic risk factors included: HbA1c, blood pressures (BP), BMI, waist circumferences, cholesterol, homeostatic model assessment of insulin resistance (HOMA), glucose, and insulin. SAS survey procedures were used for all analyses. RESULTS: Yoga participants were primarily female (82.6%), were college educated (57.6%), were mostly non-smokers (61.7%), and reported moderate alcohol consumption (75.1%). Yoga participants, compared to their non-yoga counterparts, had a healthier cardiometabolic risk profile: HbA1c (5.2 vs 5.4%), BP (114/69 vs 121/72mmHg), BMI (24.7 vs 27.7 kg/m²), waist circumferences (85.9 vs 95.3 cm), HOMA (1.2 vs 2.0mIU/L), glucose (91.8 vs 100.0 mg/dl), and insulin (7.8 vs 10.8 uU/mL), respectively. CONCLUSION: These results are the first to examine the cardiometabolic risk factor profiles of yoga users using a nationally representative sample of U.S. adults. Given the emergence of yoga as a common form of physical activity, it is imperative to understand the characteristics of those who participate in yoga to further understand its relationship with cardiovascular risk.

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357   Board #198   May 30 9:30 AM - 11:00 AM

Determination of Health Status Using SelfRated health and Physiological Markers of Fisherfolks in Ghana Central Region

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(No relevant relationships reported)

PURPOSE: Occupational lifestyle is ascertained to influence one's health. Studies have shown that 10 bpm increases in resting heart rate especially when compared with 45bpm is a significant risk cause for all mortality with increasing heart rate (HR) in linear relation. Self-rated health has been accepted as a predictor of health and mortality as well as HR and blood pressure. There is the need to ascertain the self-rated health through objective measures using physiological markers (systolic blood pressure (SBP), diastolic blood pressure (DBP), HR, Body mass index) in determining health status of fisherfolks in Central Region of Ghana. **METHODS**: The research designs were survey and quasi experimental. Purposive and convenient sampling methods were used to select the two urban fishing communities and 361 participants (64.3% (n=233males and 35.7% (n=129females) with ages ranging from 15-100 (M = 37.5, SD = 1.399) for the study. Institutional approval and informed consent were obtained. Deluxe auto Digital Blood Pressure Monitor (Model MS-752), stadiometre and body fat/hydration scale (Model 7032497) were used to collect the physiological data and a standardized self-rated health questionnaire. Descriptive statistics and multiple regression analyses were the statistical tools used.**RESULTS**: SRH of fair or poor was reported by 49% ($n = 177$) of the participants. However, 7.8% ($n = 28$) had low HR while 30% ($n = 108$) had high or very high HR; 36.3% ($n = 131$) had SBP stage one and two hypertension while 47.1% ($n = 170$) were pre-hypertensive; 44.6% ($n = 161$) had stage one or two DBP hypertension, with 23% ($n = 83$) being pre-diastolic hypertensive. Multiple regression analysis indicated that the general model was statistically significant in predicting the health status of the fisherfolks, $F (8,352) = 3.582$, $p = 0.001$, $adj.R^2 = 0.005$. However, gender ($p = 0.021$) and age ($p = 0.002$) were the only significant independent predictors of the health status of the fisherfolks. **CONCLUSIONS**: The fair and poor health of 49% SRH correlated with the objective measures of 30% high HR as well as 36.3% and 44.4% high SBP and DBP

Abstracts were prepared by the authors and printed as submitted.

predicting health status of the fisherfolks. This revealed high mortality and all-cause of cardiovascular disease risks among fisherfolks signaling the need for multilevel interventions considering age and gender.

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The Association Between Muscle Strength and Hyperuricemia in the Healthy Adults

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(No relevant relationships reported)

PURPOSE: This study aimed to examine the prevalence of hyperuricemia in association with relative grip strength and leg strength in Korean Elderly.
METHODS: We studied cross-sectional analysis with 1,896 rural adults(40-88 year-old), who were surveyed for 7 years from 2007 to 2014. grip strength was measured by using Takei grip strength dynamometer. Leg strength was measured by using Takei leg strength dynamometer. hyperuricemia was defined by examining serum uric acid(SUA) concentration(Male=SUA$\geq$7mg/dL, Female=SUA$\geq$6mg/dL). Logistic regression was conducted to evaluate the association of grip strength and Leg strength with hyperuricemia (p<0.05)
RESULTS: When age, sex and other risk factor of the hyperuricemia are adjusted, subjects who reported high level of relative grip strength had a significantly lower odds ratio (OR) of hyperuricemia than subjects who reported low level of relative grip strength (OR: 0.36, 95% CI: 0.16-0.82). When it comes to gender, subjects both high relative muscle strength(are significantly lower Multivariate-adjusted OR of hyperuricemia than subjects both low relative muscle strength in man (OR: 0.56, 95%CI: 0.31-0.99) and women (OR: 0.50, 95%CI: 0.28-0.90). But, subjects who have high relative grip strength and low relative leg strength are significantly lower Multivariate-adjusted OR of hyperuricemia than subjects both low relative muscle strength only in women (OR: 0.38, 95%CI: 0.17-0.84)
CONCLUSIONS: The relationship between hyperuricemia and relative grip strength may be mediated through decreased estimated glomerular filtration ratio (eGFR). Therefore, muscle strength is important factor in prevention of renal vascular dysfunction which is a risk factor of hyperuricemia, and resistance exercise is needed to improve muscle strength.

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359   Board #200   May 30 9:30 AM - 11:00 AM

Separate Associations of Intrinsic and Acquired Cardiorespiratory Fitness on All-Cause Mortality

Louise de Lannoy[1], Xuemei Sui[2], Steven N. Blair, FACSM[2], Robert Ross, FACSM[1]. [1]Queen's University, Kingston, ON, Canada. [2]University of South Carolina, Columbia, SC.

(No relevant relationships reported)

Cardiorespiratory fitness (CRF) is a strong and independent predictor of mortality risk, however, it is unclear whether the association between CRF and mortality is mediated by the adoption of physical activity (PA; acquired CRF) or by underlying intrinsic CRF. In response we examined the association of intrinsic and acquired CRF on risk of all-cause mortality in men and women using follow-up CRF data from the Aerobics Centre Longitudinal Study cohort.
PURPOSE: To determine whether all-cause mortality risk differs between individuals who achieve high CRF through the adoption of PA compared to those who have intrinsically high CRF.
METHODS: A prospective study with at least two clinical visits (mean follow-up time: 14.0 (8.6) years) between 1974 and 2002 to assess CRF mortality risk in individuals who became active vs those who remained inactive at follow-up. Participants were 2,337 inactive men and women at baseline. Acquired CRF was defined as CRF of individuals who became active and improved CRF at follow-up, intrinsic CRF was defined as CRF of individuals who remained inactive at follow-up. The range of follow-up CRF values for both groups was set to 8-12 METs to achieve high (~10 METs) follow-up CRF values.
RESULTS: Individuals who had intrinsically high CRF at follow-up had a 20% reduced mortality risk for every 1 MET increase in CRF after adjusting for age, sex, follow-up weight (p<0.05). Hazard ratios were not materially different after further adjusting for change in systolic blood pressure, smoking, alcohol intake, diabetes mellitus, total cholesterol, abnormal ECG, family history of CVD (HR: 0.82 (0.68, 0.98); p<0.05). Individuals who had acquired a high CRF at follow-up had a 32% reduced mortality risk for every 1 MET increase in CRF after adjusting for age, sex, follow-up weight (p<0.05). Hazard ratios were not materially different after further adjusting for common risk factors associated with premature mortality (HR: 0.72 (0.59, 0.87); p<0.05).
CONCLUSION: While both intrinsic and acquired CRF were associated with a reduction in all-cause mortality risk, individuals who became active and improved CRF had a lower risk of all-cause mortality than those with intrinsically high CRF. This is the first analysis to show that the way in which CRF is achieved influences its association with mortality.

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Flourishing in Overweight and Obese Adolescents of Varying Physical Activity Levels

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(No relevant relationships reported)

Adolescents, who are overweight or obese, are less likely to flourish, and more likely to bully others and experience emotional difficulties. However, it is unknown whether engagement in regular physical activity (PA) is associated with these measures among overweight and obese adolescents. **PURPOSE:** To examine associations between body mass index (BMI) and PA levels with measures of flourishing, bullying and emotional difficulties. **METHODS:** Analyses included 12,592 adolescents, ages 10-17 years, from the 2011-12 National Survey of Children's Health. Adolescents were grouped into categories based on BMI (overweight or obese) and PA (0-2, 3-4, or 5-7 d/wk). Outcomes included measures of flourishing (finishing tasks, staying calm when faced with a challenge, and showing interest in learning new things), emotional difficulties (excessive arguing and unhappiness) and bullying. Logistic regression models, adjusted for age, sex, gender, household income, and education assessed the odds of each outcome comparing BMI classification and PA groupings. **RESULTS:** Compared to overweight adolescents who engaged in 0-2 d/wk of PA, those who engaged in PA 3-4 d/wk were 44% more likely to finish tasks, 58% more likely to stay calm, 72% more likely to show interest in learning new things, 30% less likely to argue excessively, and 42% less likely to be unhappy (p's<0.01). Compared to obese adolescents who engaged in 0-2 d/wk of PA, those who engaged in PA 3-4 d/wk were 41% more likely to finish tasks, 37% more likely to stay calm, 73% more likely to show interest in learning new things, 27% less likely to argue excessively, 58% less likely to be unhappy, and 47% less likely to bully others (p's<0.001). Furthermore, for adolescents who engaged in PA 5-7 d/wk, the odds of flourishing were significantly higher, and the odds of emotional difficulties and bullying were significantly lower (p's<0.001). **CONCLUSIONS:** Overweight and obese adolescents that engaged in greater amounts of PA ($\geq$3 d/wk) were significantly more likely to flourish, and less likely to experience emotional difficulties and bully others compared to adolescents that engaged in >3 d/wk of PA. This suggests that increasing engagement in physical activity may increase flourishing and decrease emotional difficulties and bulling behaviors among overweight and obese adolescents.

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Combined Association of Cardiorespiratory Fitness and Family History of Hypertension on the Incidence of Hypertension

Yuko Gando[1], Susumu S. Sawada, FACSM[1], Ryoko Kawakami[2], Haruki Momma[3], Kazunori Shimada[4], Yasushi Fukunaka[5], Takashi Okamoto[5], Koji Tsukamoto[5], Motohiko Miyachi[1], I-Min Lee, FACSM[6], Steven N. Blair, FACSM[7]. [1]National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. [2]Waseda University, Saitama, Japan. [3]Tohoku University Graduate School of Biomedical Engineering, Sendai, Japan. [4]Juntendo University Graduate School of Medicine, Tokyo, Japan. [5]Tokyo Gas Co., Ltd., Tokyo, Japan. [6]Harvard Medical School, Boston, MA. [7]University of South Carolina, Columbia, SC.

(No relevant relationships reported)

Family history of hypertension (FH) is a non-modifiable risk factor of hypertension. However, cardiorespiratory fitness (CRF) is a modifiable risk factor and may be important for preventing hypertension for both people with and without FH.
PURPOSE: The purpose of this study was to investigate the combined association of CRF and FH on the incidence of hypertension in male Japanese workers. **METHODS**: A total of 6890 male workers, who were free from hypertension, were included in this study. CRF was determined using a submaximal exercise test, with a cycle ergometer. A self-reported questionnaire was used to determine FH. Six groups were established, combining the 2 groups with and without FH (Yes, No) and the 3 groups based on age-specific tertiles of CRF (Low, Moderate, High). The incidence of hypertension, defined as systolic blood pressure of $\geq$140 mmHg or diastolic blood pressure of $\geq$90 mmHg, or self-reported physician-diagnosed hypertension, was evaluated. Cox proportional hazards regression analysis was performed with incidence of hypertension as the dependent variable and the 6 groups as independent variables. Hazard ratios (HRs) and 95% confidence intervals (CIs) were calculated after adjustment for age and potential confounding factors (BMI, cigarette smoking, and alcohol intake). **RESULTS**: During the observation period of 101,212 man-years of observation (median 17 years, minimum 1 year, maximum 23 years), 2210 workers developed hypertension. There were 3860 participants who had a FH (56%). As compared with the Yes-Low group, the HRs for hypertension were 66% lower in No-High (HR 0.34 [95%CI, 0.28-0.40]),

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47% lower in No-Low (HR 0.53 [95%CI, 0.46-0.61]), and 24% lower in Yes-High (HR 0.76 [95%CI, 0.67-0.86]). FH and CRF did not show a significant interaction (*p* for interaction = 0.181).
CONCLUSIONS: The combination of FH and CRF showed a clear association with the risk of hypertension, and even participants with FH showed a lower risk of hypertension when the level of CRF was high. FH and CRF did not show a significant interaction. Therefore, these findings suggest that CRF might be equally beneficial for preventing hypertension in both people with and without FH.

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Impact of Air Pollution on Physical Activity: A Cohort Study of Beijing College Students

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(No relevant relationships reported)

Purpose: Air pollution has become a substantial environmental issue affecting human health and health-related behavior worldwide, especially in Beijing, China. Physical activity (PA) has been well demonstrated as a means to promote people's health and well-being and is potentially being influenced by the air pollution. Yet, the effects of air pollution on PA behavior have not been well investigated. This study examined of the impacts of air pollution on moderate to vigorous PA(MVPA) among college students in Beijing, China. **Methods:** We conducted the follow-up health surveys on 9,095 freshmen from Tsinghua University in Beijing during 2013-2015, and their PA was measured by the "International Physical Activity Questionnaire" (IPAQ) questionnaire. Air pollution data included average hourly air quality index (AQI), $PM_{2.5}$, PM_{10}, SO_2 and NO_2 (μg/m³) were measured by Ministry of Environmental Protection of the People's Republic of China. The data were analyzed using the linear fixed-effect regressions. **Results:** An one standard deviation (SD) increase in air pollution concentration in AQI, $PM_{2.5}$, PM_{10}, SO_2 and NO_2 was associated with a reduction in weekly total minutes of vigorous PA by 61.18, 43.14, 71.37, 20.73 and 19.66, respectively; a reduction in weekly total minutes of moderate PA by 80.10, 56.62, 93.52, 27.47 and 25.88, respectively; a reduction in weekly total minutes of MVPA by 147.17, 104.15, 171.90, 50.57 and 47.64, respectively. **Conclusions:** Air pollution discouraged MVPA among college students. Future studies are warranted to replicate study findings in other subpopulations and China cities, and policy interventions are urgently called to reduce air pollution level in China.

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Cardiorespiratory Fitness and Incidence of Dyslipidemia: A Cohort Study Among Japanese Women

Takahisa Ohta[1], Susumu S. Sawada, FACSM[2], Kana Takagi[3], Junzo Nagashima[3], Takeshi Yoshihisa[3], Yasunori Imagawa[3], Nobuyoshi Ono[3], Wataru Fukuda[3], Reno Koyanagi[3], Yuko Gando[2], Motohiko Miyachi[2], Hiroyuki Sasai[1], I-Min Lee, FACSM[4], Steven N. Blair, FACSM[5], Naokata Ishii[1]. [1]*The University of Tokyo, Tokyo, Japan.* [2]*National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan.* [3]*Yokohama City Sports Medical Center, Yokohama, Japan.* [4]*Harvard Medical School, Boston, MA.* [5]*University of South Carolina, Columbia, SC.*
(No relevant relationships reported)

Low cardiorespiratory fitness (CRF) and overweight/obesity are independent risk factors for dyslipidemia. However, the relationship between the combination of CRF and body mass index (BMI) on incidence of dyslipidemia is not clear among Asian women.**PURPOSE:** To investigate the joint effects of CRF and BMI on the incidence of dyslipidemia among Japanese women. **METHODS:** This cohort study was conducted in 927 normolipidemic Japanese (median [interquartile range] age 49 [37-63] years). Participants completed a submaximal exercise test, a medical examination, and questionnaires on their smoking and drinking habits. BMI was calculated from measured weight and height. CRF, physical work capacity at 75% of maximum heart rate, was measured using a cycle ergometer. We determined the incidence of dyslipidemia, defined as having at least one of the following criteria; fasting plasma high-density lipoprotein cholesterol <40 mg/dL, low-density lipoprotein cholesterol ≥140 mg/dL, fasting triglyceride ≥150 mg/dL, or self-reported physician-diagnosed dyslipidemia. Multivariable odds ratios and 95% confidence intervals for the incidence of dyslipidemia were obtained using logistic regression models after adjustment for age, systolic blood pressure, smoking, and drinking habit. **RESULTS:** During the mean follow-up period of 10.0 years, 196 (21.1%) women developed dyslipidemia. There was an interaction between CRF and BMI (p for interaction = 0.006). Using the 1st tertile of CRF and high BMI (≥25kg/m²) as reference, the multivariable odds ratios and 95% confidence intervals were 0.52 (0.31-0.86) for 1st tertile of CRF and low BMI (<25kg/m²), 1.92 (0.73-5.03) for 3rd tertile of CRF and high BMI, and 0.30 (0.17-0.52) for 3rd tertile of CRF and low BMI, respectively. **CONCLUSION:** This result

suggests that there is a strong interaction effect of CRF and BMI on the incidence of dyslipidemia among Japanese women, such that CRF was inversely related to lower incidence of dyslipidemia only among those with low, but not high, BMI.

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Cardiorespiratory Fitness Measured from Cardiopulmonary Exercise Testing for Mortality Risk Prediction in Apparently Healthy Men and Women

Mary T. Imboden[1], Matthew P. Harber, FACSM[1], W H. Finch[1], Derron L. Bishop[2], Mitchell H. Whaley, FACSM[1], Leonard A. Kaminsky, FACSM[1]. [1]*Ball State University, Muncie, IN.* [2]*Indiana University School of Medicine, Muncie, IN.* (Sponsor: Leonard A. Kaminsky, FACSM)
(No relevant relationships reported)

Over the past three decades numerous studies have illustrated the inverse relationship between cardiorespiratory fitness (CRF) and mortality. However, this relationship has almost exclusively been studied using estimated CRF (CRF_e), with known error of ± 3 to 7 ml/kg/min, with no studies assessing this association using directly measured CRF in both men and women that were apparently healthy at baseline testing. **PURPOSE**: To assess the association of CRF, obtained using cardiopulmonary exercise testing (CPX) on all-cause mortality in a large cohort of apparently healthy men and women at baseline. **METHODS**:Participants included 4,137 participants (2,326 M, 1,811 W; mean age: 42.8 ± 12.2 y) free from cardiovascular disease and cancer at baseline, who underwent a maximal CPX to determine CRF. Participants were followed for 24.2 ± 11.7 years (1.1 to 49.3 y) for mortality outcomes using data from the National Death Index. Participants were categorized into CRF tertiles (low, moderate, and high) based on age and sex-specific percentiles, from the Fitness Registry and the Importance of Exercise National Database (FRIEND). Cox-proportional hazard models adjusted for age were performed to determine the relationship of CRF with all-cause mortality. **RESULTS**: After a mean follow-up of 24.2 years, 727 participants were deceased. CRF was inversely related to all-cause mortality, where low CRF was associated with a 31% increased risk for all-cause mortality compared to high CRF (Hazard ratio (HR) 1.31; p<0.01). The inverse relationship between CRF and all-cause mortality was also present for men and women when examined independently. Specifically, Low fit men and women had a 54% and 28% higher risk of dying from all-causes compared to high fit men and women (Men HR 1.54, p<0.01; Women HR 1.28, p<0.01), respectively. **CONCLUSIONS**: These data demonstrate that CPX measured CRF is a strong predictor of all-cause mortality. This coupled with the known diagnostic and prognostic value of CPX measures in clinical populations and the recent support for CRF as a vital sign suggest it should be considered in clinical practice, as it may help to improve the efficacy of the risk assessment and guide clinical decisions.

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365   Board #206   May 30 9:30 AM - 11:00 AM

Obesity And Health-related Physical Activity Behavior In Selected European Countries: Needs Assessment for the Eubohealth-consortium

Lina Hermeling, Marion Flechtner-Mors, Romy Lauer, Jürgen M. Steinacker, FACSM, Susanne Kobel. *Ulm University, Ulm, Germany.* (Sponsor: Prof. Jürgen M. Steinacker, FACSM)
(No relevant relationships reported)

The global burden of overweight and obesity is constantly rising for several decades. Physical activity (PA) is an essential determinant for health, prevention and treatment of many chronic diseases that are related to overweight and obesity. **PURPOSE**: In 2017, he EUBOHEALTH-Consortium was founded with the intention to promote health and normal weight for citizens in Central, Eastern and South Eastern Europe. In order to prepare a large-scale scientific study proposal, a needs assessment in form of a meta-analysis of the initiating countries is being conducted. **METHODS**: A comparison of obesity prevalence and PA behavior between the countries of Croatia, Hungary, Estonia, Germany and the (estimated) European Union average is conduced based on the European Health Interview Survey (EHIS), wave 2 (Eurostat, 2014). Data on non-work-related PA and effort involved in performing work-related PA were used. In addition, the time spent in health-enhancing aerobic PA was assessed and subdivided into four categories: zero, one to 149, 150 to 200 and above 300 minutes per week. All subjects were aged 15 years or over. **RESULTS**: In all four observed countries, the obesity prevalence was higher than the European Union average of 15.4% (Croatia: 18.0%, Hungary: 20.6%, Estonia: 19.9%, Germany: 16.4%). On average, 48.8% of the population of the European Union are not engaged into health-enhancing aerobic PA (Croatia: 58.6%, Hungary: 43.4%, Estonia: 52.3%, Germany: 28.8%). The most severe heterogeneity can be observed in performing muscle strengthening activities (EU-average: 24.2%, Croatia: 9.6%, Hungary: 23.7%, Estonia: 15.4%, Germany: 44.1%). **CONCLUSIONS**: There is a substantial need for the promotion of health-enhancing PA to stop the rising burden of obesity associated disease in several (European) countries. No comparable data from the fifth member state (Serbia) were available. The EUBOHEALTH-Project is funded by the German Federal Ministry of Education and Research.

WEDNESDAY, MAY 30, 2018

366   Board #207   May 30 9:30 AM - 11:00 AM

The Association of Physical Activity and Body Mass Index with Myocardial Infarction: The Tromsø Study

Marius Renninger[1], Maja-Lisa Løchen[1], Ulf Ekelund, FACSM[2], Laila A. Hopstock[1], Lone Jørgensen[1], Ellisiv B. Mathiesen[1], Inger Njølstad[1], Henrik Schirmer[1], Tom Wilsgaard[1], Bente Morseth[1]. [1]UiT - The Arctic University of Norway, Tromsø, Norway. [2]Norwegian School of Sport Sciences, Oslo, Norway. [3]University Hospital of North Norway, Tromsø, Norway.
(No relevant relationships reported)

PURPOSE: Physical activity and overweight are both associated with myocardial infarction (MI). However, their joint association with MI remains unclear. Our objective was to examine the independent and joint association between physical activity, body mass index (BMI) and MI.
METHODS: This prospective cohort study included 16572 men and women aged 20-54 years who took part in the second Tromsø Study survey. At baseline in 1979-80 physical activity was assessed by questionnaire. Data on MI was collected through hospital registries between 1979 and 2013. Cox proportional hazards models were used to examine the independent and joint associations between physical activity, BMI and MI.
RESULTS: After exclusions, the final sample used in the analysis included 16104 individuals. During a median follow up of 34 years, 1613 incident cases of MI were documented. Physical activity and BMI were both independently associated with MI. Hazard ratio (HR) (95% confidence interval) for moderately active compared to inactive individuals was 0.87 (0.77-0.98), for overweight compared to normal weight individuals HR was 1.54 (1.39-1.72), and HR for obese compared to normal weight individuals was 2.70 (2.24-3.26). In joint analysis, normal weight inactive individuals had a 20% higher risk of MI compared to their active counterparts (HR 1.20 (1.02-1.41)). The highest risk of MI was seen in obese inactive individuals with a 3-fold increased risk compared to active normal weight individuals (HR 3.20 (2.30-4.44)). The risk of MI increased with increasing BMI regardless of the activity level. Nevertheless, HRs were lower for active compared to inactive individuals within the same weight category.
CONCLUSIONS: The findings suggest that physical activity and BMI are independently associated with risk of MI in young and middle-aged men and women. Physical activity seems to attenuate but not eliminate the risk of being overweight or obese with MI.
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Disclosures: None

367   Board #208   May 30 9:30 AM - 11:00 AM

Cardiorespiratory Fitness, Alcohol Consumption And The Incidence Of Hyper Non-hdl Cholesterolemia: A Cohort Study

Natsumi Watanabe[1], Kazunori Shimada[2], Susumu S. Sawada, FACSM[3], I-Min Lee, FACSM[4], Yuko Gando[3], Haruki Momma[5], Ryoko Kawakami[6], Motohiko Miyachi[3], Yumiko Hagi[7], Chihiro Kinugawa[8], Takashi Okamoto[8], Koji Tsukamoto[8], Steven N. Blair, FACSM[9]. [1]Juntendo University, Chiba, Japan. [2]Juntendo University Graduate School of Medicine, Tokyo, Japan. [3]National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. [4]Harvard Medical School, Boson, MA. [5]Tohoku University, Sendai, Japan. [6]Waseda University, Saitama, Japan. [7]Tokai University, Kanagawa, Japan. [8]Tokyo Gas Co., Ltd., Tokyo, Japan. [9]University of South Carolina, Columbia, SC.
(No relevant relationships reported)

Physical inactivity is a risk factor of non-high-density lipoprotein (HDL) cholesterolemia, and also high alcohol consumption increases HDL cholesterol. However, the interaction between cardiorespiratory fitness (CRF), an objective marker of physical activity, and alcohol consumption on the incidence of hyper non-HDL cholesterolemia is not clear.**PURPOSE**: To investigate the joint effect of CRF and alcohol consumption on the incidence of hyper non-HDL cholesterolemia among Japanese men. **METHODS**: We evaluated CRF and the incidence of hyper non-HDL cholesterolemia in 4,067 Japanese men [median (IQR) age 36 (30-44) years] who were free from hyper non-HDL cholesterolemia. Participants underwent a submaximal exercise test, a medical examination, and questionnaires on their health habits including alcohol consumption (less than 1g/day, 1-22g/day, ≥23 g/day) in 1986. CRF was measured using a cycle ergometer and maximal oxygen uptake was estimated. The incidence of high levels of non-HDL cholesterolemia (≥ 170 mg/dL) from 1986 to 2006 was ascertained based on fasting blood levels. Hazard ratios and 95% confidence intervals for the incidence of hyper non-HDL cholesterolemia were calculated using Cox proportional hazard models after adjustment for age, body mass index, systolic blood pressure, smoking, and family history of dyslipidemia. **RESULTS**: Hyper non-

HDL cholesterolemia was observed in 1,482 participants during the follow-up period. Using the Low CRF & less than 1g/day alcohol consumption group as reference, the hazard ratios and 95% confidence intervals were 0.88 (0.73 - 1.06) for Low CRF & ≥23 g/day alcohol consumption group, 0.77 (0.64 - 0.93) for the High CRF & less than 1g/day alcohol consumption group, and 0.70 (0.57 - 0.87) for the High CRF & ≥23 g/day alcohol consumption group, respectively. **CONCLUSIONS**: Japanese men with a high CRF and a high alcohol consumption have a lower the incidence of hyper non-HDL cholesterolemia.

368   Board #209   May 30 9:30 AM - 11:00 AM

Overturning the Hypothesis that Cigarettes Can Enhance Hematocrit and Improve Aerobic Capacity

Grace L. Naylor[1], Jennica Harrison[1], J. Mark VanNess[1], Michelle M. Amaral[1], Jonathan M. Saxe[2], Lewis E. Jacobson[2], Courtney D. Jensen[1]. [1]University of the Pacific, Stockton, CA. [2]St. Vincent Hospital, Indianapolis, IN.
(No relevant relationships reported)

Some athletes are willing to try any supplement or drug to enhance performance. Recent reports suggest cigarette smoking may improve endurance performance by inducing oxidative stress which would, in turn, stimulate an increase in hemoglobin and thus increase oxygen-carrying capacity. It is important to validate these claims, given the hazardous side effects of cigarette smoking. **PURPOSE:** Examine the influence of cigarette smoking on blood hemoglobin levels to determine if smoking stimulates training-like conditions for aerobic enhancement. **METHODS:** Hemoglobin and oximetry levels were measured in 594 smokers and 1,626 non-smokers across a wide age-range (ages 15 to 98). Independent variables were age, sex, obesity, smoking status, and presence of diabetes, COPD, or other respiratory diseases. Dependent variables were hemoglobin and oximetry. Independent-samples t tests and chi-square tests were used to detect group differences between smokers and non-smokers. Multiple linear regressions were used to isolate the effect of smoking on hemoglobin and oximetry. **RESULTS:** Subjects were 52.5 ± 22.5 years of age, 55.7% were male, 16.5% were obese, average hemoglobin was 13.5 ± 1.9 g/dL, and oximetry was $97.0 \pm 2.9\%$. Independent-samples t tests revealed cigarette smokers' hemoglobin levels to be 4.6% higher ($p<0.001$) and oxygen saturation to be 0.3 percentage points higher ($p=0.042$). Cigarette smokers were also 13.5 years older ($p<0.001$) and more likely to be male ($p<0.001$). Age ($p<0.001$) and sex ($p<0.001$) were strongly correlated with hemoglobin. When controlling for all significant confounders, multiple linear regression did not demonstrate a significant effect of cigarette smoking on hemoglobin ($p=0.317$) but it found a reduction of 0.4 percentage points on oximetry ($p=0.005$). **CONCLUSIONS:** Simple t-tests indicated cigarettes might confer an ergogenic advantage via elevations in hemoglobin and oximetry. This, left alone, could suggest inadequate oxygen saturation of the blood (owing to smoking) may simulate training-like conditions. However, the predominant explanatory variables were age and sex. It is not the smoking, but other subject factors of the person who smokes that influences hemoglobin levels. Controlling for confounders, smoking has no effect on hemoglobin and reduced oxygen saturation.

369   Board #210   May 30 9:30 AM - 11:00 AM

The Association Between Physical Activity, Sleep, and Cardiovascular Risk Factors in College Students

Heather H. Betz, Julie M. Cousins. Albion College, Albion, MI. (Sponsor: Jonathan Myers, FACSM)
(No relevant relationships reported)

Physical activity can help improve traditional cardiovascular risk factors, including blood pressure and body composition (Archer and Blair, 2011). In addition to the traditional cardiovascular risk factors, sleep has started to emerge as an important component to overall and cardiovascular health (Grandner et al., 2014). Low levels of sleep have been shown to negatively impact a host of cardiovascular risk factors, including blood pressure, blood lipids, markers of inflammation, and body fatness. (Carnethon et al., 2016) **PURPOSE:** The purpose of this study was to examine the associations between physical activity and sleep with blood pressure and waist circumference in college-age adults. **METHODS:** A total of 57 Albion College students (23 males, 34 females) participated. Height, weight, waist circumference, and blood pressure were measured. Physical activity was self-reported and sleep was assessed with The Pittsburgh Sleep Quality Index. Multiple regression was used to assess the purpose. **RESULTS:** 47.4% of participants were physically active five or more days per week, while 38.5% of participants averaged eight or more hours of sleep per night. 8.8% had a waist circumference categorized as high and 5.2% of participants were pre-hypertensive. 52.6% of the total participants were athletes, with 48% of those currently in-season. There was a significant interaction between physical activity and total hours of sleep on systolic blood pressure (p=0.035, $R^2 = 0.117$) and waist circumference (p=0.023, $R^2=0.13$). Total hours of sleep had a significant unique contribution to the model ($\beta=-0.364$, p=0.007) when examining waist circumference, while physical activity had a significant unique contribution to the model ($\beta=-0.264$, p=0.050) when examining systolic blood pressure. **CONCLUSIONS:** The importance

of being physically active and getting the proper amount of sleep should to be stressed to college students as this can impact their cardiovascular health at a young age. Additionally, discussing the development of cardiovascular risk factors needs to start with this age group, as some participants were noted as being pre-hypertensive or having a high waist circumference. Since this was a very active sample, additional studies need to examine these relationships with a wider variety of college students.

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370   Board #211   May 30 9:30 AM - 11:00 AM

The Association of Body Composition with Cardiometabolic Risk Factors in Apparently Healthy Young Adult Females

Samantha C. Orr, Mary A. Elsesser, Ryan T. Tyler, Timothy A. Rengers, Evan Eschker, Tamara Hew-Butler, FACSM, Charles RC Marks, Kristin R. Landis-Piwowar, Myung D. Choi, Elise C. Brown. *Oakland University, Rochester, MI.*
(No relevant relationships reported)

Although risk factors associated with cardiometabolic diseases (CMD) such as excess adiposity are oftentimes detected in young adults, most of the research examining these relationships has focused on middle-aged and older adults and those "at-risk" for chronic diseases. Given the U.S. trend of increased obesity prevalence with age and the high prevalence of metabolic abnormalities in normal-weight young adult females, understanding the link between body composition and CMD risk in healthy young females is important for developing intervention strategies for primary prevention of obesity and CMD diseases. **PURPOSE:** Therefore, the purpose of this study was to examine the associations of body composition with CMD risk factors in apparently healthy young adult females. **METHODS:** Twenty-five non-obese [body mass index (BMI) < 30 kg/m^2] apparently healthy females (22.6 ± 4.2 years) took part in this cross-sectional study. All participants had height, weight, waist circumference (WC), body composition using Dual-energy X-ray Absorptiometry, resting heart rate (HR), blood pressure, and fasting biomarkers assessed. Bivariate correlations using Spearman's rho were used to examine the relationships of CMD risk factors with anthropometric obesity indices and body composition. Significance was set a priori at P≤0.05. **RESULTS:** Significant associations were found between waist-to-height ratio (WHtR) and resting HR (Spearman's ρ = 0.436, P = 0.03), cholesterol (ρ = 0.404, P = 0.04), low-density lipoprotein cholesterol (LDL-C) (ρ = 0.475, P = 0.02), and glucose (ρ = 0.485, P = 0.01); BMI and resting HR (ρ = 0.41, P = 0.04), cholesterol (ρ = 0.437, P = 0.03), and LDL-C (ρ = 0.477, P = 0.02); total body fat percentage and resting HR (ρ = 0.636, P = 0.001); bone mineral content and glucose (ρ = -0.536, P = 0.007); and lean mass and glucose (ρ = -0.461, P = 0.02). WC was not significantly associated with any of the CMD risk factors. **CONCLUSION:** While WHtR was correlated with more CMD risk factors than other measures of body composition, the strongest correlation was found between total body fat percentage and resting heart rate. These data suggests that body composition may play an important role in cardiometabolic health in young adult females even when classified as apparently healthy and non-obese.

A-49   Free Communication/Poster - **Nutrition Interventions**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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371   Board #212   May 30 11:00 AM - 12:30 PM

Lifelong Ketogenic Diet Feeding Increases Longevity, But Does Not Alter Oxidative Stress Markers in Rats

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(No relevant relationships reported)

Purpose: Ketogenic Diets (KD) consist of high fat, moderate protein and low carbohydrate. KD have been used as a weight loss tool and as a therapeutic tool for neurological disorders. It has been suggested that KD increase longevity, but to date only two studies in mice have been performed with equivocal results. Therefore, we determined the effects of KD on longevity and multi-organ oxidative stress markers in rats. **Methods:** Ten month-old male Sprague-Dawley rats (n=8 per group) were provided with one of two isocaloric diets: standard chow (SC; 24% (% kcal) protein, 58% CHO, 18% fat; 20 g/day) or KD (23% protein, 10% carbohydrate, 67% fat; 16 g/day). Rats were euthanized if: a) vitality scores (range = 4 (good health) to 20 (poor health)) exceeded a score of 16 per the recommendations of Phillips et al. (J Am Assoc Lab Anim Sci, 2010, 49(6): 792-799), b) rapid weight loss accompanied by changes in food and water consumption, or c) the rat suffered from a condition to which a university veterinarian deemed euthanasia necessary for humane purposes.

Upon euthanasia, the gastrocnemius muscle, liver, and brain were removed and stored at -80ºC and analyzed for markers of oxidative damage (4-hydroxynonenal (4HNE) and protein carbonyls (Oxyblot)) and protein levels of the antioxidants superoxide dismutase 1/2 (SOD1/2), catalase (CAT), and glutathione peroxidase (GPX). **Results:** The survivability log-rank test indicates that KD increased the lifespan of rats (p=0.009) when compared to SC. No significant difference in body mass was observed at the beginning (SC=425.7±13.2, KD=435.9±5.8) or end (SC=428.0±25.4, KD=417.1±22.6) of the experiment, and liver and gastrocnemius mass at sacrifice was not significantly different between groups (p>0.05). Liver CAT protein levels were about 30% higher in KD, albeit not significant (p=0.062). Additionally, liver SOD1 protein levels were about 20% higher in KD, but again, this was not significant (p=0.094). No other significant differences in protein levels of antioxidants, 4HNE, or Oxyblot were observed in either the gastrocnemius, liver, or brain. **Conclusions:** Lifelong KD improves longevity in rats without altering body mass and our data show that the longevity benefits of KD come without altering oxidative damage or antioxidant protein levels in the gastrocnemius, liver, or brain.

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372   Board #213   May 30 11:00 AM - 12:30 PM

The Effects of Choline Intake and Resistance Exercise Training on Strength Gains in Older Adults

Chang Woock Lee[1], Elfego Galvan[2], Teak V. Lee[3], Vincent CW Chen[4], Steve Bui[5], Stephen F. Crouse, FACSM[6], James D. Fluckey[6], Stephen B. Smith[6], Steven E. Riechman, FACSM[6]. [1]*University of Houston-Victoria, Victoria, TX.* [2]*University of Texas Medical Branch, Galveston, TX.* [3]*Pierce College, Woodland Hills, CA.* [4]*Georgian Court University, Lakewood, NJ.* [5]*Dixie State University, St. George, UT.* [6]*Texas A&M University, College Station, TX.*
(No relevant relationships reported)

PURPOSE: The micronutrient choline plays a major role in neurotransmission and skeletal muscle contraction. We conducted a randomized controlled trial to examine the effects of choline intake on skeletal muscle responses to resistance exercise training (RET) in older adults.
METHODS: Three groups of 50 to 69-year-old generally healthy men and women (n=37, age=59.8 ± 6 y, height=168.4 ± 9 cm, weight=79.5 ± 16 kg, body fat=30.3 ± 10 kg, male/female=15/22) underwent 12 weeks of RET (3x/week, 3 sets, 8-12 reps, 70% of maximum strength [1RM]) and submitted >1,776 diet logs (>4x/week for 12 weeks, 37 subjects). Participants' diets (mean choline intake: 5.9 mg/kg lean/d) were supplemented with 0.7 mg/kg lean/d (Low, n=13), 2.8 mg/kg lean/d (Med, n=11), or 7.5 mg/kg lean/d (High, n=13) of choline in the form of egg yolk. Body composition, 1RM, and blood tests were performed before and after training.
RESULTS: ANCOVA tests showed Low choline intake, compared with Med or High choline intakes, resulted in significantly diminished gains in composite strength (leg press + chest press 1RM; Low: 19.4 ± 8.2%, Med: 46.8 ± 8.9%, High: 47.4 ± 8.1%, p=0.034) and thigh muscle quality (leg press 1RM / thigh lean mass; Low: 12.3 ± 9.6%, Med/High: 46.4 ± 7.0%, p=0.010) after controlling for lean mass, protein, betaine, and vitamin B$_{12}$. No differences were observed in lean mass gains, clinical markers of liver/muscle damage, or blood lipid profiles.
CONCLUSION: These data indicate that low supplemental choline intake negatively affects strength gains with RET in older adults.
This study was supported by U.S. Poultry and Egg Association.

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373   Board #214   May 30 11:00 AM - 12:30 PM

Utilization And Efficacy Of The "Run Fueled" Smartphone Application Among Collegiate Endurance Runners

Michelle Barrack[1], Michael Fredericson, FACSM[2], Emily Kraus[2], Brian Kim[3], Sonal Singh[4], Kristen Gravani[2], Beth Miller[5], Aurelia Nativ, FACSM[4]. [1]*California State University, Long Beach, Long Beach, CA.* [2]*Stanford University, Stanford, CA.* [3]*University of California, Irvine, Irvine, CA.* [4]*University of California, Los Angeles, Los Angeles, CA.* [5]*Duke University, Durham, NC.* (Sponsor: Aurelia Nattiv, FACSM)
(No relevant relationships reported)

PURPOSE: We evaluated the use and efficacy of an interactive, goal-specific, nutrition education intervention aimed at optimizing energy availability and the intake of bone-building nutrients among collegiate endurance runners. **METHODS**: In Spring 2016, 77 male and female NCAA Division I runners were invited to complete the 8-week nutrition education curriculum, administered through "Run Fueled", a smart-phone application. The curriculum, delivered through two, 4-week modules, provided content through daily nutrition tips and electronic handouts, videos, recipes on a weekly topic. Athletes were assessed during a one-on-one meeting with a registered sports dietitian prior to completing Module 2, which provided tips and resources specific to their nutrition goals. Each week, runners were invited to complete assessments regarding the

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weekly resources and/or dietary behavior change. **RESULTS**: Forty-eight (62.3%) of the 77 runners utilized one or more components of the 8-week curriculum. For Module 1, 39.6% (n= 19) of the 48 runners engaging with the curriculum exhibited use of ≥80% of components, i.e. "high-use". Twenty-three (47.9%) of the 48 application users completed one or more components of Module 2, four runners exhibited "high-use" of Module 2. Built-in assessments indicated that 75.8% (n= 25) of 33 runners reported the Module 1 daily tips as "engaging and effective", while 70.6% (n = 24) of 34 runners rated that the tips could assist with dietary change. Among 11 runners completing the Module 2 assessments, 54.5% (n= 6) reported making changes consistent with the nutrition goals. Runners indicating "Yes" the tips were "engaging and effective", compared to "No", "Unsure", or those not completing the assessment exhibited higher use of Module 1 (i.e. 54.8 ± 2.5 vs. 34.8 ± 4.3 vs. 7.3 ± 3.2, p<0.001) and Module 2 (6.8 ± 1.2 vs. 3.6 ± 2.2 vs. 0.0 ± 0.0) components. All runners (n= 4) exhibiting "high use" of Module 1 and Module 2 reported dietary change. **CONCLUSIONS**: A majority of runners (62.3%) engaged with one or more components of the "Run-Fueled" application, with over 70% of runners that completed the assessments rating the tips and resources as engaging, effective, and able to facilitate dietary change. Runners' reporting dietary change consistent with their nutrition goals exhibited higher application use.

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374   Board #215   May 30 11:00 AM - 12:30 PM

Effect Of Pre-sleep Whole-food Or Protein Beverage On Morning Metabolism In Active Women

Samantha M. Leyh, Brandon D. Willingham, Daniel A. Baur, Lynn B. Panton, FACSM, Michael J. Ormsbee, FACSM. *Florida State University, Tallahassee, FL.*
(No relevant relationships reported)

Dietary protein consumed as a liquid supplement pre-sleep has been shown to increase next-morning resting metabolism without blunting fat oxidation. However, the influence of whole-food protein consumed pre-sleep on metabolism is unknown. **PURPOSE:** To determine the effect of a whole-food protein (cottage cheese, CC) consumed pre-sleep on next-morning resting energy expenditure (REE), respiratory exchange ratio (RER) and appetite compared to an isocaloric/isonitrogenous liquid casein protein (CP) supplement and a placebo (PL) in active women. **METHODS:** In a beverage-blinded, randomized, cross-over design, ten active (physical activity ≥4 days/ wk for at least 12 m) women (age, 23.1 ± 1.9 yrs; body fat, $22 \pm 4.6\%$; means ± SD) consumed pre-sleep CC (160 kcals, 30g protein, 10g carbohydrate, 0g fat), calorie and nitrogen matched liquid CP, or PL (0 kcals) 30-60 min pre-sleep. Participants arrived at 1800 h for an overnight stay in the lab. 30-60 min prior to participants' normal bed time and 2 h after a standardized meal, participants consumed CC, CP, or PL and then immediately underwent measurements of REE and RER for 30 min. Upon waking the next morning (0500-0800 h) measurements of REE and RER were repeated and subjective measures of appetite (visual analog scale) were recorded. Testing occurred during the follicular phase of menstrual cycle. Statistical analyses were conducted using repeated measures ANOVA. Significance was accepted at $p \le 0.05$. **RESULTS:** There were no significant differences in acute REE (CC, 1725 ± 327; CP, 1718 ± 214; PL, 1691 ± 265 kcal/d, p=0.95) or acute RER (p=0.56) or morning REE (CC,1396 ± 293; CP, 1361 ± 175; PL, 1432 ± 216, kcals/d, p=0.79) or morning RER (p=0.52). Subjective measures of appetite were not different between groups. **CONCLUSION:** In active women, pre-sleep consumption of CC does not alter REE or RER more than a CP or PL beverage. These data suggest the form of the nutrient does not alter the metabolic response.

A-50   Free Communication/Poster - **Cognition and Emotion**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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375   Board #216   May 30 11:00 AM - 12:30 PM

The Acute Effects Of A 30-min Moderate Aerobic Exercise On Autonomic And Inhibitory Control

Yiu-Man LEE, Stanley Sai-chuen HUI, FACSM. *The Chinese University of Hong Kong, Hong Kong, Hong Kong.* (Sponsor: Prof. Stanley Sai-chuen HUI, FACSM)
(No relevant relationships reported)

High frequency component of heart rate variability (HF-HRV) is a promising biomarker of the autonomic nervous system to reflect the brain-heart integration and control of behavior that can inform research and clinical applications.
PURPOSE: The current study aims at exploring whether inhibitory control will be changed after a 20-min bout of moderate cycling exercise plus 5-min warm-up and

5-min cool-down. The study hypothesizes that subjects who demonstrate greater HF-HRV reactivity (i.e. larger HF-HRV decrease) under a mental stress evoked by a Stroop color-word test, will perform better on the Stroop tasks.
METHODS: Thirty-two healthy Chinese young male adults (mean age: 21.2 years old) participated in two separate testing sessions. The first session involved baseline VO2max test; and in the second session, participants were randomly assigned to either an exercise intervention or no exercise (control) condition. For the exercise intervention group of participants, computerized Stroop color-word test was conducted before and after the intervention to examine the acute effects of aerobic exercise on inhibitory control. HRV was measured during the Stroop tasks by using the Electrocardiogram (ECG), which was recorded via two bipolar electrodes that were placed on the left and right chest of the participants. ECG was sampled continuously with a rate of 1000 Hz.
RESULTS: Two-way repeated measures MANOVA showed significant Intervention X Time interaction on Response Time (RT) of the Stroop tasks ($p < 0.01$). Furthermore, significant Intervention X Time interaction on HF-HRV differences was revealed between the exercise intervention and control groups on the Stroop tasks ($p < 0.01$). Exercise group performed significantly faster RT on Stroop tasks at post-test than the Control group ($p < 0.05$). Larger decrease of HF-HRV during mental stress had a positive relationship with RT of the Stroop tasks.
CONCLUSION: A 30-min acute moderate aerobic exercise could elicit inhibitory control for young adults. The studies manifested the potential physiological mechanism between central nervous system and autonomic nervous system which were reflected by HRV index, likely being influenced by acute aerobic exercise in enhancing an individual's inhibitory control.

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376   Board #217   May 30 11:00 AM - 12:30 PM

Physical Fitness and Cognitive Performance in Women

Julia R. Rebellon, Meir Magal, FACSM, Daniel Henderson, Christina Huber, Abigail Leonard, Lyndsay Wolfe, Andrea Tobar, Sierra Hayden, Shannon K. Crowley. *North Carolina Wesleyan College, Rocky Mount, NC.*
(No relevant relationships reported)

PURPOSE: Cognitive impairment (including dementia and Alzheimer's disease) affects approximately 1/3 of women over the age of 75. Studies suggest that increased levels of physical activity are associated with preserved cognitive function, however, the mechanisms by which physical activity may prevent or delay cognitive decline remain elusive. Chronic psychosocial stress has been proposed as a potential contributor to cognitive decline, and research suggests that exercise training may help to buffer the negative effects of stress. However, to date, there has been limited investigation of the stress-related mechanisms underlying the relationship between physical fitness and cognitive performance in women. This study aimed to investigate relationships among physical fitness, cognitive performance, and physiological responses to mental stress in women, while experimentally controlling for ovarian cycle phase effects on the stress response. **METHODS:** Following a two-tiered screening process, healthy women (18-45y) who were medication-free and had regular menstrual cycles completed: (1) an enrollment visit, (including assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise), and (2) a mental arithmetic stressor [(the Paced Auditory Serial Addition Task (PASAT)], where hemodynamic stress responses were recorded. Mental stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which can profoundly influence the physiological response to stress. **RESULTS:** Results from this study (n = 28) showed that higher levels of physical fitness were associated with greater cognitive performance on fast (r = 0.42, p = 0.02), and moderate (r = 0.33, p = 0.08; trend) stimulus presentation rates of the PASAT. Consequently, higher levels of physical fitness were also associated with lower HR during the PASAT (r = -0.41, p = 0.03). **CONCLUSIONS:** Our results suggest that physical fitness is associated with improved cognitive performance in women, which may be explained by improved sympathetic nervous system (e.g., HR) activity during mental stress. Whether exercise training may help to delay cognitive decline via its impact on physiological stress responding will require further investigation.

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377   Board #218   May 30 11:00 AM - 12:30 PM

The Acute Effect Of Endurance Exercise On An Executive Function Task In Middle-age And Older Adults

Brandon A. Yates[1], Ariela R. Orkaby[2], Ekow Dadzie, Jr.[3], Elaine C. Lee[3], Lawrence E. Armstrong, FACSM[3]. *[1]Spaulding Rehabilitation Hospital, Cambridge, MA. [2]VA Boston Healthcare System, Boston, MA. [3]University of Connecticut, Storrs, CT.* (Sponsor: Lawrence Armstrong, PhD, FACSM, FACSM)
(No relevant relationships reported)

Middle-age and older adults are encouraged to participate in regular physical activity to counteract age-related declines of cognitive function. Acute aerobic exercise bouts of 10-60 minutes have been reported to improve key domains of cognition such

as executive function within this population. However, it is unknown if prolonged exercise bouts, which induce great cardiovascular stress and fatigue, elicit similar improvements in cognition. **PURPOSE:** To investigate the acute effects of prolonged endurance exercise on executive function in middle-age and older adult recreational cyclists. **METHODS:** This field study was conducted at the Hotter'N Hell Hundred cycling event (HHH) in Wichita Falls, Texas (ambient temperature, 26°C mean, 30°C maximum; relative humidity, 75% mean, 93% maximum). Sixty recreational cyclists (52±9 y) were enrolled following informed consent. All cyclists were screened for mild cognitive impairment via Mini-Cog assessment (4±1). Physical function was assessed utilizing a 3-meter usual gait speed measurement (1.08±0.16 m/s). At baseline (i.e., 1 day before HHH), participants were familiarized with the executive function pencil-paper test (Trail Making A and B Tests, TMT) and anthropometric measurements were recorded (14±5 % body fat, 28.4±5.1 kg body mass). Cyclists completed TMT prior to and immediately following the HHH event. Ratings of perceived exertion (RPE) were collected at 0, 98, and 164 km and total exercise time was determined at the finish line. Pre- and post TMT scores were compared via paired T-test and all data are presented as mean±SD. **RESULTS:** After the HHH 164-km endurance cycling event, there was a significant improvement (i.e., faster completion time; p<0.001) of executive function (pre vs post, 83±26 vs 75±21 s). The mean RPE at cessation of exercise was 16±2 and mean total event time was 6.15 ±1.25 h. **CONCLUSION:** An acute bout of prolonged, moderate intensity endurance exercise (> 6h) increased performance of an executive function task in a cohort of middle-age and older adults. This suggests that such exercise may provide chronic improvements in attention, working memory, and cognitive flexibility which counteract age-related declines of cognitive function.

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378   Board #219   May 30 11:00 AM - 12:30 PM

Experimental Effects of Acute Exercise on Episodic Memory Acquisition: Decomposition of Multi-Trial Gains and Losses

Eveleen Sng, Emily Frith, Paul Loprinzi. *University of Mississippi, Oxford, MS.*
(No relevant relationships reported)

PURPOSE: Research demonstrates that acute exercise may enhance retention of multi-trial episodic memories. This work has examined the effects of exercise on the mean level of memory recall. However, no study has examined whether exercise can influence the acquisition of new items, which was the purpose of this experiment. **METHODS**: Using a randomized controlled trial design, participants completed either a high-intensity bout of treadmill exercise for 15-min (n=22) or sat for 15-min (n=22) prior to completing a multi-trial episodic memory task (RAVLT). This task involved recalling 15 words for 6 successive trials, as well as after a 20-min delay (Trial 7). The performance on the multiple trials was categorized into gains (items not recalled on Trial n that were recalled on Trial $n+1$) and losses (items recalled on Trial n that were not recalled on Trial $n+1$). **RESULTS**: The exercise group recalled more words on Trial 6 (11.4 vs. 9.7; P=.009) and after the 20-min delay (10.9 vs. 9.4; P=.01). The exercise group (vs. control) had a smaller proportion of losses from Trial 3-4 (10.4% vs. 20.3%; P=.04) and had a greater proportion of gains from Trial 5-6 (38.5% vs. 14.8%; P=.01). **CONCLUSIONS**: The exercise-induced multi-trial memory effect may be influenced by greater item gains and fewer item losses from exercise.

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379   Board #220   May 30 11:00 AM - 12:30 PM

EMF Stimulation As Passive Exercise Improves Cognition And Psychomotor Activity In Senescent Rats

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(No relevant relationships reported)

PURPOSE: During advanced aging passive exercise (PE) is becoming a valuable therapeutic intervention to improve physical and mental performances. In the present study chronic PE (electromagnetic field stimulation, EMF-S) was introduced to rats reaching the senescent age of 32 months in order to develop a translational model for supporting healthy aging, attenuating cognitive decline and to clarify the mechanism of action of EMF-S on brain and muscle tissues during advanced aging. **METHODS:** Male Wistar rats were treated with EMF-S for six weeks, 3 times per week, 24 min per sessions prior to the age of 32 months. The doses of stimulation were: 45, 95 and 1250µT (Santerra MCR System, Pinding, Germany). Psychomotility (horizontal and vertical ambulation in novel environment) was estimated in open field (OF), the attention ability in novel object recognition (NOR) test, and spatial learning, reference and working memories, in Morris water maze (MWM) tests. **RESULTS:** OF: EMF stimulation enhanced novelty-induced motility, especially that of vertical type after both the middle and high doses (p<0.05 at both doses). NOR: EMF-S increased attention after middle and high doses (p<0.001 and p<0.01, respectively) reflecting an enhanced attentional capability based on memory enhancement. MWM: passive exercise facilitated the working memory type spatial learning in this test and the

highest dose of 1250µT was clearly effective (ANOVA, p=0.024). **CONCLUSION:** The results obtained on cognitive tasks showed that EMF stimulation as PE is effective in senescent age to improve cognitive and psychomotor function in rats. In the age of 32 months rodents showed rather deteriorated cognitive functions in our earlier studies. Furthermore, it may be added that the highest dose of 1250µT did not uncover undesirable side effects on the brain, which is promising for a wider therapeutic window. The results support the notion that PE may complete dementia prevention program in elderlies. These animal studies can provide options to study the cellular and molecular mechanisms behind this treatment helping human interventions. Supported by OTKA Grant K116511 in Hungary

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380   Board #221   May 30 11:00 AM - 12:30 PM

Effects of Acute Exercise on Stress-Induced Memory Function

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(No relevant relationships reported)

PURPOSE: Acute exercise during the memory consolidation stage can enhance memory, whereas acute psychological stress post-memory encoding has been shown to impair episodic memory function. However, no study has evaluated whether acute exercise during memory consolidation can attenuate the detrimental effects of psychological stress-induction on memory retrieval, which was the purpose of this experiment. We also evaluate potential gender-specific effects, which has yet to be explored in this context. **METHODS:** Forty-four university students completed a between-group randomized control trial. Participants completed the WMS-III Logical Memory sub-test prior to moderate-intensity walking for 15 minutes, or sitting for 15 minutes. After walking or sitting, participants completed an oral presentation per the Trier Social Stress Test (TSST) method, and then re-completed the memory assessment. **RESULTS:** There was no group x time x gender interaction effect (F=1.52; P=0.22), but there was evidence of a group x gender interaction (F=4.11; P=0.04). In both groups, men had a greater decline in memory function from the TSST. From pre- to post-assessment, respectively, male participants' Logical Memory scores decreased from 16.31 (3.4) to 14.54 (3.7), whereas female participants' scores remained more stable 17.89 (2.9) to 17.28 (3.1). **CONCLUSIONS:** These findings suggest gender effects extend to paragraph and logic-based memory performance, as men experienced a larger decline in memory function following a social stressor, irrespective of an acute exercise response.

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The Effects of Acute Exercise on Working Memory and Delay Discounting

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(No relevant relationships reported)

Given the choice, people tend to prefer immediate rewards over delayed rewards. This tendency to devalue rewards with increasing delays to their receipt is referred to as delay discounting. Previous research has demonstrated an inverse relationship between working memory capacity and delay discounting. Furthermore, an acute bout of moderate intensity exercise has been shown to improve working memory and thus could potentially alter discounting. Increased delay discounting has been associated with a variety of unhealthy behaviors, such as smoking, drug abuse and obesity. Therefore, intervention strategies aimed at reducing such impulsive decision-making would be advantageous across a variety of domains. To date, research has focused on the effects of prolonged exercise interventions on reducing discounting, but the effects of acute bouts of exercise remain unexplored. **PURPOSE:** To examine whether an acute bout of moderate intensity exercise improves working memory and subsequently decreases delay discounting. **METHODS:** Twenty-four healthy young adults (13 men, 11 women, age 18-35) participated. A repeated measures design was utilized in which participants first completed questionnaires assessing physical activity and impulsiveness. They then completed a 30-minute treadmill run at 65% Heart Rate Reserve or rest period. Following exercise, participants completed an intertemporal choice task, measures of working memory (*n*-back) and mood (PANAS). **RESULTS:** Preliminary results revealed exercise related changes in mood, specifically increases is positive affect and decreases in negative affect following exercise compared to rest. However, no differences in working memory performance or delay discount rates were observed between conditions. Future directions examining the influences of individual differences and acute vs. prolonged exercise interventions are discussed. **CONCLUSION:** These preliminary data suggest that although prolonged exercise interventions may effectively reduce delay discounting, an acute bout of moderate intensity exercise does not. These findings inform strategies for eliciting exercise-induced changes in decision-making and highlight the importance of intervention duration.

Abstracts were prepared by the authors and printed as submitted.

WEDNESDAY, MAY 30, 2018

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The Effects Of Pilates On Cognitive Functions In Middle-aged Women

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(No relevant relationships reported)

Pilates is a popular form of exercise for women, and previous studies have shown its effectiveness for improving physical and psychological health. Pilates is a mindful approach to exercise, stimulating awareness of body structure, muscle recruitment, and body alignment during movement. Thus, Pilates requires concentration on the body. However, the effects of Pilates on cognitive functions remain unknown. **PURPOSE**: This study aimed to investigate the effects of Pilates on cognitive functions in middle-aged women through a randomized clinical trial. **METHODS**: Forty-four middle-aged women (average age: 56.4 ± 7.3 yrs) were randomly divided into Pilates (n = 22) and control groups (n = 22). Pilates classes were performed for 60 minutes twice per week for 10 consecutive weeks. The control group underwent health education sessions three times during the intervention. Prior to the intervention and 10 weeks afterwards, cognitive functions were assessed by the Trail Making Test A/B and Stroop Color-word test. Repeated-measures analysis of variance was performed to compare between-group changes. **RESULTS**: There were no significant differences between the Pilates and control groups for any measured variables (P > 0.05) despite Trail-Making Test B significantly improving from pre- to post-Pilates classes (61.5 ± 22.0 to 52.2 ± 9.6 sec; P = 0.02; Cohen's d = 0.55) without significant changes during the control phase (64.9 ± 16.3 to 62.4 ± 12.3 sec; P = 0.53). There were no changes in Trail-Making Test A. Stroop interference time significantly weakened in both groups (Pilates: 154.6 ± 124.6 to 216.7 ± 95.6 msec; P < 0.01, control: 166.0 ± 133.0 to 258.0 ± 88.3 msec; P < 0.01) because only the neutral task significantly improved (Pilates: 1016.5 ± 159.2 to 918.0 ± 134.7 msec; P < 0.01, control: 1014.8 ± 163.2 to 887.5 ± 168.1 msec; P < 0.01). **CONCLUSIONS**: Although there were no significant between-group differences, the Pilates group showed improvement in Trail-Making Test B. Further large clinical trials are warranted to determine the effectiveness of Pilates for improving cognitive functions.

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Trade-off Between 30-minute Physical Activity And 1-hour Revision Time

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(No relevant relationships reported)

One of the major barriers for promoting physical activity (PA) in children is the general belief about the negative impact of PA on academic achievement. PA was then being scarified for extra study time and/or replaced by sedentary activity.**PURPOSE**: To explore the relationship between PA, revision time, and mathematics achievement among Chinese adolescents. **METHODS**: A total of 16 secondary schools were randomly invited in Hong Kong. Within an academic year, 781 grade 9th Chinese students' PA level, revision time afterschool, and mathematics achievement were measured twice with 9 months apart (start: T0; end: T1). Comparing the responses from a self-reported questionnaire (PAQ-A) between the two time-points, participants were categorized into Increasing-PA (IPA), Decreasing-PA (DPA), and Unchanged-PA groups. The longitudinal changes of mathematics test scores were examined between IPA and DPA groups using two-way repeated measures ANCOVA, adjusted for gender, family income, and revision time. PA-group and revision time were put into the regression analysis to investigate the explained variance of academic performance change. **RESULTS**: Significant Time x PA-group interaction effect on mathematics score (F=4.36, p=0.04) was observed. Significant improvement was found in IPA participants. In the multiple linear stepwise regression model, mathematics score change was significantly regressed on revision time (B=0.05, t=2.64, p=0.01) and PA-group (B=3.35, t=2.27, p=0.03) with *R-square* at 5.09%. **CONCLUSIONS**: Both revision time and PA level statistically predicted the change in mathematics achievement. Spending more time on PA did not necessarily deteriorate academic performance. More importantly, compared to the positive impact of increasing revision time (about 1 hour per day) on mathematics, an increment of relatively little time in PA (about 30 minutes daily) may bring similar effect in addition to physical fitness enhancement. However, other learning areas have not yet been examined.

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Does False Feedback Alter Performance in an Anaerobic Maximal Test Among Healthy Young Adults?

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(No relevant relationships reported)

It has been observed that extrinsic factors, such as music or verbal encouragement, can influence performance while exercising. It has yet to be determined if this effect is present in supra-maximal efforts. **PURPOSE**: to determine whether positive feedback (PF) or negative feedback (NF) prior to a maximal anaerobic exercise test improves or degrades performance. **METHODS**: 23 college aged adults were recruited for a two-day exercise protocol and were randomly divided into a PF or NF group. Day one: participants were oriented with the Wattbike Pro cycle ergometer and underwent a 30-second anaerobic test of power (in line with a Wingate test of power). Day two: Participants had a 24 hour-2 week window in which they could perform the second trial. Prior to the second trial participants were informed they performed better (PF) or worse (NF) than a hypothetical average prior to their second 30-second anaerobic test of power. **RESULTS**: Both PF and NF groups observed a significant improvement in peak power (p=0.03, p=0.02 respectively), and average power (p=0.042, p=0.035 respectively). Additionally, there was a significant improvement in power/mass ratio among the NF group (p=0.026). There was no difference in peak or average power between groups among the day 2 trial (p=0.95, p=0.18, respectively). **CONCLUSIONS**: PF or NF prior to a maximal anaerobic test of power improved peak and average power. It is theorized that the improvement among the PF group corresponded to an increase in self-efficacy; while the improvement among the NF group was related to a desire to perform at or above the fabricated average.

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Increased Exercise Activity In An Enriched Environment Improves Anxiety-like Behavior And Cognition.

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(No relevant relationships reported)

An enriched environment consists of complex housing with increased space and a variety of toys, which results in enhanced exercise activity and social interactions. Housing rodents in the enriched environment are known to improve both anxiety-like behavior and cognition. However, the contribution of increased exercise activity to such a functional plasticity are less clear. **[Aim]** The aim of the present study was to examine effects of increased exercise activity in the enrich environment on anxiety-like behavior and cognition. **[Methods]** Wistar rats were housed in the two different housing groups [standard environment (SE) group (N = 22); enriched environment (EE) group (N = 22)]. EE contained a slope, a small hut, three tunnels, and a running wheel such that exercise activity was increased. Exercise activity was continuously recorded using three-axis accelerometers for 6 weeks. The accelerometers were embedded in the back. The animals were submitted to the elevated plus maze (EPM) and Morris Water Maze (MWM) tests to assess anxiety-like behavior and spatial learning and memory. The muscle hypertrophy was evaluated from immunostained (MHC IIa) cross-section area (CSA). All experimental data were expressed as mean $\pm$ standard deviation. Comparisons were performed using a t-test. The level of significance was set at p < 0.05. **[Results]** Exercise activity was higher in the EE group compared with the SE group in light period. All hindlimb muscle wet weights per BW were greater in the EE group compared with the SE group. Moreover, the CSA of MHC IIa in the soleus muscle increased in the EE group (EE: 1729 ± 224 μm², SE: 1589 ± 144 μm², p < 0.05). In the EPM test, time spent in open/closed arms was significantly increased in the EE group (39.4 ± 15.8%, p < 0.05) than the SE group (24.0 ± 15.1%). This result suggests that anxiety-like behavior was reduced in the EE groups. On the third day of the MWM test, escape latency was reduced in the EE group (11.50 ± 1.87 sec) than the SE group (17.93 ± 3.40 sec, p < 0.05), which indicates that spatial learning and memory was improved in the EE group. **[Conclusions]** Increased exercise activity in the enriched environment improves anxiety-like behavior and spatial learning and memory.

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The Role of Low Frequency Power in the Relationship Between Exercise and Memory

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(No relevant relationships reported)

PURPOSE: Acute exercise (AE) has been shown to have a positive effect on memory performance, however these results are not always observed. Although some studies control for factors such as age and gender, there may be physiological factors that affect memory and the relationship between AE and memory and that may help explain inconsistent results. Low-frequency power (LF) has been suggested as a marker of baroreflex sensitivity (BRS), which is associated with memory performance. We aimed to investigate the influence of LF in the relationship between AE and memory. METHODS: 68 active adults (M=21.9, SD=3.9 yrs) were randomly assigned to 4 groups in relation to a memory task: 20-min AE prior (n=17), 20-min AE after (n=15), 10-min AE prior and 10-min AE after (n=19), and no exercise control (n=17). Baseline heart rate (HR) was collected for 5-min in the seated position, and R-R intervals were reduced to LF. AE consisted of cycling at 55-65% HR reserve and the memory measure was the Rey Auditory Verbal Learning Test 24-hr recall. RESULTS: A significant group x LF interaction was found ($F(3,60)=2.79$, $p=.048$); LF was associated with 24-hr recall for the control group ($r(15)=.637$, $p=.006$), but not for the exercising groups (p>.05). Post-hoc tests revealed benefits to 24-hr recall only for the groups that exercised before (M=10.295, SE=0.59) or both before and after (M=10.10, SE=0.57) memory tasks compared to control (M=7.72, SE=0.60, $p=.002$, $p=.004$, respectively). CONCLUSION: Evidence supports that baseline LF, as a marker of BRS, is associated with memory. Importantly, activating the sympathetic nervous system, through AE, prior to encoding appears to disrupt this relationship and improved memory performance.

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The Effect of Acute Aerobic Exercise on Attention and Affect in Middle-Aged Women

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(No relevant relationships reported)

PURPOSE: To explore the effect of one bout of moderate intensity aerobic exercise on attention and affect in healthy middle-aged women. **METHODS**: Five healthy women, age 55.2 ± 8.9 years, BMI 30.2 ± 4.4 kg/m2, and percent body fat 35.5 ± 5.7% completed a 30-minute session of aerobic exercise on the cycle ergometer at a workload corresponding to 60% of VO2peak. Subjects also completed a 30-minute control session on the cycle ergometer at 0 Watts. Before and after both 30-minute sessions, participants completed two computerized tests of attention: The Digit Span Test and the Flanker Task. Performance on the Digit Span was assessed by examining the mean forward digit span and mean backward digit span achieved. Performance on the Flanker Task was assessed by examining the error proportion and mean reaction times for incongruent and congruent trials. Participants also completed the Activation Deactivation Adjective Checklist (AD-ACL) to assess affect (i.e. energy, tiredness, calmness, and tension) before and after both 30-minute sessions. **RESULTS**: Repeated-measures ANOVAs indicated that participants achieved a significantly higher forward vs. backward mean digit span (mean difference: 0.7 ± 0.2, p = 0.046) and that mean digit span performance significantly improved from pre- to post-session (mean difference: 0.5 ± 0.2, p = 0.033). Participants displayed a larger decrease in error proportion from pre- to post-session for the incongruent vs. the congruent trials of the Flanker Task (p = 0.058), as well as a significant decrease in mean reaction time pre- to post-session (mean difference: -23.0 ± 6.8 ms, p = 0.028) that was more pronounced for the congruent vs. the incongruent trials (p = 0.08). Participants also reported feeling significantly more energetic and less tired from pre- to post-session on AD-ACL subscale scores (mean differences: 3.5 ± 0.9, p = 0.013 and -4.7 ± 1.8, p = 0.052, respectively). **CONCLUSIONS**: Exploratory results suggest that 30 minutes of aerobic exercise may positively impact some aspects of attention in middle aged women. Participants reported feeling more energized and less tired after 30 minutes of activity. Additional ongoing investigation is needed to more clearly understand the impact of acute aerobic exercise on cognitive function in this population.

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Exercise Training Related Changes in Verbal Fluency in Healthy Older Adults and Mild Cognitive Impairment

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(No relevant relationships reported)

We have previously reported that exercise training (ET) in older adults diagnosed with mild cognitive impairment (MCI) is associated with increased functional connectivity of the default mode network (Chirles et al., 2017), increased cortical thickness (Reiter et al., 2015), decreased cortical activation during semantic memory retrieval and increased episodic memory performance, but no change in verbal fluency (Smith et al., 2013). Verbal fluency, which refers to producing words from a specific category (e.g., starts with F), involves selecting words by inhibiting competing alternatives (e.g., phone). It is not known if the ET influences the total score or the complexity of the words produced. **PURPOSE**: The purpose of this study was to examine the effects of a 12-week walking ET intervention on the frequency and complexity of words produced during a phonemic fluency task. **METHODS**: Seventeen MCI participants and 18 cognitively intact controls completed a 12-week ET intervention consisting of supervised treadmill walking at a moderate intensity. Before and after ET, participants completed a phonemic verbal fluency task as part of a larger neuropsychological battery. Total word count and complexity of responses, measured by word frequencies and syllable length, were examined. **RESULTS**: There was no change in total word count. However, both groups produced words with greater frequency after ET (p = .016, partial eta-squared = .163). In addition, participants diagnosed with MCI produced words with fewer syllables after ET, an effect not observed in healthy controls (interaction p = .034, partial eta-squared = .129). **CONCLUSIONS**: These findings suggest 12-weeks of walking exercise training may modify lexical retrieval strategies, with a greater reliance on more frequently appearing words, and in the case of MCI, words that have fewer syllables. Our past finding of reduced semantic memory activation after ET suggests improved neural efficiency. These results could be interpreted similarly if producing more frequent and shorter words is adaptive and more efficient in the face of demands to quickly produce words under a time constraint. It is plausible ET is related to enhanced cognitive control by inhibiting competing words and facilitating a search for easier words to speak.
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Effects Of An Acute Bout Of Resistance Exercise On Cognitive Performance In Young Adults

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(No relevant relationships reported)

There is overwhelming support for enhanced cognitive performance (CP) as a result of an acute bout of aerobic exercise. However, there is less research, and the research is less clear regarding the effects of an acute bout of resistance exercise (RE) on cognitive performance. **PURPOSE:** To investigate the effect of an acute bout of high-intensity RE on reaction time (RT), working memory (WM) & inhibition (IC) - parameters of CP. To determine if there were sex differences for RE & CP, & to examine the relationship between CP & RE-Total Load (TL). **METHODS:** 23 healthy males (9) & females (Age = 21.7±1.8 yrs) volunteered. Day 1: body composition (Bodpod) and VO$_2$ max were assessed (HRmax = 189.6 +/-5.4 b/min, VO$_2$max = 49.0+/-7.3 ml/kg/min, BF% = 18.1+/-6.5). Day 2: Ss completed an initial battery of CP tests (imPACT) & then completed 1-repitition maximums (1-RM) for 7 Res that made-up the RE routine. Days 3&4: Ss underwent either 30 minutes of semi-reclined Rest (R) or the RE routine. The RE routine consisted of 2 consecutive sets (12 reps) of each RE at 75% 1-RM, followed by 1min of R. R & RE routine order was counter-balanced. Days 2, 3&4 were separated by 1wk. Prior to (PreR & PreEx) & following R & RE routine (PostR & PostEx) Ss performed the imPACT assessment for CP. 4(Conditions) X 2(Sex) ANOVAs with Repeated Measures & *a priori* contrasts were used to test for significant main effects & interactions for the CP variables. **RESULTS:** T-Tests confirmed Males (M) exhibited higher VO$_2$max, TL, RE-VO$_2$ & lower BF%. PreEx-PostEx RT (526+/-60ms - 510+/-58ms) was significantly reduced (p<0.02), whereas PreR-PostR RT (525+/-53ms - 532+/-67ms) & PreR-PreEx RT (525+/-53ms - 526+/-60ms) did not differ significantly. None of the CP variables differed by Sex. RT-change (PreEx-PostEx) & TL & RE-VO$_2$ were not significantly correlated. **CONCLUSION:** Following a single-bout of a high-intensity RE routine, RT was significantly reduced for M & F. However, WM & IC did not differ significantly following RE or R for M or F. M exhibited greater VO$_2$ & VCO$_2$ in response to greater TL, however the change in RT (PreEx-PostEx) was not related to TL the entire group or for M or F.

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The Impact of Music and Attentional Focus on Muscular Activation

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(No relevant relationships reported)

Neuromuscular efficiency is improved during exercise when attention is focused externally on the effects of movement, rather than internally on the generation of movement. Music is a form of external attentional focus which may yield additional psychological benefits during exercise. The impact of music on neuromuscular efficiency remains to be fully investigated. **PURPOSE**: To determine the effects of music and other attentional focus conditions on muscular activation and psychological response to single-joint isometric exercise.
METHODS: Apparently healthy subjects (N = 23; 12 men) completed an isometric elbow flexion task (40% of predetermined 3RM) for 1 min in three randomized, counterbalanced conditions: internal focus (INT), external focus with a simple distraction task (EXT), and external focus listening to music (MUS). Muscle activation of the biceps (BI) and triceps (TRI) brachii were recorded at 15 s intervals using a 4 channel Delsys EMG system, and were used to compute cocontraction ratio (CCN). Heart rate (HR) was measured throughout the exercise tasks and recorded at 15 s intervals. Psychological characteristics of perceived exertion (RPE), affective valence, task-motivation, and attentional focus were measured at the end of each trial using single-item scales. Repeated measures 3 (condition) x 4 (time) ANOVAs were used to analyze the physiological variables (BI, TRI, CCN, and HR). Psychological variables were compared across conditions using a series of one-way repeated measures ANOVAs.
RESULTS: No significant interaction effect or main effect for condition was found for any of the physiological variables (p > .05), though there was a trend (p = .071, $\eta2$ = .12) for decreased HR with MUS (91.41 bpm) compared to INT (93.87 bpm). There was a significant main effect of condition on RPE (p = .002, $\eta2$ = .25), with a greater RPE in INT (13.87) compared to EXT (12.39) and MUS (12.61).
CONCLUSIONS: The primary finding from the current study was that external focus, through both music and a distraction task, reduced the perception of effort during brief single-joint isometric exercise, despite the fact that muscle activation and physiological demand were unchanged.

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The Influence Of Self-generated Emotions On Aerobic Physical Performance: An Investigation Of Happiness, Anger, And Sadness

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to test the influence of self-generated emotions on exercise performance during an aerobic workout on a cycle ergometer.
METHODS: Sixteen males (Mean ± STDEV age = 23.1 ± 2.7 years; height = 162.7 ± 26.2 cm; weight = 82.6 ± 16.1 kg) performed 4 sessions of aerobic exercise on a cycle ergometer. A randomized within-subjects experimental design was used to test the hypotheses. The four randomized testing sessions included: the control (No-Emotion), sadness (SAD), happiness (HAPPY), and anger (ANGRY). Cycle ergometer seat heights for subjects were measured and used for each session. Subjects performed a 3-min warm-up, a 15-min workout on the cycle ergometer at a 2.5 kg resistance, and a 3-min cool-down. Subjects were instructed to stop pedaling on the cycle after the warm-up and take 1-2 min to begin self-generating the emotion being tested. Subjects alerted testers when ready to begin workout. Flexibility was measured and recorded before and after testing. Heart rate (HR) was observed and recorded before testing, every 3 min during exercise, and immediately after exercise. Blood pressure (BP) measurements were taken before and immediately after each testing session, and at the 5 min, 10 min, and 15 min mark following cycling exercise.
RESULTS: No significant condition main effect for systolic and diastolic BP was observed, but there was a significant time main effect (p < .05). HR values were significantly higher during the ANGRY session compared to the values recorded during the No-Emotion and SAD sessions (p < .05). Participants covered significantly longer distance during the ANGRY condition compared to all other conditions (p < .05).
CONCLUSIONS: Self-generation of angry emotion during aerobic exercise resulted in significant increases in heart rate and distance traveled compared to all other emotions tested. Increased performance during the ANGRY session could be due to increased sympathetic nervous system activity and/or hormonal changes such as epinephrine, norepinephrine, and cortisol leading to a temporarily altered state of consciousness similar to a situation that is perceived as a threat or danger. Further studies should investigate the effects of emotion on hormonal changes, performance, and hemodynamic responses during long-distance events such as a 10K and marathon.

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Assessment Of Knee And Ankle Proprioception In Young And Old Adults Using The AMEDA

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(No relevant relationships reported)

Proprioception is often associated with neuromuscular abilities and injury prevention in older persons. While several methods exist for testing proprioception, most instruments are impractical and assess joint position sense (JPS) in an artificial environment. The Active Movement Extent Discrimination Apparatus (AMEDA) offers a low-cost alternative to evaluate JPS in a natural standing environment. **Purpose:** To compare the active proprioception of the lower limbs and ankles in healthy young (YG) and older individuals (OG) using the AMEDA. **Methods:** Forty-four persons (YG: n=22, OG: n=22) participated in the study. During lower limb (hip, knee) testing, participants were asked to touch a rear bar before kicking forward to strike a stop board placed at one of three positions (11cm, 16cm, 22cm). For the ankle, the foot was inverted to one of three angles (1=12o; 2=14o; 3=16o). Our testing included 3 conditions: condition 1 (C1=no difference between sequential positions), condition 2 (C2=minimal differences between sequential positions), and condition 3 (C3=maximal difference between sequential conditions). Participants were asked to identify all positions while blindfolded over the course of 50 trials. Two two-way ANOVA (condition) x (group) were used to examine the number of errors within each group at each joint position. **Results:** The YG made significantly more errors than the OG for the left lower limb during C1 and C3 (p < .05). Furthermore, for the YG, the number of errors decreased from C1 through C3 (p<.05). The YG also produced significantly more errors than the OG in C1 for the left and right ankles (p<.05). The OG made more errors during C2 then any other condition for both ankles (p<.05). **Conclusion:** The YG made more JPS errors then the OG. These findings are contrary to the proposition that proprioception decreases with age. Based on these findings, older individuals appeared to be more aware of their knee and ankle joint positions. These differences may be attributed to the OG paying greater attention to their movement patterns during day to day activities as a precaution to reduce fall risk.

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During- Versus Post-Exercise Affective Forecasts: Some Affective Forecasts Are More Important than Others

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(No relevant relationships reported)

An affective forecast is the prediction of how positive or negative one will feel in response to a future event. Researchers have identified a positive relation between affective forecasts and exercise behavior. **PURPOSE:** The purpose of this study was to determine whether forecasts about pleasure experienced during an exercise bout are more strongly related to behavior and intentions than forecasts about pleasure experienced after an exercise bout. **METHODS:** A four-item scale was generated to assess forecasted affect, both during and after a future exercise bout (Cronbach's α = .97 and .98, respectively). These items consisted of bipolar visual analog scales (e.g., "I will feel terrible" to "I will feel wonderful"). Participants (N = 250, 51% men, 48% women, 1% non-binary, age: 36 ± 12 years) were randomly assigned to either (1) forecast their affect during their next exercise bout (i.e., "How will you feel during your next exercise session?"), or (2) forecast their affect 10 minutes after their next exercise bout ends (i.e., "How will you feel 10 minutes after your next exercise session?"). Participants also indicated the number of minutes of aerobic exercise they completed in the previous week and how many minutes they intend to complete in the next week. **RESULTS:** Forecasts about during-exercise affect were more strongly related to exercise intentions than forecasts about post-exercise affect (r = .49 vs. r = .22, Z = 2.34 p = .01). Likewise, forecasts about during-exercise affect were more strongly related to past exercise behavior than forecasts about post-exercise affect (r = .46 vs. r = .22, Z = 1.99, p = .02). **CONCLUSIONS:** Forecasts about post-exercise affective states explained 4.75% and 5.01% of the variance in exercise intentions and past behavior, respectively. However, forecasts about during-exercise affective states explained 23.52% and 20.70% of the variance in exercise intentions and past behavior, respectively. Researchers should consider more specific measures of affective forecasts; these data indicate that predictions about how one will feel at different times (e.g., during and after an exercise experience) are differently related to exercise behavior and intentions. Further, specifying a time point may help reduce participant confusion and measurement error.

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Effects Of Mental Fatigue Induced By A Continuous Cognitive Task On Attention Abilities Of Athletes

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(No relevant relationships reported)

Athletes need to maintain high concentration of attention in training and competition, while mental fatigue could damage their concentration, response and motor control abilities. However, there is a lack of research exploring the effect of mental fatigue on specific attention abilities of athletes.
Purpose: The present study is aimed to explore the effect of mental fatigue on athletes' selective attention and involuntary attention from the evidence of behavioral and ERPs.
Methods: Thirty elite tennis players (16 male, 14 female) were randomly selected and separated into Experiment Group (EG, n=15, age 21.08±1.5) and Control Group (CG, n=15, age 20.92±1.04). The athletes in EG were in mental fatigue after 1 hour of Flanker task, while the athletes in CG relaxed and kept themselves clear-headed for 1 hour. Heart rate variability (HRV), behavioral index and Rating of Perceive Exertion (RPE) were measured to detect players' mental fatigue during Flanker task which was divided into 4 periods (each stage 15 min). Selective attention (P3b) and involuntary attention (P3a) were evoked by novel auditory oddball task before and after the Flanker task.
Results: The accuracy of behavioral data was significantly different in 4 periods (F=35.83, $p<0.001$). The RPE score was higher in EG than CG (F=47.62, $p<0.001$). The time domain (rMSSD) and frequency domain (LF, HF and LF/ HF) in HRV data showed significant difference between the EG and the CG in all periods. Such, the mental fatigue was induced after the Flanker task. In the auditory oddball task, the reaction time was prolonged after the fatigue was induced (371.13±100.21ms vs. 388.07±93.64ms, $t = 4.878$, $p<0.01$). ERPs data showed that, after the fatigue-inducing task, P3a (19.290μV vs. 14.836μV, F=6.749,$p<0.05$) significantly decreased, indicating the impaired involuntary attention. Meanwhile, the P3b amplitude decreased and the latencies (15.373μV vs.12.036μV, F=10.451,$p<0.05$) at Fz, Cz and Pz sites increased significantly, indicating that the selective attention was impaired.
Conclusion: One hour of continuous cognitive task could induce psychological fatigue. Athletes' involuntary attention and selective attention were damaged after mental fatigue.

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Effects of Sedentary Behavior and Physical Activity on Cognitive Function are Conferred by Cortical Thickness

Evan Pasha, Takashi Tarumi, Tsubasa Tomoto, Marcel Turner, Justin Repshas, Rong Zhang. *University of Texas Southwestern Medical Center, Dallas, TX.*

(No relevant relationships reported)

Effects of Sedentary Behavior and Physical Activity on Cognitive Function are Conferred by Cortical Thickness
Evan P. Pasha[1,2], Takashi Tarumi[1,2], Tsubasa Tomoto[1,2], Marcel Turner[1], Justin Repshas[1], and Rong Zhang[1,2]
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Physical activity and aerobic fitness may have positive impacts on brain structure and function in older adults. Conversely, sedentary behavior may have negative effects.
PURPOSE: To determine associations of sedentary behavior with cerebral cortical thickness and neurocognitive function in older adults in cognitively normal older adults (NC) and patients with mild cognitive impairment (MCI).
METHODS: We tested 28 NC and 50 MCI participants matched for age, sex, and education. Participants wore a 3D accelerometer for 1 week to measure daily physical activity levels. Minutes spent in sedentary behavior (<4.0METs) and moderate-to-vigorous physical activity (MVPA) (>5.0METs) were recorded.
RESULTS: Sedentary behavior and MVPA were associated with cortical thickness in multiple brain regions within the default mode network. The effects of sedentary behavior on Trails B performance were mediated through left middle temporal gyrus (B=0.0017, SE=0.0010, 0.0002 to 0.0046 95% CI) and right frontal pole (B=0.0027, SE=0.0013, 0.0006 to 0.0058 95%CI) cortical thickness. MVPA (B=-0.011, SE=0.0070, -0.0304 to -0.0006 95%CI) positively impacted Trails B through left middle temporal gyrus thickness. California Verbal Learning Test cued recall was negatively affected by sedentary behavior (B=-0.00026, SE=0.0013, 0.0006 to 0.0058 95%CI), but positively affected by MVPA (B=0.0012, SE=0.0008, 0.0001 to 0.0033 95%CI) through right superior parietal cortical thickness. Cognitive status moderated the association of sedentary behavior with left posterior cingulate thickness (interaction, p=0.02) and MVPA to right supramarginal gyrus thickness (interaction, p=0.04) with greater effects occurring in NC.

CONCLUSION: Sedentary behavior is associated with reductions in cerebral cortical thickness which lead to impairment in memory and executive function in older adults. Sedentary behavior may be more detrimental to individuals with normal cognitive function.

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Don'T Forget To Exercise: The Effects Of Different Forms Of Exercise On Memory

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(No relevant relationships reported)

Acute bouts of exercise have been shown to positively affect memory. Although the majority of previous research has focused on the effects of exercise on retrospective memory, recent findings suggest resistance exercise may enhance prospective memory. The impact of yoga on prospective memory has not been previously examined.
PURPOSE: This study examined the effects of different forms of exercise on prospective memory (i.e., the ability to remember to execute tasks in the future) and retrospective memory (i.e., the ability to remember previously learned information).
METHODS: 145 students were randomly assigned to one of four groups: 1) treadmill running (R) (n=37), 2) kettlebell resistance exercise (K) (n=32), 3) yoga (Y) (n=35), or 4) sitting (S) (control group) (n=41). After exercising or sitting, participants completed a one-hour battery of neuropsychological tests that included two prospective memory tests: 1) an episodic prospective memory test (the reminder test) and 2) a habitual prospective memory test (the difficulty ratings test). To assess retrospective memory participants completed 1) a verbal memory test (CVLT-II) and 2) a visuospatial memory test (BVMT-R). Participants in the R, K, and Y groups performed video-guided exercise at a moderate level of intensity (50-70% of HHR) for 20 minutes, with a 5-minute warmup and a 5-minute cooldown. Participants in the S group watched an exercise video while sitting for 30 minutes. **RESULTS:** There was no significant effect of exercise on the habitual prospective memory test [$F(1,140)$=.64, p=.59], but there was a significant effect of exercise on the episodic prospective memory test [$\chi(3)$=8.30, p=.04]. Follow-up tests indicate that aerobic exercise led to fewer episodic prospective memory failures (11%) than resistance exercise (41%), yoga (31%), or sitting (27%). No significant effects were detected on either retrospective memory test [CVLLT-II, $F(3,141)$=.71, p=.55; BVMT-R, $F(3, 141)$=.48, p=.70]. **CONCLUSION:** Prospective memory is positively affected by exercise among college students. In contrast to previous findings, aerobic exercise specifically (but not resistance) appears to enhance prospective memory. This discrepancy may be due to differences in the time at which the prospective memory instructions were administered in the two studies.

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Relationship between Affective State and Enjoyment of Acute Exercise

Battogtokh Zagdsuren, Colleen L. Geary, Hayley V. MacDonald, Mark T. Richardson, Jonathan E. Wingo, FACSM, Phillip A. Bishop, FACSM, James D. Leeper, Frances A. Conners. *The University of Alabama, Tuscaloosa, AL.* (Sponsor: Jonathan E. Wingo, FACSM)

(No relevant relationships reported)

Increasing exercise adherence is one of the main challenges in lifestyle interventions. Although the affective response to exercise has been investigated extensively, it is unclear whether one's enjoyment of exercise is influenced by pre-exercise affective state. **PURPOSE:** To evaluate the relationship between pre-exercise affective state and enjoyment of acute bouts of walking of varying durations. **METHODS:** Regularly active college-aged participants (n=29; mean ± SD age=21±2 y) completed 3 counterbalanced exercise sessions involving moderate-intensity (3–5 METs) walking for 5, 10, and 30 minutes, respectively. Participants completed the Positive and Negative Affect Scale pre-exercise and Physical Activity Enjoyment Scale (PAES) immediately post-exercise. **RESULTS:** Positive affect (PA) was similar across walking bouts (28.9±6.9). Pre-exercise PA was not associated with PAES after 5 min of walking (r=0.35, p=0.07). In contrast, there was a significant association between PA and physical activity enjoyment following both the 10- (r=0.45, p=0.02) and 30-min (r=0.73, p<0.001) walking bouts. **CONCLUSION:** Pre-exercise PA appears to influence physical activity enjoyment experienced following acute walking bouts lasting 10 min or more, an effect that was strongest following the longest walking duration.

A-51   Free Communication/Poster - **Cognition and Emotion, Special Populations**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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398   Board #239   May 30 11:00 AM - 12:30 PM
Cognitive Function And Quality Of Life: Relationships In Individuals With And Without Spinal Cord Injury

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(No relevant relationships reported)

Cognitive decline is a problematic secondary complication of spinal cord injury (SCI), arising from chronic hypotension, undiagnosed brain injury, medications, or other systemic causes. In many other patient populations (the elderly, multiple sclerosis, Alzheimer's disease), mild cognitive decline exerts a negative effect on quality of life (QOL). People with chronic SCI often report lower QOL than the general population, but the potential influence of cognitive function is unknown. **PURPOSE:** The purpose of this study is to examine relationships between cognitive function and QOL in individuals with and without SCI. **METHODS**: Individuals (n = 25) with and without SCI rated QOL with two global scales (EQ-5D, PROMIS physical/mental health), and two SCI-validated scales (Secondary Health Conditions Scale (SCS-M), SCI-QOL). Cognitive function was assessed using NIH Toolbox (Dimensional Change Card Sort, Flanker Inhibitory Control & Attention, List Sorting Working Memory, Picture Sequence). **RESULTS**: Subjects with SCI rated physical function QOL dimensions (EQ-5D, PROMIS physical health, SCS-M) lower than non-SCI subjects (all $p < 0.0002$). QOL dimensions relating to mental/emotional function (PROMIS mental health, SCI-QOL Positive Affect & Well-Being (PAWB), Anxiety, Depression, Resilience) did not differ between groups (all $p > 0.14$). Subjects with SCI reported greater Pain Interference and lower Ability to Participate than non-SCI subjects (both $p < 0.011$). In non-SCI subjects, correlations existed between cognitive test scores and certain QOL domains (Resilience R^2 = 0.46 to 0.72; PAWB R^2 = 0.29 to 0.51). No correlations between QOL and cognition emerged for participants with SCI. **CONCLUSIONS**: Individuals with SCI may report high mental/emotional QOL despite reporting low QOL on domains related to physical function and participation. Relationships between cognitive function and QOL were not observed in participants with SCI, despite robust associations in those without SCI. The relationship between the QOL domain Resilience and the cognitive trait "executive function" warrants further investigation. Supported by R01HD084645 and R01HD082109. REDCap access (Institute for Clinical and Translational Science) provided via the National Center for Advancing Translational Sciences (U54TR001356).

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Both Combined And Aerobic Training Improve Cognitive Function In Hypertensive Elderly

Wellington Martins Santos, Amanda Sardeli, Victor Gadelha, Daisa Moraes, Claudia Cavaglieri, Mara Chacon-Mikahill.
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(No relevant relationships reported)

Aging process and diseases such as hypertension contributes to cognitive impairment. Exercise training has been extensively recommended due to its benefits to the cognitive function in elderly. Inconsistent findings in the literature related to the better exercise training program for learning, executive functions and memory. **PURPOUSE:** Compare the effects of two different exercise program (combined vs. aerobic) on cognitive function of hypertensive elderly. **METHODS:** Hypertensive medicated elderly (age 65.5±4, mini-mental state examination 25.4±3, geriatric depression scale 3.5±2.2, PAS 133.8±20, PAD 84±11) were allocated to combined training (CT, n=17), composed by resistance exercises to the main muscle groups (15 rep) twice/week and the aerobic exercises at 50min walking on a treadmill at 60% VO_2 reserve, three times/week, or to Aerobic Training (AT, n=13) composed by the same aerobic protocol, or to the control group (CG, n=19) which received no treatment. Cognitive function of the three groups were performed before and after 16 weeks of interventions or control period. Groton Maze Learning Test (GML) was used to assess spatial memory executive function (Working memory, attention and inhibitory control), along with Shopping list (ISL) for auditory learning and latter memory recall. We compared delta of groups by ANOVA One-way followed by Hochberg post hoc test and by Kruskal-Wallis following by Mann-Whitney for parametric and non-parametric data, respectively. Data is presented in mean ± standard deviation. **RESULTS:** There was larger GML rule-break error reduction (P<0.05) for CT (-2.7±6) and AT (-2.7±4) compared to CG (2.3±4). There was a tendency (p<0.07) to improve recording short auditory memory (ISL) after CT (1.5 ± 2) when compare to CG (0.0±0). No differences were found for latter recall. Furthermore, CT (-2.6±2) reduced more depression scores (P<0.05) compared to AT (-0.7±0) and CG (0.16±1). **CONCLUSIONS:** The reduction in rule-break errors suggest CT and AT improve attention, inhibitory control and

working memory and only CT improve short term auditive memory in hypertensive elderly individuals. The improvement in short-term memory could be associated with the improved attention which could be also dependent of lower depression score in this group.

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Mismatch Between Perception of Disability and Functional Outcomes in Individuals with Large Burn Injuries

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(No relevant relationships reported)

Functional limitation can be a serious problem in burn survivors. Such individuals report physical limitations following a burn injury which leads to a perceived reduction in health-related quality of life that persists years after the initial injury. **Purpose:** We tested the hypothesis that well-healed burn survivors having prior burn injuries covering a large body surface area will have greater subjective and objective functional limitations compared to those with prior injuries covering a small body surface area. **Methods:** Subjective information was collected through the SF-36 questionnaire, with a focus on the physical function domain. Objective measurements of functional ability included a maximal aerobic capacity test, timed-up-and-go, five times sit-to-stand, and timed stairs test. These variables were collected in three experimental groups: 8 individuals (2 female) with burn injuries greater than 50% (high burn, HB) of their total body surface area (TBSA); 9 individuals (5 female) with burn injuries covering less than 50% (low burn, LB) of their TBSA; and 7 (3 female) non-injured control subjects (CON). **Results:** Analysis of the perception of limitations in Physical Function from the SF-36 revealed a statistically significant difference between groups (P=0.0014). Further post hoc pairwise testing revealed that SF-36 Physical Function scores were higher in the CON group (99±2, p=0.002) and LB group (93±9, p=0.02) when compared to the HB group (71±19). No difference was found in the SF-36 Physical Function scores between the LB and control groups (p>0.99). Of note, this pattern of differences in the perception of physical limitations between the experimental groups was not reflected in the functional measurements. Specifically, no significant differences were identified in maximum aerobic capacity (CON:32±10, LB:27±5, HB:29±5 ml/kg/min, p=0.65), five times sit-to-stand (CON:9±2, LB10±2, HB:10±1 s, p=0.26), timed up-and-go (CON:13±3, LB:13±2, HB:14±2 s, p=0.51), and timed stairs test (CON:11±2, LB:11±1, HB:11±2 s, p=0.85). **Conclusion:** Collectively, these data suggest that in burn survivors with injuries covering greater than 50% of their TBSA, perceived physical limitations do not reflect objective measures of functional ability. Supported by NIH Grant GM068865

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Effects of Acute Aerobic Exercise on Cognitive Function in Individuals with Down Syndrome

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(No relevant relationships reported)

Individuals with Down syndrome (DS) commonly exhibit a mild to moderate level of cognitive impairment, which further affects quality of life in this population. Regular aerobic exercise has been shown to improve cognitive function among individuals with and without DS. However, if an acute bout of moderate intensity aerobic exercise has cognitive benefit in individuals with DS has yet to be explored. **PURPOSE**: To investigate the effect of an acute bout of aerobic exercise on cognitive function in individuals with and without DS.
METHODS: Forty volunteers with and without DS (DS=20, 25 yrs; Control=20, 25 yrs) participated in this study. VO2peak was obtained via indirect calorimetry by an individualized maximal exercise treadmill protocol. Participants exercised at 60% of maximal capacity for 20 min on a separate day. Cognitive function tests (task completion time and accuracy of task completion, A Quick Test for Cognitive Speed, AQT) were measured before, immediately after, and 30 min after the submaximal walking bout. Individuals without DS performed an additional cognitive function test, the Flanker test, to avoid the known ceiling effect of the AQT.
RESULTS: Individuals with DS exhibited impaired cognitive function compared to individuals without DS with slower task completion time and higher error rate. (p < 0.05 for both). AQT components, task completion time and error rate, were not altered after 20 min of treadmill exercise in either group. However, improved reaction time and error rate on the Flanker test (immediate; 30 min post), suggest exercise positively benefited cognitive function among those without DS. (p < 0.05).

CONCLUSIONS: Our results indicate that individuals with DS may need a higher intensity or longer exercise time for cognitive improvement. In addition, in-depth cognitive function testing may be more sensitive in detecting changes with exercise in individuals with DS.

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The Effects of Cardiovascular Health on Cognitive Function in Older Adults

Justin Mason[1], Salvador Jaime[2], Arun Maharaj[3], Roque Nelson[1], Gershon Tenenbaum[1], Arturo Figueroa, FACSM[3]. *[1]Florida State University, Tallahassee, FL. [2]University of Wisconsin - La Crosse, La Crosse, WI. [3]Texas Tech University, Lubbock, TX.* (Sponsor: Arturo Figueroa, FACSM)
(No relevant relationships reported)

Aging is associated with a decline in cognitive and psychomotor functions, resulting in difficulties with daily activities such as driving. Cognitive function has been found to be associated with carotid intima-media thickness (IMT) and aortic stiffness (carotid-femoral PWV, cfPWV). These age-related decrements can be mitigated through routine aerobic exercise.
PURPOSE: To determine the effects of life-long aerobic exercise on cognitive function, driving performance, and cardiovascular health among older adults (65 – 84 years old). **METHODS:** A cross-sectional design was utilized to compare 27 endurance-trained (ET) with 35 sedentary (S) older adults (70±5yrs). Older adults were excluded from the study if they were classified as having stage II hypertension, diabetes mellitus, cardiovascular diseases, or currently taking more than 1 medication for blood pressure or cholesterol. Driving performance and cognitive function were measured via driving simulator and a cognitive battery, respectively. Cardiovascular health consisted of assessing estimated VO_2max, carotid IMT, and cfPWV. Fitness comparisons were made using an independent sample t-test. Cognitive function and driving performance scores were transformed to Z-scores. **RESULTS:** VO_2max was higher among ET than S (41±9 vs 25±3 ml/kg/min, p<.01). BMI was higher among S than ET (26±4 vs 24±4, p<.01) There were no differences in brachial systolic blood pressure (131±13 vs 132±19 mmHg), cfPWV (12±2 vs 12±2 m/s), carotid-IMT (.74±.15 vs .76±.13 mm), and cognitive function scores (-.01±.57 vs -.09±.97) between the groups. However, ET performed better on the driving simulator (.18±.58 vs -.28±.92, p<.05). Carotid IMT and cfpwv were moderately associated (r = .38, p < .01). VO_2max was no associated with age, carotid IMT, or cfpwv. **CONCLUSION:** Enhanced cardiorespiratory fitness may mitigate age-related decrements in driving performance independently of central artery structure and function.

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Longitudinal Investigation of Daily Physical Education on Fitness Levels and Processing Speed among Minority Youth

Brooke E. Huhn, Julian A. Reed, Caroline E. Stanton. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)
(No relevant relationships reported)

PURPOSE: To examine the impact of 45 minutes of daily physical education on the fitness levels and Processing Speed among minority elementary school youth. **METHODS**: An analysis of variance (ANOVA) univariate linear model was used to evaluate the effectiveness of 45 minutes of daily physical education on physical fitness and Perceptual Speed among youth in grades 2 through 5 attending Legacy Early College, a Title I school in the southeastern United States. Gain scores (post-test assessment in May 2017 -- pre-test assessment in September 2015) were calculated, stratified by ethnicity and gender, and analyzed for significance. The interaction between school and time was estimated for each outcome. Each analysis was stratified by gender and adjusted by age to control for baseline differences by school. Control school students received physical education only once per week. **Summary of RESULTS**: Legacy students demonstrated significant gain increases on 3 of 3 (p<0.05) FITNESSGRAM[R] assessments. Legacy females improved on the number of laps during the Progressive Aerobic Cardiovascular Endurance Run (PACER) (Gain Score=10.58; F=7.766; df =1; p=0.007), number of push-ups (Gain Score=4.09; F=15.030; df =1; p=0.000), and number of curl-ups (Gain Score=13.69; F=19.619; df =1; p=0.000). Legacy males improved on PACER laps (Gain Score=15.97; F=10.355; df=1; p=0.002), number of push-ups (Gain Score=4.16; F=19.030; df=1; p=0.000), number of curl-ups (Gain Score=14.79; F=24.138; df=1; p=0.000), and 3 of 4 Perceptual Speed sections. Most notably, significant increases were observed in the Total section (Gain Score=15.43; F=8.294; df=1; p=0.005). **CONCLUSION**: 45 minutes of daily physical education led to an increase in physical fitness levels and Processing Speed among minority elementary school youth attending Legacy Early College.

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Investigation Between Daily PE, Fluid Intelligence, Fitness and BMI among Middle School Youth Over Time

Caroline E. Stanton, Julian A. Reed, Brooke E. Huhn. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)
(No relevant relationships reported)

Developmental research has demonstrated that higher cognitive abilities are often linked to physical activity participation. **PURPOSE**: The purpose of the study was to examine the impact of 45 minutes of daily physical education on Fluid Intelligence, fitness levels and BMI among middle school youth. **METHODS**: An analysis of variance (ANOVA) mixed effect linear model was used to evaluate the effectiveness of 45 minutes of daily physical education on Fluid Intelligence, Progressive Aerobic Cardiovascular Endurance Run (PACER), push-ups, curl-ups and BMI among youth in grades 6th-8th attending Legacy Early College, a Title I school in the southeastern US. Gain scores (final post-test assessment in May 2017 - original pre-test assessment in September 2014) were calculated and analyzed for significance. The interaction between school and time was estimated for each outcome. Each analysis was stratified by gender and adjusted by age to control for baseline differences by school. A Title I control school that provided physical education for only one semester was identified and utilized as a comparison. **Summary of RESULTS**: Legacy Early College students observed gain increases on Fluid Intelligence sections, significantly the Total Section, (Gain Score=10.31; F=5.920; df=140; p=.016) over time. Legacy students observed gain increases in PACER laps, push-ups and curl ups, over time compared to controls. Legacy students also observed decreases in BMI over time, compared to gain increases in controls. **CONCLUSIONS**: 45 minutes of daily physical education led to increases in Fluid Intelligence, PACER laps, push-ups and curl-ups, as well as decreases in BMI among Legacy middle school students from 2014 to 2017.

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405   Board #246   May 30 11:00 AM - 12:30 PM

Lasting Effects of Acute Exercise on Working Memory Performance in Older Adults with Long and Short Sleep

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(No relevant relationships reported)

BACKGROUND: A growing body of research indicates that acute exercise in older adults is associated with enhanced executive function, including inhibitory control and working memory. However, most studies have measured cognition shortly after the exercise session, and whether or not acute exercise has longer lasting cognitive benefits in older adults has not been established.
PURPOSE: To investigate executive function performance 1.5 hours after a single session of exercise, compared to rest, in healthy older adults; and to secondarily determine if sleep moderates these effects.
METHODS: 24 healthy older adults (65.8±8.1 years) completed two experimental sessions on different days that entailed 30-min of seated rest or moderate intensity exercise on a Monark cycle ergometer. Ninety minutes after exercise and rest, participants performed the Stoop Color and Word Task (Stroop) to measure inhibitory control and the Symbol Digit Modalities Test (SDMT) to for working memory. To examine sleep, participants wore an actigraphy watch for at least three days prior to the first experimental session.
RESULTS: SDMT performance following acute exercise (60.0±9.6) was significantly better compared to rest (57.7±8.9) [p = .049, η^2 = 0.146]. Moreover, oral SDMT performance was significantly better after exercise compared to rest in short sleepers (< 7.5 hr/night) [p < .001, η^2 = 0.885], but did not differ between exercise and rest in long sleepers (> 7.5 hr/night) [Condition*Sleep interaction, p = .047, η^2 = 0.174]. Short sleepers also significantly performed better in written SDMT after exercise relative to rest [p = .004, η^2 = 0.583]. Stroop interference score (incongruent minus congruent) was not significantly different between exercise and rest conditions.
CONCLUSION: These findings suggest that working memory performance is enhanced up to 1.5 hours after acute exercise in older adults who sleep less. Future studies should explore whether these effects of acute exercise confer a long-term protection against cognitive decline in older adults with poor sleep.

WEDNESDAY, MAY 30, 2018

406   Board #247   May 30 11:00 AM - 12:30 PM
Cognitive Performance Changes After 12 Weeks Of Strength Training In Elderly Overweight Women

Andre C. Smolarek[1], Steven R. McAnulty[2], Brad J. Schoenfeld[3], Karla D. Varela[1], Monica Dangui[1], Luis H. Ferreira[4], Luis P. Mascarenhas[1], Cleyton S. Oliveira[4], Alan C. Utter, FACSM[5], Tacito P. Souza-Junior[4]. *[1]UNICENTRO, Irati, Brazil. [2]Appalachian State University, Boone, NC. [3]University of New York City - Lehman College, New York, NY. [4]Universidade Federal do Parana, Curitiba, Brazil. [5]Texas Woman's University, Denton, TX.* (Sponsor: Alan C Utter, FACSM)
(No relevant relationships reported)

Healthy aging is a challenge to the world population, not only due to age related cognitive impairment but also dinapenia and sarcopenia which can affect strength dependent activities. Therefore, it is of interest to evaluate the effects of strength training concurrent with cognitive performance. The purpose of the study was to determine the effect of 12 weeks of strength training on cognitive performance changes in overweight older women. Twenty-one elderly overweight women were recruited and divided into a Control group (n = 5) and Intervention Group (n = 16). Participants had body mass, height, body mass index (BMI), waist circumference, waist to height ratio, Upper Lean Limbs (ULL) Lower Lean Limbs, (LLL) and cognitive performance measured. To evaluate differences between the control group and intervention group, a 2-way ANOVA with Tukey's post hoc comparison was used. The results indicate that after the intervention period with strength training, there were no differences in anthropometric variables. However, significant differences were found (p ≤0.05) in ULL, LLL and cognitive performance. Strength training in elderly overweight women exerts positive effects on upper and lower limb strength and also increases cognitive performance.

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Associations Of Objectively Measured Physical Activity With Executive Functioning In Chinese Young Adults

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(No relevant relationships reported)

Purpose: The purpose of study was to examine the associations of objectively measured physical activity with executive functioning in Chinese young adults.
Methods: Participants were 162 university students (45.7% females, mean age =19.0 ± 1.1 years) recruited from a university in Shanghai, China. Participant's daily physical activity was measured by hip-mounted accelerometers (Actigraph wGT3X-BT, Pensacola, FL, USA). The accelerometer data were analyzed using Actilife 6 software (Pensacola, FL, USA). Executive functioning was assessed by a task-switching paradigm programed using E-Prime 2 professional (Psychology Software Tools, Inc., Sharpsburg, PA, USA). Global switch costs and local switch costs were derived and used as the outcomes of the task. Anthropometrics were measured using standardized procedures.
Results: After controlling for wear time of accelerometers, age and gender, moderate-to-vigorous physical activity (MVPA, β = -0.19, 95% CI, -0.35 to -0.03, p = 0.02) and light physical activity (LPA, β=-0.17, 95% CI, -0.34 to -0.01, p = 0.04) were associated with smaller global reaction time (RT) switch costs. The findings suggested that higher levels of both MVPA and LPA were associated with better task-switching performance, as indicated by smaller global RT switch costs. No significant association was observed between total PA and global RT switch costs, despite a trend toward near statistical significance (β = -0.15, 95% CI, -0.31 to 0.01, p = 0.06). PA indicators were not associated with global accuracy switch costs, and no associations were observed between PA indicators and local RT or accuracy switch costs. Taken together, the results indicated that higher levels of MVPA and LPA were associated with some aspects of executive functioning measured by a task-switching paradigm.
Conclusion: Higher levels of objectively measured MVPA and LPA were associated with better performance on some aspects of executive functioning in Chinese young adults.

408   Board #249   May 30 11:00 AM - 12:30 PM
The Effects Of High-Cadence Cycling On Emotional Recognition In Individuals With Parkinson'S Disease

Angela L. Ridgel, Sara A. Harper, Bryan T. Dowdell, Brandon S. Pollock. *Kent State University, Kent, OH.* (Sponsor: J Derek Kingsley, FACSM)
(No relevant relationships reported)

Parkinson's disease (PD) is a progressive neurodegenerative disease that can lead to cognitive dysfunction including deficits in emotional recognition, which is the ability to identify facial expression of happiness, sadness, fear, anger and disgust. This deficit has been shown to lead to difficulties in social interaction and communication. High cadence cycling is a unique rehabilitation modality that has been shown to improve motor function in PD, but it is not known how this modality alters cognition. **PURPOSE:** To examine if three bouts of high-cadence cycling improved emotional recognition in individuals with PD. **METHODS:** Individuals (N=17) completed three sessions of high cadence cycling, on a custom motorized stationary cycle, consisting of a 5-minute warm-up at 50 revolutions per minute (rpm), 30 minutes of high cadence cycling between 75-85 rpm, and a 5-minute cool down. Emotional recognition was assessed using a computerized cognitive assessment battery at baseline and after (post-test) the three cycling sessions. The percentage of accurately identified emotions and the average reaction time to correctly select an emotion (emotion bias) was used for the analysis. Z-scores were used for the analysis and negative numbers represented scores below expected normal values. **RESULTS:** Three bouts of high-cadence cycling resulted in a significant improvement in the accuracy of identifying emotions from baseline to post-test for disgust (0.007±1.2 vs. 0.71±1.17, p=0.013). There were also improvements in emotion bias from baseline to post-test for sad (-1.37±1.29 vs. -0.66±1.00, p=0.003), anger (-1.18±1.08 vs. -0.41± 1.21, p=0.006) and fear (-1.60±1.33 vs. -1.10±1.25, p=0.030), but there were no significant changes in emotion bias for disgust (-1.55±1.28 vs. -1.23±1.15, p=0.130). **CONCLUSIONS:** Three bouts of high-cadence cycling improved several measures of emotional recognition, specifically negative-bias emotions. These findings suggest that high-cadence cycling could be a valuable rehabilitation modality for improving emotional recognition and potentially social interactions in individuals with PD. Support: Kent State University's School of Health Sciences, Midwest American College of Sports Medicine, Ohio Parkinson Foundation Northeast Region Grant.

409   Board #250   May 30 11:00 AM - 12:30 PM
Impact of Physical Activity on Cognition in Older Mexican Americans

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(No relevant relationships reported)

Alzheimer's disease (AD) is a devastating public health problem that affects over 5.4 million Americans. Exercise is considered a modifiable risk factor for Alzheimer's disease and cognitive decline. Physical activity has been found to improve cognitive function in older adults. However, few studies have examined the relationship between self-reported PA and cognitive functioning in Mexican American elders.
PURPOSE: To examine to impact of PA levels (inactive vs. highly active) on cognition in Mexican Americans elders.
Methods: Data was analyzed from HABLE (Health and Aging Brain among Latino Elders), which is an epidemiological study of aging among Mexican Americans. The IPAQ-long form was administered to 361 cognitively normal participants (59+7yrs). IPAQ scores were stratified into two groups inactive and high PA. Cognition was assessed via neuropsychological test scores in five domains: Memory (Logical Memory I & II), Executive (CLOX 1, Trails A), Visual Spatial (CLOX 2, Trails B), Attention (Digit Span), Language (Animal Naming), and global cognition (MMSE). An independent samples t-test was used to compare inactive and high PA groups on cognitive performance.
RESULTS: The inactive group scored significantly lower on WMS III Logical Memory I (32+9 vs. 35+9, p<0.01), WMS III Logical Memory II (19+7 vs. 22+7, p<0.01), CLOX 1 & 2 (24+3 vs. 25+3, p<0.05), and MMSE (26+3 vs. 27+2, p<0.01). There were no significant differences found among the groups on Trails A (59+31 secs vs. 54+23 secs), Trails B (141+68 secs vs. 145+69 secs), Digit Span (11+3 vs.11+3), and Animal Naming (16+4 vs.17+4).
CONCLUSION: High levels of physical activity was associated with better performance in memory, executive functioning, and global cognition among Mexican American elders with normal cognition. Inactivity was associated with poorer cognitive performance.

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Safety, Enjoyment, And Physiological Responses Of Kinect-based Exergames In Older Adults At Risk For Falls

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(No relevant relationships reported)

Exergaming has the potential to improve physical function, cognition and dual-task function, and could be an effective new strategy for reducing risk of falling in older adults. **PURPOSE:** To evaluate and test the safety, enjoyment, and physiological responses on custom Microsoft Kinect-based motion-tracking games that train specific dual-task function in older adults at risk for falls. **METHODS:** Community-dwelling older adults who reported current mobility difficulties or falling in the past year were included in the study. Participants played three newly developed exergames (Double Decision, Target Trackers, and Visual Sweeps, 5 minutes each) in random order. Heart rate (HR) was measured during each exergame, and blood pressure (BP), rating of perceived exertion (RPE) and rating of the Physical Activity Enjoyment Scale were recorded immediately after each exergame. Student t-tests were used to examine the differences in variables at resting state and during/after exercise. Repeated measure analyses of variance were used to examine the differences in variables among the three exergames. **RESULTS:** Seven participants (aged 76±6 years; 4 females) completed the study. The exergames did not cause any injuries. Average exercise HRs for Double Decision, Target Tracker, and Visual Sweeps were 87.57±6.58 bpm, 84.71±8.48 bpm, and 82.00±9.72 bpm; post-exercise BPs were 129.29±12.35/78.14±9.06 mmHg, 129.86±7.99/81.86±13.28 mmHg, 132.86±14.31/79.43±13.01 mmHg; post-exercise RPEs were 11.14±1.07, 10.14±1.21, and 9.86±1.86; and post-exercise enjoyment ratings were 81.22±0.14%, 90.61±0.18%, and 79.59±0.16%, respectively. Average exercise HRs were significantly higher than resting HRs for all three exergames (p<0.01). Visual Sweep had significantly lower average exercise HR compared to Double Decision (p<0.05) and Target Tracker (p<0.05), and there was a significant difference in post-exercise RPE between Double Decision and Target Tracker (p<0.05). There was a significant difference between Target Tracker and Double Decision in post-exercise enjoyment ratings (p<0.05). **CONCLUSION:** The newly developed exergames were safe, enjoyable, and light for older adults who are at risk for falls. Future intervention studies are needed to examine the benefits of exergames for this special population.

A-52   Free Communication/Poster - **Exercise Psychology, Neuroscience**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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411   Board #252   May 30 11:00 AM - 12:30 PM

Acute Dose-response Effects Of Aerobic Exercise On Cerebrovascular Hemodynamics

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(No relevant relationships reported)

Exercise may influence cerebrovascular hemodynamics. Few studies have evaluated acute effects of aerobic exercise on cerebral blood flow and cerebral pulsatile flow. **PURPOSE**: To evaluate acute effects of aerobic exercise on cerebrovascular hemodynamics following sitting, a 10-minute exercise bout and a 30-minute exercise bout. **METHODS:** Fifteen adults (age = 45.4±8.9 years) participated in this randomized crossover study comprised of three experimental sessions: 30 minutes of sitting (SIT), 20 minutes of sitting followed by 10-minutes of exercise (EX10), and 30-minutes of exercise (EX30). The exercise consisted of walking on a treadmill at 70-75% of age-predicted maximum heart rate. Cerebrovascular hemodynamics were measured using transcranial Doppler ultrasonography before the experimental session and at 30- and 60-minutes post-session. Beat-to-beat peak systolic, mean systolic and diastolic cerebral blood flow velocities (CBFv) as well as pulsatility index were recorded bilaterally for 1 min via insonation of the middle cerebral artery (MCA). **RESULTS**: Pulsatility index was 4.7% (P=0.08) higher in EX30 vs. SIT at the 30-minute but not the 60-minute post session assessment. There was no difference in pulsatility index at the 30 or 60-minute post-session between SIT and EX10 (P>0.33) or EX30 and EX10 (P>0.27). Peak systolic, mean and diastolic CBFv were not different across conditions at either post-session assessment (P>0.10). **CONCLUSIONS**: Exercise that is either 10 or 30 minutes in duration does not

improve cerebrovascular hemodynamics in the MCA within one hour of following the exercise session. Research may be necessary to understand affects cerebrovascular dynamics in response to acute and chronic exercise.

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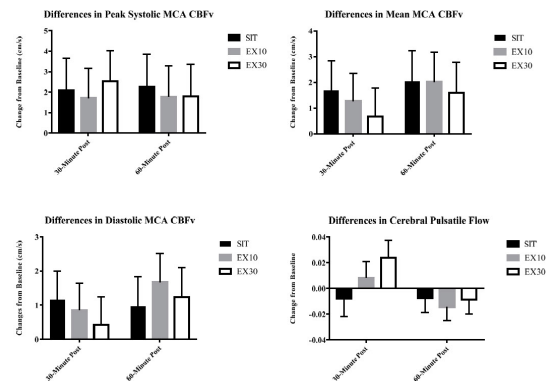
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Endocannabinoid Responses to Exercise in Individuals with Substance Use Disorders

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(No relevant relationships reported)

The endocannabinoid system (eCB) is downregulated in substance use disorder (SUD) patients. Pharmacologically targeting the eCB system has led to improved SUD treatment outcomes in both preclinical and clinical studies. Exercise is a non-pharmacological method of augmenting the eCB system in healthy adults, but it is unknown whether exercise can activate the eCB system in SUD patients. **PURPOSE:** To examine eCB responses to acute and chronic aerobic exercise in SUD patients. **METHODS:** Twenty-one SUD patients (35 ± 9 yrs) were recruited from local intensive outpatient treatment programs. Participants were randomized to either treatment-as-usual (TAU, at their outpatient clinic) or TAU plus aerobic exercise training (EX). EX participants engaged in supervised, moderate-intensity exercise sessions 3 x/wk for 6 wks. TAU participants came into the laboratory once per week for assessments and a quiet rest session. At 0- (baseline), 3- (mid), and 6- (post) wks, participants provided blood samples before and after exercise or quiet rest to assess plasma eCB concentrations (anandamide [AEA] and 2-arachidonoylglycerol [2-AG]). Data were analyzed using mixed model ANOVAs and Cohen's d effect size calculations. **RESULTS:** There was a significant group X time interaction for AEA (p < 0.001). Simple effects indicated that AEA increased acutely after exercise in the EX group (p < 0.001) but did not change after quiet rest in the TAU group (p = 0.39). There were no group differences or significant changes in 2-AG (p > 0.05). Effect size calculations indicated there were small to moderate increases in AEA (d = 0.36) and 2-AG (d = 0.37) concentrations from 0 to 6 weeks in the EX group but small to moderate decreases in AEA (d = -0.42) and 2-AG (d = -0.40) concentrations in the TAU group, though these changes were not statistically significant. **CONCLUSION:** These results indicate that aerobic exercise is able to activate the eCB system in SUD patients, which may contribute to improved treatment outcomes. Exercise may also increase basal eCB concentrations over time, suggesting that exercise could be one method to restore eCB function in SUD patients. Additional investigations with larger sample sizes and longer exercise program durations are warranted. Supported by NIH R36DA040140 and the UW Virginia Horne Henry Fund.

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Impact of High-Intensity Interval Exercise on Executive Function and Brain Derived Neurotrophic Factor

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(No relevant relationships reported)

PURPOSE: Prefrontal cortex (PFC)-dependent executive function (EF) is enhanced immediately following completion of high-intensity interval exercise (HIIE). Brain-derived neurotrophic factor (BDNF) is a key protein that enhances EF at rest and in

response to acute exercise. However, no studies have examined the possible utility of plasma and/or serum BDNF as a biomarker of improved EF in response to a single session of HIIE.
METHODS: Thirteen subjects performed the Wisconsin Card Sorting Task (WCST) to assess EF immediately following a 5 min seated rest and participation in a HIIE (10 x 20 s bouts of maximal cycling against 5.5% of the subject's body weight). Whole blood was collected prior to and immediately following HIIE and the WCST to assess plasma and serum BDNF concentrations.
RESULTS: HIIE increased the number of correct responses (p = 0.048) and reduced the number of total and non-preservative errors (p = 0.048; p = 0.027, respectively) on the WCST compared to the seated rest. Elevated plasma and serum BDNF concentrations prior to exercise were also associated with enhanced WCST performance during the seated rest, and in response to HIIE, BDNF concentrations in plasma, and to a lesser extent in serum, predicted a faster and more accurate performance on the WCST. However, while plasma BDNF concentrations were unaltered and serum BDNF concentrations increased in response to HIIE (F[2,48] = 6.759, p = 0.003), these response were not associated with improved WCST performance.
CONCLUSIONS: These data provide evidence supporting circulating BDNF in plasma, and to a lesser extent in serum, as a biomarker of enhanced PFC-dependent EF at rest and in response to HIIE.

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Effect Of A Single Session Of High-intensity, Resistance Or Combination Exercise Training On Neurotrophic Factors In Overweight Collegiate Men: The Brainfit Study

Maria Andrea Domínguez-Sanchéz[1], Gina Paola Velasco-Orjuela[2], Andrea del Pilar Quintero[2], Jorge Enrique Correa-Bautista[2], Antonio García-Hermoso[3], Rosa Helena Bustos-Cruz[1], Carlos Andrés Peña-Guzmán[4], Luis Andrés Téllez-T[2], Robinson Ramírez-Vélez[2]. [1]Universidad de La Sabana, Chia, Colombia. [2]Universidad del Rosario, Bogotá D.C, Colombia. [3]Universidad de Santiago de Chile, USACH, Santiago de Chile, Chile. [4]Universidad Santo Tomás, Bogotá D.C, Colombia.
(No relevant relationships reported)

PURPOSE: To compare the neurotrophic factor response following one session of high-intensity exercise, resistance training or both in a cohort of physically inactive overweight adults aged 18-30 years old.
METHODS: A randomized, parallel-group clinical trial of fifty-one men (23.6±3.5 years; 83.5±7.8 kg; 28.0±1.9 kg/m^2) who are physically inactive (i.e., <150 min of moderate-intensity exercise per week for greater than 6 months) and are either abdominally obese (waist circumference ≥ 90 cm) or have a body mass index ≥ 25 and ≤ 30 kg/m^2 were randomized to the following four exercise protocols: high-intensity exercise (4×4 min intervals at 85-95% maximum heart rate [HRmax] interspersed with 4 min of recovery at 75-85% HRmax) (n=14), progressive resistance training (25 to 30 repetitions per set, at 70% of one repetition maximum with 60 s of recovery) (n=12), combined high-intensity and resistance exercise (n=13), or non-exercising control (n=12). The plasma levels of neurotrophin-3 (NT-3), neurotrophin-4 (also known as neurotrophin 4/5; NT-4 or NT-4/5), and brain-derived neurotrophic factor (BDNF) were determined before (pre-exercise) and 1-min post-exercise for each protocol session.
RESULTS: Resistance training induced trivial increases in BDNF, NT-3 and NT-4/5 (15.5 ng/mL [95% CI, 1.2 to 32.3; *d*=0.14], 39.6 ng/mL [95% CI, 2.5 to 76.6; *d*=0.19], and 1.3 ng/mL [95% CI, 0.3 to 2.3; *d*=0.17], respectively). Additionally, combined training results in favorable effects on both BDNF (22.0, 95% CI, 2.6 to 41.5; *d*=0.19) and NT-3 (32.9, 95% CI, 12.4 to 53.4; *d*=0.25). In the per-protocol analyses, the combined training group but not the other interventions showed greater changes in BDNF (99.7, 95% CI, 22.4 to 176.7; *d*=1.01), NT-3 (89.9, 95% CI, 2.2 to 172.1; *d*=0.79), and NT-4 (7.5, 95% CI, 1.7 to 13.3; d=1.07) compared to the control group.
CONCLUSIONS: The findings indicate that acute resistance training and combined exercise increase neurotrophic factors in physically inactive overweight adults. Further studies are required to determine the biological importance of changes in neurotrophic responses in overweight men and chronic effects of these exercise protocols.

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Effects Of Prior Endurance And Resistance Training On PD: Role Of Autophagy And Apoptosis

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(No relevant relationships reported)

PURPOSE: To determine the relationship between autophagy and apoptosis in midbrain striatum in PD model mice and to investigate whether prior endurance and resistance training can intervene the pathogenesis.
METHODS: Male C57BL/6J mice aged 12 months were randomly divided into 3 groups: control (C), endurance training (E), or resistance training (R). E were exercised on a treadmill for 12 weeks. R was subjected to ladder training for 12 weeks. After training, each group was randomly administered with either MPTP (2*30mg/kg×2, i. p., 16 hr apart, M) or saline (S). Mitochondrial function, proteins in autophagy and apoptosis were measured in the midbrain striatum.
RESULTS: Compared with C, M suppressed mitochondria state 3 respiration (-42%, p<0.01) , respiratory control ratio (RCR, -44%, p<0.01) , and ATP synthesis activity (-40%, p<0.01); and elevated Beclin1 (+35%, p<0.05), LC3-II (+26%,p<0.05), BCl2 (+41%,p<0.01) , and BAX (+21%,p<0.05) protein levels(p<0.05). Both ME and MR significantly elevated mitochondria state 3 (+72%,+101%, p<0.01), RCR (+47%,+98%, p<0.01), and ATP synthesis activity (+27%,+45%, p<0.01), and elevated Beclin1 (+28%, p<0.05; +57%, p<0.01), LC3-II (+30%,+39%; p<0.05), BCl2 (+23%,+38%; p<0.01), and BAX (+30%,+48%, p<0.01) protein levles. MR increased mitochondria state 3 respiration (+16%, p<0.05), RCR (+34%, p<0.01), ATP synthesis (+14%, p<0.05), Beclin1 (+23%, p<0.01), LC3-II (+7%, p<0.05) , BCl2(+12%,p<0.05) protein levels , compared to ME.
CONCLUSIONS:MPTP can damage mitochondrial respiratory function in the midbrain and striatum possibly related to an up-regulation of autophagy and apoptosis. Prior training increases autophagy and apoptotic tendency in PD mice. Resistant training appears more effective in ameliorating autophagy and apoptosis and mitochondrial function. (Supported by NSFC No.31000523 and 31370021).

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Impacts of Cerebellar tDCS During a Dual-Task: Sustained Balance Improvement

Kira G. Oberle, Caroline J. Ketcham. *Elon University, Elon, NC.*
(Sponsor: Dr. Eric Hall, FACSM)
(No relevant relationships reported)

The importance of accurate cognitive performance during a complex motor task is essential for professions including athletes, police and military personnel. Cerebellar transcranial direct current stimulation (tDCS) has been used as a low-cost, non-invasive technique to enhance performance of individuals in a variety of isolated motor and cognitive tasks but not in a dual-task. **PURPOSE**: The purpose of this study was to examine the effect of cerebellar tDCS during a dual task. **METHODS**: Twenty healthy college-age individuals completed this study. A baseline dual-task was conducted with participants completing four cognitive tasks: Reaction Time (simple, choice) and Working Memory (Stroop and N-Back) while simultaneously maintaining balance on an unstable BioDex Balance platform. Each participant received anodal (n=10) or sham (n=10) cerebellar tDCS at 1mA for a total of 40mA (~45mins). During this time, participants completed cognitive and balance training. Participants repeated the dual-task testing immediately following training, and again one week later. **RESULTS**: Results showed no differences in cognitive performance between the tDCS and sham groups (p>0.05). Balance continued to show improvements during the simple cognitive tasks in the tDCS group one week later (p<0.05). **DISCUSSION**: Overall there were limited dual-task performance improvements of cerebellar tDCS in a 45-minute training session. It is possible the dual-task was too complex and the training session too short for this population. There is potential of cerebellar tDCS in an athletic population who rely on peak performance in both cognitive and motor skills simultaneously.

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Aerobic Exercise Training Effects on NrF2 and the Antioxidant Defense System

Lauren S. Vervaecke, Allan H. Goldfarb, FACSM, Laurie Wideman, FACSM, Joseph Starnes, FACSM, Keith Erikson. *University of North Carolina Greensboro, Greensboro, NC.*
(No relevant relationships reported)

Nuclear factor erythroid 2 related factor 2 (NrF2), is an essential transcription factor and master regulator of the antioxidant defense system aiding in cellular protection and survival. **PURPOSE**: To determine the effect of chronic aerobic exercise on NrF2 and antioxidant factors in individual brain regions. **METHODS**: Male Sprague Dawley

rats (n=12-13/group), 6 weeks of age, were exercise trained (ET) or were sedentary controls (SD). The exercised rats ran on a treadmill using a ramped protocol for 5-7 weeks at an intensity equal to ~75% VO_{2max}. Five hours after the final exercise session rats were euthanized and the cortex, hippocampus, and cerebellum brain regions were collected and stored at -80°C until further analysis. NrF2 protein concentration was measured via western blot analysis. Total glutathione (TGSH) and reduced glutathione (GSH) concentration were measured via HPLC. Manganese superoxide dismutase (Mn-SOD) activity was measured using a spectrophotometric assay. All samples were analyzed in duplicate. The significance level was set a-priori at p<0.05 and the results are displayed as the mean ± SEM. **RESULTS**: Hippocampal NrF2 was significantly elevated with exercise (ET=3.62±0.20 vs. SD=2.28±0.10 arbitrary units), but was significantly reduced in the cortex (ET=3.20±0.24 vs. SD=6.39±0.26 arbitrary units) and cerebellum (ET=2.02±0.11 vs. SD=3.12±0.16 arbitrary units). TGSH and GSH significantly increased in the hippocampus (ET=182.76±4.64 vs. SD=135.54±4.89 umol/mg protein) (ET=178.94±4.59 vs. SD=131.36±4.83 umol/mg protein), respectively, but were unchanged in cortex and cerebellum regions. No significant differences were detected in Mn-SOD with aerobic exercise in any brain region. **CONCLUSIONS**: NrF2 and antioxidant factors were up-regulated in the hippocampus only with chronic aerobic exercise training compared to sedentary controls. However, other brain regions respond differently to aerobic exercise. This merits notation as the hippocampus is a primary brain region susceptible to neurodegenerative diseases.

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The Effects of Acute Aerobic Exercise On Primary Motor Cortical Excitability in Healthy Older Adults

Bea A. Francisco, Jason L. Neva, Katlyn E. Brown, Kristin L. Campbell, Lara A. Boyd. *University of British Columbia, Vancouver, BC, Canada.*
(No relevant relationships reported)

Age-related motor deficits are associated with a decreased ability to modulate primary motor cortex (M1) excitatory and inhibitory circuits. In young healthy adults, an acute bout of lower-limb aerobic exercise modulates upper-limb corticospinal excitability and intracortical circuitry. Importantly, these changes are associated with improved performance on skilled upper-limb motor tasks. However whether these effects extend to healthy older adults is not known.
PURPOSE: To determine whether an acute bout of lower-limb aerobic exercise alters corticospinal and intracortical excitability using single and paired pulse transcranial magnetic stimulation (TMS) of the extensor carpi radialis muscles in healthy older adults. **METHODS:** Corticospinal excitability, short-interval intracortical inhibition (SICI), and intracortical facilitation (ICF) were assessed in 16 healthy older adults (10 female, aged 65.3 ± 6.4 years) at two time-points prior to (30 minutes pre- and immediately pre-exercise) and two time-points following an exercise bout (immediately and 30 minutes post-exercise) to evaluate the time course of cortical excitability modulation. The exercise bout consisted of 20 minutes of continuous cycling at moderate-intensity (50% peak power output (watts) from a maximal stress test performed in a pre-experimental session). **RESULTS:** Due to no significant difference between baseline time-points, the two pre-exercise time-points were collapsed to provide an average baseline value for all measures. To control for baseline fitness levels ($VO2_{peak}$), a one-way repeated measures ANCOVA revealed an increase in SICI by 12 ± 7% immediately after and by 11 ± 9% 30 minutes post-exercise compared to baseline levels ($F_{(2,14)}$=3.829, p=.034). There was no effect of exercise on any of the other measures. **CONCLUSION:** This study is the first to show that primary motor cortical inhibitory circuits may be modulated by a single bout of aerobic exercise in healthy older individuals. These findings imply that short bouts of moderate intensity exercise promote motor cortical plasticity in healthy older people.

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Pathways To Functional Hypothalamic Amenorrhea: Role Of Energetic And Psychosocial Factors

Nicole C. Aurigemma. *Pennsylvania State University, University Park, PA.* (Sponsor: Mary Jane De Souza, FACSM)
(No relevant relationships reported)

Functional hypothalamic amenorrhea (FHA) can occur due to the independent or combined effects of psychogenic and energetic stressors. In exercising women, research has primarily focused on energy deficiency related to restrictive eating as the cause of FHA while other psychogenic stressors known to contribute to FHA have been ignored.
PURPOSE: To assess psychosocial and energetic factors associated with FHA in exercising women.
METHODS: We performed a cross-sectional comparison of exercising women (≥2 hours/week, age 18-35 years, BMI 16-25 kg/m²) who were eumenorrheic or who had hypothalamic amenorrhea. Menstrual status was determined using daily urine samples assayed for estrogen and progesterone metabolites and menstrual calendars. Blood samples, exercise logs, DXA, and resting metabolic rate (RMR) testing provided data on metabolic hormones, physical activity, anthropometrics, and energy expenditure.

Psychosocial factors were assessed with these scales: Beck Depression Inventory (BDI), Dysfunctional Attitudes Scale (DAS), Daily Stress Inventory (DSI), Perceived Stress (PSS), Brief Resilience Coping Scale (BRCS), Profile of Mood States (POMS), Eating Disorder Inventory (EDI-3), and Three-Factor Eating Questionnaire (TFEQ). Differences between groups were assessed using ANOVA and Mann-Whitney tests. **RESULTS**: Participants did not differ with respect to weight, lean body mass, and fat free mass; however, amenorrheic women had significantly lower body mass index (p=0.010), percent body fat (p=0.017), and fat mass (p=0.018). Amenorrheic women also had significantly lower serum T4 (p=0.008), T3 (p<0.001), leptin (p<0.001), and ratio of measured to predicted RMR (p=0.011) as well as elevated PYY (p<0.000) and scores for drive for thinness (p=0.016), cognitive restraint (p=0.001) subscales. **CONCLUSIONS**: FHA in exercising women is associated with energy deficiency but only mild indications of psychosocial factors known to be associated with the suppression of reproductive function. FHA in women may vary in its etiology depending on the population studied.

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420   Board #261   May 30 11:00 AM - 12:30 PM
Objective Sleep Characteristics of Young Elite Female Gymnasts

Jasmien Dumortier[1], Jan Boone[1], An Mariman[2], Liesbeth Delesie[2], Els Tobback[2], Dirk Vogelaers[2], Jan G. Bourgois[1]. *[1]Ghent University, Ghent, Belgium. [2]Ghent University Hospital, Ghent, Belgium.*
(No relevant relationships reported)

PURPOSE: Sleep is considered one of the most important recuperation techniques for elite athletes, with its specific features implicating different aspects of learning skills and physical recuperation. The aims of this study were (1) to assess objectively the sleep characteristics of elite gymnasts and (2) to correlate these findings with their age. **METHODS**: Twelve elite female gymnasts (15.1 ± 1.5 years old; VO_{2MAX}: 53.18 ± 5.1 ml·min⁻¹·kg⁻¹; 30.7 ± 1.7 training hours/week) underwent a nocturnal polysomnography (PSG) after a regular training day (6 - 6.5 h of training). The PSG was scored according to the guidelines of the American Academy of Sleep Medicine (AASM). Time in bed (min), Total Sleep Time (TST, min), Sleep Efficiency (SE, %), Non Rapid Eye Movement 1 (NREM1, %), NREM2 (%), Slow Wave Sleep (SWS, %), REM (%), Wake After Sleep Onset (WASO, min), Sleep Onset Latency (SOL, min), Awakening Index (/h) and Apnea-Hypopnea-Index (/h) were measured and analyzed. Furthermore, the gymnasts completed the Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI). Sleep parameters were correlated with age using a Pearson Correlation.
RESULTS: The following objective values were attained: time in bed 487 ± 13 min, TST 437 ± 27 min, SE 89.5 ± 4.1 %, NREM1 4.9 ± 3.6 %, NREM2 38.7 ± 10.2 %, SWS 36.9 ± 11.4 %, REM 19.3 ± 3.8 %, WASO 32.4 ± 9.2 min, SOL 18.3 ± 16.5 min, Awakening Index 16.1 ± 6.3 /h, Apnea-Hypopnea-Index 0.9 ± 0.8 /h, ESS 5.3 ± 2.5 (/24), PSQI 2.6 ± 1.9 (/21). Age-matched correlations for %SWS (R=-0.693, P=0.013) and arousals from SWS (R=-0.622, P=0.031) were found. The younger the gymnasts, the higher %SWS was found, with higher amounts of arousals from SWS in the younger gymnasts.
CONCLUSIONS: Objective sleep assessments through PSG in elite female athletes suggest a higher amount of SWS compared to non-elite athletic peer students (Suppiah et al., Ped. Ex. Sc. 2016; 28:588-595) as a salient feature in their sleep architecture. This may represent an advantage towards higher performance, as sleep deficits are related with lower performance. Hence, it needs to be explored whether a thorough analysis of elite athletes' sleep should be incorporated in health screenings.

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421   Board #262   May 30 11:00 AM - 12:30 PM
Impact of a Carbohydrate Mouth Rinse on Motor Performance and Corticospinal Motor Excitability

Darrin C. LaForge[1], Julie Hibbard[1], Madison Moon[1], Stephen Folger[1], Gabriel K. Harris[2], Stephen Bailey, FACSM[1]. *[1]Elon University, Elon, NC. [2]North Carolina State University, Raleigh, NC.*
(No relevant relationships reported)

Application of a carbohydrate (CHO) mouth rinse (MR) prior to exercise has been shown to improve physical performance and facilitate corticospinal motor excitability. It is unclear if different forms of CHO impact this phenomenon. PURPOSE: The purpose of this investigation is to determine the effects of different forms of a CHO MR on muscular performance and corticospinal motor excitability. METHODS: Ten normal healthy subjects (5 females, 5 males; 25±1 years; 1.71±0.03 m 73±5 kg) completed 4 trials each separated by at least 48 hours. A different MR condition was applied during each trial (Placebo (PLAC), 6.4% glucose (GLU), 6.4% maltose (MAL), 6.4% maltodextrin (MDX)). Maximal voluntary contraction (MVC) of the right knee extensors and motor-evoked potential (MEP) of the right vastus medialis was determined pre (10 min before), immediately after, and post (10 min after) application of the MR. MEP was precipitated by applying transcranial magnetic stimulation (TMS) during muscle contraction (50% of MVC). The MR was held

in the mouth for 20 sec and MR treatments were applied using a Latin square design. RESULTS: No differences were found in the change of MEP from pre to immediately after the MW across the conditions (PLAC=1.5±4.4%; GLU=-6.2±11.2%; MAL=3.9±3.4%; MDX=8.9±7.9%). In contrast, the increase in MEP was greater at the post time point in CHO conditions (GLU=-11.3±14.7%, p=0.01; MAL=12.9±7.9%, p=0.07; MDX=28.0±14.4%, p=0.02) as compared to PLAC (PLAC=-14.3±7.8%). MVC was similar at pre (PLAC=260±26 Nm; GLU=241±19 Nm MAL=245±21 Nm; MDX=248±25 Nm), after (PLAC=269±26 Nm; GLU=249±18 Nm MAL=257±19 Nm; MDX=250±23 Nm), and 10 min after (PLAC=262±28 Nm; GLU=256±17 Nm MAL=269±25 Nm; MDX=253±21 Nm) the MW. CONCLUSIONS: CHO MR increased corticospinal motor excitability 10 min after application; however, the form of CHO used did not influence this response. The increase in corticospinal motor excitability did not translate into an improvement in motor performance.

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422 Board #263 May 30 11:00 AM - 12:30 PM

Endocannabinoid System Involvement in Exercise-Induced Enhancement of Fear Extinction in Mice

Kevin M. Crombie[1], Angelique G. Brellenthin[1], Cecilia J. Hillard[2], Kelli F. Koltyn, FACSM[1]. [1]University of Wisconsin - Madison, Madison, WI. [2]Medical College of Wisconsin, Milwaukee, WI. (Sponsor: Kelli F. Koltyn, FACSM)
(No relevant relationships reported)

The endocannabinoid (eCB) system has emerged as a promising target for enhancing fear extinction learning, which has therapeutic implications for the treatment of stress and anxiety disorders that rely primarily on exposure-based therapies. Although previous investigations have used pharmacological approaches to enhance fear extinction, there is a strong rationale to investigate the efficacy of non-pharmacological approaches (e.g., exercise) shown to activate the eCB system. **PURPOSE:** To examine the effects of exercise on the extinction of conditioned fear, anxiety-like behaviors, and eCB adaptations in cortico-limbic regions. **METHODS:** ICR/CD1 male mice (N = 26) completed a series of behavioral tests prior to and following a fear-conditioning (day 1; FC) and fear-extinction (days 2-5; FEXT) protocol. Following FC, mice were randomly assigned to caging containing either an unlocked (EX) or locked (CON) running wheel, with unlimited access until 24 hours following the last FEXT session. Mice were sacrificed 48 hours after the last behavioral test in order to examine central eCB tissue content. Data were analyzed using a series of one-way and mixed model ANOVAs, Pearson correlations, and Cohen's d effect sizes. **RESULTS:** EX mice exhibited a significant reduction in anxiety-like behaviors from pre to post compared to the CON mice ($p < 0.05$). Although both groups experienced less freezing over time, EX mice exhibited significantly less freezing on days 2 ($d = 0.39$), 3 ($d = 0.50$), 4 ($d = 1.16$), and 5 ($d = 0.89$) compared to CON mice ($p < 0.05$). Additionally, moderate to strong negative correlations were found between wheel running revolutions and freezing time on days 2 through 5, indicating that mice who ran more in between extinction sessions tended to freeze less during subsequent sessions. Lastly, EX mice exhibited significantly greater amygdalar eCB content and significantly less hippocampal eCB content compared to CON mice ($p < 0.05$). **CONCLUSION:** These preliminary results suggest that voluntary exercise enhances fear-extinction and reduces anxiety-like behaviors in mice, possibly due to eCB system adaptations in brain regions involved in regulating fear and anxiety responses.
Supported by the UW Virginia Horne Henry Fund and the Advancing a Healthier Wisconsin Endowment at the Medical College of Wisconsin.

A-53 Free Communication/Poster - **Age and Gender Issues**

Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

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423 Board #264 May 30 11:00 AM - 12:30 PM

Moderate Risk of the Female Athlete Triad Predicts Injuries in Division II Female Athletes

Jennifer L. Scheid, Morgan E. Stefanik, Michelle Copolo-Ziemer, Karen L. Roehling. *Daemen College, Amherst, NY.*
(No relevant relationships reported)

BACKGROUND: The female athlete triad is the interrelation of low energy availability, menstrual dysfunction, and low bone mineral density. Previously, the components of the female athlete triad have been linked to stress fractures and tendinopathies. However, limited research exists regarding the female athlete triad beyond the relationship of these injuries. **PURPOSE:** The purpose of this study was to explore the relationship between risk for the female athlete triad and musculoskeletal injuries. We hypothesized that athletes who presented with a higher risk of the female athlete triad would have a greater occurrence of musculoskeletal injuries during their competitive season. **METHODS:** Fifty-seven female athletes from a NCAA Division

II college completed questionnaires that assessed female athlete triad cumulative risk using 5 factors (low energy availability, low body mass index, delayed menarche, oligomenorrhea or amenorrhea, and stress fractures). Women were grouped according to how many risk factors they had for the female athlete triad. At the end of each sport season, injury data was compiled using SportsWare (an electronic medical record database used by the athletic trainers to manage injury data). **RESULTS:** Forty-one women were considered low risk for the female athlete triad (Low Risk Triad group) and 16 women were considered moderate risk for the female athlete triad (Moderate Risk Triad group). No women in our study were at high risk for the female athlete triad. Forty-seven of the 57 women (82%) incurred 90 musculoskeletal injuries. The most prevalent injuries included: low back pain/spasm/strain (n=12), followed by shin splints/medial tibial stress syndrome (n=9), general knee pain (n=7), quadriceps strain (n=6), and knee sprain (anterior cruciate ligament, posterior cruciate ligament, medial collateral ligament and lateral collateral ligament sprains; n=5). The number of in-season injuries in the Moderate Risk Triad group (2.1±0.4) was higher (p<0.05) than the Low Risk Triad group (1.3±0.2). **CONCLUSION**: Moderate risk of the female athlete triad appears to increase the risk of injury during the competitive season beyond stress fractures and women with a moderate risk of the female athlete triad should be monitored closely by athletic trainers and coaches.

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424 Board #265 May 30 11:00 AM - 12:30 PM

Perceptions Regarding Injury and Training in Elite, Adolescent Rock Climbers

Rachel N. Meyers[1], Morgan N. Potter[2], Steven L. Hobbs[1], Aaron J. Provance[2]. [1]University of Colorado Boulder, Boulder, CO. [2]Children's Hospital Colorado, University of Colorado School of Medicine, Aurora, CO.
(No relevant relationships reported)

PURPOSE: Our objective was to examine the awareness and knowledge of youth-specific climbing injuries and risk factors amongst elite, adolescent rock climbers. **METHODS**: We surveyed elite adolescent rock climbers, ages 8-18 competing in the 2017 USA Climbing Sport and Speed National Championships. Subjects answered questions on their knowledge and awareness of the most common youth climbing injury and safe training practices. One-way ANOVAs and Bonferroni post hoc tests identified misperceptions about youth climbing injuries and the safe age to start double dyno campusing, a climbing-specific training exercise. Risk ratios were used to compare the proportion of athletes who self-reported as "informed" and "uninformed" when asked about common finger injuries in adults and youth.
RESULTS: 267 climbers completed the survey (age =13.99±2.66, 51.9% male, 48.1% female). The adult-specific A2 pulley injury, was erroneously reported by the subjects to be the most common youth climbing injury, with an average ranking of 3.09±2.20 on a scale of 1 (most common) to 8 (least common). The youth-specific and most common injury in adolescent climbers, growth plate finger injuries, ranked second most common, with an average of 4.0±2.22. These rankings were significantly different (p<0.001). Only 5.7% of climbers correctly reported the safe age to begin double dyno campusing, a risk factor for growth plate injuries. 48.9% of climbers reported they were aware of growth plate injuries to the finger; yet only 54% of these climbers correctly identified the injuries as stress fractures. 73.5% overall reported growth plate finger injuries to either be a type of A2 pulley injury or did not know.
CONCLUSION:
Adolescent climbers demonstrated the misconception that skeletally immature climbing-specific injuries and training techniques do not need to be treated differently from skeletally mature climbers. As climbing enters the 2020 Olympics, it is imperative that adolescent climbers, coaches, and parents be better educated on pediatric-specific climbing injuries and when to seek medical attention. Improved knowledge can help reduce the risk of these injuries and the potential for permanent finger deformity and/or loss of function.

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425 Board #266 May 30 11:00 AM - 12:30 PM

The Relationship Between Flexibility and Low Back Pain in Female Adolescent Gymnasts

Morgan N. Potter, David R. Howell, Emily A. Stuart. *Children's Hospital Colorado, Aurora, CO.*
(No relevant relationships reported)

PURPOSE: Our objective was to elucidate the association between lower back pain, flexibility, and individual characteristics in adolescent female gymnasts.
METHODS: Female gymnasts ages 6-18 years competing in the USA Women's Artistic Junior Olympic Program levels 3-10 were enrolled in the study. Subjects underwent active and passive flexibility measurements at the shoulder, hip, quadriceps, and hamstrings. They were then asked if they experienced back, shoulder, and/or hip pain in the last 12 months. Those with a history of back pain then completed the Micheli Functional Scale and Oswestry Low Back Pain Scale. Demographic information, clinical characteristics, and flexibility measurements were compared between gymnasts with and without back pain in the previous 12 months using t-tests

WEDNESDAY, MAY 30, 2018

and Chi square tests. A binary multivariable logistic regression model was used to assess the association between back pain in the past 12 months, flexibility, and participant characteristics.
RESULTS: Fifty-one gymnasts participated: 19 who reported back pain in the past 12 months (age= 13.3±3.3 years; BMI= 18.6±2.6) and 32 who did not (age= 11.1±2.4 years; BMI= 17.5±1.9). Those with back pain reported more hours per week of gymnastics participation (22.7±6.9 vs. 18.5±5.9 hours/week; p= 0.026), and a higher proportion reported experiencing menarche (37% vs. 6%; p= 0.009) than those who did not. Passive Hookline shoulder flexion (178.6±6.1 vs. 180.0±0.0 degrees; p= 0.008) and active right prone knee flexion (131.1±9.2 vs. 132.0±5.1 degrees; p= 0.07) were lower among those who reported back pain. When considered together, having experienced menarche at the time of assessment was independently associated with the presence of self-reported back pain the past 12 months (adjusted odds ratio= 7.317, 95% CI= 1.22-43.87; p= 0.029).
CONCLUSION: Risk factors for back pain in adolescent female gymnasts may be more complex and multifaceted than the simple flexibility measurements we used. While the history of low back pain and flexibility were not significantly associated, low back pain was more common in gymnasts with a history of menarche. As back pain etiology is likely related to many factors,
clinicians should be aware of intrinsic patient factors, such as pubertal maturation, when considering risk of future back injury.

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426   Board #267   May 30 11:00 AM - 12:30 PM
Sex Differences in Objective and Subjective Sleep in Collegiate Athletes

Janelle L. Adomeit[1], Brett M. Gervais[1], Stephanie L. Dietrich[1], Babak Mokhlesi[2], Jason R. Carter[1]. [1]*Michigan Technological University, Houghton, MI.* [2]*University of Chicago, Chicago, IL.*
(No relevant relationships reported)

Despite the importance of sleep in athletic performance, objective assessments of sleep are not well characterized in collegiate athletes, and the impact of sex (i.e., male vs. female) on subjective and objective sleep in collegiate athletes remains equivocal. **Purpose:** To establish normative estimates of subjective and objective sleep in male and female collegiate athletes, and determine if sex differences exist.
Methods: Subjective and objective sleep were assessed during the off-season in 108 collegiate athletes (56 males, 21 ± 1 years; 52 females, 20 ± 1 years) recruited from the Michigan Tech University varsity football, basketball, volleyball, soccer, hockey, track, and nordic ski teams. Subjective assessments included Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), and 3-5 consecutive weeknights of sleep diary to determine subjective total sleep time (TST). Objective assessments of TST, sleep efficiency (SE), and wake after sleep onset (WASO) were determined using wrist actigraphy in parallel with sleep diaries. The apnea-hypopnea index (AHI) was determined using an at-home apnea screening test during one of the actigraphy nights. **Results:** Actigraphy revealed that 94% of all athletes received <8 hrs of objective TST, with 61% receiving <7 hrs. Male athletes reported significantly higher subjective TST (i.e., sleep diary) compared to female athletes (7.6±0.1 vs. 6.9±0.1 hrs, p<0.001). However, objective TST (i.e., actigraphy) was not different between males and females (6.9±0.1 vs. 6.8±0.1 hrs, p=0.56). Moreover, females demonstrated significantly higher SE (87±1 vs. 82±1%, p<0.001) and lower WASO (31±2 vs. 38±2 min, p=0.02) compared to males. PSQI, ISI, and ESS were not significantly different between sexes. AHI was significantly higher in male athletes (1.2±0.2 vs. 0.5±0.1 episodes/hr, p<0.001), but both groups were well below the threshold for clinical sleep apnea. **Conclusion:** Subjective and objective assessments of sleep differed in male and female subjects, yet both groups were well below recommended levels of sleep for collegiate athletes. These findings suggest that different sleep education strategies and interventions may be necessary in male and female collegiate athletes to improve sleep duration and/or quality.

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427   Board #268   May 30 11:00 AM - 12:30 PM
Can Ultrasound Subcutaneous Fat Thickness be used to Estimate Percent Body Fat in Older Adults?

Robert Thiebaud[1], Takashi Abe[2], Jeremy Loenneke[2], Eiji Fujita[3], Takuya Akamine[3]. [1]*Texas Wesleyan University, Fort Worth, TX.* [2]*University of Mississippi, Oxford, MS.* [3]*National Institute of Fitness and Sports in Kanoya, Kagoshima, Japan.*
(No relevant relationships reported)

Ultrasound imaging has been used to estimate body composition, which includes percent body fat (%BF), in young and middle-aged adults. However, it is unknown whether ultrasound imaging can predict %BF in older adults when using dual-energy x-ray absorptiometry (DXA) as the criterion method. **PURPOSE**: To develop prediction equations to estimate %BF in older men and women using ultrasound subcutaneous fat thickness. **METHODS**: Four-hundred and nineteen men (n=176) and women (n=243) participated in this study. The average age, BMI and %BF of participants were 70.6 ± 6.4 yrs, 23.5 ± 3.0 kg/m^{2} and 28.2 ± 7.4%. Participants were randomly separated into a model development group (n=260) and cross-validation

group (n=159). B-mode ultrasound using a 5-MHz scanning head imaged subcutaneous fat thickness on the right side of the body at the anterior forearm, anterior and posterior upper arm, anterior trunk, posterior trunk, anterior and posterior thigh, and anterior and posterior lower leg. A whole body scan using DXA was used to determine %BF. IBM SPSS Statistics 24 was used to analyze the data. For multicollinearity assumption, variables with a variance inflation factor (VIF) > 10 were excluded from analysis. Stepwise multiple linear regression analysis was used to develop prediction equations. Bland-Altman plots were used to validate the prediction equations. **RESULTS**: Variables included in the stepwise linear regression analysis were height, sex, and all fat thicknesses. Age and weight were not significantly correlated with %BF (p<0.05). The prediction equation for %BF was the following: %BF = 27.075 + (3.284*Anterior Trunk) + (4.916*Posterior upper arm) + (2.166*Sex) - (0.099*height) where males = 1 and females = 2. The adjusted r-square of the prediction equation was 0.701 with a standard error of the estimate of 4.1%. Bland-Altman plots revealed a mean bias of 0.2266 ± 7.9772 (95% confidence intervals). A significant correlation (r = 0.245, p=0.002) between the difference in %BF (measured - predicted) and the average %BF [(Measured + predicted %BF)/2] suggests some systematic error in the prediction equation.
CONCLUSIONS: Ultrasound imaging can be used to predict %BF in older adults; however, there is some systematic error in the prediction equation.

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428   Board #269   May 30 11:00 AM - 12:30 PM
Menstrual Cycle Influence on Iron-Status Markers in Female Athletes. IronFEMME Pilot Study

Ana B. Peinado[1], Laura Barba[1], Ángel E. Díaz[2], Javier Butragueño[1], Nuria Romero-Parra[1], Francisco J. Calderón[1], Pedro J. Benito[1], Rocío Cupeiro[1]. [1]*LFE Research Group, Universidad Politécnica de Madrid, Madrid, Spain.* [2]*Ministry of Education, Culture and Sport, Highest Spanish Sports Council, Madrid, Spain.*
(No relevant relationships reported)

Female athletes may experience an elevated risk of iron deficiency as iron status may decline during physical training. Further, the interaction between hormones involved in regulating the menstrual cycle and its effect on iron status still remains unclear. **PURPOSE:** To study the influence of the menstrual cycle phases on iron-related parameters in women after endurance exercise. **METHODS:** Thirteen healthy eumenorrheic endurance-trained women (34.9± 4.2 years; 163.9±6.1 cm; 58.4±5.5 kg; peak oxygen consumption (VO$_{2peak}$) 49.7±3.1 ml·min^{-1}·kg^{-1}) participated in the study. Each participant performed 40 min running at the speed corresponding to the 75% of VO$_{2peak}$. Exercise was completed on a treadmill and was performed in three different phases of menstrual cycle randomly assigned: early follicular (EFP), mid-follicular (MFP) and luteal phase (LP). Blood samples were obtained at baseline and immediately (Post0h) and 3 hours (Post3h) after exercise and analyzed for serum iron, ferritin and transferrin. Mixed linear models were conducted to analyze the data. **RESULTS:** Serum iron (µg/dl) was not different across menstrual cycle phases (EFP: 59.7±36.1; MFP: 80.2±39.6; LP: 83.6±58.2; p=0.101), although we observed lower values at EFP. Time was not significant on serum iron (Baseline: 69.9±45.4; Post0h: 76.6±49.3; Post3h: 77.0±45.6; p=0.247). Ferritin (ng/ml) values were similar across menstrual cycle phases (EFP: 27.9±21.7; MFP: 31.8±25.2; LP: 32.0±27.4; p=0.451); however there was a significant effect for time (p=0.017) with higher values at Post0h (33.1±27.0) compared to baseline (28.8±23.1). We observed similar values of transferrin (mg/dl) across menstrual cycle phases (EFP: 300.8±40.4; MFP: 298.6±44.6; LP: 300.5±47.2; p=0.902). Time was significant on transferrin (p=0.001) with higher values at Post0h (307.7±47.8) compared to baseline (293.7±41.5) and Post3h (298.5±41.8). No significant menstrual cycle phases × time interactions were found for any of these variables. **CONCLUSION:** Based on the preliminary results from this pilot study, iron-status markers are not influenced by the menstrual cycle, although serum iron values seem to be lower at EFP. Ferritin and transferrin values were increased after exercise along the menstrual cycle. Funding: DEP2016-75387-P (Spanish National Plan 2013-2016)

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429   Board #270   May 30 11:00 AM - 12:30 PM
Menstrual Cycle Influence on Hepcidin Secretion and Inflammatory Reponses in Female Athletes. IronFEMME Pilot Study

Laura Barba[1], Rocío Cupeiro[1], Ángel E. Díaz[2], Elena Santiago[3], Víctor Alfaro[1], Beatriz Rael[1], Cristina Maestre-Cascales[1], Juan Orellana[4], Ana B. Peinado[1]. [1]*LFE Research Group, Universidad Politécnica de Madrid, Madrid, Spain.* [2]*Ministry of Education, Culture and Sport, Highest Spanish Sports Council, Sports Medical Center, Madrid, Spain.* [3]*Tambre Clinic, Madrid, Spain.* [4]*ETSIAAB, Universidad Politécnica de Madrid, Madrid, Spain.*
(No relevant relationships reported)

Deficient iron absorption may be conditioned by an increase in inflammatory markers and hepcidin levels after exercise. The interaction between inflammatory markers

and hepcidin along menstrual cycle is still unknown. **PURPOSE:** To elucidate the effect of hormonal fluctuations during menstrual cycle on inflammatory and hepcidin responses after endurance exercise **METHODS:** Thirteen healthy eumenorrheic endurance-trained women (34.9± 4.2 years; 163.9±6.1 cm; 58.4±5.5 kg; peak oxygen consumption (VO_{2peak}) 49.7±3.1 ml·min^{-1}·kg^{-1}) participated in the study. Subjects performed 40 min running on a treadmill at the speed corresponding to the 75% of VO_{2peak}. Exercise was performed in three different moments: during early follicular (EFP), mid-follicular (MFP) and luteal phase (LP). Blood samples were obtained at baseline and immediately (Post0h) and 3 hours (Post3h) after exercise and were analyzed for interleukin-6 (IL-6), C-reactive protein (CRP) and hepcidin. Mixed linear models were conducted to analyze the data. **RESULTS:** Hepcidin (ng/ml) was not different across menstrual cycle phases (EFP: 76.5±25.3; MFP: 78.4±19.5; LP: 78.0±23.0; p=0.762). Time was significant (p=0.001) on Hepcidin with higher values at Post0h (81.9±21.5) compared to Baseline (74.2±24.1) and Post3h (76.8±21.9). IL-6 (pg/ml) levels were not different over menstrual cycle (EFP: 3.5±3.0; MFP: 3.0±1.5; LP: 5.4±6.6; p=0.079); however time (p<0.001) at Post3h (5.4±6.3) showed significant higher values compared to Baseline (2.6±2.1) and Post0h (3.9±3.2). We found an interaction between menstrual cycle phases and time (p=0.038) with greater values at Post3h during LP (8.7±9.9) compared to EFP (3.7±2.90) and MFP (3.7±1.9). Increased CRP (mg/dl) levels were reported (p=0.033) during EFP (2.0±3.3) related to MFP (1.0±1.1) and LP (0.8±1.4). Time had no significant effect on CRP (Baseline: 1.3±2.4; Post0h: 1.3±2.3; Post3h: 1.2±2.0; p=0.707). **CONCLUSION:** According to our preliminary results, inflammatory responses seem to be influenced by menstrual cycle even though hepcidin levels may not be affected by hormonal fluctuations. Hepcidin and IL-6 peak levels were found Post0h and Post3h after exercise respectively. CRP levels did not show an increase after exercise at any phase. Funding: DEP2016-75387-P (Spanish National Plan 2013-2016)

430   Board #271   May 30 11:00 AM - 12:30 PM
Biolosical Matulity for Japanese Soccer Player 2007-2015
Ryo Takahara, Akihiro Kanamori, Shumpei Miyakawa.
University of Tsukuba, TSUKUBA, Japan.
(No relevant relationships reported)

PURPOSE: The soccer is one of the sports loved all over the world. Many children will dream of professional football player and being National team member in the future.Upbringing of the player is begun than low age and the player selection of the athlete spreads among lower aged people. The Late maturity player is not found in many cases when a coach select player by only physical ability. U-17 international championship of the soccer had many early maturity players. This study predicted a biological maturity degree and final height prediction of the Japanese soccer players. **METHODS:** The sample included 483 male soccer players(12.4±0.6y,154.7±8.9 cm,182.2-134.1cm) who were professional soccer club under category team(2007-2015). Players were evaluated the skeletal maturity degree, skeletal age and final height in Tanner-Whitehouse 2 Method (JAPAN) and Tanner-Whitehouse 3 Method. The biological maturity classification method assumed it mature early,on time,late divided differences between chronological age and skeletal age by ±1.0 year. The statistics processing assumed it less than level of significance 5% with, SPSS ver.25. **RESULTS:** The Bone maturation score(Radius-ulna-short bone score) was 465.4 ± 156.3pt. Average of skeletal age was 12.5 ± 1.3 years old with Tanner-Whitehouse 2 Method(Japan). Biological maturity classification was Late 68 players, On time 318 players, Early 90 Players and Adult 4 players. Final height prediction average was 173.3±5.2cm(187.7-149.8cm) with Tanner-Whitehouse 2 Method(TAKAI). **CONCLUSION:** In this study, 7 players were adults by biological maturity. The difference of the skeletal age was 7.3 years old in early and late. When a team performs the player selection, Coach and recuiter should select in consideration of the difference of the biological maturity degree.

431   Board #272   May 30 11:00 AM - 12:30 PM
The Effect of Pre-Sleep Consumption of Casein Protein on Resting Metabolic Rate and Appetite in Postmenopausal Women
Christopher Schattinger[1], Joeseph Leonard[2], Ashley Artese[1], Michael Ormsbee, FACSM[1], Cara Pappas[1], Lynn Panton, FACSM[1]. *[1]Florida State University, Tallahassee, FL. [2]Florida State University College of Medicine, Tallahassee, FL.* (Sponsor: Lynn B. Panton, FACSM)
(No relevant relationships reported)

PURPOSE: To determine the acute effects of nighttime pre-sleep consumption of casein protein (CP) and a placebo (PLA) supplement on next-morning measures of resting metabolic rate (RMR) and appetite in postmenopausal women. METHODS: This study was a randomized crossover double-blind placebo-controlled trial. Eight postmenopausal (N=8, age: 57±5 yrs, BMI= 28±6 kg/m2) women participated. Subjects had body composition (DXA), RMR (indirect calorimetry), and appetite (visual analog scale; VAS) measured. Subjects consumed either CP (35 g, 130

kcals) or PLA (7.2g, 10 kcals) 30 min prior to bed time on two separate occasions separated by 48-hours. RMR and measures of hunger, desire to eat, and satiety were analyzed using Paired T-tests. Significance was accepted at p≤0.05. RESULTS: RMR (CP:1286±175; PLA:1278±201 kcals/day) and relative oxygen consumption (CP:2.66±0.33; PLA 2.67±0.26 ml/kg/min) were not different between CP and PLA. There were also no effects of CP and PLA on measures of appetite (Hunger: CP: 3.44±2.98; PLA: 3.75±3.06 cm; Satiety: CP: 4.06±2.09; PLA:4.79±3.11 cm; Desire to Eat: CP:4.28±3.58; PLA:4.06±3.17 cm). CONCLUSION: There were no differences in RMR and measures of appetite between CP and PLA. There is growing evidence that a small snack before bed (150-200 kcal) is not harmful to metabolism or appetite. This study was supported with product by Dymatize Nutrition.

A-54 Free Communication/Poster - **Exercise - Multiple Sclerosis and Parkinson's Disease**
Wednesday, May 30, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

432   Board #273   May 30 11:00 AM - 12:30 PM
Cardiometabolic Prediction Equations Overestimate Cardiorespiratory Fitness for Treadmill and Cycle Ergometry in Multiple Sclerosis Patients
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(No relevant relationships reported)

Multiple sclerosis (MS) patients exhibit a decreased peak oxygen uptake (VO_{2peak}) compared to age-matched peers, and therefore have the potential for increased relative gains in VO_{2peak} in response to chronic exercise training. Individualized exercise prescriptions and monitoring improvement both rely on accurate assessment of VO_{2peak}; however, expired gas analysis is not always available. Therefore, prediction equations have been established to estimate VO_{2peak} for both treadmill (TM) and cycle ergometry (CE) tests based on work rates. Whether or not these equations are appropriate for MS patients has yet to be investigated. **PURPOSE:** To compare VO_{2peak} obtained via TM and CE maximal exercise tests to previously established cardiometabolic prediction equations. **METHODS:** MS patients (44 ± 11 yrs, 28.1 ± 8.0 kg/m², 11 ± 10 yrs since dx) performed a maximal graded exercise test on both a TM and CE. Twenty-five subjects completed the TM test, and 26 completed the CE test. TM tests consisted of 2 min stages with a constant, self-selected pace, with a 2% increase in grade per stage. CE tests increased by 15 Watts/min. VO_{2peak} was compared to previously established mode-specific cardiometabolic prediction equations using paired samples *t*-tests and further examined with Bland-Altman plots. **RESULTS:** Predicted VO_{2peak} was higher than measured values for both TM and CE (*p*<0.05). The TM had a mean bias, upper limit of agreement (LOA), and lower LOA of -2.35, 6.63, and -11.32 mL/kg/min, respectively. The CE had a mean bias, upper LOA, and lower LOA of -2.20, 3.31, and -7.72 mL/kg/min, respectively. **CONCLUSION:** Cardiometabolic prediction equations resulted in higher VO_{2peak} estimates for both TM and CE in MS patients. The wide limits of agreement (Bland-Altman plots) suggest the accuracy in predicting individual VO_{2peak} values is compromised among individuals with MS.

	Measured VO_{2peak} (mL/kg/min)	Predicted VO_{2peak} (mL/kg/min)
Treadmill	26.6 ± 6.3	28.9 ± 7.0*
Cycle Ergometry	24.1 ± 7.0	26.3 ± 6.0*

Data are mean ± SD. *$p<0.05$ between measured and predicted VO_{2peak}.

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Relationship Between Dorsiflexion Strength Asymmetry, Walking Performance, and Disability in Multiple Sclerosis Patients
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(No relevant relationships reported)

Multiple sclerosis (MS) is one of the most common progressive neurological diseases in young adults and is characterized by neurologic disruption within the

central nervous system. Previous research has shown strength asymmetry (SA) in the quadriceps of MS patients to be correlated with a decrease in functional walking performance (FWP). Due to limited ankle mobility in MS patients during walking, an investigation of the relationship between dorsiflexion SA and walking ability is necessary to better understand the impact on quality of life in MS patients. **PURPOSE:** To investigate SA during isometric/isokinetic dorsiflexion in MS patients compared to healthy individuals (Non-MS), and investigate the relationship between SA and FWP in both groups. **METHODS:** 26 individuals participated in the study (MS = 13, Age = 50.3 $\pm$ 9.1 years; Non-MS = 13, Age = 50.8 $\pm$ 8.5 years). Visit 1 consisted of test familiarization. Visit 2 consisted of maximal isometric (MVC) and isokinetic (MVIC) dorsiflexion contractions performed at 60º/s in both legs. SA ratio was calculated from the peak torque achieved. On visit 3, subjects performed three tests of FWP: 25 Foot Walk Test (25W), Timed Up-and-Go Test (TUG), and 6-Minute Walk Test (6MW). **RESULTS:** The mean expanded disability status score (EDSS) for the MS patients was 3.5 ± 1.8, indicating mild-moderate disability. There was a significant difference in MVC SA between groups (MS vs NON-MS = 13.7 ± 18.1 vs. 3.3 ± 2.6, p = 0.03) however no difference was observed in MVIC SA between groups (p > 0.05). Differences were observed between groups for all three FWP tests and gait speed (p < 0.05). There was a significant relationship between MVC SA and two FWP tests in the MS group (25W: r = 0.76, p = 0.002; TUG: r = 0.61, p = 0.03) and a significant relationship between MVIC SA and all four FWP variables (25W: r = 0.93, p < 0.001; gait speed: r = -0.76, p = 0.002; TUG: r = 0.81, p < 0.001; 6MW: r = -0.67, p = 0.01). There was no significant relationship between MVC or MVIC SA and the FWP tests in the Non-MS group (p > 0.10). There was no significant relationship between MVC SA or MVICSA and EDSS in the MS patients (p > 0.05). **CONCLUSION:** SA differed between groups, and dorsiflexion SA appears to be related to impaired walking performance in MS patients. This relationship may be independent of disease severity based on EDSS.

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Relationship between Soleus H Reflex and Balance Metrics in People with Multiple Sclerosis

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(No relevant relationships reported)

Multiple Sclerosis (MS) is a disease of the central nervous system with poor balance as one of the most reported symptoms. Previous research has shown limb to limb differences in a number of physiological measures (e.g., leg strength). One measure yet to be evaluated between limbs in MS patients is the soleus Hoffmann (H) reflex, which is regarded as the electrical analogue to the stretch reflex. **Purpose:** The intent of this study was to 1) quantify the soleus H reflex in both legs to determine whether asymmetry was present and 2) correlate H reflex asymmetry to balance performance. **Methods:** The study consisted of six visits. The first visit consisted of paperwork and familiarization. The soleus H reflex was measured twice in both legs over four visits (V2 - V5) to assess bilateral differences in 17 participants (MS=9, Age=49.3±11.3 years; Non-MS=8, Age=48.6±11.3 years). Balance testing was conducted on the final visit, and consisted of a sensory organization test (SOT) and limits of stability (LOS). **Results:** One MS participant was unable to complete balance testing, leaving 16 participants in the balance analyses. The mean expanded disability status score for the MS participants was 3.4±2.2 (range=1 to 6; median=2), indicating mild-to-moderate disability. No difference was observed between limbs in the soleus H reflex for either group; however, when converted into an asymmetry score (AS) the MS group had significantly more asymmetry (MS=26.1±16.6, Non-MS=4.6±3.9; p=0.01). The MS group had a significantly lower SOT composite score (MS=80.4±4.0, Non-MS=85.8±2.9, p < 0.05). Sagittal plane endpoint excursion (EPE) and maximum excursion (ME) were significantly less in the MS group (EPE: MS=36.8±9.2, Non-MS=69.0±11.4, p <0.001; ME: MS=61.5±16.4, Non-MS=83.0±10.2, p <0.01) during LOS testing. A significant negative relationship was observed between AS and EPE (r=-0.625), ME (r=-0.709), and directional control (r=-0.615) during LOS testing in the sagittal plane. A significant positive relationship (r=0.518) was observed between AS and reaction time in the sagittal plane during LOS testing. **Conclusion:** Differences in the soleus H reflex asymmetry was observed between groups, which appears to significantly influence balance performance as the Non-MS participants generally performed better than the MS participants.

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Body Temperature Regulation In Ms Patients Performing Physical Activity In The Heat

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(No relevant relationships reported)

PURPOSE: The impact of heat intolerance and associated fatigue among people with multiple sclerosis (MS) is well documented, particularly during physical activity in the heat. However to date it is unclear whether an impaired thermoregulatory capacity is evident in people with MS. It is also unknown whether any such impairment is manifested in the sudomotor (sweating) system or vasomotor (skin blood flow) system. Therefore the aim of this study was to determine whether thermoregulatory responses are independently altered in MS patients relative to healthy controls during physical activity in a warm/hot environment. **METHODS**: Sixteen participants with relapsing-remitting MS (EDSS 2.8±0.9; 47±8 y; 77.6±14.0 kg; 1.7±0.1 m) and 14 age- and mass-matched healthy controls (43±11 y; 78.6±17.0 kg; 1.70±0.09 m) cycled at a fixed metabolic heat production of 4 W.kg^{-1} on a semi-recumbent ergometer for a maximum of 40 minutes in a 30°C, 30%RH environment. A subset of 8 MS (EDSS: 2.6±0.5; 44±8 y; 82.3±18.2 kg; 1.7±0.1 m) and 8 healthy controls (44±12 y; 81.2±21.1 kg; 1.7±0.1 m) also completed the same exercise bout in a 35°C, 30%RH environment. In both trials, rectal temperature (T_{re}), mean skin temperature (T_{sk}), and local sweat rate (LSR) and cutaneous vascular conductance (CVC) on the upper-back was measured throughout. **RESULTS**: At 30°C, end-exercise T_{re} (MS:37.2±0.3, CON:37.3±0.4°C; P=0.31), T_{sk} (MS:34.5±0.5, CON:34.6±0.5°C; P=0.43), LSR (MS:0.44±0.22, CON:0.47±0.21 mg.cm^{-2}.min^{-1}; P=0.71), and CVC (MS:344±256, CON:268±157% of baseline; P=0.35) were similar between groups. Likewise, at 35°C, end-exercise T_{re} (MS:37.2±0.4, CON:37.3±0.3°C; P=0.70), T_{sk} (MS:35.5±0.5, CON:35.5±0.5°C; P=0.87), LSR (MS:1.26±0.44, CON:1.34±0.38 mg.cm^{-2}.min^{-1}; P=0.61), and CVC (MS:425±163, CON:378±236% of baseline; P=0.68) were not different. **CONCLUSIONS**: Individuals with relapsing-remitting MS do not demonstrate any clear impairments of sweating or skin blood flow control during moderate levels of physical activity at air temperatures as high as 35°C.

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Physical Activity is Associated with Walking Capacity in Persons with Multiple Sclerosis

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(No relevant relationships reported)

Multiple sclerosis (MS) is a chronic inflammatory disease of the central nervous system which affects 1 in 1000 persons in the United States. MS results in functional limitations, including impairments in walking capacity, balance, and increases in overall fatigue, leading to decreased physical activity. However, the potential associations between physical activity, walking ability and functional capacity are not clear in this population. **Purpose:** To evaluate the association between physical activity, walking ability and functional capacity in individuals with MS. **Methods:** Fifty-eight individuals with MS between the ages of 18-70 (Male = 15, 47 ± 12 years, BMI = 28.8 ± 6.5, EDSS = 0-4) performed a maximal incremental cycle test to assess peak aerobic capacity (VO$_2$ peak). Subjects completed a timed 25-foot walk test (T25FW), 6 minute walk test (6MW), and wore an accelerometer for one week to determine physical activity. Moderate / vigorous physical activity (MVPA) was defined as >1722 counts per minute. **Results:** MVPA was correlated with 6MW, T25FW and VO$_2$peak (p<0.05, Table 1). In stepwise regression analyses, MVPA was a stronger predictor of T25FW (β: −0.44, p<0.01) and 6MW (β: 0.48, p<0.01) than VO$_2$peak (β: −0.29, p=0.03; β: 0.32, p<0.01). **Conclusion:** Although both MVPA and VO$_2$ peak provide unique contributions to the prediction of 6MW and T25FW, MVPA is a stronger predictor. These results suggest that improving both physical activity and cardiovascular fitness may improve walking ability in persons with MS.

Table 1				
	6MW	T25FW	VO$_2$ peak	MVPA
6MW	--	--	--	--
T25FW	-0.793*	--	--	--
VO$_2$ peak	0.568*	-0.504*	--	--
MVPA	0.630*	-0.580*	0.478*	--

*Significant correlation, $p < 0.05$

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Reduced Cognitive Function and Preserved Physical Function in Cannabis Users with Multiple Sclerosis

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(No relevant relationships reported)

Multiple Sclerosis (MS) is an inflammatory disease of the central nervous system characterized by a variety of symptoms including reduced physical and cognitive function. Cannabis is known to improve spasticity and pain in MS, but its effects on physical function are unknown.**PURPOSE**: The purpose of this study was to compare physical/cognitive function and overall quality of life in cannabis users and non-users with MS.
METHODS: Twenty-two people with relapsing-remitting MS (Users, N = 13, age: 51.0 (14.2); Non-users, N = 9, age: 53.4 (14.7)) completed the following evaluations: 25ft walk test, timed up and go, 9-hole peg test, mCTSIB (balance), handgrip strength, and the Paced Auditory Serial Addition Test (PASAT). The MS Quality of Life-54, Patient Determined Disease Steps (disability status), Activities of Balance Confidence, Numerical Rating Scale of Spasticity, and Fatigue Severity Scale questionnaires were also completed by all participants. Cannabis use status was confirmed via urinalysis. Comparisons between the groups were made using independent T-Tests.
RESULTS: Cannabis users and non-users were similar in all measures of physical function and overall quality of life ($P \geq 0.12$). Cannabis users scored significantly lower on cognitive function than non-users (PASAT, Users 32.4 ± 9.9 vs. Non-users 43.0 ± 8.4, $P = 0.02$).
CONCLUSIONS: People with MS currently using cannabis perform similarly on physical tasks as non-users. However, the performance of the cannabis users during abstinence from the drug is not known. These results suggest that cannabis may not have an impact on physical function and overall quality of life in people with MS, although cannabis likely has negative effects on cognitive function, which is consistent with findings from healthy individuals. Longitudinal and/or interventional studies with on/off drug testing are needed to better quantify the positive and negative effects of cannabis in MS.

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Body Fatness is Associated with Lower Aerobic Fitness in Persons with Multiple Sclerosis

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(No relevant relationships reported)

Multiple sclerosis (MS) is an unpredictable disorder of the central nervous system that results in a varied of symptoms and is often disable. Studies conducted in large samples of persons with MS (pwMS), estimate a combined prevalence of overweight (body mass index; BMI ≥ 25kg/m^2) and obesity (BMI ≥ 30 kg/m^2) ranging from approximately 50 to 65 percent. This is a concern as this measure appears to be strongly correlated with various adverse health outcomes. Excess body fat may have negative implications in health-related fitness and consequently in participation in this population. However, little is known about the impact of body fatness on components of health-related fitness in pwMS. **PURPOSE:** To examine the impact of body fatness on aerobic fitness (AF) in pwMS with similar levels of disability. **METHODS:** This study involved a secondary data analysis and interpretation from a previous work where 62 pwMS were assessed. For the purpose of this study participants were separated in three different groups based on established BMI categories (i.e., normal, overweight, obese). BMI was used as an indirect measure of body fatness and AF was measured using peak oxygen consumption (i.e., VO$_{2peak}$). ANCOVA with a priori linear contrast analysis on the outcome controlling for age, sex, disease duration and disability was performed. The univariate F-ratio, and η^2 were used to examine the presence and magnitude of linear differences in the dependent outcome (i.e., AF) per BMI category. Statistical significance was set at $p < .05$. **RESULTS:** The average AF (i.e., VO$_{2peak}$) for the entire sample was 19.5 (7.2) mL.kg^{-1}.min^{-1} and differed significantly between the subsamples of BMI categories (normal: 20.8 (.85); overweight: 19.7 (1.13); obese: 16.9 (1.73) mL.kg^{-1}.min^{-1}) based on the linear contrast analysis; F (2, 55) = 3.33, $p = 0.043$; $\eta^2 = 0.11$. **CONCLUSION:** The findings suggest that body fatness (i.e., BMI) has a negative impact on AF in pwMS, with a marked

difference for those classified as obese. This is important as low AF and excess body fatness are important risk factors for developing cardiovascular diseases and the potential devastating impact of co-morbidities in this population.
Keywords: Aerobic Fitness, Body Fat, Neurological Disease.

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Hemodynamic and Functional Variables in Parkinson Disease Patients: High Intensity Interval versus Continuous Moderate Exercise Training

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(No relevant relationships reported)

PURPOSE: To assess the effects of high-intensity interval training (HIIT) versus continuous moderate exercise training (CME) on hemodynamic and functional capacity in subjects with Parkinson disease (PD). **METHODS**: 20 subjects (13/7 men/women) with PD were randomly assigned to a twice-weekly HIIT ($N = 12$) or CME ($N = 8$) for 12 weeks, and have hemodynamic (resting heart rate and blood pressure, carotid femoral pulse wave velocity, endothelial reactivity and heart rate variability) and functional variables (5-time seat-to-stand (STS), timed-up and go and 6 min walking test (6MWT)) assessed before and after training period. Exercise training intensity was regulated by the 6-20 rating of perceived exertion scale (RPE), and consisted of 25 min of HIIT (4 min walking warm-up at 9-11 RPE level, followed by 21 min alternating 1 min of briskly walking/jogging/running at 15-17 RPE level with walking at 9-11 RPE level) or 30 min of CME (4 min walking warm-up at 9-11 RPE level, followed by 26 min of walking/jogging at 11-13 RPE level). **RESULTS**: No significant differences between HIIT and CME were found in all variables at baseline. Endothelial reactivity tended to increase after HIIT, but not after CME, which result in improved level (~8%, P < 0.01) of this variable in HIIT versus CME during follow-up (Figure 1). 6MWT improved (10.4 ± 3.8 %, P < 0.05) after HIIT, but did not changed after CME. STS improved similarly after HIIT (27.2 ± 6.1 %, P < 0.05) and CME (21.5 ± 5.4 %, P < 0.05). No significant changes were found after HIIT or CME in any other variable assessed. **CONCLUSIONS**: There different adaptations of endothelial reactivity and 6MWT after HIIT and CME, whereas no changes between group were found in the other assessed variables. The present results suggest that exercise intensity may influence the training-induced adaptation on endothelial reactivity and walking capacity in PD patients.
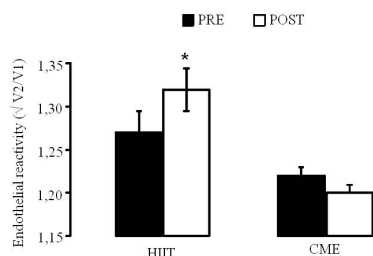
Figure 1. Endothelial reactivity pre and post 12 weeks of high-intensity interval (HIIT) and continuous moderate exercise training (CME). * denotes significant difference from CME during the same period ($P < 0.05$)

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Inflammation And Denervation In Skeletal Muscle Of Parkinson'S Disease Patients: Impact Of High-intensity Exercise Training

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(No relevant relationships reported)

PURPOSE: Parkinson's disease (PD) is a neurodegenerative condition that compromises skeletal muscle function in ~1% of the population over 60y. Increasing evidence indicates PD has an inflammatory component, which may contribute to denervation in skeletal muscle and eventual motor unit loss. However, while the effects of aging on muscle inflammation are reasonably well-studied, the effects of aging with PD are unclear. Compared to age-matched controls, we have previously shown exaggerated architectural changes in PD muscle (e.g., type I myofiber grouping

resulting from dynamic denervation/renervation cycling) along with increased expression of indices of neuromuscular junction instability, and some signs of reversal with high intensity exercise training. The purpose of this study is to further investigate PD skeletal muscle pathology, examine the role of muscle inflammation, and explore the impact of exercise training.

METHODS: Vastus lateralis skeletal muscle biopsies were obtained from three cohorts of individuals: PD patients (n=30, 67±7y, Hoehn & Yahr stage 2-3), age-matched older adults (OA) and young adults (YA). To assess the effect of exercise training, a subset of PD patients (n=16) underwent 16wk high intensity training. Markers of denervation (e.g., neural cell adhesion molecule (NCAM) and sodium channel $Na_v1.5$) and inflammation [e.g., IL-1β, TNF-α, and TNF-like weak inducer of apoptosis (TWEAK)] are being assessed across the three groups and within the PD group pre- and post-training.

RESULTS AND CONCLUSION: We expect the study findings to aid in differentiating the effects of primary aging vs. aging with PD in skeletal muscle. Further, we anticipate high intensity exercise training will improve the inflammatory profile of PD muscle.

Complete results will be available for presentation at the 2018 ACSM national meeting.

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Effects Of Boxing Training On Cognitive And Physical Function In Patients With Parkinson's Disease

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(No relevant relationships reported)

Boxing training is a community based exercise program incorporating high intensity exercise for patients with Parkinson's disease (PD). A 90 min boxing session consists of performing footwork to improve balance and agility, performing punching combinations to develop coordination, and engaging in vocal exercises to strengthen the voice. Flexibility exercises are performed to reduce muscle rigidity. Core strengthening and weight lifting exercises are performed to strengthen muscles. Long-term benefits of boxing training include improvements in gait, balance, activities of daily living, and quality of life. An immediate effect of this nontraditional form of exercise on cognitive function, strength, and fall risk has not been explored.

PURPOSE The purpose of the study was to investigate the immediate effect of a single boxing training session on cognitive and physical function in patients with PD. The hypothesis was that cognitive function, fall risk, and functional strength would improve immediately following a boxing training session. **METHODS** Cognitive function was measured with the Montreal Cognitive Assessment (MoCA). The MoCA assesses attention, concentration, executive function, orientation, language, memory, conceptual thinking, and calculation. The physical function tests included an assessment of fall risk with the Timed-Up-and-Go (TUG) test. The Sit-to-Stand (STS) test was used to assess functional strength. Measurements were performed before and immediately after the boxing session. **RESULTS** Participants were male and female persons with PD (*N* = 13) with a mean age of 70 (±8.2) years, who attended a mean of 2.5 (±0.7) boxing sessions weekly. Mean body mass index was 31.1 (±7.0) kg·m⁻². The MoCA score increased from pre (24.2 ± 3.8) to post (25.7 ± 4.4) boxing session, *t*(12) = -2.9, *p* =.01. TUG times did not statistically improve from pre (7.8 s ± 2.2) to post (7.4 s ± 2.4) exercise, *t*(12) = 1.6, *p* = .13. Participants were able to perform more chair stands after (18.31 ± 6.61) compared to before the training session (16.4 ± 6.4), *t*(12) = 2.4, *p* = .03. **CONCLUSION** An improvement in cognitive and physical function was observed following a single session of boxing training in patients with PD. Performing a single boxing session may lead to improved cognitive function and functional strength throughout the day.

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The Influence of Long-Term Transcranial Direct Current Stimulation on Gait Function in Parkinson's Disease

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(No relevant relationships reported)

INTRODUCTION: Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation form capable of improving motor performance in the upper limbs in healthy individuals as well as in Parkinson's disease (PD). One of the major motor symptoms of PD is impaired gait function. PURPOSE: The purpose of this study was to determine the long-term influence of tDCS on gait function in PD. METHODS: The study was a sham-controlled, double-blind, between-subjects design. Ten PD patients were allocated to either a tDCS or a SHAM stimulation group. Each subject performed 9 training similar sessions involving gait training on an instrumented treadmill with online feedback of performance during either tDCS (motor cortex contralateral to their primarily affected leg (dominant hemisphere). Stimulation lasted 20 minutes with a current strength of 2 mA. Gait function was quantified in testing sessions performed before the first training session, after the last training session, as well as two and four weeks post training using an instrumented walkway (Zeno Walkway). The following variables related to gait performance were quantified in the test sessions: gait velocity, step length, stride length, and gait cycle time. The dependent variables were analyzed with a 2 (group) x 4 (test session) ANOVA. RESULTS: For all of the dependent variables, there was no main effect for group (*P* value range: 0.09-0.555), no main effect for testing session (*P* value range: 0.332-.88), and no group x testing session interaction (*P* value range: 0.212-0.786). Main comparison across groups with means and SD for the variables after baseline were: gait velocity (116.22 ± 13.35 vs 123.45 ± 11.38 cm/s); step length (63.31 ± 8.12 vs 65.34 ± 7.22 cm); stride length (126.75 ± 15.87 vs 131.21 ± 14.59 cm); gait cycle time (1.08 ± 0.05 vs 1.06 ± 0.04 s), tDCS and SHAM, respectively. CONCLUSION: These preliminary findings indicate that long-term tDCS applied to the motor cortex does not seem to elicit improvements in gait function in Parkinson's disease. Therefore, tDCS may not be as effective for improving complex, whole body movements compared to upper limb movements involving fine motor control. The first author is a CAPES PhD student grantee (BEX 13509/13-6). This research was supported by an intermural research grant to Brach Poston.

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The Behavior of Activity Tracker Usage in Trained Users

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(No relevant relationships reported)

Purpose: The purpose of this cross-sectional study was to assess the continued activity tracker (AT) usage of a convenience sample of 165 university faculty and staff, determine the prevalence of various behaviors that comprise AT usage, and elucidate the relationship between usage and number of steps per day.

Methods: Participants were recruited by email from five cohorts of faculty/staff in the Ready-to-Move (RTM) coaching program during 2014-2016; all had been previously trained to use ATs as part of the program. In the summer of 2016, an online Qualtrics survey was utilized to discern usage patterns and steps/day; various quantitative analyses were performed using SPSS.

Results: In a sample of 165 trained users (mean age: 47.6 years; 84.8% female), a pattern variable frequency analysis showed that a total of 61.2% of previously trained users continued to do some, or all, of three usage behaviors (wearing, looking, and adjusting) on the day prior to data collection. There was a significant difference in the number of self-reported steps between those who did all 3 usage behaviors yesterday (M = 9032.4) and those who did not (M = 6459.2); $p \leq .005$.

Conclusion: Results showed that about half of trained-users from a physical activity program continued to use their trackers for months or even years after an initial period of coaching, depending on the cohort. This finding contrasts with findings from other studies where AT owners' usage dropped off more dramatically. We also found that those who consistently performed wearing, looking, and adjusting behaviors took significantly more steps than those who did not. The findings from this study indicate that AT use can be sustained in trained users and that the application of three usage behaviors can lead to an increased number of steps/day.

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The Effects of Exercise and Cortisol on Cognitive Functioning

Ryan T. Albright, Kelly Massey, Lauren Black, Brittany Haoui, Emily Simonavice, Thomas Toney. *Georgia College, Milledgeville, GA.*
(No relevant relationships reported)

PURPOSE: To examine effects of cortisol and an acute bout of moderate intensity, aerobic exercise on Cognitive Functioning. **METHODS:** A counterbalanced, random selection repeated measures design was implemented for this study. 19 subjects (M=6, F=13; 20.3 +/- 1.6yrs) completed two testing sessions separated by one week. During the first session, participants filled out a PAR-Q, medical health history, and informed consent paper. Saliva samples were taken to measure cortisol levels. The CogState Brief Battery Assessment was administered. Body composition was assessed using DXA. Subjects rested quietly for 30 minutes while listening to soothing music. During the exercise testing, subjects cycled on a Monark cycle ergometer for 20 minutes at a submaximal exercise intensity against 1 kp and self-selected rpm's to elicit at 70% HRR (or RPE of 15). Subjects then performed a cool-down for 5 minutes where

salivary samples were again taken to determine post-treatment cortisol levels. The CogState Brief Battery Assessment was administered a second time. **RESULTS:** Changes in Speed of Performance (SOP) for working memory (WM) was found to be significantly quicker in post cognitive assessments for both resting and exercise trials (Resting $\Delta = 0.044$ +/- 0.0519, p= 0.002; Exercise $\Delta = 0.036$ +/- 0.0516, p= 0.007). However, accuracy of performance (AOP) for WM was only shown to increase in the resting trial (p > 0.05). SOP for Visual Learning (VL) was significantly enhanced only after exercise (Pre = 2.99 +/- 0.0768; Post = 2.96 +/- 0.0892, p= 0.016). Significant differences were not seen in the AOP for VL between the two trials. Subsequent analysis showed that there was no significant interaction between cortisol and the cognitive tests (p > 0.05). **CONCLUSION:** An acute bout of moderate intensity exercise was found to significantly improve the SOP of VL. The SOP during the WM assessment was significantly improved after both the resting and exercise trials. Supported by Georgia College and State University Faculty Grant, 2016.

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445 **Board #286** **May 30 11:00 AM - 12:30 PM**

The Effects of Pilates on Mental Health Outcomes: A Meta-Analysis of Controlled Trials

Karl M. Fleming, Matthew P. Herring. *University of Limerick, Limerick, Ireland.*

(No relevant relationships reported)

Population-based and experimental evidence supports the mental health benefits of exercise among otherwise healthy adults, chronically-ill patients and adults with anxiety and depressive disorders. Mental health benefits have been supported for traditional modes of exercise, including aerobic exercise training. However, the mental health benefits of non-traditional modes of exercise such as yoga, tai chi, and qigong remain understudied. Pilates, an alternative form of exercise, is posited to provide a valuable tool for every individual, regardless of age, gender, capacity, or ability to utilise in order to enhance both physical and mental states. **PURPOSE:** This meta-analysis estimated the population effect size for Pilates effects on mental health outcomes. **METHODS**: Articles published prior to August 2017 were located with searches of Pubmed, Medline, Cinahl, SportDiscus, Science Direct, PsychINFO, Web of Science, and Cochrane Controlled Trial Register using combinations of: *Pilates*, *Pilates method*, *mental health*, *anxiety*, and *depression*. Eight English-language peer-reviewed articles that included both allocation to a Pilates intervention or non-active control condition that lacked exercise training and a validated measure of depressive and/or anxiety symptoms assessed at baseline and after the Pilates intervention were selected. Extracted data included participant and intervention characteristics, anxiety and depression outcomes, and other relevant mental health outcomes, including feelings of energy and fatigue and quality of life. Hedges' d effect sizes were computed, study quality was assessed, and random effects models were used to estimate sampling error and population variance for the observed effects. **RESULTS**: Pilates resulted in significant, large, heterogeneous improvements in depressive ($\Delta=1.27$, 95%CI: 0.44, 2.09, $z=3.02$, $p\leq0.003$) and anxiety symptoms ($\Delta=1.29$, 95%CI: 0.24, 2.33, $z=2.40$, $p\leq0.02$), and feelings of energy ($\Delta=1.49$, 95%CI: 0.67, 2.30, $z=3.57$, p<0.001) and fatigue ($\Delta=0.93$, 95%CI: 0.21, 1.66, $z=2.52$, $p\leq0.012$). Though statistically non-significant, a large increase was also found for quality of life ($\Delta=0.79$, 95%CI: -0.04, 1.61, $z=1.87$, P>0.06). **CONCLUSIONS**: The available evidence supports that Pilates improves mental health outcomes.

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446 **Board #287** **May 30 11:00 AM - 12:30 PM**

Sleep Quality Moderates the Association Between Physical Activity Frequency and Feelings of Energy and Fatigue in Adolescents

Matthew P. Herring[1], Derek C. Monroe[2], Christopher E. Kline[3], Patrick J. O'Connor, FACSM[4], Ciaran MacDonncha[1]. [1]*University of Limerick, Limerick, Ireland.* [2]*University of California Irvine, Irvine, CA.* [3]*University of Pittsburgh, Pittsburgh, PA.* [4]*University of Georgia, Athens, GA.*

(No relevant relationships reported)

Physical activity (PA) can improve sleep quality, low energy, fatigue. Though poor sleep quality may induce feelings of low energy and fatigue, the potential moderating effect of sleep quality on associations between PA and feelings of energy and fatigue among adolescents is unknown. **PURPOSE:** This study examined the moderating effect of sleep quality on associations between PA frequency and feelings of energy and fatigue among adolescents in Ireland. **METHODS:** Adolescents (N=481; 281 male, 200 female) aged 15.1±1.7y self-reported PA frequency (Patient-Centered Assessment and Counselling for Exercise Plus Nutrition; low-, moderate- and high PA frequency were classified as 0-2, 3-4 and ≥5d/wk), the intensity of feelings of energy and fatigue (Profile of Mood States - Brief), and sleep quality (Pittsburgh Sleep Quality Index; criterion for poor sleep was a global score >5). Two-way ANCOVAs examined variation in feelings of energy and fatigue according to the interaction of PA and sleep quality. Standardized mean differences (d) quantified the magnitude of differences. **RESULTS:** A statistically significant two-way interaction between poor sleep status and PA was found for feelings of fatigue ($F_{(2,413)}$=5.91, $p\leq0.003$, η_p^2=0.028). Poor

sleepers with low PA reported greater feelings of fatigue compared to normal sleepers with low PA (d=1.02; 95%CI: 0.60, 1.44), and poor sleepers with moderate PA reported greater feelings of fatigue compared to normal sleepers with moderate PA (d=0.50; 0.17, 0.82). Poor sleepers with low PA reported greater feelings of fatigue compared to both poor sleepers with moderate PA (d=0.44; 0.05, 0.83) and poor sleepers with high PA (d=0.87; 0.46, 1.28). Poor sleepers with moderate PA reported greater feelings of fatigue compared to poor sleepers with high PA (d=0.52; 0.14, 0.91). Poor sleep did not moderate the association between PA and feelings of energy (p>0.57). **CONCLUSIONS:** Sleep quality moderated the association between PA frequency and intensity of feelings of fatigue. Among adolescents with good sleep quality, fatigue scores were invariant across PA frequency categories. However, a dose-response relationship was suggested among adolescents with poor sleep quality, with less fatigue symptoms with greater PA frequency among adolescents with poor sleep quality.

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447 **Board #288** **May 30 11:00 AM - 12:30 PM**

Exercise Referral for Major Depressive Disorder

Chad Rethorst. *UT Southwestern Medical Center, Dallas, TX.*

Reported Relationships: C. Rethorst: *Contracted Research - Including Principle Investigator; NIH.*

PURPOSE: Despite its proven efficacy in research trials, exercise is rarely used as a treatment for Major Depressive Disorder (MDD) in real-world clinical settings. Clinicians cite a lack of training in exercise prescription as a barrier, and indicate a preference for referral to community resources. The purpose of this project was to assess the feasibility and preliminary efficacy of referral from primary care to a research-tested exercise program in the treatment of MDD. **METHODS**: Patients diagnosed with MDD in a primary care clinic were provided a written Exercise Is Medicine prescription by their provider and referred to a research-tested exercise program. Patients met weekly for 12 weeks with an exercise specialist at a community recreation center. In addition, patients received access to the recreation center for 6 months and a Fitbit Charge HR to monitor their activity. Depressive symptoms were assessed on a weekly basis. **RESULTS**: To date, 24 patients have been referred to the program and 17 patients (70.8%) have been enrolled. Patients have attended 73.75% of supervised exercise sessions. Based on Fitbit data, patients have engaged in a mean of 150.66 minutes of moderate-vigorous physical activity per week ("Very Active" minutes + Fairly Active" minutes). Depressive symptoms, as assessed by the PHQ-9, reduced from 9.06 at baseline to 4.76 at last observation (p < 0.01). **CONCLUSIONS**: Patient adherence data indicates exercise referral is a feasible intervention in patients with MDD. Furthermore, patients experienced a significant reduction in depressive symptoms demonstrating the potential of referral to exercise as a viable treatment option.

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448 **Board #289** **May 30 11:00 AM - 12:30 PM**

Factors Influencing Firefighters' Perceptions of Worksite Exercise

Charity L. Lane, O'Dane Brady, Thomas Janus, John M. Mayer, FACSM. *University of South Florida, Tampa, FL.*

(No relevant relationships reported)

PURPOSE: Firefighters have physically demanding jobs resulting in high rates of cardiovascular disorders, musculoskeletal injuries, and disabilities. Many fire service stakeholders advocate worksite exercise to counteract the impact of these disorders in firefighters. However, implementation of worksite exercise is fragmented in this population, and barriers and facilitators have not been fully explored. The purpose of this study was to assess factors influencing firefighters' perceptions about implementation of worksite exercise. **METHODS**: A cross-sectional study was conducted in career firefighters (n = 181; 23 F, 158 M; age 35.3 +/- 8.6 yr) from 3 fire departments in the Tampa Bay region of Florida. The participants completed a 45-item implementation questionnaire after a 12-month worksite exercise injury prevention trial. The questionnaire inquired about implementation outcomes, such as uptake, adherence, access, resources, and stakeholder engagement. Relationships were assessed between items responses and independent variables, including department, age, BMI, physical activity, and low back pain history. **RESULTS**: Significant departmental differences were noted for perceptions in leadership support for exercise (p = 0.03), fitness personnel availability (p < 0.001), regular off-duty exercise (p = 0.03) and gym memberships (p = 0.01). Respondents with lower BMI values were more likely to report that regular exercise was important (p = 0.04). Younger respondents were more likely to have gym memberships (p = 0.003) and to report sufficient fitness personnel availability (p = 0.01). Respondents without low back pain history were more likely to exercise off-duty (p = 0.05). No significant relationships were observed between questionnaire responses and physical activity. **CONCLUSIONS**: Intrapersonal, interpersonal, and institutional factors influence firefighters' perceptions about the implementation of worksite exercise. Stakeholder engagement (leadership support) and available resources vary across departments and

impact implementation. Potential barriers related to these factors need be addressed to successfully implement worksite exercise programs to reduce the adverse effects of injuries, illnesses, and subsequent disabilities in firefighters.

WEDNESDAY, MAY 30, 2018

B-02   Highlighted Symposium - **The Past, Present and Future of ACL Injury Prevention: Biomechanics Screening and Neuromuscular Interventions that Work!**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-101AB

This symposium will highlight previous and current work related to reducing the risk of anterior cruciate ligament (ACL) injuries in athletes. The future of implementing evidence based lab and field screening with targeted neuromuscular interventions will be discussed.

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454   **Chair:** Kevin R. Ford, FACSM. *High Point University, High Point, NC.*

(No relevant relationships reported)

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455   May 30 1:10 PM - 1:40 PM
Keynote - State of the Art Screening and Biofeedback for ACL Injury Prevention
Kevin R. Ford, FACSM. *High Point University, High Point, NC.*
(No relevant relationships reported)

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456   May 30 1:40 PM - 1:55 PM
Focused Interventions for Special Populations
Jeffrey B. Taylor. *High Point University, High Point, NC.*
(No relevant relationships reported)

Anterior cruciate ligament injury prevention programs (ACL-IPP) are generally successful at reducing injury rates; however, these ACL-IPP are more effective with women's soccer (SOC) than basketball (BB) athletes. Purpose: To compare the biomechanical profiles and responses to an ACL-IPP in women's BB and SOC players. Methods: 87 single-sport athletes (38 BB, 49 SOC) were cluster randomized into intervention (6-week ACL-IPP) and control groups. 3D biomechanical analyses of drop vertical jump (DVJ), double- (SAG-DL) and single-leg (SAG-SL) sagittal, and double- (FRONT-DL) and single-leg (FRONT-SL) frontal plane jump landing tasks were tested before and after the intervention. Baseline peak angles, excursions, and joint moments were analyzed using repeated measures MANOVA, while delta (Δ) scores of the same biomechanical measures were analyzed using two-way MANCOVAs controlling for pre-test scores. Results: At baseline, BB players landed with less hip and/or knee excursion during all tasks (p<0.05) except for the SAG-SL task. The FRONT-SL task elicited the most distinct differences, including decreased hip adduction angles (mean difference: 5.0±1.3°, p<0.001), increased hip internal rotation excursion (mean difference: 2.8±0.9°, p=0.003), greater knee abduction moments (mean difference: 0.07±0.02 N·m/kg·m, p=0.003) and lower hip adduction moments (mean difference: 0.15±0.05 N·m/kg·m, p=0.001) in basketball players. After completing the ACL-IPP, the basketball intervention group exhibited a lower reduction in peak knee abduction angles (Δ=0.9±3.5°) compared to the basketball control group (Δ=2.6±3.0°, p=0.004) and soccer intervention group (Δ=1.5±3.4°, p=0.01) during the SAG-SL. During FRONT-SL, the basketball intervention group exhibited greater knee flexion excursion (Δ=1.5±4.5°) after training than the control group (Δ=-1.8±5.5°, p=0.01). Conclusion: Soccer players exhibit a more protective landing strategy than basketball players, yet women's basketball and soccer players largely exhibit similar biomechanical adaptations to ACL-IPP. These data indicate that ACL-IPP may need to account for sport-specific biomechanics, including technique training that emphasizes soft landings during basketball-specific frontal plane and single-leg jumping activities.

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457   May 30 1:55 PM - 2:10 PM
Modeling of ACL Injury Mechanism
Nathaniel A. Bates. *Mayo Clinic, Rochester, MN.*
(No relevant relationships reported)

Invasive biomechanical techniques and the unpredictable nature of anterior cruciate ligament (ACL) injury events limit direct in vivo investigations. Instead, researchers have developed in vitro models such as the mechanical impact simulator to recreate ACL injury events. Purpose: To quantify the biomechanical response of the ACL and medial collateral ligament (MCL) in a simulated landing environment capable of producing ACL ruptures consistent with clinical injury presentation. Methods: 39 cadaveric full lower extremity specimens (19M:20F) completed testing with impulse forces delivered to sole of the foot in the mechanical impact simulator. Pneumatic pistons mounted on the mechanical impact simulator generated knee abduction moments (KAM), internal tibial rotation moments (ITR), anterior tibial translation

forces (ATS), hamstrings, and quadriceps forces <1 sec prior to impulse load delivery. KAM, ATS, and ITR magnitudes corresponded to in vivo recorded kinetics from athlete cohorts exhibiting high, medium, low, and no relative risk for ACL injury. Each kinetic input was independently randomized and a series of impulses was repeated on each specimen until hard or soft tissue failure occurred. ACL and MCL strains were recorded with implanted sensors, while a 6-axis load cell recorded forces and torques at the knee. Results: 87% of specimens produced ACL failures during simulation, with 92% presented at the femoral insertion or midsubstance and concomitant MCL failures in 31%. Peak strain was greater in the ACL (15.3 ± 8.7%) than the MCL (5.1 ± 6.3%; P < 0.01). Overall ACL strain across all external loading conditions was 3.5% greater in females than males (P = 0.04), but no sex differences were noted in the MCL (P = 0.36). Under identical external loading conditions, female specimens also exhibited larger KAM moments than males (P = 0.04). Conclusion: The mechanical impact simulator is the first in vitro model to reliably create ACL ruptures consistent with clinical presentation. Female specimens were more susceptible to ACL injury and KAM than males, which supports the established association between sex, KAM, and ACL injury risk. Future iterations of this model could be manipulated to investigate efficacy of injury prevention interventions and ACL reconstructions during simulated ACL injury events.

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458   May 30 2:10 PM - 2:40 PM
Keynote - Future Directions for ACL Injury Prevention: Coupled Biomechanics and Epidemiology
Timothy Hewett, FACSM. *Mayo Clinic, Rochester, MN.*
(No relevant relationships reported)

B-08   Thematic Poster - **Concussion Assessment and Management in Pediatric Athletes**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100C

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485   **Chair:** Daniel C. Herman, FACSM. *University of Florida, Gainesville, FL.*
(No relevant relationships reported)

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486   Board #1   May 30 1:00 PM - 3:00 PM
Static And Dynamic Cognitive Task Performance In Youth And Collegiate Athletes With Concussion
Anna N. Brilliant[1], William P. Meehan, III[1], David R. Howell[2].
[1]*Boston Children's Hospital, Waltham, MA.* [2]*Children's Hospital Colorado, Aurora, CO.*
(No relevant relationships reported)

PURPOSE: To determine if individuals with a concussion demonstrate worsened cognitive task performance while standing still or walking, relative to uninjured controls.
METHODS: Athletes seen at a local sports medicine clinic and college were recruited. Participants were diagnosed with a concussion by a physician and assessed within 10 days of injury. All participants were asked to stand still for 30 seconds while completing a cognitive task and to walk along a 16m pathway while completing the same cognitive task. Each condition was repeated five times. One of three different cognitive tasks were completed on each trial, including subtraction by 7s from a 2-digit number, spelling five-letter words backwards, and reciting the months in reverse order from a random month. Cognitive task accuracy and the number of responses were recorded for both conditions. We used ANCOVAs to evaluate the effect of group (concussion vs. control) on cognitive accuracy and total number of responses, while controlling for the independent effect of age, gender, and prior concussion history.
RESULTS: Two hundred and eighteen participants completed the study (n=76 with concussion, 5.5±3.0 days post-injury, 51% female, 16.7±3.3 years of age; n=142 controls, 31% female, 18.0±1.9 years of age). Controlling for the effect of age, gender, and prior concussion history, the concussion group was significantly less accurate than the control group while walking (89.3±15.1% vs. 95.0±6.0%; p=0.04) but similar while standing (93.6±9.9% vs. 96.4±5.0%; p=0.15). The concussion group had fewer total responses than the control group while standing (34.8±14.3 vs. 44.5±17.3 total responses; p < 0.001) and walking (22.2±7.7 vs 32.4±12.6 total responses; p < 0.001).
CONCLUSIONS: Athletes displayed lower cognitive task accuracy rates after concussion compared to controls while walking, but similar levels of accuracy while standing. Walking during cognitive processing may be a more accurate representation of sport-like activity than movement or cognitive based assessments performed in isolation. Following concussion, understanding the ability to perform a cognitive task while walking may be crucial when determining readiness to return to full athletic participation, as deficits may not be otherwise identified.

487   Board #2   May 30 1:00 PM - 3:00 PM

Persistent Vestibular Symptoms and Impairment following Concussion in Adolescents

Aaron M. Sinnott[1], Valerie L. Reeves[2], Cyndi L. Holland[2], Nicholas A. Blaney[2], Andrew M. Rosse[2], Hannah B. Blitzer[2], R.J. Elbin[3], Michael W. Collins[2], Anthony P. Kontos[2]. [1]University of Pittsburgh, Pittsburgh, PA. [2]University of Pittsburgh Medical Center, Pittsburgh, PA. [3]University of Arkansas, Lafayette, AR.
(No relevant relationships reported)

Vestibular impairment following concussion is associated with higher symptom burden, worse cognitive performance, and longer recovery. However, the role of persistent vestibular symptoms and impairment on these outcomes among adolescents is unknown. **PURPOSE:** Determine the role of persistent vestibular symptoms and impairment following concussion on recovery time and clinical outcomes among adolescents. **METHODS:** 50 (F-22/M-28) adolescents aged 12-20 years completed the Vestibular/Ocular Motor Screening tool (VOMS), Immediate Post-concussion Assessment and Cognitive Testing (ImPACT), and Post-concussion Symptom Scale (PCSS) at 0-10 and 11-21 days after concussion. Participants were grouped into: 1) persistent vestibular (PV), 2) vestibular improvement (VI), and 3) no vestibular (NoV). A 3 (group) X 2 (time) ANOVA with Bonferroni correction was performed for cognitive and symptom scores, and one-way ANOVA was performed for recovery time. **RESULTS:** Participants included 17 (35%) PV, 12 (25%) VI, and 20 (40%) NoV with one being excluded based on outlier analyses. Results supported group differences on PCSS at 11-21 days (p=.004), with PV (29.0±24.9) reporting higher symptoms than VI (13.0±15.5; p=.045) and NoV (5.45±10.0; p=.005). The VP group took longer to recover (34.9±11.6 days, p=.03) than the NoV (22.9±14.9 days) group. There were no significant group by time interactions for cognitive scores. However, all groups improved on verbal (p=.007) and visual (p=.03) memory, visual motor speed (p=.02), and reaction time (p=.03) from 0-10 to 11-20 days. Females were 5.7x more likely than males to be in the PV versus NoV group (p=.02, *95% CI*=1.3-24.6). **CONCLUSION:** Persistent vestibular symptoms and impairment following concussion may play a role in higher symptom burden and prolonged recovery that warrants attention from clinicians. Females may be more likely to experience these persistent vestibular symptoms and impairment.
Funding

488   Board #3   May 30 1:00 PM - 3:00 PM

Influence Of Motion Sensitivity On Baseline Symptoms, Cognitive, And Vestibular/oculomotor Scores In Adolescent Athletes

R.J. Elbin[1], Mallory McElroy[1], Katie Stephenson-Brown[1], Anthony Kontos[2]. [1]University of Arkansas, Fayetteville, AR. [2]University of Pittsburgh Medical Center, Pittsburgh, PA.
(Sponsor: Dr. Matthew Ganio, FACSM)
(No relevant relationships reported)

Researchers report that a history of motion sensitivity is associated with vestibular/oculomotor impairment and symptoms in non-concussed collegiate athletes. However, previous research did not include other commonly used baseline concussion assessments (e.g., neurocognitive, symptoms) or adolescent athletes. **PURPOSE**: To examine the effects of motion sensitivity on baseline neurocognitive, symptom, and vestibular/oculomotor scores in high school athletes (HS). **METHODS**: A total of 423 HS athletes (15.04 $\pm$ 1.24 years; 97 females - 24%) completed the Motion Sickness Sensitivity Questionnaire (MSSQ), the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT), Post-Concussion Symptom Scale (PCSS), and Vestibular/Ocular Motor Screening tool (VOMS) at baseline. Athletes were categorized into three groups: 1) NONE- MSSQ score=0 (33%, 142/421), 2) LOW-MSSQ score >0<7.07 (34%, 144/421) or 3) HIGH- MSSQ score >7.20 (32%, 135/421) based on median split of MSSQ scores >0. A series of ANOVAs were performed to examine between group differences on VOMS item scores, near-point convergence (NPC) distance, cognitive testing, and symptoms. A series of chi-square analyses with odds ratios (ORs) were used to analyze the association of motion sensitivity to clinical cutoffs on VOMS (i.e., ≥2 on any item) and NPC distance (≥ 5cm). **RESULTS**: A total of 34% (150/441) and 30% (18/62) of athletes exceeded clinical cutoffs on at least one VOMS item and NPC distance, respectively. Total PCSS scores were greater for the HIGH compared to the NONE group (p=.003). There were no differences between motion sensitivity groups on cognitive performance (p >.05). The HIGH group had higher total VOMS scores than the NONE group for horizontal saccades, horizontal vestibulo-ocular reflex (VOR), vertical VOR, and visual motion sensitivity (p < .01). The HIGH group was 2.94x (p≤ .001) more likely than the NONE group to exceed clinical cutoffs on VOMS. **CONCLUSION**: Motion sensitivity was associated with scores above clinical cutoffs on VOMS. Sports medicine professionals should assess motion sensitivity in athletes at baseline to inform better SRC care.

489   Board #4   May 30 1:00 PM - 3:00 PM

Longitudinal Multimodal Assessment To Quantify Concussion Recovery Trajectory Among Youth Athletes

David R. Howell[1], Gregory D. Myer[2], Anna N. Brilliant[3], Kim Barber Foss[2], William P. Meehan, III[3]. [1]Children's Hospital Colorado, Aurora, CO. [2]Cincinnati Children's Hospital Medical Center, Cincinnati, OH. [3]Boston Children's Hospital, Waltham, MA. (Sponsor: Louis R. Osternig, FACSM)
(No relevant relationships reported)

PURPOSE: Our aim was to evaluate a quantitative and multifaceted approach for determination of concussion recovery among youth athletes across different functional domains.
METHODS: Youth athletes 8-18 years of age and diagnosed with a concussion were tested 3 times: within 10 days of injury (T1), approximately 3 weeks post-injury (T2), and after clinical recovery, defined as symptom resolution and return to sport clearance (T3). Control participants completed the protocol in similar temporal increments as concussion participants. All participants completed a multifaceted protocol that included a symptom inventory (PCSS), a dual-task gait evaluation, an electroencephalography (EEG)-based auditory oddball task, and objective eye tracking. Repeated measures ANCOVAs were used to evaluate between group differences with sex, age, and prior concussions as covariates. We also examined if the rate of change across time for each outcome variable was different between groups using analysis of response profiles for longitudinal data.
RESULTS: Sixty-seven athletes participated: 36 post-concussion (age= 14.0±2.6 years; 44% female) and 31 controls (age=14.6±2.2 years; 39% female). Concussion symptoms were significantly higher for the concussion group compared to controls at T1 (PCSS=31.7±18.8 vs. 1.9±2.9; p<0.001) and T2 (PCSS=10.8±11.2 vs. 1.8±3.6; p=0.001), but resolved by T3 (PCSS=1.7±3.6 vs. 2.0±3.8; p=0.46). The concussion group walked significantly slower during dual-task gait than controls at each of the three tests (0.83±0.19 vs. 0.95±0.15 m/s; p=0.049). We found no significant differences between groups for the EEG oddball task or objective eye tracking measures. The EEG auditory oddball connectivity recovery trajectory differed significantly between groups, where the concussion group scores decreased and the control group scores increased across the testing timeline (χ2=14.1, p=0.001).
CONCLUSIONS: Despite symptom resolution, athletes with concussion displayed altered dual-task gait speeds at their final visit and their auditory oddball connectivity scores worsened throughout the test timeline. A multimodal and objective approach to concussion monitoring may support clinicians in the detection of brain function deficits that are undetectable with standard clinical assessments.

490   Board #5   May 30 1:00 PM - 3:00 PM

Association Between Sleep Quality and Symptoms Following a Sports-Related Concussion in the Pediatric Population

Aaron J. Zynda[1], Jane Chung[1], Shane M. Miller[1], Meagan J. Sabatino[1], Chan-Hee Jo[2], Cason Hicks[3], Nyaz Didehbani[3], Kathleen Bell[3], Munro Cullum[3]. [1]Texas Scottish Rite Hospital for Children, Plano, TX. [2]Texas Scottish Rite Hospital for Children, Dallas, TX. [3]University of Texas Southwestern Medical Center, Dallas, TX.
(No relevant relationships reported)

PURPOSE: To determine if there is an association between reported sleep quality and concussion symptoms in pediatric athletes. **METHODS:** A review of prospectively collected data from subjects diagnosed with a sports-related concussion between October 2015 and June 2017, and enrolled in the North Texas Concussion Network Prospective Registry (Con-Tex), was performed. Subjects were treated at one of four outpatient clinics, in North Texas, specializing in concussions. Records were reviewed for sleep quality, indicated by composite scores on the Pittsburgh Sleep Quality Index (PSQI). According to PSQI guidelines, good sleep quality (GOOD SLEEP group) is indicated by a composite score of ≤5 (possible total=21), and poor sleep quality (POOR SLEEP group) by a score of >5. Demographics, symptoms, and total symptom score, as assessed by the Sports Concussion Assessment Tool 3 (SCAT3) at initial visit and 3-month follow-up, were compared between groups. **RESULTS:** Of 356 eligible subjects, 180 (50.6%) were girls and 176 (49.4%) were boys, with a mean age of 14.38 years (7-18). 261 subjects had a PSQI composite score of ≤5 at their initial visit (GOOD SLEEP), while 95 had scores >5 (POOR SLEEP). At initial visit, the POOR SLEEP group had a higher mean PSQI composite score (8.7) and total symptom score on SCAT3 (39.2) compared to the GOOD SLEEP group (2.6 and 20.4, respectively, p<.0001). The POOR SLEEP group also had a higher mean PSQI composite score (5.7) and total symptom score (12.2) at 3 months compared to the GOOD SLEEP group (3.0 and 4.2, respectively, p<.0001), although both groups improved. Additionally, subjects in the POOR SLEEP group reported more fatigue, drowsiness, and trouble falling asleep on the SCAT3 at both the initial visit and 3-month follow-up when compared to the GOOD SLEEP group (p<.005). Gender was also significantly different between the two sleep groups with more girls included in the POOR SLEEP

group than boys (61.1% vs 38.9%, respectively, p=.017). **CONCLUSIONS:** Poor sleep was strongly associated with increased symptom burden within pediatric athletes both at initial visit and 3-month follow-up post-concussion. Clinicians should include an evaluation of sleep quality in young athletes treated for a sports-related concussion.

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491   Board #6   May 30 1:00 PM - 3:00 PM

Functional Near Infrared Spectroscopy Identifies Changes in Cognitive Workload Following Pediatric Concussion

christina lin master[1], Eileen Storey[1], Lei Wang[2], Olivia Podolak[1], Matthew Grady[1], Andrew Mayer[3], Hasan Ayaz[2]. [1]*The Children's Hospital of Philadelphia, Philadelphia, PA.* [2]*Drexel University, Philadelphia, PA.* [3]*Mind Research Network, Albuquerque, NM.*
(No relevant relationships reported)

PURPOSE: To determine if functional near infrared spectroscopy (fNIRS), a noninvasive imaging modality detecting oxygenation changes reflective of cognitive workload, distinguishes physiologic differences between concussion subjects and healthy controls during King-Devick (KD) testing, a rapid number naming task **METHODS**: We recruited 57 cases, ages 7 to 21 years, 51% female, and 17 controls, ages 10-21 years, 47% female from a subspecialty referral concussion program for this prospective case control study where the subjects performed the KD test while wearing a fNIRS device consisting of a headband which records anterior prefrontal cortex oxygenation changes with 4 optodes at a 4Hz sampling rate. The main outcome measures were KD times, symptom provocation and oxygenation change during KD testing. **RESULTS**: Concussion subjects demonstrated longer times and greater oxygenation change on fNIRS compared to healthy controls. However, within the group of concussion subjects, KD times did not distinguish between those with and without symptom provocation upon testing. In contrast, fNIRS was able to detect oxygenation change differences between these two subgroups, with the symptomatic group exhibiting greater oxygenation change with testing.
CONCLUSIONS: Based on our data, the prolongation of KD times observed following concussion has physiologic correlates with increased cognitive workload. Among subjects with concussion, KD times did not distinguish between those with and those without symptom provocation upon testing. In contrast, fNIRS was able to differentiate between these two subgroups of concussion, with symptomatic subjects exhibiting a pattern of greater cognitive workload compared to asymptomatic. fNIRS has utility in detecting subclinical differences in cognitive workload in concussion. In addition, our data supports the concept that the physiologic basis for symptom provocation in concussion may be related to cognitive overload.

fNIRS with Symptom Provocation on KD testing

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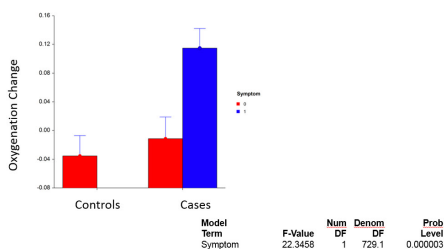
492   Board #7   May 30 1:00 PM - 3:00 PM

The Effect of Anxiety on Baseline Concussion Assessment in Adolescent Females

Christopher P. Tomczyk, Jody Langdon, George Shaver, Tamerah Hunt, FACSM. *Georgia Southern University, Statesboro, GA.* (Sponsor: Tamerah Hunt, FACSM)
(No relevant relationships reported)

Anxiety occurs in approximately 15-20% of adolescent females. The potential for the interaction between anxiety and impaired cognition commonly assessed by concussion batteries require clinicians and researchers to examine the effect of anxiety on baseline concussion test scores. **PURPOSE**: Examine the effects of trait anxiety on concussion baseline testing in adolescent female athletes. **METHODS**: Prior to their competitive season, 35 adolescent female athletes ranging from 13-18 years of age (mean age: 15.66 ± 1.28) were administered the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT) and the State Trait Anxiety Inventory during baseline testing. Participants were divided into groups, based off a previously validated T-Anxiety

cutoff score of 35, which was derived from the literature (low n=18, high n=17). ImPACT composite scores served as dependent variables. Multiple one-way ANOVAs were calculated to examine group differences on ImPACT composite scores. All statistical analyses were conducted using SPSS 23.0 (IBM, Armonk, NY). Significance level was set *a priori* at 0.05 with a Bonferroni correction (p<.008) **RESULTS:** Significant differences were found between high and low trait anxiety groups for total symptom score ($F_{(1, 33)}$ = 9.58, p = .004; High: 12.30 ± 10.57, Low: 4.12 ± 5.57), and composite visual motor speed ($F_{(1, 33)}$ = 10.11, p = .003; High: 37.31 ± 4.96, Low: 40.31 ± 5.82). Athletes with high trait anxiety reported more symptoms and performed slower on visual motor speed. No statistical differences existed for composite: verbal memory, visual memory, reaction time and impulse control (p>0.05). **CONCLUSION:** This study provides preliminary evidence that adolescent females with high trait anxiety during baseline concussion assessment present with higher symptoms and slower visual motor speed. In order to subscribe to a holistic approach of concussion management, anxiety needs to be incorporated into the clinical decision process. Without examining adolescent levels of anxiety the clinician may be vulnerable to making inaccurate interpretations of baseline test scores.

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493   Board #8   May 30 1:00 PM - 3:00 PM

Concussion Recovery In Adolescents: The Influence Of Race And Sex On Neurocognition

Seema S. Aggarwal, Summer D. Ott, Nikhil S. Padhye. *The University of Texas Houston Health Science Center, Houston, TX.*
(No relevant relationships reported)

An estimated 500,000 to 800,000 concussions occur annually among U.S. high school athletes. However, the association of sex and race/ethnicity with recovery remains unclear. **PURPOSE:** The aim of this study was to examine influence of sex and race/ethnicity on the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) in adolescents. **METHODS:** This was a retrospective cohort study of adolescents, 13-19 years old, evaluated for an acute concussion (≤10 days from injury) at a university-based concussion clinic. General linear models (GLM) were used to examine race and sex interaction on post-concussion ImPACT composite scores on verbal memory, visual memory, visual motor, reaction time, and symptoms. **RESULTS:** A total of 227 charts that met inclusion criteria. There were no differences in the distributions of age and sex. The sample (N = 227) was primarily male (75%), and the median age was 15 years. Minorities (Blacks and Hispanics) constituted 46% of the sample. White females had the longest recovery time (median 27.5 days) and minority males had the shortest recovery time (median 11 days). Univariate tests indicated that the interaction of sex and race was statistically significant for visual memory ($F(3,223)$ = 3.83, p = .011, η_p^2 = .049), reaction time ($F(3,223)$ = 2.87, p = .037, η_p^2 = .037), and symptoms ($F(3,223)$ = 9.46, p < .001, η_p^2 = .113). On these ImPACT subscales, White females had the poorest performance, and minority males had the best performance. Compared to the scores for minority males, ImPACT scores for White females on these subscales were as follows: visual memory (70.67±14.1 vs. 60.95±14.5), reaction time (.67±.17 vs. .76±.19), and symptom scores (12.19±14.5 vs. 28.29±22.04). Multivariate tests for the main effect of the interaction of race and sex ($F(15,663)$ = 3.00, p = <.001, η_p^2 = .06) were statistically significant. **CONCLUSION:** This study found that both race and sex appear to influence concussion recovery. White females took longest to recover and had worse ImPACT visual memory, reaction time, and symptoms scores than White males, minority females, and minority males. In contrast, minority males had shorter recovery times and better ImPACT scores on these subscales than all other race-sex categories.

B-09   Thematic Poster - Exercise Psychology-Stress

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100E

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494   Chair: Steven J. Petruzzello, FACSM. *University of Illinois at Urbana-Champaign, Urbana, IL.*
(No relevant relationships reported)

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495   Board #1   May 30 1:00 PM - 3:00 PM

Multidimensional Stress influencing Mental Health of Chinese Professionals and the Health Promotion of Physical Activity

Chunmei Zheng. *Shandong University, Jinan, China.*
(No relevant relationships reported)

Social and economic changes in China have seriously influenced the mental health of citizens. Although work stress has been studied by scholars within China and

abroad. little is known about multidimensionality of stress factors and their effects among various populations. **PURPOSE:** The purpose of this study was to examine the influence of multidimensional stressors on the mental health in Chinese adults and identify the impact of physical exercise on mental health. **METHODS:** Participants for the survey were randomly recruited from Jinan institutions, parks, squares and streets. A total of 1000 questionnaires were distributed, of which 819 questionnaires were returned (response rate 81.9%), 110 invalid excluded. A total of 709 valid questionnaires were used for the data analysis. Using SPSS version 16.0, descriptive statistics, T-test, Multivariate Analysis of Variance (MANOVA) and hierarchical regression analysis were used to analyze the data. **RESULTS:** Analysis of variance ($P = 0.046 < 0.05$) indicated that the stress levels of professionals across the ranks are significantly different. Descriptive Statistic analysis showed that the main sources of stress across different occupational groups are work (35.8%), education (36.1%), and health (18.1%). MANOVA (Wilkslambda Criterion = 0.86) showed that satisfaction, emotional balance, self-awareness, and interpersonal relationship are significantly different among different occupations ($p < 0.01$, respectively). T-test indicated that there was significant differences in life satisfaction, emotional balance, self-awareness, and interpersonal relationships between physical activity and non-physical activity group (all $p < 0.05$). **CONCLUSION:** It can be concluded that China has distinct social classes, whose mental health conditions vary; The stress levels of professionals across the ranks are significantly different; Work, education, and healthcare were identified as main sources of stress among working professionals; Respondents who regularly engaged in physical activity far better in terms of mental health compared to the non-exercise group. Supported by the China Scholarship Council; Shandong Soft Science. [2015RKE27016]; National science and technology basic work. [2015FY111600].

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496   Board #2   May 30 1:00 PM - 3:00 PM

Effects of Voluntary Wheel Running Exercise on the Depressive-Like Behavior and Circadian Alterations of Neuroendocrine Induced by Chronic Unpredictable Mild Stress in Rats

YAN ZHAO. *CHENGDU SPORT UNIVERSITY, CHENGDU, China.*

(No relevant relationships reported)

PURPOSE: To investigate effects of voluntary wheel running exercise on circadian rhythmic alterations of plasma hormone and peptide induced by Chronic Unpredictable Mild Stress (CUMS).
METHODS: Ninety male SD rats were divided into three groups: CUMS, EC (Exercise plus CUMS), and Con (Control) group. Rats were under a 12h/12h light/dark cycle (19:00 light up; 07:00 light off). The CUMS procedure consists of a variable sequence of 11 stressors. Rats were randomly exposed to two stressors every day for 3 weeks. Rats in EC group were trained in a voluntary wheel running program for a total of 8 weeks, plus CUMS procedure during the last three weeks. Blood samples were collected at each of six time points (ZT1 and 5, 9, 13, 17, 21). Plasma concentrations of corticosterone (CORT), melatonin (MT) and vasoacutive intestinal peptide (VIP) were detected by ELISA. Data were analyzed by one-way ANOVA, and the circadian rhythms by single cosinor method.
RESULTS: Rats in Con group showed robust circadian rhythms in plasma CORT, MT and VIP. Rats in CUMS group showed an obvious disorder in circadian rhythm of plasma CORT, including phase advance and decrease in amplitude, and markedly blunted circadian rhythm. There also showed a markedly blunted circadian rhythm and decreased levels of plasma melatonin in CUMS rats compared to Con rats. VIP still has 24-hour rhythm, but the amplitude was significantly lower than that of the Con group, peak phase also delayed for 6 hours, expression was significantly higher than that of the Con group. 8-week voluntary wheel running exercise can significantly inhibit the disturbance of MT, CORT and VIP circadian rhythm, and also the abnormal expression of these hormones secretion.
CONCLUSION: CUMS induce these peptides and hormones desynchronized from SCN and voluntary wheel running exercise can rescue the disturbed circadian rhythms of these synchronizers.
Supported by the Innovation Project of Sports Medicine and Health Institute of Chengdu Sport University

Table 1. The comparison of CORT circadian property in each group

Group	P	Median±SE	Amplitude (95% CL)	Peak Phase (95% CL)
Con	<0.01	77.365±4.225	14.586 (7.044, 22.129)	-157.405 (-182.181, -132.626)
CUMS	0.432	83.918±3.025	8.954 (3.560, 14.354)	-89.852 (-116.942, 62.761)
EC	0.041	74.366±3.356	14.296 (8.305, 20.288)	-146.302 (-177.441, -115.161)

Table 2. The comparison of MT circadian property in each group

Group	P	Median±SE	Amplitude (95%CL)	Peak Phase (95%CL)
Con	<0.01	5.769±0.167	1.093 (0.795, 1.392)	-359.232 (-343.385, -15.081)
CUMS	0.653	2.773±0.158	0.718 (0.436, 1.001)	-149.495 (-192.680, -106.311)
EC	0.032	5.332±0.176	1.037 (0.722, 1.351)	-356.925 (-339.267, -14.583)

Table 3. The comparison of VIP circadian property in each group

Group	P	Median±SE	Amplitude (95% CL)	Peak Phase (95%CL)
Con	<0.01	64.420±1.823	5.915 (2.661, 9.168)	-258.505 (-291.875, -225.130)
CUMS	0.046	81.120±2.055	3.422 (0.654, 6.190)	-348.738 (-332.477, -14.998)
EC	0.022	62.225±1.707	5.033 (1.987, 8.080)	270.178 (307.429, 232.925)

Notes for Table 1-3: 360 degrees=24 h, Phase reference: 00:00=0 degree, P<0.05, meaning existence of circadian rhythm by Single cosinor method.

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497   Board #3   May 30 1:00 PM - 3:00 PM

A Comparison Of Stress Levels And Coping Skills Of Collegiate Freshmen Athletes And Non-athletes

Jessica E. Jochum, Nicole Vetroczky, Marina Kuchenberg, Lauren Dybwad. *University of Indianapolis, Indianapolis, IN.* (Sponsor: Amy Jo Sutterluety, FACSM)

(No relevant relationships reported)

Despite knowing the factors that increase stress levels in collegiate freshmen, there is limited research that compares the stress levels and coping mechanisms between collegiate, freshmen athletes and freshmen non-athletes. **PURPOSE:** To investigate differences in perceived stress levels and coping mechanisms in collegiate freshmen athletes and non-athletes. **METHODS:** One hundred and forty-seven NCAA Division II freshmen ($n_{athlete} = 68$, $n_{non-athlete} = 69$) ($n_{female} = 86$, $n_{male} = 49$) completed three self-report questionnaires: Perceived Stress Scale (PSS-10), Brief COPE, and demographic information questionnaire. The 10-item PSS-10 was used to measure the degree to which an individual appraises his/her situation as stressful. The 28-item Brief COPE was used to measure frequency of positive, neutral and negative coping mechanisms on fourteen different scales. An alpha level of $p \leq .05$ was set for statistical significance. An independent t-test was conducted to compare mean scores of the PSS-10, and Mann-Whitney U tests were used to compare Brief COPE scales. A Spearman's rho correlation was used to determine relationships between perceived stress and coping mechanisms. **RESULTS:** Analysis revealed no statistical difference between athletes and non-athletes on perceived stress or coping mechanisms. All participants rated a high level of perceived stress on the PSS-10, (females 29 (SD = 6) males 26 (SD = 5)) out of 40 possible points, yielding a statistical difference between genders, $t(133) = -3.117$, $p = 0.002$. Of the 14 coping strategies measured, four were found to be statistically significant for females: emotional support ($p = 0.001$), instrumental support ($p = 0.03$), venting ($p = 0.001$), and self-blame ($p = 0.05$). A positive correlation exists between increased stress levels and eight coping mechanisms. The two highest correlations were disengagement r_s =.422, p<.001 and self-blame r_s =.523, p<.001. **CONCLUSION:** No difference was observed in perceived stress levels between collegiate freshmen athletes and non-athletes, all freshmen perceive high levels of stress. Females perceive higher levels of stress than males, and tend to select negative coping mechanisms. The higher levels of perceived stress, the more likely the person would be to use disengagement and self-blame as coping mechanisms.

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498   Board #4   May 30 1:00 PM - 3:00 PM

Relationships Among Physical Fitness, Sleep-wake Behavior, And Hemodynamic And Cortisol Responses To Stress In Women

Shannon K. Crowley, Julia Rebellon, Abigail J. Leonard, Christina Huber, Lyndsay Wolfe, Andrea Tobar, Sierra Hayden, Daniel Henderson, Meir Magal, FACSM. *North Carolina Wesleyan College, Rocky Mount, NC.*

(No relevant relationships reported)

PURPOSE: Dysregulation in the physiological stress response has been proposed as one mechanism by which disturbed sleep increases risk for the development

Abstracts were prepared by the authors and printed as submitted.

of psychiatric diseases. Being physically fit has been associated with improved sleep. However, to date, there has been limited investigation of physiological stress responding as a mediating factor in the relationship between physical fitness and improved sleep, and even fewer which have investigated this relationship in women while experimentally controlling for the influence of the ovarian cycle on the physiological stress response. This study aimed to investigate relationships among physical fitness, sleep disturbances, and physiological responses to psychosocial stress in women. **METHODS:** Following a two-tiered screening process, 30 healthy women (18-45y) who were medication-free and had regular menstrual cycles completed: (1) enrollment visit, (including mood and sleep assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise); (2) one-week sleep monitoring period (objective and subjective measures of sleep-wake behavior); and (3) psychosocial stressor protocol for the collection of heart rate (HR) and cortisol stress responses. Psychosocial stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which have been shown to influence the physiological response to stress. **RESULTS:** Higher levels of physical fitness were significantly associated with reduced objectively measured wake after sleep onset (WASO) duration ($r = -.38$, $p = 0.04$), higher self-reported sleep quality (higher scores reflect poorer sleep quality; $r = -.37$, $p = 0.05$), and lower HR during the psychosocial stressor ($r = -.39$, $p = 0.04$). Consequently, lower self-reported sleep quality was significantly associated with a higher HR during the psychosocial stressor ($r = .41$, $p = 0.02$), and increased WASO duration was significantly associated with blunted cortisol responses to the psychosocial stressor ($r = -.41$, $p = 0.04$, $n=26$). **CONCLUSIONS:** Results suggest that, in women, physical fitness may be protective against the deleterious effects of stress via improved sleep-wake behavior.

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499   Board #5   May 30 1:00 PM - 3:00 PM

Correlations Between Serum Biomarkers Of Stress And Subjective Measures Of Well-being In Collegiate Swimmers

Connor A. Kuremsky[1], Wang Haoyan[1], Neil M. Johannsen[1], Jack Marucci[1], Shelly Mullenix[1], Brian A. Irving[1], Rick L. Sharp, FACSM[2], Brian Harrell[3], Guillaume Spielmann[1]. *[1]Louisiana State University, Baton Rouge, LA. [2]Iowa State University, Ames, IA. [3]Baton Rouge General Sports Medicine, Baton Rouge, LA.* (Sponsor: Rick Sharp, FACSM)
(No relevant relationships reported)

Collegiate student-athletes experience prolonged physical, psychological and academic stressors, putting them at risk for impaired athletic performance and overall well-being. Practical feasibility undermines the use of objective physiological measures of stress, such as serum cortisol, alternatively favoring subjective measures of well-being by using self-reported questionnaires. **Purpose**: To determine the relationship between serum cortisol and various subjective measures of well-being in NCAA D1 swimmers over a 6-month training period. **Methods**: Early morning resting serum samples were collected from sixteen NCAA Division 1 swimmers (8 M, 8 F: 19.81 ± 0.65 yrs) at 2 timepoints (early season and immediate post-season), and an additional mid off-season timepoint was collected in a subset of 10 swimmers. Self-reported subjective measures of well-being were collected at each timepoint by using questionnaires for overtraining (DALDA), sleep quality (PSQI) and mood state (AD-ACL). The gold-standard physiological biomarker of stress, serum cortisol, was measured using commercially-available ELISA kits (R&D Systems). Pearson's correlation coefficients determined linear correlations between serum cortisol concentration and questionnaire responses ($\alpha=0.05$). **Results**: At the pre-season timepoint, higher serum cortisol concentrations (138.99 ± 33.9 ng/mL) were observed in swimmers reporting less calmness ($r=-0.79$, $p=0.006$), while this association disappeared at the early season timepoint ($p=0.935$). At the post-season timepoint, serum cortisol concentrations (123.3 ± 76.7 ng/mL) were negatively correlated with calmness ($r=-0.46$, $p=0.035$) and tension ($r=-0.45$, $p=0.041$). Surprisingly, however, swimmers reporting greater symptoms of overtraining at the post-season timepoint had reduced cortisol concentration ($r=-0.44$, $p=0.046$). **Discussion**: Subjective questionnaires have been used as a surrogate to objective biomarkers of stress, such as serum cortisol concentration. Although the results obtained from self-reported questionnaires were highly correlated with serum cortisol levels during periods of high academic and athletic stress (post-season), the correlation between cortisol concentration and mood states did not remain consistent throughout the competitive season.

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500   Board #6   May 30 1:00 PM - 3:00 PM

Resting Heart Rate Variability Moderates a Relationship Between Attentional Bias and Stress Response

Derek C. Monroe[1], Zachary Rader[2], Matthew P. Herring[3], Jonathan Golden[2]. *[1]University of Califorina--Irvine, Irvine, CA. [2]Georgia College & State University, Milledgeville, GA. [3]University of Limerick, Limerick, Ireland.*
(No relevant relationships reported)

University students report greater symptoms of psychological distress compared to age-matched controls, which plausibly contribute to a greater incidence of anxiety and depressive disorders. Maladaptive responses to, and recovery from, stress may be partially explained by cognitive (e.g., threat bias) and physiological (e.g., poor autonomic balance) correlates of affective dysfunction that may be modifiable through exercise training. Thus, elucidating interactions among psychological and physiological predictors of stress has implications for better understanding the mental health benefits of exercise training.
PURPOSE
To quantify the moderating effect of heart rate variability on a relationship between threat bias and perceived stress during exam week in healthy, undergraduate students.
METHODS
45 undergraduate students completed a Spielberger Trait Anxiety Inventory, a computerized Dot-Probe Task, and a 5-minute assessment of resting heart rate variability (HFTF). Threat bias was operationalized as a positive bias score (discordant vs. concordant trials), and HFTF was computed as a ratio of power density in the high frequency spectrum (.15-.40 Hz) to power density in the entire spectrum (.04-.40 Hz). The Perceived Stress Scale was completed online during exam week 4-8 weeks later. Bivariate correlations were computed between trait anxiety and threat bias and HFTF. Moderation was tested using hierarchical linear regression with interaction effects.
RESULTS
Trait anxiety was inversely associated with HFTF ($r_= -.35$, $p =.01$) and positively associated with bias scores ($r_= .34$, $p =.01$). The relationship between threat bias and perceived stress during exam week was moderated by HFTF, $F(1,26)=26.04$, $p<.001$, $\Delta R^2=.2605$. Lower stress was only predicted by a lack of attentional bias among participants who also had the highest resting HFTF, $b= 6.60$, $SE_b= 1.43$, $p < .001$. There was no association between trait anxiety and perceived stress.
CONCLUSION
Findings suggest that in young, healthy individuals the protective effects of high parasympathetic tone are only revealed among those who do not exhibit threat biases. Cognitive and physiological correlates of affective dysfunction should be measured when determining the efficacy of exercise training programs designed to improve mental health outcomes.

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501   Board #7   May 30 1:00 PM - 3:00 PM

Appraisals Significantly Influence Endurance Performance and Psychophysiological Response: Stress Appraisals, Emotions, Coping, and Cortisol Responses

Mark A. Thompson, John Toner, John L. Perry, Rachel Burke, Adam R. Nicholls. *University of Hull, Hull, United Kingdom.*
(No relevant relationships reported)

Athlete stress appraisals have been associated with athletic performance, which is purported to be mediated by emotions and coping behaviours. However, our understanding of how these psychological mechanisms underpin endurance performance is equivocal. **PURPOSE:** To assess the causal psychophysiological and performance impact of past- (e.g., harm/loss and benefit) and future-oriented (e.g., challenge and threat) stress appraisals on performance. **METHODS:** Thirty trained and gender-matched athletes were randomly engendered with one of five stress appraisals (challenge, threat, benefit, harm/loss, or control) and completed three 16.1km cycling time trials on a SRM cycle ergometer. Salivary cortisol concentration was measured via an ELISA to assess neuroendocrine response, whilst psychometrics measuring appraisals, emotions, and coping behaviours were also completed. **RESULTS:** Penalized Multinomial Logistic Regression analyses of performance change revealed that temporal orientation of appraisal was a causal influence upon performance, with benefit ($\beta = 5.13$, 95% CI = 1.90, 10.93, $p < 0.001$, OR = 169.00) and harm/loss ($\beta = 3.15$, 95% CI = .46, 8.18, $p = 0.019$, OR = 23.40) groupings significantly facilitating and inhibiting performance respectively. Threat appraisals lead to a performance dichotomy, with both significant improvement ($\beta = 3.41$, 95% CI = .52, 8.54, $p = 0.018$) and significant deterioration ($\beta = 3.08$, 95% CI = 0.06, 8.23, $p = 0.046$) more likely to occur than a non-significant change (OR = 30.33 and 21.67 respectively). Variation across temporal orientation also translated into neuroendocrine response, with cortisol spikes found in threat ($g = -0.9$), compared to a decrease in harm/loss ($g = 0.74$). **CONCLUSION:** Stress appraisals significantly influence psychophysiological response and performance, with past-oriented appraisals as autonomous and influential as future-oriented appraisals. Spikes in cortisol levels in

the future-oriented stress appraisal threat, compared to a decline in the past-oriented harm/loss, suggest that the fear of defeat may be physiologically more stressful than losing itself. Practitioners are advised to engender benefit stress appraisals in order to facilitate both psychophysiological well-being and subsequent performance proficiency among their athletes.

B-10   Basic Science World Congress - Thematic Poster - **Moderating Skeletal Muscle I**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100C

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502   **Chair:** Troy Hornberger. *University of Wisconsin-Madison, Madison, WI.*

(No relevant relationships reported)

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503   Board #1   May 30 1:00 PM - 3:00 PM

No Effect Of Hmb Or α-hica On Training-induced Changes In Performance Or Body Composition

Filipe J. Teixeira[1], Catarina N. Matias[2], Cristina P. Monteiro[2], Maria J. Valamatos[2], Joana F. Reis[3], Francisco Tavares[4], Christophe Domingos[1], Francisco B. Alves[2], Ana R. Batista[1], Luís B. Sardinha[2], Stuart M. Phillips, FACSM[5]. *[1]Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal. [2]CIPER, Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal. [3]Universidade Europeia, Laureate International Universities, Lisbon, Portugal. [4]Waikato University, Hamilton, New Zealand. [5]McMaster University, Hamilton, ON, Canada.*

(No relevant relationships reported)

Some leucine metabolites like β-hydroxy-β-methylbutyrate (calcium: HMB-Ca and free acid: HMB-FA) and α-hydroxy-isocaproic acid (α-HICA or leucic acid) have been suggested to augment training-induced adaptations in body composition and performance. **PURPOSE:** To compare the effects of commercially available supplements, HMB-Ca, HMB-FA and α-HICA, on resistance training-induced changes in fat mass and fat-free mass (FFM) and performance. **METHODS:** Forty men were block-randomized (based on handgrip strength, age, and fat-free mass [FFM]) to one of four groups: HMB-FA (n=11, age 30 ± 2.4 y, FFM 62.7 ± 10.5 kg), HMB-Ca (n=9, age 34 ± 1.5 y, FFM 65.6 ± 10.1 kg), α-HICA group (n=10, age 31 ± 2.7 y FFM 62.0 ± 7.1 kg), and placebo (PLA) group (n=10, age 31 ± 2.1 y FFM 64.2 ± 5.7 kg). The training program consisted of whole body thrice weekly training for 8wk (7 exercises/session, 3-4 sets per session, 70-80% 1RM). Whole body fat and FFM were assessed by DXA, and performance measures (vertical jump, 1RM for bench press, squat and Wingate test) were all assessed at baseline and at the end of weeks 4 and 8. Participants were instructed to consume at least 45 kcal/kg FFM/d and 1.6 g protein/kg body weight/d. **RESULTS:** Time-dependent changes were observed for 1RM bench press (p < 0.001), 1RM Squat (p < 0.001), vertical jump height (p = 0.028) and vertical jump power (p = 0.006). No significant between-group or time-group interactions were observed for body weight, Wingate peak and average power, handgrip, whole body fat or whole body FFM (Δ changes: HMB-FA 0.1 ± 1.5 kg; PLA 0.6 ± 0.8 kg; α-HICA -0.1 ± 1.0 kg; HMB-Ca 0.6 ± 2.0 kg) **CONCLUSION:** When consuming sufficient protein while in an estimated positive energy balance, none of the leucine metabolites studied resulted in any ergogenic effects on any outcome variable. We do not recommend leucine metabolites as a supplement strategy to augment training-induced gains in performance or body composition.

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504   Board #2   May 30 1:00 PM - 3:00 PM

Human Skeletal Muscle Lipid Mediator Responses to Resistance Exercise and Anti-inflammatory Drugs

Tommy R. Lundberg[1], Mats Lilja[1], Mirko Mandić[1], Krishna Rao Maddipati[2], Thomas Gustafsson[1], Eric Rullman[1]. *[1]Karolinska Institutet, Stockholm, Sweden. [2]Wayne State University, Detroit, MI.*

(No relevant relationships reported)

Exercise has been found to induce bioactive lipid mediators which possess both pro- and anti-inflammatory activity, yet the role of these mediators in the muscle adaptive response to resistance exercise (RE) remains to be explored. **PURPOSE:** The present study aimed to characterize the presence of polyunsaturated fatty acid-related bioactive lipids in human skeletal muscle. Specifically, we hypothesized that high doses of anti-inflammatory drugs (NSAIDs) would hinder the action of both pro-inflammatory and pro-resolving lipid mediators in response to acute RE, thereby providing a mechanistic

link to the negative effect of high (compared with low) doses of NSAIDs on the muscle hypertrophic response to RE reported by us. **METHODS:** Thirty-one men and women (18-35 years old) performed 8 weeks of RE with daily consumption of either a high dose of ibuprofen (IBU; 1200 mg) or a low dose of aspirin (ASA; 75 mg). Muscle biopsies were obtained before the training/treatment period and 3 h after an acute RE bout at week 4 of the intervention. We used a targeted lipidomics approach (High-Performance Liquid Chromatography with Tandem Mass Spectrometry) to compare the response of over 140 pro- and anti-inflammatory lipid mediators in IBU and ASA as well as in relation to untreated controls (CON). **RESULTS:** We could reliably detect 71 lipid metabolites in skeletal muscle, where 12/71 belonged to the cyclooxygenase pathway but the majority of the mediators were from the lipoxygenase and epoxygenase pathways. Overall, both the pro-inflammatory and the pro-resolving lipid mediator signature was decreased in both IBU and ASA, yet remained unchanged with exercise in CON. Pathway analysis revealed significant differences between drug treatments in the lipoxygenase pathway, specifically in mediators derived from the 5-LOX and 15-LOX enzymes, where levels after exercise were significantly lower in ASA compared with IBU. Specific metabolites driving these differences were 5-HETE, 13-OxoODE and 17-HDoHE. **CONCLUSIONS:** The results show that both high and low doses of NSAIDs markedly affect the skeletal muscle lipid mediator response to RE. We put forth the idea that lipid mediators from the lipoxygenase pathway may have a role in explaining the differential muscle hypertrophic response to RE noted with different doses of NSAID treatment.

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505   Board #3   May 30 1:00 PM - 3:00 PM

Hyperbaric-oxygen Reduces Inflammation And Regenerates Rats Skeletal Muscle Via Macrophage And Satellite Cell Activation.

Takuya Oyaizu, Mitsuhiro Enomoto, Naoki Yamamoto, Masaki Horie, Atsushi Okawa, Kazuyoshi Yagishita. *Tokyo Medical and Dental University, Tokyo, Japan.*

(No relevant relationships reported)

Muscle contusion injury is the most common sport-related injury. Hyperbaric oxygen treatment (HBO) promotes rapid recovery from soft tissue injuries. **PURPOSE:** Uncover a potential mechanism of the restorative effect of HBO on injured muscle. **METHODS:** A muscle contusion injury was performed by the drop-mass method on the rat calf muscle. Rats were divided into non-treated (NT) and HBO-treated (HBO). HBO consisted of 2.5ATA 100% oxygen for 120 minutes once per day. Circulating CD11b, CD68 positive cells were measured with flow cytometry. Injured muscles were homogenized and interleukin-6 (IL-6) and signal transducer and activator of transcription 3 (STAT3) were measured with enzyme-linked immune-sorbent assay (ELISA). Calf muscles sections were immunostained with CD68 and CD163 (macrophage markers), Pax7 and MyoD (satellite cell markers). **RESULTS:** Expression of IL-6 (NT vs. HBO: 995 ± 144 vs. 1964 ± 396 pg/mg, p<0.05) and the ratio of phosphorylated to total STAT3 (0.42 ± 0.05 vs. 1.17 ± 0.07, p<0.01) are increased at 3 hrs in HBO. The percentages of circulating CD11b-positive cells 6 hrs (NT vs. HBO: 65.5 ± 4.6 vs. $42.2 \pm 4.1\%$, p<0.001) and 24 hrs (45.6 ± 6.1 vs. $21.9 \pm 1.1\%$, p<0.001) were deceased in HBO. In the injured muscle, peak infiltration of CD68-positive cells occurred 2 days earlier in HBO. CD163-positive cells were higher at 3 days (NT vs. HBO: 9.3 ± 0.75 vs. 12.7 ± 0.83/HPF, p<0.05), 5 days (13.3 ± 0.63 vs. 17.2 ± 0.89/HPF, p<0.01) and 7 days (11.9 ± 0.86 vs. 17.3 ± 1.70/HPF, p<0.05) after injury. In muscle tissue, the number of Pax7+MyoD- cells was higher at 3 days (NT vs. HBO: 8.7 ± 0.75 vs. 17.2 ± 0.99/HPF, p<0.01) and 5 days (14.73 ± 2.7 vs. 24.89 ± 2.2/HPF, p<0.05) after injury. The number of Pax7+MyoD+ cells was higher at 1 day (NT vs. HBO: 9.9 ± 1.4 vs. 15.4 ± 0.48/HPF, p<0.01) and 3 days (12.6 ± 1.5 vs. 21.96 ± 1.4/HPF, p<0.05) and the number of Pax7-MyoD+ cells was higher at 1 day (NT vs. HBO: 4.4 ± 0.21 vs. 8.2 ± 1.0/HPF, p<0.05), 3 days (6.9 ± 1.1 vs. 15.5 ± 2.6/HPF, p<0.05) and 5 days (13.0 ± 1.4 vs. 23.4 ± 1.4/HPF, p<0.01). **CONCLUSIONS:** HBO increased levels of a tissue inflammatory cytokine, reduces circulating inflammatory cells and induces a rapid macrophage response. These early-onset inflammatory responses appear to enhance satellite cell proliferation and differentiation, leading to rapid recovery of injured skeletal muscle.

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506   Board #4   May 30 1:00 PM - 3:00 PM

Muscle Fiber Type Adaptations To Exercise Differ In Obese And Non-obese Volunteers

Maxime Moreillon, Yannick Morard, Nicholas T. Broskey, Sonia Conde Alonso, Cyril Besson, Francesca Amati, FACSM. *University of Lausanne, Lausanne, Switzerland.*

(No relevant relationships reported)

Human skeletal muscle is composed of slow fibers (type I), fast fibers (IIa and IIx), and a continuum of hybrid fibers co-expressing different myosin heavy chains. Cellular responses to exercise involve changes in fiber type proportions and cross sectional area (CSA). To our knowledge, the impact of obesity on these responses is not yet known. **PURPOSE:** To determine if obesity impacts changes in fiber type proportions and CSA in response to endurance exercise in a sedentary population.

METHODS: Twenty-two obese sedentary healthy men and women (O, BMI>30kg/m²) and 15 non-obese (Lean, L, BMI<26kg/m²) volunteers participated in a 4 months supervised endurance exercise intervention. 18 endurance trained volunteers matched by gender and age (60-79) served as controls (C). *Vastus lateralis* muscle biopsies were analyzed using immunohistochemistry to determine fiber type distribution and CSA. Baseline group comparisons were made using 1-way ANOVA. Pre/post-intervention changes were assessed by paired *t* tests.
RESULTS: At baseline, both L and O had less type I fibers than C. No difference was found in proportions of type IIa, IIx or hybrid I-IIa fibers. The proportion of hybrid type IIa-IIx was higher in O than C. Type I CSA was larger in O than L. No difference in CSA was found for type IIa, IIx or hybrid fibers. With intervention, proportions of type I, IIa, IIx and hybrid type IIa-IIx were not modified. An increase in proportion of hybrid type I-IIa was seen in L but not in O. Type I CSA increased in O and L, while IIa CSA increased only in L.
CONCLUSION: Different adaptations in proportion of fiber types and CSA were observed in O and L previously sedentary volunteers. The increased proportion of hybrid I-IIa fibers with intervention observed in L could be interpreted as a shift of fibers towards a more oxidative muscle such as the profile of C. This transition was not observed in O. As exercise dose was similar in both groups, this unequal shift may be time-dependent, thus not yet apparent here in O. Although fiber CSA was on average 1.5x larger in O than L at baseline, similar CSA increments were observed with endurance exercise in both groups. In previously sedentary seniors, increments of CSA with exercise, even if concurrent to a significant weight loss in the obese subjects, are crucial to prevent age related muscle atrophy.

507   Board #5   May 30 1:00 PM - 3:00 PM
2000 Steps/Day Does Not Prevent Muscle Atrophy or Strength Loss During Bed Rest
Emily Arentson-Lantz, Elfego Galvan, Sneha Nagamma, Adam Wacher, Christopher Fry, Doug Paddon-Jones, FACSM. *University of Texas Medical Branch, Galveston, TX.* (Sponsor: Douglas Paddon-Jones, FACSM)
(No relevant relationships reported)

Bed rest rapidly compromises muscle health in older adults. Physical activity interventions in an inpatient setting often include periods of walking, but are hampered by key knowledge gaps that limit our ability to provide efficient, evidence-based exercise prescription.
PURPOSE: To determine if 2000 steps/day can protect key markers of skeletal muscle health during 7 days of bed rest.
METHODS: Healthy, community-dwelling older adults (N=17, 11M/6F; 68 ± 2 y; 72.5 ± 3.2 kg; 169.4 ± 2.4 kg) were subjected to 7-days bed rest, with and without a 2000 steps/day intervention. This model mimics the physical inactivity experienced during hospitalization, while isolating the intrinsic catabolic effects of skeletal muscle disuse.
RESULTS: Performing 2000 steps/day during 7 days of bed rest corresponded to 155 minutes/week of walking at a moderate intensity (50% heart rate reserve: 102 ± 5 bpm). The intervention partially preserved lean leg mass (Δ STEP: -609 ± 129 vs. Δ CON: -1035 ± 159 g), glucose tolerance; OGTT AUC (Δ STEP: -0.5 ± 6.3 vs. CON: 9.6 ± 5.5 %) and type 1 muscle fiber cross sectional area (Δ STEP: 27 ± 745 vs. CON: -698 ± 343 μm²), but had no effect on muscle strength (Δ STEP: -14.4 ± 3.8 vs. CON: -16.2 ± 2.4 Nm), or aerobic capacity (Δ STEP: 0.3 ± 1.1 vs. CON: -1.2 ± 1.0 mL/kg/min).
CONCLUSIONS: Performing 2000 steps/day is broadly consistent with cardiovascular fitness guidelines, but in isolation does not fully counter the negative effects of bed rest in healthy older adults.
Supported by NIH Grant R01NR012973 and NIH/NIA grant #P30-AG024832

508   Board #6   May 30 1:00 PM - 3:00 PM
Muscle Size and Strengths and their Associations with Sports Participation among Young Adults
Harold H. Lee[1], Theodore J. Angelopoulos, FACSM[2], Paul M. Gordon, FACSM[3], Niall M. Moyna[4], Paul S. Visich[5], Robert F. Zoeller[6], Heather Gordish-Dressman[7], Paul D. Thompson, FACSM[8], Eric P. Hoffman[7], Joseph M. Devaney[7], Linda S. Pescatello, FACSM[9]. *[1]Brown University, Providence, RI. [2]University of Central Florida, Orlando, FL. [3]Baylor University, Waco, TX. [4]Dublin City University, Dublin, Ireland. [5]Florida Atlantic University, Boca Raton, FL. [6]7Children's National Medical Center, Washington, DC. [7]Children's National Medical Center, Washington, DC. [8]Hartford Hospital, Hartford, CT. [9]University of Connecticut, Storrs, CT.* (Sponsor: Linda Pescatello, FACSM)
(No relevant relationships reported)

PURPOSE: A decision to participate in physical activity is heavily influenced by one's self-efficacy related to exercise capacity, but it is not clear if muscle size and strength influence one's decision to engage in sports and recreation. We examined this relationship and hypothesized that those with stronger and larger muscle would engage in more sports and recreation.
METHODS: Subjects were young (23.4 ± 5.6yr), normal weight (24.4 ± 4.6 kg/m²) European-American women (n=227) and men (n=192). The Paffenbarger Physical Activity Questionnaire assessed self-reported weekly Kcal expended in sport and recreational physical activity. We obtained muscle size and strength on the dominant and non-dominant arms. Muscle strength was measured with the maximum voluntary contraction (MVC) and one repetition maximum (1RM), and muscle size by cross sectional area (CSA) using magnetic resonance imaging. Weekly sport and recreation participation was categorized by the median for purposes of statistical analysis. Logistic regression tested the associations among muscle size and strength and sport and recreation participation by gender adjusting for age and body mass index (BMI). Akaike Information Criterion was used to identify the most parsimonious model.
RESULTS: On average, men spent about 1568.7±2397.5 kcal/wk and women spent 1732.2±2184.8kcal/wk in sports and recreation. Among men, a one-unit increase in dominant arm 1RM and MVC was associated with 16.9% (95%CI: 5.0-31.1%) and 2.3% (95%CI: 0.6-4.2%) higher odds of engaging in sports and recreation, respectively. Among women, a one-unit increase in non-dominant arm MVC was associated with 5.3% (95%CI = 2.2-8.7%) higher odds of engaging in sports and recreation, while a one-unit increase in non-dominant arm CSA was associated with 19.8 % (95%CI = 8.9-30.0%) lower odds of engaging in sports and recreation.
CONCLUSIONS: As hypothesized, greater MVC predicted engaging in more sport and recreation for both men and women, but greater 1RM predicted engaging in more sport and recreation among men only. Contrary to our hypothesis, greater CSA (i.e., muscle size) predicted engaging in less sports and recreation among women only. The interactions among putative psychosocial mediators, muscle capacity, and sport and recreation participation warrants future investigation.

B-11   Thematic Poster - **Muscle Basic Science Applications**
Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100F

509   **Chair:** Cory Baumann. *University of Minnesota, Minneapolis, MN.*
(No relevant relationships reported)

510   Board #1   May 30 1:00 PM - 3:00 PM
Aerobic Exercise Training Alters The Lipopolysaccharide-induced Cytokine Secretory Profile Of Skeletal Muscle In Mice
Alex J. Mattingly, Orlando Laitano, Thomas L. Clanton. *University of Florida, GAINESVILLE, FL.*
(No relevant relationships reported)

Skeletal muscles secrete cytokines in response to engagement of toll-like receptors (TLR) with pathogen associated molecular patterns (PAMPS), such as lipopolysaccharides (LPS). Though acute exercise is a known stimulus for cytokine secretion, it is unknown if chronic exercise training alters the cytokine secretory response to LPS. PURPOSE: To determine if spontaneous free-wheel aerobic exercise training in mice alters the cytokine secretory profile from isolated soleus muscles in response to LPS. METHODS: Age-matched (12 weeks old) C57BL6 mice (N=4) were given 24-hour access to running wheels for 69 days (EX). Their daily running distance was recorded. Results were compared to matched sedentary controls (CON; N=8). Solei from the mice were excised in Krebs-Ringer and placed in 2 ml, 35°C muscle baths with 1 μg/ml LPS for 2 hours. Bath samples were drawn after hours 1 (T1) and 2 (T2), flash frozen, and analyzed via Luminex multiplex analysis. Cytokine accumulations at T1 and T2 were compared via one-way parametric or nonparametric ANOVA, as appropriate. RESULTS: Mean daily running distance for EX mice was 3406 m/day, with a peak of 5477 m/day at day 21. At T1, EX muscles secreted less IL-12p70 (6.03 vs. 56.17pg/ml; p=0.016), and more TNFα (1.89 vs. 1.60pg/ml; p=0.020) than CON. At T2, the concentrations of IL-12p70 (8.08 vs. 46.56pg/ml) and KC (36.54 vs. 572.43pg/ml) were reduced in EX baths compared to CON (p=0.016 for both), but TNFα was elevated (1.99 vs. 1.60pg/ml; p=0.020). All other cytokines (MIP-1β, IL-13, IL-12p40, MIP-1α, IL-6, GCS-F, MCP-1, IL-10, RANTES, GM-CSF, IL-15, IP-10, IL-1β, IL-1α, MIP-2, and IFN-y) were not significantly different. CONCLUSION: Spontaneous free wheel running in mice alters the cytokine secretory profile of isolated mouse solei in response to LPS. Since endurance exercise training has been shown to reduce mortality in rodent models of septic shock, the results raise the possibility that conditioned muscles may be participating in improvements in host defense associated with aerobic exercise training. *Supported by NIGMS 1R01GM118895-01*

511   Board #2   May 30 1:00 PM - 3:00 PM

Activation of G Protein-Coupled Estrogen Receptor Contributes to Muscle Force Potentiation in Ovariectomized Mice

Gengyun Le[1], Gordon L. Warren, FACSM[2], Dawn A. Lowe, FACSM[1]. [1]*University of Minnesota, Minneapolis, MN.* [2]*Georgia State University, Atlanta, GA.* (Sponsor: Dawn Lowe, FACSM)
(No relevant relationships reported)

Estrogens influence force generation of skeletal muscle. When estrogen is deficient, post-tetanic potentiation (PTP) of force is low and estradiol treatment can rescue potentiation in ovariectomized mice both in vivo and in vitro. However, it is not known whether this estrogenic influence is through estrogen receptors, and if so, activation of which specific receptor augments PTP is also unknown. **PURPOSE:** We hypothesized estrogens utilize G protein-coupled estrogen receptor (GPER) to enhance in vivo skeletal muscle PTP in ovariectomized mice. **METHODS**: Adult female C57BL/6J mice (n = 7-12 per treatment) had a nerve cuff surgically implanted on the left common peroneal nerve. Six weeks later mice were ovariectomized (OVX). Four weeks later, PTP of the anterior crural muscles was measured immediately before and 1 h after treatment with either vehicle (OVX+vehicle), GPER agonist G1 (OVX+G1; 2.4 nM G1) or GPER antagonist G15 (OVX+G15; 27 nM G15) via tail vein injection. PTP was measured and calculated as the percent increase in twitch torque from baseline to the highest torque of the post-tetanic twitches. One-way ANOVAs with Holm-Sidak post hoc tests were used for data analysis of PTP. Results are reported as mean ± SE. **RESULTS**: Peak torques of unpotentiated, baseline twitches were not different among OVX+vehicle, OVX+G1, and OVX+G15 mice (0.51 ± 0.03, 0.48 ± 0.03 and 0.54 ± 0.02 N*mm, respectively; p=0.25). Potentiated twitches generated 15-108% more torque than unpotentiated twitches. However, the extent of PTP depended on the presence of GPER modulator (main effect, p=0.03). PTP of OVX+vehicle and OVX+G15 mice were not significantly different from each other (35 ± 5% and 46 ± 4% increase, respectively; p=0.26). PTP of OVX+G1 mice resulted in a 61 ± 7% increase which was significantly greater than that of OVX+vehicle mice (p=0.02), but not different from OVX+G15 mice (p=0.26). **CONCLUSION**: Acute treatment with a GPER agonist increased in vivo PTP of the anterior crural muscles in anesthetized mice, supporting our hypothesis that estrogens mediate their effects on skeletal muscle force potentiation through specific estrogen receptors. Supported by NIH grants R01-AG031743 and T32-AR050938.

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512   Board #3   May 30 1:00 PM - 3:00 PM

The Role Of Dynamin-related Protein 1 (drp1) In The Adaptations To Exercise

Timothy M. Moore[1], Zhenqi Zhou[2], Amanda J. Lin[2], Nareg Kalajian[2], Kevin Corey[2], Kate Whitney[2], Joe Lee[2], Timothy Ho[2], Theodore Ho[2], Lorraine Turotte, FACSM[1], Andrea Hevener[2]. [1]*University of Southern California, Los Angeles, CA.* [2]*University of California, Los Angeles, Los Angeles, CA.* (Sponsor: Lorraine Turcotte, FACSM)
(No relevant relationships reported)

Mitochondria are highly dynamic organelles within eukaryotic cells that function primarily to produce energy. Exercise has been known to positively impact mitochondria for over 50 years. Our previous work indicated that one novel factor, dynamin-related protein 1 (Drp1) that is responsible for splitting mitochondria, was impacted by exercise. However, it is not known whether Drp1 is essential for the development of exercise adaptations. **Purpose:** To determine the impact of reduced Drp1 expression in skeletal muscle on muscle strength, exercise performance, and long-term exercise induced adaptations. **Methods:** For each protocol, skeletal muscle specific heterozygous (mDrp1^{+/-}) and littermate control mice were used. Animals were sacrificed and tissues harvested at the times indicated. <u>Protocol 1</u>: Treadmill exercise at 15 m/min (5° grade) for 90 minutes for controls and 13 m/min for mDrp1^{+/-} mice. <u>Protocol 2</u>: Thirty days of in cage voluntary wheel running (VWR) after which wheels were locked. Animals were sacrificed 30 hours later. Exercise effects were statistically assessed with two-way ANOVA or t-test (*P*<0.05 established *a priori*; values presented as mean ± SEM). **Results:** Muscle strength was reduced in mDrp1^{+/-} mice resulting in a reduction in protocol 1 exercise speed but not relative intensity. Following protocol 1, signaling molecules and cellular factors regulating mitochondrial life cycle were not different between mDrp1^{+/-} and control exercised mice. Additional metabolites including plasma lactate and triglyceride and muscle glycogen levels post exercise were not different between groups. In untrained mice, endurance exercise capacity was not different between groups; however, following VWR, mDrp1^{+/-} mice had a reduced increase in exercise capacity when compared to control trained mice. Several cellular factors and signaling molecules regulating mitochondrial life cycle showed similar expression levels in mDrp1^{+/-} animals when compared to control exercise trained animals. **Conclusions:** Our results indicate that Drp1 is particularly important for muscle strength in untrained mice and may play a role in the improvement of exercise capacity.

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513   Board #4   May 30 1:00 PM - 3:00 PM

Effect of Inflammation on Ribosome Biogenesis during Myotube Hypertrophy in Primary Human Myogenic Cells

Brandon M. Roberts, Derek Wiggins, Sam Windham, Marcas Bamman, FACSM. *University of Alabama at Birmingham, Birmingham, AL.* (Sponsor: Marcas Bamman, FACSM)
(No relevant relationships reported)

Background: Ribosomal biogenesis and protein translation are finely coordinated with and essential for cell growth, proliferation, differentiation, and muscle development. Furthermore, there is a significant positive correlation between the fold change in total muscle RNA content from pre- to post- resistance training and the increase in muscle fiber cross sectional area. Our previous findings in vitro indicate de novo ribosome biogenesis is necessary for myotube hypertrophy. Because chronic muscle inflammation appears to impair myofiber hypertrophy in vivo, we hypothesize this inhibitory influence of inflammation may manifest by disrupting ribosome biogenesis. **PURPOSE**: The aim of the present study was to determine if inflammation inhibits myotube hypertrophy by interfering with ribosome biogenesis in human primary myogenic cells.
METHODS: Skeletal muscle satellite cells were isolated from untrained older (69 ± 4 y, *n* = 6) adults after percutaneous needle biopsy of the vastus lateralis. Cells were grown in DMEM containing 20% FBS, 5 ng/ml fibroblast growth factor, 100 μl/ml streptomycin, and 100 U/ml penicillin until they reached ~70% confluence. They were then placed in differentiation media (DMEM containing 2% horse serum, 100 μl/ml streptomycin, and 100 U/ml penicillin) for seven days to induce formation of multinucleated myotubes. Myotubes were then treated for 48 hours with 20% FBS, TNFa (5ng/mL), 20% FBS + TNFa (5ng/mL), or control (differentiation) media. Cells were subsequently harvested for analysis of mRNA, muscle protein synthesis, ribosomal RNA (rRNA) and constituent ribosomal proteins, myotube size and myofusion index.
RESULTS: Myotubes treated with FBS increased myotube diameter by 20% compared to control. TNFa (5ng/mL) induced 16% atrophy, while a combination of both treatments caused 7% hypertrophy compared to control. Total RNA concentration (ng/ul) increased 32% in FBS treated cells but only 20% in response to the combination of FBS + TNFa. Phase II fusion was decreased in myotubes treated with TNFa or a combination of FBS + TNFa.
CONCLUSIONS: TNFa-mediated inflammation impairs human myotube hypertrophy, which may be driven by impairments in both ribosome biogenesis and phase II myoblast-myotube fusion

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514   Board #5   May 30 1:00 PM - 3:00 PM

Skeletal Muscle Gene Expression Study of Monozygous Twins with 35 Years of Divergent Exercise History

Adam Osmond[1], Robert J. Talmadge[1], Katie E. Bathgate[2], James R. Bagley[3], Lee E. Brown, FACSM[2], Jared W. Coburn, FACSM[2], Andy J. Galpin[2], Kevin A. Murach[4], Edward Jo[1]. [1]*Cal Poly Pomona, Pomona, CA.* [2]*California State University Fullerton, Fullerton, CA.* [3]*San Francisco State University, San Francisco, CA.* [4]*University of Kentucky, Lexington, KY.* (Sponsor: Lee Brown, FACSM)
(No relevant relationships reported)

Variations in physical ability and capacities among individuals depend on both genetic inheritance and lifestyle. Previous research has yet to utilize a human model of monozygous (MZ) twins with substantial and long-term differences in exercise backgrounds to identify molecular and cellular mechanisms underlying exercise-mediated adaptations in muscle and whole-body phenotype. **PURPOSE**: In particular, this study examined skeletal muscle expression of genes related to muscle growth, inflammation, metabolism, and fiber type distribution in MZ twins with 35 years of substantially differing exercise history. **METHODS**: Muscle biopsies were collected from the vastus lateralis of male, 52-year-old MZ twins. Reverse transcriptase-polymerase chain reaction was used for the quantification of mRNAs associated with the following gene markers of various adaptive responses: a) skeletal muscle fiber type shift: MyHC-1, MyHC-2a, and MyHC-2x; b) adaptations in oxidative capacity: transcription factor A of the mitochondria (TFAM), and citrate synthase; c) angiogenesis: endothelial nitric oxide synthase, and vascular endothelial growth factor; d) muscular growth and satellite cell activation: myostatin, Pax7 (PAX7), mechano-growth factor (IGF1Ec), insulin-like growth factor a (IGF1Ea), and MyoD; and e) the inflammatory response: TWEAK (TNFSF12), the FN14 TWEAK receptor (TNFRSF12A) and tumor necrosis factor-α (TNF). **RESULTS**: MyHC-2x was expressed at a lower level in the trained subject relative to the untrained subject. No differences were observed for other markers of fiber type or metabolic or angiogenesis gene products. Some differences were observed in the expression of genes related to muscle growth including elevations in PAX7, MGF and IGF1Ea, and a reduction in MyoD. Finally, the only difference in expression of markers for the inflammatory

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response was an elevation in TNFRSF12A in the trained twin. **CONCLUSIONS**: At the mRNA-level, differences in expression of some key markers related to muscle fiber type, muscle growth, and the inflammatory response were observed in the trained vs the untrained twin. These data highlight the adaptability of skeletal muscle at the molecular level with decades of divergent physical activity patterns.

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515   Board #6   May 30 1:00 PM - 3:00 PM

Exercise Training Attenuates the Muscle Genomic Response to Bed Rest

Shlomit Aizik, Fadia Haddad, Gregory R. Adams. *University of California Irvine, Irvine, CA*. (Sponsor: Kenneth M Baldwin, FACSM)

(No relevant relationships reported)

Long stays in space can have deleterious effects on the body homeostasis. Significant adverse effects of long-term weightlessness include loss of skeletal muscle mass, strength and endurance that can lead to fatigue and poor performance of astronauts during space missions and put them at high risk of injury when they return to earth. Bed rest studies have been proven to be a reliable model to study the effect of spaceflight on muscle. **PURPOSE:** To characterize the vastus lateralis (VL) gene and microRNA (miR) responses to 70-day bed rest with and without countermeasures to mitigate the negative consequences of weightlessness. **METHODS**: 22 healthy young adults participated in a NASA 70 day bed rest study with and without 2 different modes of exercise interventions (6 participants bed rest only; 8 bed rest + flywheel exercise; 8 bed rest + standard aerobic training). RNA extracted from the VL was hybridized to Agilent Human Gene (V3) and miR (V2) microarrays. Data was analyzed using GeneSpring 14.5 and differential gene and miR expression was determined using ANOVA, (FDR<0.05, Fold Change>2 for GE, >1.1 for miR). Kegg pathway was used to classify the genes into pathways (EASE<0.05). **RESULTS:** 70 day bed rest significantly altered the level of 268 VL genes and 83 miRs. 16 oxidative phosphorylation pathway genes (e.g., ATP5G1, ATP5G3, ATP5J, NDUFS1, COX7A2, SDHB and UQCR10) and 37/40 metabolic pathway genes (e.g., HMGCS2, NDUFS3, ACY1 and FH) that were significantly altered had reduced expression in all 3 conditions. All genes in the oxidative phosphorylation pathway and 31 out of 40 genes in the metabolic pathway had attenuated response when exercise was introduced with no significant difference between the two different modes of exercise. Five let-7 family miRs were significantly upregulated and miR-1 and miR-133a were downregulated (30 and 50% respectively in the bed rest only group), all of which known to be linked to muscle atrophy. Both exercise modes mitigated the miRs response. **CONCLUTION:** 70-day bed-rest altered the expression of genes and miRs that could affect muscle metabolism and promote muscle atrophy. Introducing exercise as countermeasures mitigated the expression of almost all bed rest altered genes and miRs, with no significant difference in the 2 modes of exercise. Supported: NSBRI MA02801 & PERC Systems Biology Fund

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516   Board #7   May 30 1:00 PM - 3:00 PM

Altered Skeletal Muscle IGF-1 and miR-206 at Rest and Following Resistance Exercise in Obese Humans

Brian P. Sullivan[1], Jessica A. Weiss[2], Ron T. Garner[1], Yaohui Nie[1], Tim P. Gavin, FACSM[1]. *[1]Purdue University, West Lafayette, IN. [2]Bellarmine University, Louisville, KY. [3]Harvard University, Cambridge, MA*. (Sponsor: Tim Gavin, FACSM)

(No relevant relationships reported)

Obesity is a significant health problem and is associated with numerous changes in skeletal muscle. Obesity increases muscle mass and muscle fiber cross sectional area (FCSA) of type I and II fibers. Resistance exercise (RE) promotes muscle fiber hypertrophy. Activation of the IGF-1/Akt/mTOR pathway is critical for muscle mass maintenance and muscle hypertrophy. **PURPOSE**: To investigate: 1) if obesity alters basal muscle IGF-1/Akt/mTOR expression; and 2) if obesity alters the muscle response to acute RE. **METHODS**: Vastus lateralis biopsies were obtained to investigate mRNA, miRNA, and protein expression between lean (LN) and obese (OB) sedentary subjects at rest, and 15 min and 3 hr post-acute RE. **RESULTS**: Type II FCSA in OB was larger than FCSA of type I in OB and type I and II in LN (Type 1: LN=4804.53 vs. OB=6044.78 μm, Type II: LN=4609.71 vs. OB=8114.34 μm). Skeletal muscle expression was lower in OB for IGF-1 mRNA (Pre: LN=1.00 vs. OB=0.53 AU; 15 min: LN=1.00 vs. OB=0.58 AU; 3 hr: LN=0.96 vs. OB=0.54 AU) and IGF-1 protein (Pre: LN=0.82 vs. OB=0.56 pg/μg; 15 min: LN=3.98 vs. OB=2.19 pg/μg; 3 hr: LN=4.98 vs. OB=2.91 pg/μg). The expression of miR-206, a post-translational inhibitor of IGF-1 expression, was higher in OB (Pre: LN=1.00 vs. OB=1.60 AU; 15min: LN=0.97 vs. OB=1.66 AU; 3hr: LN=1.18 vs. OB=1.61 AU), but there was no difference in pri-miR-206 (Pre: LN=1.00 vs. OB=0.81 AU; 15min: LN=0.95 vs. OB=0.94 AU; 3hr: LN=1.04 vs. OB=1.20 AU). A negative relationship was observed between miR-206 and IGF-1 mRNA at rest (r = -0.54) consistent with miR-206 regulating IGF-1 expression. **CONCLUSIONS**: In spite of greater muscle FCSA, obesity decreases muscle IGF-1 expression suggesting a negative feedback mechanism may be limiting muscle mass expansion in obesity.

B-12   Thematic Poster - **Running**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100H

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517   **Chair:** William R. Lunn, FACSM. *Southern Connecticut State University, New Haven, CT.*

(No relevant relationships reported)

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518   Board #1   May 30 1:00 PM - 3:00 PM

The Effects of the VK Performance Insole on Running Economy in Highly-Trained Distance Runners

Robert W. Gregory, William R. Lunn, Marc I. Robertson, Robert S. Axtell, FACSM. *Southern Connecticut State University, New Haven, CT*. (Sponsor: Robert S. Axtell, FACSM)

(No relevant relationships reported)

Several design features of running shoes such as decreased mass, appropriate midsole cushioning, and increased longitudinal bending stiffness are associated with improved running economy (RE). While increased longitudinal bending stiffness has been achieved through the use of carbon fiber plates inserted into shoe midsoles, there are several limitations associated with this construction method. An alternative solution to increase longitudinal bending stiffness in running shoes is to utilize a carbon fiber shoe insole (CFI) tuned for optimal mechanical efficiency of the athlete-footwear system. **PURPOSE**: To determine if a carbon fiber shoe insole (VK Performance Insole; VKTRY Gear; Milford, CT) can improve running economy in highly-trained distance runners. **METHODS**: Ten highly-trained male distance runners (age: 24.7 ± 6.8 years, height: 177.9 ± 5.59 cm, mass: 67.7 ± 5.7 kg) participated in this study. To measure RE, participants ran for 6 min at 16 km·hr^{-1} for the following three conditions: 1) control footwear (no CFI), 2) medium flex CFI (VK Pro 4), and 3) stiff flex CFI (VK Pro 5). Indirect calorimetry was used to measure oxygen consumption (VO_2). The first 4 min were to allow the athlete to reach a steady state and metabolic data from the last 2 min were used to determine submaximal VO_2. The shoe insole conditions were presented in random order; each RE test was separated by a period of 6 min to minimize the effects of fatigue. A repeated-measures ANOVA was used to determine the effects of shoe insole condition on RE. **RESULTS**: The submaximal VO_2 values for each of the shoe insole conditions were as follows: 1) control (no CFI): 49.8 ± 3.0 ml·kg^{-1}·min^{-1}; 2) medium flex CFI (VK Pro 4): 50.2 ± 3.5 ml·kg^{-1}·min^{-1}; and, 3) stiff flex CFI (VK Pro 5): 51.3 ± 3.1 ml·kg^{-1}·min^{-1}. Based on these submaximal VO_2 values, there was no difference in RE between the three different shoe insole conditions [$F(2,8) = 0.97$, $p = 0.44$]. **CONCLUSIONS**: Previous studies have shown that increased longitudinal bending stiffness achieved through the use of carbon fiber plates inserted into shoe midsoles can significantly improve RE by 1-4%. However, the use of a CFI did not result in similar improvements in RE. Further design work and testing of the CFI is required to determine the optimal longitudinal bending stiffness for improved RE at submaximal velocities.

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519   Board #2   May 30 1:00 PM - 3:00 PM

The Effectiveness of Compression Socks on Aerobic Running Performance and Heart Rate Response

Christopher Ball, Elaina Biechler. *Loras College, Dubuque, IA*. (Sponsor: Vincent Paolone, FACSM)

(No relevant relationships reported)

PURPOSE: The purpose of the present investigation was to determine the effect of compression socks on maximal aerobic running performance and heart rate response. **METHODS**: Moderately fit college aged students (n=28) were recruited as subjects for the study. Each subject completed four exhaustive treadmill runs utilizing the McConnell Treadmill Protocol. Each phase included two testing sessions, 24 hours apart. Each phase was separated by a minimum of seven days to ensure proper recovery. The two phases included a control phase, and a compression phase. In the compression phase, subjects wore compression socks during the 24 hours separating trial one and two. The assignment of phases was determined by a randomized crossover design. During each treadmill test, time to exhaustion was recorded, as well as maximal heart rate achieved during the run and 20 minutes post run. **RESULTS**: Time to exhaustion was significantly higher (p = .012) in the compression phase in comparison to the control phase (15.82 min; 15.11 min, respectively). Maximal heart rate achieved during the treadmill run was significantly lower (p = .024) while wearing the compression socks compared to the control phase (189.65 BPM; 192.39 BPM, respectively). Heart rate measurement 20 minutes post run was significantly lower (p = .032) in the compression phase when compared to the control phase (99.89 BPM; 101.46 BPM, respectively). **CONCLUSIONS**: Time to exhaustion was significantly improved while wearing compression socks, which indicated an improvement in fatigue resistance and enhanced running performance. Moreover, heart rate, both maximal and recovery (20

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minute) was significantly lower while wearing compression socks, which indicated a reduction in cardiovascular stress. Compression socks have a positive effect on running performance and heart rate responses associated with maximal aerobic exercise for moderately fit college aged individuals. It is hypothesized that this change is brought about as the compression applied decreases venous pooling in the lower leg, assisting in venous return. The applied compression allows for a more efficient circulation path back to the heart, promoting increased clearance rates of muscle metabolites while also lowering the workload on the heart.

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520   Board #3   May 30 1:00 PM - 3:00 PM

The Effects Of Training Load On Salivary Amylase, Testosterone And Performance In Collegiate Runners

Dylan Mariano, Christopher Peterson, Richard Feinn, Thomas Martin. *Quinnipiac University, Hamden, CT.*

(No relevant relationships reported)

PURPOSE: To determine the effects of training load on salivary amylase and testosterone levels and their association with race performance in Female Division I cross-country athletes. **METHODS:** 18 female athletes (18.9 ± 0.86 yrs old) were monitored during the 2015 cross-country season. VO_2 max, and baseline salivary amylase and testosterone levels were assessed during the pre-season. Participants also underwent tri-weekly data collection sessions in which saliva samples were collected. Salivary levels of amylase and testosterone were analyzed using ELISA kits from Salimetrics (State College, PA) according to the manufacturers instructions. Athletes utilized a GPS/HR monitor system daily during practice sessions to record training load. Training load was calculated using the Running Training Stress Score (rTSS) according to a commercial website (www.TrainingPeaks.com). Race performance was also monitored during the season. Linear mixed models were used to analyze the effect of cumulative training load on amylase and testosterone levels and race performance during the season. **RESULTS:** There were no significant effects of training load on salivary amylase levels however, training load was a significant predictor of weekly salivary testosterone levels (p=0.009). Athletes, who had a high weekly training load, expressed lower levels of testosterone for that week. While controlling for race distance and baseline VO2 max, both salivary amylase and testosterone were predictive of race performance. Athletes who expressed higher than normal salivary amylase levels for a particular week, showed a decline in performance (p=0.006). However, the higher the weekly salivary testosterone level, the better the athletes performed (p=0.002). **CONCLUSION:** In this study, higher levels of weekly salivary testosterone were associated with optimal training and improved race performance. While higher levels of salivary amylase, were associated with a decline in race performance. Periodic measurements of salivary amylase and testosterone could be an important diagnostic marker for monitoring overtraining and predicting performance in collegiate athletes. Funding was provided by the School of Health Science Faculty Grant.

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521   Board #4   May 30 1:00 PM - 3:00 PM

Evaluating The Effects of Two-Minutes Active Recovery On A "Booster" VO_2max Test Using Ultramarathon Runners

Andy Bosak[1], Will Peveler[1], John Houck[2], Matt Sokoloski[3], Hannah E. Nelson[1], Jimmy Kelly[1], Austin Smith[4], Robert T. Sanders[1]. *[1]Liberty University, Lynchburg, VA. [2]The University of New Mexico, Albuquerque, NM. [3]Texas Woman's University, Denton, TX. [4]East Tennessee State University, Johnson City, TN.* (Sponsor: James Schoffstall, FACSM)

(No relevant relationships reported)

Maximal oxygen consumption (VO_2max) tests typically end at the point of volitional exhaustion. However, prior research with averagely fit females and males as well as highly fit female collegiate athletes suggest that concluding a maximal treadmill test with 2min active recovery and allowing subjects to exercise a second time (ie. a booster test) at the workload eliciting the initial volitional exhaustion results in significantly greater VO_2max values (1.4% and 4.2% mean increase, respectively). The potential effects of this testing sequence (ie. 2min active recovery) on VO_2max treadmill graded exercise tests (GXT) has not been evaluated utilizing ultramarathon runners, yet accurate assessment of these unique athletes' VO_2max is crucial for training program design, implementation, and evaluation of training adaptations. **PURPOSE:** To examine changes in VO_2max values, in fit ultramarathon runners, following 2min of active recovery at the conclusion of a treadmill GXT to volitional exhaustion. **METHODS:** Twenty-nine (19 males and 10 females) ultramarathon runners completed a max treadmill GXT by reaching volitional exhaustion (MX1). Following 2min active recovery (at 0% grade & 2.5 mph) after reaching MX1, subjects had an immediate return to the ending MX1 speed and grade and exercised (ie. a booster test) to volitional exhaustion a second time (MX2). MX1 and MX2 values were compared using a Paired-Samples t-Test with significant differences occurring at $p \leq 0.05$. **RESULTS:** MX1 (53.9 ± 6.0 ml/kg/min) was significantly different (p = 0.03) than MX2 (52.7 ± 7.0 ml/kg/min). The mean change from MX1 to MX2 was

-2.2%, yet 37.9% of the subjects benefited (+2.9% mean increase) from the booster test with individual increases of +0.2% up to +8.0%. **CONCLUSION:** Mean results suggest that 2min active recovery may not allow significantly greater VO_2max values to be achieved by fit ultramarathon runners during a max treadmill GXT, yet 37.9% of the subjects increased their VO_2max during the "booster VO_2max test" treadmill protocol. Future research may examine if fitness level, training experience, age, ultramarathon distance specialty, or other variables might affect this exercise testing protocol.

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522   Board #5   May 30 1:00 PM - 3:00 PM

Effect of 8 Weeks of Eccentric Cycling Training on Running Economy in Healthy Males

Albino G. Schifino, Andrew J. Weiler, Jonathan Huaqui, Chee Hoi Leong. *Central Connecticut State University, New Britain, CT.* (Sponsor: Dr. Sean Walsh, FACSM)

(No relevant relationships reported)

Running economy (RE) has been shown to be a determinant of running performance. Evidence from recent investigations suggests that various forms of resistance and plyometric training can improve RE by augmenting changes in leg spring stiffness and/or exaggerating the stretch-shortening cycle. While eccentric cycling training (ECT) has been demonstrated to elicit improvements in muscular hypertrophy, muscular power, and increased leg spring stiffness, it remains unclear if ECT will improve running economy and/or performance. **PURPOSE**: The purpose of our investigation was to examine if an 8-week ECT intervention could improve RE and in healthy males. **METHODS**: Seven healthy males (age=29 ± 9 yrs; mass=76.6 ± 15.6 kg; height=1.72 ± 0.1 m; BMI=25.6 ± 3.7 kg/m²) performed modified 10-second Wingate tests to obtain peak power output (PPO). ECT intensity was prescribed based on baseline PPO values. Participants performed ECT for 8 weeks (2x/week; 5-10.5 min; 20-55% of PPO). RE was obtained through metabolic analysis during treadmill running at 3 randomized speeds (2.24m/s, 2.68m/s, and 3.13m/s) for 4 minutes consecutively. PPO (W) and RE (ml/kg$^{0.75}$/min) were assessed prior to, and following the 8-week ECT intervention. Pre- versus post training changes in RE were analyzed using paired sample t-tests, alpha level was set at 0.05. Cohen's d effect size (ES) were calculated for all analyses and ES magnitudes of 0.10, 0.30, and 0.50 were interpreted as small, medium, and large effects, respectively. **RESULTS**: Post-training RE was significantly improved while running at 2.24m/s ($P=0.002$, $ES=0.91$; Table 1). **CONCLUSIONS**: These results demonstrate that 8 weeks of ECT was effective in improving RE in healthy individuals. We speculate that the improvement in RE may be attributed to an increase in leg spring stiffness. To the best of our knowledge, this is the first report of a significant improvement in RE following ECT. Improvement in RE would be beneficial for both coaches and athletes.

Table 1. Pre- versus post-training changes in Running Economy (RE) Data presented as mean±SD.

Running Speed (m/s)	Running Economy (ml/kg$^{0.75}$/m)			
	Pre-training	Post-training	P	ES
2.24	0.71 ± 0.08	0.67 ± 0.08	0.002*	0.91
2.68	0.65 ± 0.04	0.63 ± 0.04	0.085	0.64
3.13	0.66 ± 0.04	0.63 ± 0.04	0.153	0.20

*Significantly different compared to pre-training ($P<0.05$).

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523   Board #6   May 30 1:00 PM - 3:00 PM

The Impact of a Novel Wrist Cooling Device on 10km Running Performance in the Heat

Kelsey Denby, Emily Schlicht, Ronald Caruso, Michael Lopez, Stephen Ives. *Skidmore College, Saratoga Springs, NY.* (Sponsor: Paul Arciero, FACSM)

(No relevant relationships reported)

The combination of environmental heat stress and exercise is a potent physiological challenge and is known to impair performance. While pre-cooling might improve performance in the heat, it may prove impractical. PURPOSE: to investigate the impact of a novel wrist cooling device (DhamaSport™), which can be worn during exercise, on exercise performance and physiological responses in the heat. METHODS: In a single-blind, counterbalanced, crossover design, 13 male athletes (33 ± 9 yrs, 15 ± 7 %body fat, and VO_2max 59 ± 5 ml/kg/min, range 50-71) completed three 10km running time trials in the heat (80°F, 60% relative humidity), while wearing two

DhamaSport™ bands: 1) both bands were off (off/off), 2) one band on (off/on), 3) both bands on (on/on). Heart rate (HR), core temperature (T_{CO}), running speed (RS), rating of perceived exertion (RPE) and thermal sensations (TS) were recorded at baseline, during the 10km TT, and during recovery. To understand potential impacts on recovery and fatigue post-exercise, heart rate variability (root mean square of successive differences; RMSSD, and standard deviation of N-N intervals; SDNN), mean arterial pressure (MAP), and visual analog scale (VAS) for fatigue were measured. Due to safety constraints, trials were terminated if $T_{CO} \geq 39.2°C$, in which average speed was used to estimate 10km time. RESULTS: Use of the cooling bands had no effect ($p<0.05$) on resting T_{CO}, MAP, TS, VAS, RPE, RMSSD, or SDNN, but modestly increased ($p>0.05$) HR (Δ3-5 beats/min). During exercise, use of the bands significantly ($p<0.05$) increased RS (-0.25 Δmi/hr), HR (5 Δbeats/min), but had no significant effects on T_{CO} (Δ0.3°C), RPE, or TS were observed over time. The increased RS with the use of the bands, tended to reduce projected 10km time (~10-30s). Use of the cooling bands did not impact RMSSD, SDNN, MAP, or fatigue post-exercise ($p>0.05$). CONCLUSION: Our data demonstrate that use of the cooling bands improves running speed, decreasing projected 10km time. This modest improvement in performance comes at a cost of increased HR; although, interestingly, sensations of effort and thermal comfort were not impacted, despite the faster speed and higher HR. Taken together, use of the cooling bands has the potential to improve exercise performance in the heat perhaps due to altered thermal sensation. Support: Dhamausa.

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524   Board #7   May 30 1:00 PM - 3:00 PM

The Influence of AlterG Treadmill Training on Lower Extremity Muscle Performance in Cross Country Runners

Tracy A. Dierks[1], Vincent C. Nittoli[2], Todd W. Arnold[2], Jason Pociask[3], Jacquelyn Fletcher[1]. [1]Indiana University, Indianapolis, IN. [2]St. Vincent Sports Performance, Indianapolis, IN. [3]Community Health Network, Indianapolis, IN.
(No relevant relationships reported)

Running on an AlterG® Treadmill (AGT) at reduced bodyweight requires speed to be increased if heart rate response is to match overground running. This can be beneficial as one can run at faster speeds for longer durations, without increasing impact forces or heart rate intensity beyond typical training, all while increasing lower extremity muscle demands. However, it is unknown if AGT training influences lower extremity muscle performance. **PURPOSE:** Investigate the effect of an AGT training program on lower extremity muscle performance. **METHODS:** As an offseason supplement, 19 uninjured high school boys cross country runners replaced 2 overground running sessions/week with AGT runs for 6 weeks. AGT runs were 80-85% of bodyweight with speed increased to elicit a heart rate intensity and distance/time consistent with each runner's mile pace for that day. Bilateral isokinetic muscle performance testing was completed at baseline and post program; 10 concentric/eccentric contractions at a speed of 180º/s for sagittal motions at the hip, knee, and ankle. A 2-way ANOVA (side x time) was used to assess pre-post changes (torque, work, power) and side-to-side symmetry ($p\leq0.05$). **RESULTS:** Significant interactions were found for almost all hip variables for pre-post and side-to-side comparisons, while both the knee and ankle generally showed no differences. At the hip, the right generally improved pre-post for all variables, while the left decreased. This resulted in side-to-side asymmetries at pre, but improved to mostly symmetric at post. **CONCLUSION:** The AGT program seemed to primarily influence hip musculature, possibly related to pre-existing asymmetry. However, after training in the AGT environment for 6-weeks, both sides were generally symmetric post-program, mostly due to right side improvements. Thus, AGT training appears to be associated with improved symmetry of hip muscle performance, which may be significant when considering the role of the hip in overuse injuries.

Table 1. Outcome variables for the hip flexor and hip extensor muscle groups at pre and post program for the right and left sides. Contraction type (Concentric or Eccentric) indicates the type of muscle contraction performed during isokinetic testing. ^The hip extensors eccentric contraction variables displayed a similar outcome pattern to the extensors concentric, with the exception of mean power where no difference was observed.

Hip Muscles, Contraction	Peak Torque (Nm)		Mean Peak Torque (Nm)		Work (Joules)		Mean Power (watts)	
Flexors, Concentric								
Right Pre	77.2*	(30.8)	55.7*	(25.2)	653.4*	(323.4)	83.4*	(41.2)
Right Post	81.4*	(17.6)	63.5*	(16.3)	706.1*	(198.1)	93.6*	(25.5)
Left Pre	86.6*	(28.9)	64.2*	(21.5)	783.3*	(234.4)	101.2*	(29.7)
Left Post	74.7*	(18.2)	57.9*	(16.7)	632.2*	(164.8)	86.8*	(22.7)
Flexors, Eccentric								
Right Pre	117.5**	(23.8)	94.2**	(27.4)	1005.5*	(460.5)	83.4*	(40.0)
Right Post	109.1**	(24.9)	88.6**	(23.5)	1007.4*	(431.6)	85.5*	(37.3)
Left Pre	114.5**	(25.7)	89.5**	(27.2)	879.2*	(350.4)	77.2*	(29.5)
Left Post	94.6**	(24.2)	77.9**	(25.5)	765.5*	(357.4)	68.0*	(31.1)
^Extensors, Concentric								
Right Pre	116.0*	(38.4)	88.6*	(31.8)	1007.8**	(545.6)	75.8*	(36.2)
Right Post	132.9*	(36.8)	108.4*	(37.5)	1070.5**	(374.1)	112.1*	(41.4)
Left Pre	132.9*	(42.2)	105.4*	(40.0)	1227.6**	(481.9)	96.2*	(43.0)
Left Post	133.2*	(39.4)	106.6*	(37.8)	1120.0**	(328.6)	107.7*	(48.4)

*Significant interaction between side and time ($p<0.05$).
**Trend towards significant interaction between side and time ($p<0.10$).

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525   Board #8   May 30 1:00 PM - 3:00 PM

Nocturnal Heart Rate Variability and Morning Orthostatic Test as Tools to Monitor Training Load

Ville Vesterinen, Ari Nummela. KIHU - Research Institute for Olympic Sports, Jyväskylä, Finland.
(No relevant relationships reported)

Both the nocturnal heart rate variability (HRV) and the morning Orthostatic Test are widely used to monitor training load and recovery status of athletes. Both measurements have been observed to be associated with cardiac autonomic regulation. But less is known whether the measurements show similar responses to training load. **PURPOSE:** This study investigated the effects of easy and hard training days on the nocturnal HRV and the Orthostatic Test. In addition, the aim was to investigate relationships between nocturnal and morning HRV variables. **METHODS:** Thirty-four recreational endurance runners performed nocturnal R-R interval recordings and the morning Orthostatic test (5 min supine + 3 min standing) after an easy and a hard training day (moderate- or high-intensity endurance training). Nocturnal HRV was analyzed as four-hour period starting 30 min after going to bed for sleep. Morning HRV was analyzed over 4 min supine (00:30-04:30) and 2 min standing position (06:00-08:00). In addition, peak HR after stand-up and Orthostatic heart rate (HR) (HRstanding - HRsupine) were analyzed. **RESULTS:** Training load (session RPE) of hard training day (638 ± 638) was significantly ($P < 0.001$) greater compared to easy training day (50 ± 100). Nocturnal HR was lower (52 ± 6 vs. 57 ± 9, $P < 0.001$) and all nocturnal HRV variables were higher (Total power: 8.86 ± 0.63 vs, 8.41 ± 0.79, $P < 0.001$) after easy training day. HR in supine position was lower (53 ± 7 vs. 56 ± 7, $P = 0.011$) and high frequency power in supine position was higher (8.06 ± 0.89 vs. 7.74 ± 0.93, $P = 0.027$) after easy day. Other Orthostatic test variables were not different between easy and hard training days. Nocturnal HR and HRV variables showed moderate correlations ($r = 0.62 - 0.78$, $P < 0.001$) to the morning supine variables, but trivial and small correlations ($0.19 - 0.39$) to standing variables. **CONCLUSIONS:** Different training load after easy and hard training days can be observed in both nocturnal HRV and Orthostatic Test. However, the differences are greater in nocturnal HRV recordings compared the morning Orthostatic Test. In addition, it seems that standing variables are not able to evaluate the training load of the previous day. The results suggest that both nocturnal HRV and selected, supine variables of the Orthostatic test can be used in monitoring training load.

B-13   Free Communication/Slide - **Heat Stress/ Stroke**

Wednesday, May 30, 2018, 1:00 PM - 2:45 PM
Room: CC-101CD

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526   **Chair:** W. Larry Kenney, FACSM. *Pennsylvania State University, University Park, PA.*

(No relevant relationships reported)

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527   **Chair:** Jody Greaney. *Pennsylvania State University, University Park, PA.*

(No relevant relationships reported)

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528   May 30 1:00 PM - 1:15 PM

Fitness Level Does Not Impact Cardiovascular Drift and Decreased Maximal Oxygen Uptake during Heat Stress

Tori M. Stone, Jonathan E. Wingo, FACSM. *The University of Alabama, Tuscaloosa, AL.* (Sponsor: Jonathan E Wingo, FACSM)

(No relevant relationships reported)

Cardiovascular drift (CV drift) has been shown to be related to reduced maximal oxygen uptake (VO_{2max}) during heat stress. At a given relative metabolic intensity (%VO_{2max}), individuals with higher fitness levels would be expected to experience greater CV drift, and thereby greater decrements in VO_{2max}, because of a greater metabolic heat production resulting from exercising at a higher absolute intensity. However, this has not been directly investigated. PURPOSE: To test the hypothesis that individuals with a higher initial VO_{2max} (i.e., fitness level) will experience a greater magnitude of CV drift and accompanying decrement in VO_{2max} compared to those with a lower initial VO_{2max} during prolonged, moderate-intensity exercise in the heat. METHODS: Data from 7 studies ($n = 62$) were used to assess the relationships between fitness level and 1) CV drift (change in heart rate and stroke volume) and 2) VO_{2max}. CV drift and VO_{2max} were assessed between 15 and 45 min or between 15 and 60 min of cycling at 60% VO_{2max} in 35 °C or 30 °C. RESULTS: Initial VO_{2max} (i.e., fitness level) was not related to change in heart rate (r=0.17, p=0.20), change in stroke volume (r=-0.06, p=0.63), and decrease in VO_{2max} (r=-0.14, p=0.28). CONCLUSION: Contrary to our hypothesis, fitness level was unrelated to the magnitude of CV drift or decrement in VO_{2max} during prolonged submaximal exercise in the heat. However, these findings support the results of previous studies in that the greater the magnitude of CV drift—regardless of fitness level—the greater the decrement in VO_{2max} during constant-rate, moderate-intensity exercise in the heat.

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529   May 30 1:15 PM - 1:30 PM

24 Hour Naproxen Dose On Core Temperature And Il-6 During Cycling In The Heat

Dawn M. Emerson[1], J. Mark Davis, FACSM[2], Toni M. Torres-McGehee[2], Stephen CL Chen[3], Charles C. Emerson[4], Craig E. Pfeifer[5], Joseph D. Bivona[2], Justin V. Stone[2], J. Larry Durstine, FACSM[2]. [1]*University of Kansas, Lawrence, KS.* [2]*University of South Carolina, Columbia, SC.* [3]*Bob Jones University, Greenville, SC.* [4]*University of Missouri - Kansas City, Kansas City, MO.* [5]*Lander University, Greenwood, SC.*

(No relevant relationships reported)

Due to anti-pyretic and anti-inflammatory effects, non-steroidal anti-inflammatory drugs (NSAIDs) are theorized to blunt core temperature (Tc) rise during exercise. On the other hand, the adverse events from NSAID use (eg, gastrointestinal and renal damage) can cause an inflammatory response. Existing literature examining NSAIDs on Tc during exercise in the heat is limited and conflicting. **PURPOSE:** To determine the effects of naproxen on Tc and interleukin-6 (IL-6) in hydrated, exercising humans. **METHODS:** We utilized a double-blind, randomized and counterbalanced, cross-over design. Independent variables were a 24 hr naproxen dose (220 mg naproxen/dose) or placebo (0 mg naproxen/dose) and an ambient (22.7 ± 1.8°C, 52.4 ± 5.5% humidity) or hot (35.7 ± 1.3°C, 53.2 ± 3.2% humidity) environment. Participants (n = 11; 6 male, 5 female; age = 27.8 ± 6.5 yrs, weight = 79.1 ± 17.9 kg, height = 177 ± 9.5 cm) completed 4 conditions: 1) placebo and ambient (Control); 2) placebo and heat (Heat); 3) naproxen and ambient (Npx); and 4) naproxen and heat (NpxHeat). Participants cycled 80 min at a heart rate corresponding to 70% VO_{2max} followed by a 10 min time trial for maximum distance. Participants then rested 3 hrs in an ambient environment. Tc and IL-6 were assessed pre-, during, post-, and 3 hrs post-cycling. **RESULTS:** Tc significantly increased pre- to post-cycling (37.1 ± 0.4°C to 38.2 ± 0.3°C, $P < 0.001$) and decreased during rest ($P < 0.001$), reaching baseline by 75 min post-

cycling. Rate of Tc change and maximum Tc were not significantly different between conditions. IL-6 increased pre- to post-exercise (0.54 ± 0.06 pg/ml to 2.46 ± 0.28 pg/ml, $P < 0.001$) and remained significantly higher than pre- at 3 hrs post- (1.17 ± 0.14 pg/ml, $P = 0.001$). No significant IL-6 differences were found between conditions. **CONCLUSION:** A 24 hr over the counter naproxen dose did not significantly affect Tc or IL-6 among hydrated males and females cycling at moderate intensity in hot or ambient conditions. These results are important for physically active individuals and those working with persons who may be taking naproxen. Future research should examine stronger naproxen doses, longer usage, and more intense exercise to determine potential effects on the thermoregulatory and inflammatory systems.
Supported by the ACSM Foundation Carl V. Gisolfi Memorial Fund

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530   May 30 1:30 PM - 1:45 PM

Music Mitigates Heat-Related Reductions In Exercise Performance, But At What Cost?

Timothy English, Yorgi Mavros, Ollie Jay, FACSM. *The University of Sydney, Lidcombe, Australia.* (Sponsor: Dr Ollie Jay, FACSM)

(No relevant relationships reported)

PURPOSE: It is well established that reductions in exercise performance are observed in hot environmental conditions relative to cooler environments. Listening to motivational music is known to improve exercise performance, by enhancing positive affect and reducing ratings of perceived exertion. However, it is not known if listening to motivational music mitigates heat-related reductions in exercise performance, and if any additional work leads to a greater rise in core temperature and/or cardiovascular strain. Our aim was to determine if listening to motivational music during a 15-minute cycling time trial (15TT) mitigates the decrement in cumulative work output typically observed in the heat, leading to a greater increase in core temperature and cardiovascular strain.
METHODS: 7 participants (27 ± 6 y; 71 ± 13 kg) completed a VO_2max test on a cycle ergometer with a VO_2max verification stage (48 ± 7 ml·kg^{-1}·min^{-1}). Each participant completed 30 mins of cycling at 50% VO_2max, followed by a 5-min rest, a 15TT and 5 mins of post-exercise recovery on six occasions. The protocol was completed three times for familiarisation in a neutral (~20°C) environment, and then another three trials in a counterbalanced crossover order under the following conditions: i) 21°C/50%RH (CLD); ii) 36°C/50%RH (HOT); and iii) 36°C/50%RH with motivational music during the 15TT (HOT-MUSIC). Cumulative work output, the rise in rectal temperature (ΔT_{re}) and Rate Pressure Product (RPP) were measured throughout.
RESULTS: Cumulative work output was lower (p<0.001) in HOT (155 ± 54 kJ) compared to CLD (180 ± 50 kJ). However, work output was greater (p<0.001) in HOT-MUSIC (166 ± 51 kJ) compared to HOT, but still lower than CLD (p<0.001). The greater work output in HOT-MUSIC resulted in a greater ΔT_{re} (0.82 ± 0.35°C, p<0.05) at the end of the 5-min post-exercise recovery period compared to HOT (0.67 ± 0.36°C). By the end of the 15TT, there was a trend for a higher RPP (p=0.06) in HOT-MUSIC (31696 ± 4871 mmHg·beats·min^{-1}) compared to HOT (26696 ± 3035 mmHg·beats·min^{-1}).
CONCLUSIONS: Listening to motivational music partially mitigated (by approximately half) the observed heat-related decrements in exercise performance. However, the greater work output resulted in a greater increase in core temperature, and a trend towards a greater cardiovascular strain.

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531   May 30 1:45 PM - 2:00 PM

Acute Response to Skeletal Muscle Heating via Pulsed Short-wave Diathermy

Paul Hafen, Rob Hyldahl. *Brigham Young University, Provo, UT.*

(No relevant relationships reported)

The heat stress response is associated with several beneficial adaptations to promote cell health and survival. Specifically, *in vitro* and animal investigations have shown that exposure to a mild heat stress (~40°C) elicits mitochondrial adaptations within skeletal muscle that are similar to those observed with exercise. **Purpose:** To investigate the acute effects of deep tissue heating on heat shock protein (HSP) expression and signaling pathways associated with mitochondrial adaptation. **Methods:** Twenty healthy men (n = 10) and women (n = 10) volunteered for the study (21 ± 2 yrs, 172 ± 11 cm, 65 ± 13 kg). From each volunteer, a randomly selected leg underwent a 2-hr heating session via pulsed short-wave diathermy. Intramuscular temperature was measured with the insertion of a temperature probe to the approximate depth at which muscle tissue would be sampled (≈ 3.5 cm). Muscle biopsies were taken immediately after heating from the vastus lateralis muscles of both legs (treatment and control). From the collected tissue, we measured HSP phosphorylation and protein expression. In addition, we explored whether the heating protocol was able to elicit phosphorylation of AMPK and several well-defined MAPKs (p38, JNK, and ERK1/2) associated with mitochondrial biogenesis. **Results:** Muscle temperature increased significantly in response to the diathermy treatment (3.96 ± 0.51°C, p<0.0001). In response to the 2-hr heating session, we found the phosphorylation of HSP27 to be significantly depressed (-28 ± 0.08%, p = 0.0016), with no changes in overall total protein expression of any of the measured HSPs (HSP27, 60, 70, and 90). Additionally,

in the heated muscle we found significant increases in the phosphorylation of AMPK ($32 \pm 16\%$ p = 0.0365) and ERK1/2 ($205 \pm 77\%$, p = 0.0246). There were no changes in the phosphorylation of either p38 or JNK. **Conclusion:** The altered phosphorylation status of HSP27, together with the increased phosphorylation of AMPK and ERK1/2, suggest that a single, 2-hr heating session is capable of eliciting a significant cellular stress response, which may influence metabolic adaptive processes.

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532   May 30 2:00 PM - 2:15 PM

Sustained Metabolic Switch to Lipid Oxidation In Murine Cardiac Muscle After Exertional Heat Stroke

Orlando Laitano[1], Brian Ingram[2], Christian K. Garcia[1], Gerard P. Robinson[1], Alex J. Mattingly[1], Danielle L. Ippolito[3], Lisa R. Leon[4], Thomas L. Clanton[1]. *[1]University of Florida, Gainesville, FL. [2]Metabolon, Morrisville, NC. [3]US Army, Ft Detrick, MD. [4]US Army, Natick, MA.* (Sponsor: Scott K. Powers, FACSM)
(No relevant relationships reported)

Cardiac dysfunction has been documented after exertional heat stroke (EHS), but little is known about the metabolic (mal)adaptations occurring in the heart after exposure to EHS. **PURPOSE:** To identify metabolic biomarkers in a preclinical model of EHS that could indicate long-term cardiometabolic complications or adaptations to EHS. **METHODS:** 56 male mice ran on an incremental forced running wheel while exposed to 37.5°C/ ~40% humidity to induce EHS. Mice ran 124.1 ± 7.2 min, reaching a core temperature of 42.2 ± 0.07 °C at the time of collapse. Animals lost 7.5 ± 0.9 % body weight. Plasma and heart ventricle tissue were obtained at 0.5, 3, and 24 h and at 4, 9 and 14 days post EHS and compared to exercise-matched controls at 4 days post-exercise. Metabolites were extracted from biospecimens and analyzed by mass spectrometry. Ions were matched to a library of standards for identification and quantification. **RESULTS:** At 0.5-3 h after EHS, there was a marked loss in carbohydrate availability (1.6-1.9-fold reduction in plasma glucose, pyruvate and lactate). During the immediate post-EHS period there was also evidence for mobilization of a variety of amino acids. Elevations in acetylated amino acids were also observed. Elevated nucleic acid breakdown products were evident until 24 h post EHS, then recovered. By 3 h, 1.4-12.1-fold increases in acyl carnitine and ketone bodies were evident in the plasma. In cardiac muscle, most species of acyl carnitines were 2.2-25.0-fold lower than control at 0.5 h, suggesting rapid intracellular turnover of available free fatty acids (FFA). Interestingly, in the heart, carnitine FFA remained 2.0-16.7-fold lower than control through 14 d. **CONCLUSION:** Our results are consistent with an acute "energy crisis" following EHS that resolves within 3-24 hours, primarily via a sustained, persistent (≥ 14 day) shift toward fatty acid metabolism in the heart. Other metabolic changes reflect responses to injury, inflammation or wound repair during the recovery phase. *The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the DoD.*

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533   May 30 2:15 PM - 2:30 PM

Physical Factors Related To Heat Exchange In Male And Female Mice During Exertional Heat Stroke

Christian K. Garcia, Alex Mattingly, Gerard P. Robinson, Orlando Laitano, Thomas L. Clanton. *University of Florida, Gainesville, FL.* (Sponsor: Scott K Powers, FACSM)
(No relevant relationships reported)

Physical factors related to heat exchange in male and female mice during exertional heat stroke
Christian Kyle Garcia, Alex Mattingly, Gerard Patrick Robinson, Orlando Laitano, and Thomas Clanton
Physical and biological characteristics such as body surface area (BSA), mass and power production can influence heat tolerance during exercise. The extent of their influence has yet to be determined in a comprehensive model of exertional heat stroke in mice. We hypothesize that differences observed in performance between male and female mice in the heat may be attributed to their physical factors related to heat exchange. **PURPOSE:** To determine the effects of sex, body surface area to mass (BSA/mass), and rate of thermal radiation on heat stroke defense in a preclinical exertional heat stroke model. **METHODS:** 84 mice were separated by sex and given exertional heat stroke within an environmental chamber. Mice ran on a forced running wheel with incremental increases in speed. Environmental conditions included an ambient temperature and humidity of 37.5°C/~40%RH. **RESULTS**: Using analysis of covariance, with BSA/mass, power and sex as the factors determining place ran in the heat, we found the following in both sexes. Power output and the BSA/Mass were significant predictors for run distance (P<0.000001 for both). Crossed effects between sex and power output as well as sex and BSA/mass were highly significant (P<0.000001 for both). We also hypothesized that females may have had a physical advantage in terms of capacity for thermal radiation in the heat and indeed females exhibited a ~44% higher maximal rate of thermal radiation when normalized for BSA (P<0.03). **CONCLUSION**: In both sexes the rate of power production and body surface area to mass were strong determinants of performance in the heat; however,

sex remained a significant factor over and above these variables. When thermal radiation is normalized per area available for net exchange females had higher heat radiation capacity. Therefore, the results are consistent with a biological advantage in females that incorporates an elevated rate of heat radiation capacity independent of other physical factors. *Author views not official US Army or DoD policy. W81XWH-15-2-0038*

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534   May 30 2:30 PM - 2:45 PM

Comparison of Rectal Temperature Responses During a Modified Heat Tolerance Test

Yuri Hosokawa, Kelsey M. Rynkiewicz, Luke N. Belval, Courteney L. Benjamin, Ryan M. Curtis, Gabrielle E.W. Giersch, Rachel K. Katch, Rebecca L. Stearns, Douglas J. Casa, FACSM. *Korey Stringer Institute, Storrs, CT.*
(No relevant relationships reported)

Heat tolerance testing (HTT) has been used in clinical settings to determine readiness to return to activity after exertional heat stroke. However, published HTT data are mostly limited to a walking protocol (5km·h^{-1} at 2% grade) in a climatic chamber set at 40°C and 40% relative humidity (RH), which may limit application in determining one's ability to achieve thermoregulatory equilibrium during exercise. **Purpose:** To investigate factors that are associated with differences in temperature response during a modified HTT (mHTT). **Methods:** Thirty-two participants completed mHTT on a treadmill set at 60% of the velocity at VO_2max in a climatic chamber set at 27.3 ± 0.4°C and $51.1\pm1.7\%$RH. Within this cohort, we identified three pairs of participants (A, B, C) who tested at the same treadmill speed respectively, with body mass (BM) and body surface area (BSA) difference <5% but exhibited rectal temperature (T_{REC}) difference ≥0.75°C at the end of mHTT. Pooled data of participants with lower end T_{REC} (LOW) and higher end T_{REC} (HIGH) during the first 60 min of the mHTT were compared using a two-way ANOVA. **Results:** BM and BSA %difference in pairs A, B, C were 3.8%, 4.8%,1.0% and 3.4%, 3.5%, 1.1%, respectively. Starting T_{REC} difference was largest in pair A (HIGH-LOW: A, 0.72°C; B, 0.06°C, 0.27°C). The ten-minute average of the slope of T_{REC} change was greater at all time points in HIGH than LOW with no statistical significance (*p>0.05*). However, all LOW exhibited a plateau in slopes during the last 20 min (slope ≤0.01°C·min^{-1}). Greater SR (sweat rate) was observed in HIGH in two pairs (SR %difference: A, 26.1%; C, 16.3%). Overall RR was greater in HIGH in all pairs but the difference observed in pair A was negligible (0.001°C·min^{-1}). **Conclusions:** Fluid was not replaced during mHTT, which may have served as the limiting factor for high sweaters in pair A and C to sustain thermoregulatory equilibrium and contributed in the greater slope, SR, and overall RR. In designing a mHTT that accounts for physical demands greater than walking, SR should be recorded to understand the influence from dehydration. Starting T_{REC} may have also affected the negligible difference observed in RR in pair A. Future studies should investigate the normative values for T_{REC} response during mHTT under a setting where the treadmill speed, BM, BSA, and body mass loss are controlled.

B-14   Free Communication/Slide - **Respiratory Physiology**

Wednesday, May 30, 2018, 1:00 PM - 2:45 PM
Room: CC-Mezzanine M100D

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535   **Chair:** Jonathon L. Stickford. *Appalachian State, Boone, NC.*
(No relevant relationships reported)

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536   May 30 1:00 PM - 1:15 PM

Thoracic Blood Volumes and Periodic Breathing in Chronic Heart Failure

Caitlin C. Fermoyle, Steven C. Chase, Bruce D. Johnson. *Mayo Clinic, Rochester, MN.*
(No relevant relationships reported)

Purpose: Half of all heart failure (HF) patients have a reduced left ventricular ejection fraction (LVEF) and cannot achieve a cardiac output sufficient to meet the metabolic demands of the body. Reduced ejection of the left ventricle causes a centralization of blood volume, specifically an increase of blood within the pulmonary vasculature, which can alter the compliance of the lung tissue leading to changes in breathing patterns. Periodic breathing (PB), defined as cyclic oscillations in ventilation, has been observed in stable HF patients at rest. However, the mechanism underlying the disturbance in ventilation control is unknown. We investigated the relationship between PB and thoracic blood volumes in patients with stable HF. **Methods:** Eleven stable HF subjects (10M, age=69 ± 12years, height=178.0 ± 9.5cm, weight=92.2 ± 12.6kg, BMI=29.0 ± 2.4kg/m^{2}) and twelve healthy controls (8M,

age=65±9years, height=168.5±9.3cm, weight=70.8±12.8kg, BMI=24.7±2.6kg/m^2) participated in the study. PB was determined by the presence of a distinct peak in the 0.003-0.04 Hz frequency range of the flow signal during six minutes of resting breathing. Blood volumes in the thorax (V_t), heart (V_h), and pulmonary circulation (V_p) were quantified using CT perfusion imaging from the mean transit time of iodinated contrast moving through the pulmonary circulation.
Results: PB was observed in 7 HF subjects and was associated with poorer functional status and lower LVEFs. HF subjects with PB had blood volumes that were nearly doubled compared to healthy and HF subjects without PB. This relationship persisted when blood volumes were normalized to body surface area (Volumes reported as ml·m^{-2}, p-values vs. healthy; V_t, Healthy = 779.2±257.4, HF without PB = 821.6±160.7, p=0.981, HF with PB = 1579.2±549.9, p=0.002; V_p, Healthy = 393.9±104.9, HF without PB = 434.2±57.5, p=0.874, HF with PB = 748.3±187.7, p=0.000; V_h, Healthy = 385.3±169.4, HF without PB = 387.5±107.8, p=1.000, HF with PB = 830.9±373.3, p=0.008).
Conclusions: HF patients with PB at rest have augmented central blood volumes, which is consistent with previous studies demonstrating a relationship between PB and high pulmonary pressures. Supported by NIH grant HL71478.

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537   May 30 1:15 PM - 1:30 PM
Elastic and Resistive Work of Breathing in Older and Younger Adults
Joshua R. Smith, Troy J. Cross, Erik H. Van Iterson, Thomas P. Olson, FACSM. *Mayo Clinic, Rochester, MN.* (Sponsor: Thomas Olson, FACSM)
(No relevant relationships reported)

Aging results in significant alterations in the structure and function of the pulmonary system. For example, aging is associated with the loss of elastic recoil, stiffening of the chest wall as well as decreased airway caliber, and expiratory flow rates. During exercise, older adults exhibit greater expiratory flow limitation (EFL) and increased operating lung volumes than younger adults; however, it is not known if these translate to a higher total work of breathing (WOB) owing to elevated elastic and resistive WOB. **PURPOSE:** To compare the total WOB and its components (inspiratory and expiratory elastic and resistive WOB) in older and younger adults at matched ventilations (V_E). We hypothesized that older compared to younger adults would exhibit a greater total WOB as a result of greater inspiratory and expiratory elastic and resistive WOB.
METHODS: Older (OA: n=9; 60±8 yrs) and younger (YA: n=9; 38±7 yrs) adults were recruited for this study. Participants performed an incremental cycling test to volitional fatigue. Esophageal pressure, lung volumes, EFL, and ventilatory variables were measured at matched V_E (i.e. 25, 50, and 75 L/min) during exercise. Modified Campbell diagrams were used to determine the inspiratory and expiratory elastic and resistive WOB.
RESULTS: At V_E of 75 L/min, older adults had greater % EFL and tidal volume to forced vital capacity ratio (p<0.05), while end-expiratory and inspiratory lung volumes were not different (p>0.19). Older compared to younger adults had greater total WOB at V_E of 50 (OA: 47±20 vs. YA: 31±7 J/min) and 75 L/min (OA: 97±41 vs. YA: 64±18 J/min) (p≤0.05 for both). At V_E of 50 L/min, older adults had a greater inspiratory resistive WOB (OA: 13±8 vs. YA: 6±2 J/min, p<0.03). At V_E of 75 L/min, older adults had a greater inspiratory elastic and resistive WOB (OA: 44±27 vs. YA: 24±22 and OA: 23±15 vs. YA: 11±3 J/min, respectively) (p<0.02 for both) and expiratory resistive WOB (OA: 23±19 vs. YA: 14±9 J/min, p=0.04) than younger adults.
CONCLUSIONS: These data demonstrate that aging-induced pulmonary alterations result in a greater WOB during exercise owing to greater inspiratory (elastic and resistive) and expiratory resistive WOB. These findings suggest that the respiratory muscles necessitate an increased blood flow demand in older than younger adults for a given V_E during exercise.

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538   May 30 1:30 PM - 1:45 PM
Experimentally Manipulating Mechanical Ventilatory Constraint During Exercise Does Not Influence Dyspnea in Older Men and Women
Yannick Molgat-Seon[1], Andrew H. Ramsook[1], Carli M. Peters[1], Michele R. Schaeffer[1], Paolo B. Dominelli[2], Lee M. Romer, FACSM[3], Jeremy D. Road[1], Jordan A. Guenette[1], A. William Sheel, FACSM[1]. *[1]University of British Columbia, Vancouver, BC, Canada. [2]Mayo Clinic, Rochester, MN. [3]Brunel University London, Uxbridge, United Kingdom.* (Sponsor: Bill Sheel, FACSM)
(No relevant relationships reported)

During exercise at a standardized metabolic work load, the perception of dyspnea is higher in older women than older men, which is thought to be related to sex-differences in mechanical ventilatory constraint; however, this hypothesis has yet to be experimentally tested. **PURPOSE:** To determine the effect of manipulating the magnitude of mechanical ventilatory constraint during submaximal exercise

on dyspnea in older men and women. **METHODS:** Thirteen healthy subjects (60-80 y; n=7 women) completed two days of testing. On Day 1, subjects performed pulmonary function testing and a maximal incremental cycle exercise test. On Day 2, esophageal pressure (P_{es}) and diaphragm electromyography (EMG_{di}) were recorded during three constant load cycle exercise tests (6 min each) at ventilatory threshold (V_{Th}). Constant load exercise tests were performed under three conditions in a single blind, randomized, counterbalanced fashion: i) breathing normoxic helium-oxygen gas (HeO_2) to reduce the work of breathing (W_b) and alleviate expiratory flow limitation (EFL); ii) inspiratory resistance (RES) of 5 cmH$_2$O·l^{-1}·s^{-1} to increase W_b; and iii) control (CON) breathing room air. During exercise on Day 2, P_{es}-derived measures of W_b, EMG_{di}, and EFL were assessed. **RESULTS:** During the HeO_2 condition, there was a significant decrease in W_b (men= -20±4%, women= -16±5%) and EMG_{di} (men= -11±7%, women= -9±7%) relative to CON (both $p<0.01$). Moreover, if EFL was present during the CON condition (n=3 men, n=5 women), it was alleviated during HeO_2. Conversely, during the RES condition, there was a significant increase in W_b (men= 34±11%, women= 50±12%) and EMG_{di} (men= 32±15%, women= 23±12%) relative to CON (both $p<0.01$). The effect of condition on W_b and EMG_{di} was not significantly different between the sexes (both $p>0.05$). Across conditions, women reported significantly higher levels of dyspnea than men (3.3±0.4 vs. 1.9±0.4 Borg units, $p<0.05$). However, despite significant differences in the degree of mechanical ventilatory constraint between conditions, there was no effect of condition on the perception of dyspnea intensity, regardless of sex ($p=0.46$). **CONCLUSION:** Our results suggest that during short bouts of exercise at V_{Th}, sex-differences in dyspnea in older adults are not related to sex-differences in mechanical ventilatory constraint.

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539   May 30 1:45 PM - 2:00 PM
Alterations In Pulmonary And Respiratory Muscle Function In Response To 10 Marathons In 10 Days
Nick B. Tiller[1], Louise A. Turner[1], Bryan J. Taylor[2]. *[1]Sheffield Hallam University, Sheffield, United Kingdom. [2]University of Leeds, Leeds, United Kingdom.*
(No relevant relationships reported)

Alterations in pulmonary and respiratory muscle function in response to 10 marathons in 10 days
Tiller NB, Turner LA, Taylor BJ.
[1] Academy of Sport and Physical Activity, Sheffield Hallam University, UK
[2] Faculty of Biological Sciences, School of Biomedical Sciences, University of Leeds, UK
Background: Marathon and ultramarathon running are sufficient to induce pulmonary dysfunction and respiratory muscle fatigue. However, it is unknown how the respiratory system responds to multiple, consecutive days of endurance exercise.
Methods: Eleven well-trained endurance runners (8 male, 3 female) contested an ultra-endurance challenge comprising 10 marathons in 10 consecutive days. Lung function (FVC, FEV$_1$, FEV$_1$/FVC, PEF) and maximal static inspiratory and expiratory mouth pressures (MIP and MEP) were measured before and after marathon 1, 4, 7 and 10. Perceptual ratings of breathlessness (Borg CR10), respiratory muscle soreness (Visual Analogue Scale), and symptoms of upper-respiratory tract infection (URTI) were also recorded. **Results:** Group mean time for the 10 marathons was 276 ± 35 min, and post-marathon breathlessness was 2.0 ± 0.3 (range 1.0 to 3.0). Relative to pre-challenge baseline (159 ± 32 cmH$_2$O), MEP was reduced after marathon 1 (136 ± 31 cmH$_2$O, $p = 0.017$), marathon 7 (138 ± 42 cmH$_2$O, $p = 0.035$) and marathon 10 (130 ± 41 cmH$_2$O, $p = 0.008$), but there were no consistent reductions in baseline (pre-marathon) MEP. There were no changes in FVC, FEV$_1$, FEV$_1$/FVC, PEF, MIP, perception of breathlessness or respiratory muscle soreness throughout the challenge ($p > 0.05$). Moreover, there was no change in symptoms of URTI during and up to 2-weeks following the challenge ($p > 0.05$). **Conclusions:** Ten days of marathon running did not induce a chronic reduction in resting pulmonary or respiratory muscle function, despite acute pre-to-post-marathon reductions in maximal expiratory muscle strength. These data underscore the robustness of the healthy respiratory system.

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540   May 30 2:00 PM - 2:15 PM
Work of Breathing Influences Muscle Sympathetic Nerve Activity During Whole-Body Exercise
Paolo B. Dominelli[1], Keisho Katayama[2], Tyler D. Vermuelen[3], Troy JR Stuckless[3], Courtney V. Brown[3], Glen E. Foster[3], Andrew W. Sheel, FACSM[1]. *[1]University of British Columbia, Vancouver, BC, Canada. [2]Nagoya University, Nagoya, Japan. [3]University of British Columbia, Kelowna, BC, Canada.*
(No relevant relationships reported)

Manipulating the work of breathing (Wb) during exercise influences: quadriceps and respiratory muscle blood flow, locomotor and respiratory muscle fatigue, exercise performance and sensations of dyspnea. The mechanism underpinning these changes is hypothesized to be a sympathetically mediated respiratory muscle metaboreflex. However, no direct evidence for altered muscle sympathetic nerve activity (MSNA) during whole-body exercise has been demonstrated. **PURPOSE:** To determine if

lowering the Wb decreases MSNA during whole-body cycle exercise. **METHODS**: Healthy active subjects (n=12, 3 female) performed semi-recumbent cycling to exhaustion (VO_{2peak}= 45±2 ml kg^{-1} min^{-1} means ± SE). On a subsequent day, three constant load exercise trials at 40, 60 and 80% of peak workload were performed. Each trial was 7 min long and consisted of: 3 min spontaneous breathing, 2 min reduced Wb followed by 2 min spontaneous breathing. MSNA was recorded via microneurography of the right median nerve at the elbow. A proportional assist ventilator (PAV) was used to reduce the Wb. All statistical comparisons were made within each workload between PAV and post-PAV. **RESULTS**: The 40, 60 and 80% trials resulted in 57±1, 79±1 and 96±2 % of VO_{2peak}, respectively. At 40%, the PAV resulted in a similar Wb (62±7 vs. 67±7 J min^{-1}, P=0.4), decreased MSNA as (27±2 vs. 30±2 burst min^{-1} P>0.05) and increased V_E (67±3 vs. 55±2 l min^{-1}, P>0.05); for PAV and post-PAV, respectively. At 60%, the PAV significantly (P<0.05) reduced Wb (103±2 vs. 144±14 J min^{-1}), MSNA (35±3 vs. 42±2 burst min^{-1}), heart rate (151±4 vs. 154±4 beats min^{-1}) and VO_2 (2.4±0.2 vs. 2.6±0.1 l min^{-1}) without influencing V_E (86±3 vs. 82±3 l min^{-1} P>0.05); for PAV and post-PAV, respectively. At 80% (n=8) the PAV reduced (P<0.05) Wb (235±39 vs. 361±53 J min^{-1}), MSNA (48±2 vs. 53±4 burst min^{-1}), heart rate (173±4 vs. 176±4 beats min^{-1}) and VO_2 (2.9± 0.2 vs. 3.2±0.2 l min^{-1}) but not V_E (121±7 vs. 123±7 l min^{-1}) compared to post-PAV. **CONCLUSIONS**: During whole-body aerobic exercise above ~57% of VO_{2peak}, attenuating the normally occurring Wb has a significant effect on sympathetic vasomotor outflow. Our findings support the theory of a respiratory muscle metaboreflex that influences the integrative response to exercise.
Funding: NSERC, JSPS KAKENHI Grant Number JP16KK0201

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541 May 30 2:15 PM - 2:30 PM
Lack of Association Between Muscle and Ventilatory Chemoreflexes

James A. Pawelczyk, FACSM[1], Nathan Garvin[1], Nathan Raver[1], Christopher I. Schrock[2]. [1]*Pennsylvania State University, University Park, PA.* [2]*Gettysburg College, Gettysburg, PA.*
(No relevant relationships reported)

PURPOSE: Ventilation and blood pressure during exercise are mediated, in part, by chemoreflex activation in medullary and muscle interstitial spaces, respectively. We therefore hypothesized that intra-subject variability in the responsiveness to both reflexes would be similar.
METHODS: Ventilatory chemoreflex and exercise pressor reflexes were assessed in 30 healthy, normotensive college-aged men and women. Ventilatory responsiveness was measured as the slope of the relation between breath-by-breath ventilation and end-tidal PCO_2 elicited by hyperoxic, hypercapnic rebreathing. Sensitivity of the exercise pressor reflex was assessed as the slope of the relation between systemic systolic blood pressure (SBP, Finapres) and estimated forearm perfusion pressure (SBP minus cuff pressure) during steady-state rhythmic handgrip exercise (30 contractions/minute at 10% maximum) with progressive forearm blood flow restriction induced by a pneumatic cuff inflated at 3 mmHg/15 sec. For both tests, inflection points defining thresholds for reflex engagement were determined using cumulative sums (Changepoint package, R 3.3.2). Linear regression was used to quantify stimulus:response slopes beyond inflection points to relate the two reflex slopes.
RESULTS: 14 subjects were eliminated because the responses were not amenable to statistical analysis. The remaining data were normally distributed. Across subjects there were wide differences in ventilatory (mean=2.4 L/min/mmHg, range=0.9-5.0) and exercise pressor (mean=0.5 mmHg/mmHg, range=0.1-1.4) reflex responsiveness. However, there was no correlation between the two reflexes (r²=0.02, P=NS).
CONCLUSION: We suggest that neural pathways invoked by ventilatory and muscle chemoreflexes are sufficiently different that a "stress sensitive" phenotype does not exist.
Supported by American Heart Association 16UFEL27930008

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542 May 30 2:30 PM - 2:45 PM
Effect Of Daily, High-intensity Voluntary Hyperpnea On Maximal Expired Airflow And Maximal Voluntary Ventilation

Hans C. Haverkamp, Adriane Morrison-Taylor, Jeni Demar, Andrew Klansky, Kasie Craig, Eden Towers. *Johnson State College, Johnson, VT.*
(No relevant relationships reported)

Repeated bouts of voluntary isocapnic hyperpnea (i.e., hyperpnea training) has been used in both healthy and diseased populations as a potential means to improve exercise capacity and functional status. However, the repeated episodes of high airflow may cause airway inflammation and subsequently compromise airway function. **PURPOSE**: To determine if repeated, daily bouts of voluntary isocapnic hyperpnea alters airway function in healthy adults. **METHODS**: Eleven subjects (age, 21 yrs; ht, 1.7 m; wt, 65 kg) completed ten days of hyperpnea training (HYP) over the course of no more than 15 days. Hyperpnea sessions were 20-minutes in duration with the targets for minute ventilation based on percentage of maximal voluntary ventilation (MVV): days 1-4, 70% MVV; days 5-7, 75% MVV; days 8-10, 80% MVV. During

hyperpnea, dead space was added to maintain end-tidal CO2 at baseline levels. Maximal forced exhalations and MVV were performed at baseline prior to each hyperpnea session. Eight control subjects (CON) completed ten days of spirometry but no hyperpnea training. Outcome variables included peak expiratory flow (PEF), forced vital capacity (FVC), forced expiratory volume 1.0 second (FEV1) and MVV. **RESULTS**: In both HYP and CON subjects, PEF, FVC, and FEV1 did not change during the ten experimental days. In CON subjects, MVV did not change during the ten experimental days (MVV10-MVV1, +0.05 ± 0.3 L/min). In HYP subjects, MVV decreased gradually over time during the ten experimental sessions, reaching its nadir during the final day of training (MVV10-MVV1, -14 ± 22 L/min; -7 ± 14%); however, the decrease was not statistically significant (P=0.07).
CONCLUSIONS: These findings suggest that repeated bouts of high airflow hyperpnea do not compromise airway function in healthy adults. In the absence of any changes in the maximal forced exhalations, we speculate that the decreased MVV in HYP subjects may be due to respiratory muscle fatigue.

B-15 Clinical Case Slide - **Cardiovascular I**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-200E

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543 **Chair:** Aaron L. Baggish, FACSM. *Massachusetts General Hospital, Boston, MA.*
(No relevant relationships reported)

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544 **Discussant:** Sourav Poddar. *University of Colorado Health Sciences Center, Denver, CO.*
(No relevant relationships reported)

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545 **Discussant:** Mats Börjesson. *Sahlgrenska University Hospital, Gothenburg, Sweden.*
(No relevant relationships reported)

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546 May 30 1:00 PM - 1:20 PM
Exercise Induced Electrocardiogram Abnormalities In Elite Swimmer

Dalya Navot-Mintzer[1], Naama W. Constantini, FACSM[2]. [1]*Wingate Institute and Clalit Health Services, Netanya, Israel.* [2]*Shaare Zedek Medical Center, Jerusalem, Israel.*
(No relevant relationships reported)

HISTORY: A 17-year-old male national team swimmer came for an intake examination at The Academy for Sports Excellence at Wingate Institute. He reported being a non-symptomatic carrier of familial long QT mutation of the LQT2 type (KCNH2 mutation (R744X)) which was diagnosed through a family screening examination. He is taking Bisoprolol 2.5 milligrams once daily since he was 10 years old. Three other family members were diagnosed with the same long QT mutation (brother, mother and maternal grandfather). None of the family members have ever developed cardiac symptoms or arrhythmia, except for the grandfather who had one event of Torsade de Pointes at an old age, following acute MI. The whole family was screened following this event.PHYSICAL EXAMINATION: PE revealed no pathological finding, including normal cardiac examination. Resting ECG at supine position was within normal limits (Herat rate (HR)=49/min, QTc=415 msec). QT interval became elongated (HR=88/min, QTc=550 msec) at the first minute on the treadmill stress test. During the stress test the swimmer was asymptomatic, had a normal blood pressure response and reached maximal oxygen consumption of 65ml/min/Kg. Exercise ECG showed two patterns of wide premature beats with few bigeminis that started at a HR of 95/min.DIFFERENTIAL DIAGNOSIS: 1- Benign ventricular pre-mature beats during exercise.2- Electrical myocardial instability, due to channelopathy.3- Co-existence of CPVT in the family.TESTS AND RESULTS:1- Repeated resting ECG, normal.2- Echo-cardiography, normal.3- Repeated family history and family ECG examination. No evidence of any cardiac symptoms except for the index event of the maternal grandfather.4- Repeated 24h holter, normal. 5- Expert consultation. WORKING DIAGNOSIS:Asymptomatic elite swimmer. A carrier of benign familial LQT2 type mutation. No evidence of QT elongation on resting ECG and therefore does not meet QTc elongation criteria. Exercise induced ventricular pre-mature beats should be evaluated separately. Channelopathy expert physicians concluded that there is no justification for disqualification.TREATMENT AND OUTCOME:Cleared for swimming with no limitations. Repeated stress test and switching to a non-selective beta-blocker drug was recommended.

547   May 30 1:20 PM - 1:40 PM

Cardiac Rehabilitation: A Gateway to the Senior Olympics

Kirk D. Hendrickson. *Beaumont Health, Royal Oak, MI.* (Sponsor: Barry A. Franklin, FACSM)

(No relevant relationships reported)

HISTORY: An 81 year old male with a history of hypertension in 2012 initially underwent graded exercise testing (GXT) followed by cardiac catheterization that revealed severe multivessel coronary artery disease (CAD). He underwent urgent coronary artery bypass surgery (CABG x 4) and enrolled in an exercise-based cardiac rehabilitation program (CR).
PHYSICAL EXAM: (1/2012): Lipid values: Total cholesterol (TC), HDL-C, LDL-C, and triglycerides (TG) were 118, 25, 56, and 186 mg/dL, respectively. Resting heart rate (HR) and blood pressure (BP): 59 bpm and 102/80 mmHg; body mass index (BMI), 29.2 kg/m^2.
DIFFERENTIAL DIAGNOSIS: CAD
TEST AND RESULTS:
Baseline GXT with myocardial perfusion imaging (MPI): patient achieved 94% HRmax and 4.8 METs; no symptoms or diagnostic ST segment depression were noted. However, MPI revealed a transient inferoapical wall and a fixed posterior wall perfusion defect. Peak HR and BP: 136 bpm and 192/110 mmHg. Resting ejection fraction (EF) = 55%.
Cardiac Cath 1/13/2012: Left anterior descending coronary artery (LAD) had 70-80% stenoses in the proximal and distal LAD. There were multiple 80-95% lesions in the left circumflex coronary artery (LCx), obtuse marginal artery (OM), and right coronary artery (RCA). EF=55%.
CABG x 4, 1/16/2012: LAD, OM1, OM2, and RCA.
Most recent GXT 2/18/2015: 8.3 METs, negative for symptoms or ischemic ST segment shifts. MPI showed mild reversible defects in the anterior and lateral wall. Follow-up coronary computed tomography angiography was unremarkable. Lipid values (9/2017) were largely unchanged from his 2012 profile, except for an increased HDL-C, 41 vs 25 mg/dL, formerly. His BMI also decreased, 27.1 vs 29.2 kg/m^2 at baseline.
FINAL/WORKING DIAGNOSIS: CAD; previous CABG
TREATMENT AND OUTCOMES: Patient initiated CR in 2012, follows a plant-based diet, is currently taking a beta-blocker, ACE inhibitor, aspirin, and statin and exercises in our CR program 5 d/wk (cycle
ergometer, graded treadmill walking) complemented with outdoor biking, ≤25 miles/wk. In 2016 he won a silver medal in the Senior Olympics, 10 Km Cycling, 80-84 year old class and in 2017 won silver medals in the 5 and 10 Km events. By improving his lifestyle, risk factors, and fitness, and by attaining silver medal status in the Senior Olympics, he serves as a role model for our CR program.

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548   May 30 1:40 PM - 2:00 PM

Chest Pain and Palpitations - Lacrosse

Elizabeth E. Barton, Vicki R. Nelson, Irfan M. Asif. *Steadman Hawkins Clinic of the Carolinas, Greenville Health System, Greenville, SC.* (Sponsor: Kyle J. Cassas, FACSM)

(No relevant relationships reported)

HISTORY:
A 15-year-old female HS lacrosse player presented for episodes of chest pain and palpitations, initially at rest for minutes and then became exertional with SOB. She denied nausea, HA, and syncope. Family history was negative for congenital heart disease and sudden cardiac death, but her mother had atrial fibrillation and MGF died before age 60 from an MI.
PHYSICAL EXAMINATION:
T 97.7°F, HR 56, BP 116/68, RR 20, SpO$_2$ 98% RA, BMI 20.7
Well appearing with clear breath sounds. Cardiac exam: regular rhythm, normal S1 and S2, no S3 or S4, and a 2/6 low frequency systolic murmur best heard at the left upper sternal border. 2+ pulses. No peripheral edema, cyanosis, or hepatomegaly.
DIFFERENTIAL DIAGNOSIS:
1. arrhythmia - SVT, WPW, aflutter, afib, PACs
2. pulmonary valve stenosis, tricuspid valve regurgitation
3. cardiomyopathy—hypertrophic cardiomyopathy, ARVD
4. ASD
5. anemia
6. hyperthyroidism
TEST AND RESULTS:
-ECG- sinus bradycardia, no chamber enlargements or pre-excitation, normal QTc
-28 day event monitor- two episodes of chest pain and rapid heart beat correlate with nsr and sinus tachycardia
-Transthoracic echocardiogram- normal cardiac segmentation, valvular function, biventricular size, and systolic function. No effusion. There is a small coronary cameral fistula entering the main pulmonary artery.
-Exercise stress with 2D echocardiogram performed showed normal EF with no wall motion abnormalities, ischemia, or arrhythmias

FINAL WORKING DIAGNOSIS:
Coronary-cameral fistula
TREATMENT AND OUTCOMES:
1. The patient was cleared to play after symptoms spontaneously resolved and serial echocardiograms over a 5 year period demonstrated a stable coronary-cameral fistula.
2. Cardiology consultants recommended a rest/stress MRI to further determine the anatomical nature of the fistula given the symptom history. However, they believe that the fistula was an incidental finding and likely not the cause of her symptomatology.
3. Coronary-cameral fistula is a rare cause of congenital cardiac anomalies. Although most are small and asymptomatic, larger ones may cause MI or CHF, thus requiring intervention.
4. There are no published reports of this condition in athletes, highlighting provocative issues surrounding risks of incidental findings of unknown significance and return to play considerations.

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549   May 30 2:00 PM - 2:20 PM

Painful Arm Mass-Weight Lifting

Jenna Crowder, Franklin Sease, FACSM, Irfan Asif, Vicki R. Nelson. *Greenville Health System, Greenville, SC.* (Sponsor: Franklin Sease, FACSM)

(No relevant relationships reported)

HISTORY:
A 29 year old male reports acute onset of pain and palpable mass in his right distal bicep while weight lifting 2 weeks prior to presentation. He reports a dull ache that has persisted despite heat and ibuprofen. He developed bruising which resolved. He has continued lifting. He has no paresthesia, weakness, or radiculopathy. He has no exertional pain. He has a known history of multiple aneurysms diagnosed at the age of 7 with negative genetic testing. **PHYSICAL EXAMINATION**: There are no overlying skin changes or deformity. There is a tender, non-pulsatile 2cm mass within the medial distal bicep with firmness of the surrounding soft tissues. Active range of motion at the shoulder and elbow are full and symmetric. Pain cannot be recreated with manual muscle testing. Brachial and radial pulses are symmetric and equal. Right ulnar pulse is difficult to palpate. Allen's test reveals reduced right ulnar blood flow. Lower extremity pulses are symmetric and equal. Cervical spine motion is normal. Spurling's test is negative bilaterally. **DIFFERENTIAL DIAGNOSIS**:
Superficial phlebitis
Intramuscular hemorrhage
Biceps or brachioradialis muscle tear
Neoplasm (vascular, sarcoma, nerve sheath)
Brachial artery aneurysm or pseudoaneurysm
TEST AND RESULTS: Bilateral extremity angiogram - Right arm: multiple aneurysms proximal to the antecubital fossa, the largest measures over 1.5 cm. Aneurysms at the origin of the ulnar and radial arteries without distal abnormality. Left arm: 1.5 cm aneurysm proximal to the antecubital fossa. Right mid vertebral artery aneurysm (1.4 cm); prior coil embolization of the left vertebral artery. Lower extremities: 33 discrete aneurysms. Pseudoaneurysm at the proximal anastomosis of the aorto-bi-iliac graft that measures 4 cm proximally and 2.2 cm on the right iliac limb. **FINAL WORKING DIAGNOSIS**:
Multiple aneurysmal disease of unknown origin **TREATMENT AND OUTCOMES**: This case highlights provocative issues of a rare vascular disorder with no literature related to physical activity recommendations. Increased intravascular pressure related to heavy resistance likely accelerates disease progression, and as such, the athlete was advised to refrain from weightlifting. Vascular surgery was consulted for evaluation of abdominal aortic pseudoaneurysm and right vertebral artery aneurysm.

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550   May 30 2:20 PM - 2:40 PM

Cardiovascular Disease—Ice Hockey

Bradley Changstrom[1], Robert Quaife[1], Matt Sokolowski[2], Nicholas Edwards[1], Gregory Coe[3], William Cornwell[1]. [1]*University of Colorado Hospital, Denver, CO.* [2]*Colorado Avalanche Hockey Club, Denver, CO.* [3]*University of Colorado Denver- Anschutz Medical Campus, Denver, CO.*

(No relevant relationships reported)

History:
An 18 year-old healthy male semi-professional ice hockey player presented with a chief complaint of dizziness during a graded oxidation and lactate bike test. During the episode, he exhibited fluctuating levels of consciousness, gagging and cough. Following this episode, he mentioned two similar episodes while performing bike fitness tests. During hockey activities, he denied chest pain, dyspnea, dizziness, or syncope.Physical Examination: On examination following the episode, he was responsive to verbal commands but appeared dizzy and confused. He was frequently coughing and appeared dyspneic. Blood pressure 120/70. Heart rate was in the 120s. Pulse oximetry was 93%. Heart was regular rhythm without murmurs, rubs or gallops. Pulmonary exam demonstrated upper respiratory rhonchi.
The patient was transferred to the emergency room.

Differential Diagnosis:
1) Cardiac arrhythmia
2) Structural heart disease
3) Seizure disorder
4) Hypoglycemia
5) Exercise induced asthma
Test and Results:
An electrocardiogram was normal. A complete blood count, comprehensive metabolic panel, cardiac troponin and brain natriuretic peptic were normal. A chest radiograph was normal. The patient was discharged with follow up.
The following day, a transthoracic echocardiogram was normal.
A stress echocardiogram on a bike was performed under the same graded exercise protocol as the provoking bike test. At similar sub-maximal effort for heart rate and lactate levels, the patient developed recurrent symptoms. A continuous EKG did not demonstrate arrhythmia; however, the stress echocardiogram demonstrated hyperdynamic left ventricular contractility. At the same time, a cerebral perfusion monitor demonstrated a decrease in cerebral blood flow. No left ventricular outflow tract gradient was noted.
A cardiac magnetic resonance imaging (MRI) was normal.
A dobutamine stress echocardiogram was performed which confirmed an abnormal cardioinhibitory reflex response.
Final Diagnosis:
Bezold-Jarisch (Cardioinhibitory) response to exercise due to a hyperdynamic left ventricle.
Treatment and Outcomes:
1) He was cleared for full athletic participation.
2) He has returned to hockey activities without issues.

551 May 30 2:40 PM - 3:00 PM
Palpitations, Diaphoresis, Left-sided Chest, And Shoulder Pain - Football
James N. Cornwell, David Wilhelm. *LECOM Health Sports Medicine, Erie, PA.* (Sponsor: Patrick F. Leary, DO FACSM, FACSM)
(No relevant relationships reported)

Palpitations, Diaphoresis, Left-sided Chest and Shoulder pain – Football
James N. Cornwell, LECOM Health Sports Medicine, Erie, PA
e-mail: james.cornwell@med.lecom.edu
(Sponsor: Patrick F. Leary, FACSM)
HISTORY: A 19 year-old freshman division II football player presented to the athletic training staff at a local university with palpitations, abdominal discomfort, left-sided chest and shoulder pain along with severe diaphoresis. At that time, the football player had denied trauma to the chest or abdomen during the practice. The athletic training staff immediately arranged for transport of the patient to a local hospital for evaluation.
PHYSICAL EXAMINATION: Upon evaluation in a local emergency department, the athlete was found to be in moderate distress, but A+Ox3. Skin was cool and diaphoretic. Cardiovascular - tachycardia, distal pulses present. Pulmonary - tachypnic, breath sounds present in all fields. Abdominal tenderness in epigastric & left upper quadrant regions, bowel sounds present. Musculoskeletal examination of left shoulder normal
DIFFERENTIAL DIAGNOSIS:
1. Blunt force trauma to spleen
2. Pneumothorax
3. Liver laceration
4. Pancreatitis
5. Left Kidney trauma
TEST & RESULTS:
Vital Signs – 98.4, 112, 24, 108/68, 98% RA
Labwork – slight anemia
CXR – wnl, no pneumothorax
CT of Abdomen and Pelvis
- Grade 3 splenic laceration, free blood
Repeat CT of Abdomen and Pelvis
- Grade 4 splenic laceration, free blood
FINAL/WORKING DIAGNOSIS:
Splenic Laceration (Grade 4) secondary to blunt force trauma to left abdomen
TREATMENT & OUTCOMES:
1. After initial ED eval and diagnosis of splenic laceration, athlete transferred to hospital with interventional radiology capabilities
2. Athlete did remember getting a direct helmet hit to the left side of the abdomen, that "knocked his wind out," 2 days prior
3. Diagnosed with grade 4 splenic laceration
4. Endovascular embolization procedure performed with optimal results - no complication
5. ICU for post-surgical care
6. After an uncomplicated hospital course, the patient was discharged home
7. Follow-up instructions included serial labwork and repeat CT of the abdomen/pelvis in 3 months

8. The aim of this case presentation is to review into current literature and practice and to discuss what is advisable versus safe for return to play in this case of abdominal organ injury

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B-16 Clinical Case Slide - **Musculoskeletal: Spine to Ankle**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-200F

552 **Chair:** Joshua Blomgren. *Rush University Medical Center, Chicago, IL.*
(No relevant relationships reported)

553 **Discussant:** Kaleigh Suhs. *Advocate Lutheran General, Park Ridge, IL.*
(No relevant relationships reported)

554 **Discussant:** Kyle J. Cassas, FACSM. *Greenville Health System, Greenville, SC.*
(No relevant relationships reported)

555 May 30 1:00 PM - 1:20 PM
Ankle Pain--Volleyball Player
Jacob Reisner[1], Cara Prideaux[2], Edward Laskowski, FACSM[2]. [1]*Mayo School of Graduate Medical Education, Rochester, MN.* [2]*Mayo Clinic, Rochester, MN.* (Sponsor: Edward Laskowski, FACSM)
(No relevant relationships reported)

HISTORY:
An otherwise healthy 24 year old female volleyball player presented to the sports medicine clinic with a two week history of atraumatic severe left ankle pain and swelling. She localized the pain to her tibiotalar area. She described a sensation of "tightness" in the ankle. She denied any numbness or tingling or mechanical features to her pain, and she denied focal weakness. She did not endorse any other swollen or painful joints. She denied any history of autoimmune disease, inflammatory arthritis, or exposure to ticks. She had tried Ibuprofen and Tylenol with no significant relief.
PHYSICAL EXAMINATION:
Exam revealed a left ankle effusion and tenderness to touch over the anterior tibial-talar joint but not on the medial, lateral or posterior ankle. No laxity was noted with anterior drawer test. External rotation stress test was not painful. No pain was produced with resisted ankle motion in all planes. Neurologic exam did not reveal any focal strength or sensory changes in the lower extremities. Distal pulses and capillary refill were symmetric.
DIFFERENTIAL DIAGNOSIS:
1. Septic Arthritis
2. Inflammatory Arthritis/Synovitis
3. Crystalline Monoarthritis
4. Lyme Arthritis
5. Internal Derangement
6. Occult Fracture
7. Pigmented Villonodular Synovitis
8. Synovial Chondromatosis
TEST AND RESULTS:
Laboratory testing showed normal white blood cell count. Sedimentation rate and C-reactive protein were slightly elevated. Lyme disease ELISA, rheumatoid factor, and CCP were all negative.
X-ray showed left ankle effusion but no fractures. Attempted ultrasound guided aspiration showed extensive tibiotalar synovitis but did not produce any fluid for analysis. MRI of the left ankle showed extensive nodular synovial thickening of the anterior compartment consistent with Diffuse PVNS.
FINAL WORKING DIAGNOSIS:
Diffuse Pigmented Villonodular Synovitis(PVNS)
TREATMENT AND OUTCOMES:
1. Modest improvement of pain with activity reduction
2. Orthopedic Foot and Ankle Surgery consult for planned arthroscopic nodule excision and synovectomy

556   May 30 1:20 PM - 1:40 PM

Rare Cause of Second Webspace Interdigital Neuritis Diagnosed with Ultrasound

Marissa L. Dombovy-Johnson[1], Brennan J. Boettcher[2], Jonathan T. Finnoff, FACSM[2]. *[1]Mayo Clinic, Rochester, MN. [2]Mayo Clinic Sports Medicine Center, Minneapolis, MN.* (Sponsor: Jonathan T. Finnoff, FACSM)

(No relevant relationships reported)

HISTORY: A 68 year-old male with history of right second metatarsal Weil osteotomy, third webspace interdigital neuroma removal and third hammertoe correction presented with non-traumatic, burning pain in his second webspace that radiated into his second and third toes over the last four years. His pain was present at rest and worsened with activity.

PHYSICAL EXAMINATION:

He had full, symmetric, and painless ankle and subtalar joint range of motion. Strength and sensation to light touch were full and normal. There was tenderness to palpation in right second webspace but no tenderness over the second and third MTP joints. No pain or click was elicited on Mulder's test. He walked without a limp.

DIFFERENTIAL DIAGNOSIS:

- Interdigital neuroma
- Intermetatarsal bursitis
- Metatarsophalangeal joint instability
- Metatarsalgia
- Metatarsal stress fracture

TEST AND RESULTS:

Foot Radiographs

- Healed osteotomy right 2nd metatarsal neck with screw fixation
- Post-operative changes right 2nd and 3rd PIP joints

Diagnostic Ultrasound

- No neuroma or intermetatarsal bursitis was noted
- Third digit flexor tendons were dislocated medially between the second and third metatarsal heads compressing the adjacent neurovascular structures

L15-7io
58Hz
RS

2D
60%
Dyn R 64
P Low
Gen

3RD MT   2ND MT

THIRD DIGIT
FLEXOR TENDON

R FOOT
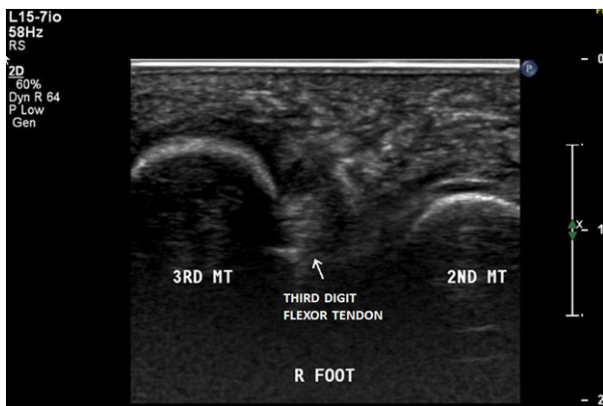
Foot MRI

- Confirmed US findings of medial dislocation of the third flexor digitorum longus and brevis tendons in between the second and third metatarsal heads

FINAL/WORKING DIAGNOSIS:

- Medial dislocation of third flexor digitorum longus and brevis tendons between the second and third metatarsal heads likely causing mass effect on the interdigital nerve in the second interspace

TREATMENT AND OUTCOMES:

- It was felt that relocation of the tendons was not a technically feasible surgery
- An ultrasound-guided second webspace corticosteroid injection along the interdigital nerve provided immediate relief of all patient's symptoms, however the pain and burning returned within one week
- Definitive treatment with an interdigital neurectomy was planned

557   May 30 1:40 PM - 2:00 PM

Low Back Pain in a First-year Medical Student

Michael S. Antonis. *MedStar Georgetown University, Washington, DC.*

(No relevant relationships reported)

HISTORY:

A 22-year-old male presents to MedStar Sports Medicine clinic from Student Health physician with complaint of hamstring and back pain for the last year. Patient describes the pain is worse when he rides his bike to school (5 miles) improved with walking to class and through the day, but worsens when he tries to run at night beyond 4 miles.

PHYSICAL EXAMINATION:

Gait: antalgic gait

Palpation -- Tone: [abnormal]

Tenderness: [paraspinous area at level of T10 through S1]

Range of Motion: Forward Flexion - [90 +] Deg

Extension - [15] Deg

Forward bending: [symmetric / normal]

Extension: [exacerbates pain] [R] and [L]

Stork test: [exacerbates pain] [R] and [L]

Straight Leg Raise (Laseague) Test: [negative]

DIFFERENTIAL DIAGNOSIS:

1. Lumbago
2. Stress Fracture
3. Hamstring/ITB Syndrome
4. Psychosomatic
5. Spondylarthropathy

TEST AND RESULTS:

Lumbar Xray (obtained via fax from PCP visit in New York): There is mild lumbar scoliosis. There is narrowing of all intervertebral disc spaces from T12-L5. Schmorl node endplate deformities and discogenic changes are present. No fracture or subluxation. Facet joints and SI joints are normal.

MRI Lumbar: Degenerative changes greater than expected for age and multiple Schmorl's nodes. No spondylolisthesis or spondylolysis. Consider ordering thoracic MRI as concern exists for Scheuermann's disease. There is subchondral sclerosis along the iliac sides of bilateral sacroiliac joints.

MRI Thoracic: Scattered endplate irregularities and small Schmorl's nodes with disc space narrowing throughout the thoracic spine with associated endplate change.

LABS:

HLA B-27: negative

CRP: 7.4

ESR: 4

Quantiferon Gold TB: negative

ANA: positive

DS-DNA and Anti-Sm: negative

FINAL/WORKING DIAGNOSIS:

Schueuermann's Disease and HLA-B27 seronegative Axial Spondyloarthritis

TREATMENT AND OUTCOMES:

Patient is doing well in medical school and currently being managed on naproxen 500mg twice a day with no gastrointestinal side effects.

Patient has followed up with Rheumatology who recommends naproxen at this time and if symptoms flair will consider initiating an anti-TNF agent with monitoring of CRP values.

558   May 30 2:00 PM - 2:20 PM

Rib Injury in a Professional Baseball Player

Christopher Trinh, Brian Coleman, James Barrett. *University of Oklahoma Health Science Center, Oklahoma City, OK.*

(No relevant relationships reported)

History: A 24 year old previously healthy left handed male professional baseball pitcher was warming up on the mound before a game when he suddenly felt a vague pain in his lower left anterior-lateral rib cage region but denied hearing a pop. Pain was a localized deep ache on the lower anterior rib cage. Although he felt discomfort the player was able to complete his warm up regimen and start the game. During the game he was only able to throw four pitches prior to unbearable pain during the acceleration phase of pitching causing him to be pulled from the game and seek medical attention.

Physical Exam: Normal appearance of the chest wall. Point tenderness to palpation and a 1x1cm soft tissue mass on the lower left anterior chest wall on palpation. Any active and passive motion of the torso exacerbated the pain and the mass was exquisitely tender to palpation. Bilateral shoulder exams were within normal limits and pain was not affected by inhalation or exhalation. On exam, he was neurologically and vascularly intact. There was no winging of the scapula or crepitus along the rib cage.

Differential Diagnosis:

1. Oblique muscle strain
2. Rib stress fracture
3. Costochondral junction avulsion fracture
4. Serratus anterior avulsion fracture
5. Intercostal muscle strain

Test and Results:

Thoracic MRI findings suggested either a fracture or stress injury of the costochondral cartilage along the left anterior-inferior aspect of the ribcage. There was extensive edema present along the region that measured 8x10 cm but there was no evidence of rib fractures.

Chest CT without contrast revealed edema around the costochondral junction of ribs 7 and 8 on the left with anterior prominence of the cartilage but no focal displacement or rib fractures.

Final Working Diagnosis: Based on Imaging, injury most likely to be costochondral junction avulsion fracture of ribs 7 and 8.

Treatment and Outcomes:

WEDNESDAY, MAY 30, 2018

The player was initially treated with 6 weeks of activity restriction and rest. Surgery was not warranted due to lack of significant separation of the fragment. Repeat radiographs were obtained at 6 weeks which revealed proper healing. After 6 weeks he began a graduated pitching regimen. Pain improved throughout his rehabilitation with rest and NSAIDS once he began physical activity. He returned to full activity at 8 weeks.

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559   May 30 2:20 PM - 2:40 PM
Acute Lumbar Pain - Football
Timothy J. Durkin, Katherine Edenfield, Guy Nicolette, Stephen Carek, Jay Clugston. *University of Florida, Gainesville, FL.*
(No relevant relationships reported)

HISTORY:
A freshman collegiate football player presented to the athletic training facility after his first official practice, complaining of worsening, severe pain in his R greater than L lumbar region without radiation or radicular symptoms. He denied any injury during practice. He had previously reported mild low back tightness during summer conditioning workouts that resolved with rest. He and the sports health staff were aware that he has sickle cell trait.
PHYSICAL EXAMINATION:
Pt in severe distress with diaphoresis, agitation and restlessness Limited lumbar ROM. Tenderness in lumbar paraspinal muscles R greater than L. Non-tender abdomen, symmetric pulses x4 extremities, no neurologic deficits or costa-vertebral tenderness. HR and BP elevated. Afebrile. High-flow oxygen by mask initiated and athlete transported to ED.
DIFFERENTIAL DIAGNOSIS:
Lumbar muscle/myofascial strain
Lumbar disc rupture
Lumbar paraspinal myonecrosis
Ureteral calculus
Renal angiomyolipoma
TESTS AND RESULTS:
CMP Cr 1.7, Ca 10.6, Glu 140; otherwise normal WBC 11.8, Hgb 15.5, Hct 47.5, Plt 178 CK 747 U/L Urinalysis SpGr 1.010, Pro 30, Small blood, 2 RBC, 4 WBC, myoglobin negative
MRI lumbar spine: T2 hyperintense signal in the paraspinous muscles bilaterally, R greater than L. Spine and nervous structures normal. *Impression*: Multifocal paraspinous muscular edema. Considerations would include strain, acute myonecrosis (given clinical history), or acute blood products
FINAL DIAGNOSIS:
Acute lumbar paraspinal myonecrosis in athlete with SCT
TREATMENT AND OUTCOMES:
1. High-flow oxygen continued
2. IV fluids initiated and 3L NS bolus given by pressure infusion
3. IV hydromorphone prn for pain control
4. Rapid improvement in pain post IV fluid bolus
5. Inpatient admission, transitioned from IV hydromorphone to PO oxycodone
6. Peak CK of 10,169 approximately 13 hours post event
7. Discharged home hospital day 2 with CK down trending at 7,060 ,Cr 0.98, off all pain meds
8. Cleared for activity at 7 days post event
9. Completed return to play activities, returned to full practice at 11 days post event
10. No related medical issues, no visible loss of muscle bulk/tone and continued full team participation as of abstract submission

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560   May 30 2:40 PM - 3:00 PM
Low Back Pain - Recreational Soccer Player
Sean Matsuwaka, Brian Liem. *University of Washington, Seattle, WA.*
(No relevant relationships reported)

HISTORY: A 21-year-old female recreational soccer player presented with intermittent right-sided low back pain for two years. She denied any trauma or inciting event. Pain was localized to the right lumbosacral region without radiating leg pain and was described as dull and aching. It was rated on average 5/10 on a numerical rating scale and associated with nausea when pain worsened. Symptoms were worse with prolonged sitting, and several times in the last month she reported worsening of typical pain with alcohol intake. She denied leg weakness, numbness, or bowel/bladder dysfunction. She participated in six weeks of physical therapy, which helped with nausea and pain with sitting, but she continued to have pain with alcohol consumption.
PHYSICAL EXAM: Full and symmetric strength, sensation, and reflexes. Mild lumbar dextroscoliosis. No palpable step-offs. Tenderness over right lumbar paraspinals and above right iliac crest. No tenderness over PSIS. Full, non-painful range of motion with lumbar flexion and extension. No pain with facet loading. Full, non-painful hip range of motion. Negative FABER, FADIR, and straight leg raise test bilaterally.

DIFFERENTIAL DIAGNOSIS: 1. Discogenic pain 2. Facet-mediated pain 3. Disc herniation 4. Muscular strain 5. Sacroiliac joint dysfunction 6. Intrabdominal/intrapelvic etiology 7. Neoplasm
TESTS AND RESULTS: 1. Lumbar spine X-rays: -Normal alignment, normal vertebral body and disc space height -Partial lumbarization of S1 vertebral body -Five degrees of lumbar dextroscoliosis 2. MRI lumbar spine: -Lumbarization of S1 vertebral body -Normal disc heights and signal -Normal central canal and neural foramen size throughout lumbar spine -T1/T2 hyperintensity within S2 vertebral body, likely lipoma -Increased T2 signal medial to right kidney suggestive of hydronephrosis
3. Renal ultrasound:-Moderate right hydronephrosis with extrarenal pelvis. No nephrolithiasis. 4. Renogram with furosemide: - Right kidney with blunted flow and delayed clearance improved slightly with furosemide, consistent with partial obstruction at right ureteropelvic junction
FINAL/WORKING DIAGNOSIS: Ureteropelvic junction obstruction causing Dietl's crisis
TREATMENT AND OUTCOMES: 1. Referral to urology 2. Resolution of pain and improvement in renal function after pyeloplasty

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B-17   Clinical Case Slide - **Shoulder**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100F

561   **Chair:** Tracy Ray, FACSM. *Duke University, Durham, NC.*
(No relevant relationships reported)

562   **Discussant:** C. Mark Chassay, FACSM. *IRONMAN Sports Medicine Institute, Houston, TX.*
(No relevant relationships reported)

563   **Discussant:** David Olson, FACSM. *University of Minnesota, St. Paul, MN.*
(No relevant relationships reported)

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564   May 30 1:00 PM - 1:20 PM
Pectoralis Muscle Rupture While Lifting Weights
Mimi Zumwalt, Thomas Githens, Adam Wooldridge. *Texas Tech University Health Science Center, Lubbock, TX.* (Sponsor: Jacalyn McComb, FACSM)
(No relevant relationships reported)

HISTORY: 41 y/o male RHD sustained an injury to his chest area while performing a heavy bench press. His arm gave out when his spotter failed to assist him during the eccentric phase. He felt a painful snapping sensation near his right shoulder with subsequent throbbing, swelling and bruising. He suddenly felt nauseated/lightheaded, unable to perform any more exercises so he immediately sat down. He was evaluated by a fitness specialist, obtained an MRI study within 2 days, then seen 3 days later in Sports clinic. He denies any supplement usage or paresthesias but relates some weakness when using his arm.
PHYSICAL EXAMINATION: Right upper extremity/chest region reveals asymmetry of pectoralis muscle with less fullness/dimpling upon "hands on hips" pose; ecchymosis of proximal arm area with loss of axillary fold; tender over medial humerus with difficulty palpating the tendon; weakness with resisted shoulder internal rotation/adduction maneuvers.
DIFFERENTIAL DIAGNOSIS:
1. Right arm contusion/tendon strain
2. Right partial pectoralis muscle tear
3. Right pectoralis major tendon rupture
TESTS AND RESULTS:
Right shoulder radiographs: AP, Y and axillary lateral views show no bony avulsion
MRI films: reveal "extensive edema around musculotendinous junction of right pectoralis"; "small amount of linear fluid" in area of humeral insertion and "absence of tendon" with "retraction" into chest wall
FINAL/WORKING DIAGNOSIS:
Right pectoralis major tendon rupture
TREATMENT AND OUTCOMES:
1. Underwent primary open right pectoralis tendon repair/reattachment 6 days post injury
2. Wore shoulder immobilizer for 6-8 weeks
3. Participated in formal physical therapy rehabilitation at 1month post-surgery
4. Progressed to light weightlifting at 4 months
5. Experienced transient scar hypersensitivity-resolved with local massage
6. Discharged himself at 5 months
7. Follow-up 2 years 9 months later for another complaint-doing well, back to working out (lighter weights/higher reps)

565   May 30 1:20 PM - 1:40 PM

Teen With Acute Shoulder Pain Four Years After A Car Accident.

Natalie Ronshaugen, Kyle Nagle. *University of Colorado, Aurora, CO.* (Sponsor: John Hill, FACSM)

(No relevant relationships reported)

HISTORY: 18yo male with sudden onset, severe right shoulder pain occurring while sitting in class 11 days prior to presentation. He had a history of a posterior shoulder dislocation at age 14 in a car accident, requiring relocation under sedation without known complication. He completed PT at that time, however was unable to return to football or overhead throwing activities. At the start of his new onset pain, he suspected re-dislocation of his shoulder and went to the ED. X-rays were abnormal but with unclear diagnosis. He was referred to sports medicine clinic for further evaluation and treatment.
PHYSICAL EXAMINATION: Inspection: Significant atrophy of the supraspinatus and infraspinatus. Right shoulder was held elevated. Intertrigo noted in right axilla. Range of motion of the shoulder: 20 degrees forward flexion, 20 degrees forward flexion, 0 degrees external rotation, and internal rotation to T12. Strength: 4/5 empty can, 4/5 internal rotation, 3+/5 external rotation. Neurovascular: Brisk pulses, 2 second capillary refill, intact motor exam, and sensation intact in all dermatomes. Special tests: Neer's positive pain with no increased ROM, Speed's test positive, O'Brien's test positive, cross over test negative, and Hawkin's positive.
DIFFERENTIAL DIAGNOSIS: Recurrent shoulder dislocationMalignant or benign bony lesionPathologic fracture of proximal humerusRotator cuff tearDisruption of suprascapular nerve **TEST AND RESULTS**: X-rays of the right shoulder:- Patchy sclerosis and irregular shape of the humeral head. - Decreased joint space of the glenohumeral joint and elevation of the humeral head.- Hill-Sachs deformity with small adjacent osseous fragment. - Curvilinear osseous density superior to the humeral head - likely calcification of the rotator cuff or loose body. MRI with and without contrastiv>
FINAL WORKING DIAGNOSIS: Osteonecrosis of the humeral head
TREATMENT AND OUTCOMES: Referred to orthopedic shoulder specialist who plans to do a hemiarthroplasty without a stem. Surgery is planned for December 1, 2017. Follow-up will be available by May 2018.

566   May 30 1:40 PM - 2:00 PM

Back and Shoulder Pain in a Weightlifter with Ehlers Danlos

James Kelley. *Wellspan, York, PA.* (Sponsor: Mark Lavallee, FACSM)

(No relevant relationships reported)

Back and Shoulder Pain in a Female Weight Lifter with Ehlers Danlos
History: The Patient is a 44 yo woman who is a former fitness model, power lifter, and police office. She has a past medical history consisting of, pituitary tumor, Macromastia (C to DDD), right and left temporal aneurysms, Bilateral hip subluxation, Chiari Type I herniation – nonoperable and Ehlers Danlos. She is treated for chronic pain and her regimen consists of Tylenol, Tramadol and Oxycodone based on severity. NSAIDs are contraindicated due to the Xarelto use. In her most recent EDS clinic visit, she was referred to the sports medicine clinic for pain in her back and right shoulder. She was swimming and performing rehab exercises and presented with her 9/10 shoulder pain. The pain is worse with motion and is located on her posterior and lateral shoulder.
Physical Exam:
GENERAL: Healthy appearing, Alert and Oriented, no acute distress, mood appropriate, respiratory rate non-labor, hearing intact
THORACIC:
PALPATION: TENDER over Bilateral Trapezius, splenius captius, rhomboids
ROM: LIMITED inflexion-extension lateral rotation B/L
EXTREMITY EXAM
SENSATION:
Upper Extremity: intact bilateral, no deficits
Lower Extremity: intact bilateral, no deficits
STRENGTH:
Upper extremity: full strength in all major muscle groups
Lower extremity: full strength in all major muscle groups
SPECIAL TESTS
(+) Hawkins right side
(+) Spurling's away from affected
Differential Diagnosis : 1. Complex Regional Pain Syndrome 2. Thoracic outlet syndrome 3. Acute shoulder instability Nerve entrapment (i.e. suprascapular nerve) 4. Strain of her rhomboids/trapezius/splenus capitus 5. Brachial artery aneurysm 6. RTC injury 7. Spinal Stenosis/Radiculopathy 8. Polymyalgia Rheumatica Syringomelia
Final Working Diagnosis: Chronic Rotator Cuff tendonosis from chronic subluxation, and bilateral trapezius, rhomboid and splenus capitus strain, likely from overly active rehab and her Macromastia
Treatment: Subacromial shoulder injection with glucocorticoids and dry needling of her splenus capitus, rhomboids, and trapezius muscles
Outcome: Significant reduction in her pain, reduced narcotic use and continuing with her rehab and swimming. Receiving dry needling on a monthly basis.

567   May 30 2:00 PM - 2:20 PM

Shoulder Pain - Builder with Chronic Calcifications

Lauren Nadkarni, Krystian Bigosinski, Heather Gillespie, FACSM. *Maine Medical Center, Portland, ME.* (Sponsor: Heather Gillespie, FACSM)

(No relevant relationships reported)

History:
A 48 year old right hand dominant male smoker who works as a builder presents with chronic left shoulder pain. 15 years ago, he dislocated his left shoulder while breaking up a fight. Since then, he has dislocated it several times, most recently 5 years ago, but is able to replace it on his own. Two years ago, he had x-rays at an outside hospital emergency room and was diagnosed with calcium in his shoulder (images were unavailable). Last year, he felt a "squishy mass" and then "felt like something left my shoulder" when he was getting out of his car, and has had pain since then. He feels his shoulder is weaker and has less muscle mass, but denies hand weakness. However, he has had some neck issues and had numbness in his left arm secondary to cervical stenosis at C5-7, spondylolisthesis of C2-3, disc herniation at C4-5, and radiculopathy of C5-6, which improved after physical therapy which was prescribed by a physiatrist (PM&R, neuro/spine).
Physical Exam:
Office examination of his left shoulder revealed mild pain at terminal motion with overhead movements, full range of motion, 5/5 rotator cuff and distal strength, and negative AC joint testing. Impingement tests (Hawkins and Neer), and instability tests (apprehension and relocation) were positive. Distal neurovasculature was intact. His elbow and contralateral shoulder exam were normal.
Differential Diagnosis:
Rotator cuff tear, shoulder impingement, osteoarthritis, osteochondromatosis, labrum tear, lipoma, ganglion cyst, foreign body, erosive arthritis, pigmented villonodular synovitis, synovial sarcoma, intra-articular fracture fragments, neuropathic joint, and multidirectional instability
Tests and Results:

WEDNESDAY, MAY 30, 2018

Left shoulder x-rays (AP/Outlet/Axillary): "innumerable calcific loose bodies consistent with synovial osteochondromatosis as well as significant osteoarthritic changes at the glenohumeral joint with close to bone-on-bone narrowing seen best on the axillary view. The loose bodies are dispersed throughout the joint capsule and into the bicipital groove."
Final/Working Diagnosis:
Synovial osteochondromatosis
Treatment and Outcomes:
- Continued physical therapy
- Over the counter analgesics, ice/heat as needed
- Referral to orthopedic surgeon for loose body removal vs. shoulder joint replacement

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568   May 30 2:20 PM - 2:40 PM
Shoulder Pain in a Youth Hockey Player

Brennan J. Boettcher, Jeffrey M. Payne, Jonathan T. Finnoff, FACSM. *Mayo Clinic, Minneapolis, MN.* (Sponsor: Jonathan T. Finnoff, FACSM)
(No relevant relationships reported)

HISTORY: A 14 year-old male hockey player presented for right shoulder pain. He checked an opponent with his left shoulder and developed right shoulder pain immediately. There were no associated neurovascular symptoms. The pain was sharp, and radiated down the lateral shoulder to the mid-arm with abduction. Outside shoulder radiographs were normal.
PHYSICAL EXAMINATION: Athletic male resting with his right hand on his abdomen. Asymmetric depression of his right acromion with arms unsupported at his side. Right shoulder range of motion was slightly limited due to pain. He had tenderness just posterior to the distal mid-third of the clavicle diaphysis over the trapezius insertion. Neurologic and strength examination were normal.
DIFFERENTIAL DIAGNOSIS: -Trapezius strain -Occult clavicle fracture -ACJ separation -Physeal injury -Brachial plexus injury -Rotator cuff injury -Labral tear
TEST AND RESULTS: Diagnostic Ultrasound revealed an avulsion of the deep fibers of the trapezius from the clavicle, with ACJ sprain and distal clavicular hypermobility. Repeat radiographs demonstrated subtle periosteal lifting of the inferior clavicle near the avulsion visualized on sonographic evaluation indicative of a clavicular physeal injury.
FINAL WORKING DIAGNOSIS: Grade 1 right ACJ separation with trapezius avulsion off of the clavicle and distal clavicular physeal injury.
TREATMENT AND OUTCOMES: The patient was placed in a sling for comfort for 2 weeks. At the 3 week follow-up, he was about 95% of normal, repeat ultrasound demonstrated a small amount of distal clavicular callus formation. He was cleared to resume non-contact aerobic activity (e.g.skating) and gentle, non-painful shoulder isometrics. Re-evaluation at 6 weeks demonstrated full, pain-free shoulder range of motion, normal strength, and distal clavicular callus formation on radiographs. He was released to unrestricted activity.

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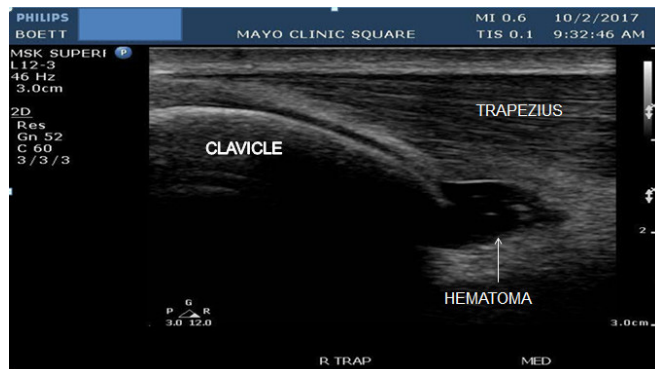
569   May 30 2:40 PM - 3:00 PM
"OCD": A Zebra In The Glenoid Fossa

Elizabeth Barchi. *New York University, New York, NY.*
(No relevant relationships reported)

History:
A 19-year-old female Division 1 volleyball player presented with 5 months of right shoulder pain and decreased range of motion. The pain was localized to "inside" the shoulder and aggravated by serving and setting (right hand dominant). 2 months after the onset of symptoms, she noticed an acute increase in pain following a collision that resulted in a cervical strain. The symptoms persisted despite 3 months of physical therapy in the training room and 2 months of post-season rest. She denied neurological or instability symptoms.

Physical exam:
Right shoulder: Tenderness to palpation over AC joint. Limited active and passive range of motion: Forward flexion 160deg, Abduction 160deg, External rotation 60deg, Internal rotation to T12. Mild supraspinatus weakness. Positive Neer and Hawkins tests. Positive Obrien test. Negative cross arm adduction and anterior apprehension.
Differential Diagnosis:
1. Impingement Syndrome
2. Labral tear
3. Rotator cuff tendinopathy
4. Osteochondral defect of the glenoid fossa
5. Osteochondroma
Testing and Results:
MRI Right Shoulder: Large osteochondral defect centered in the posterior superior aspect of the glenoid measuring approximately 1.6 x 1.7 cm. Associated marked irregularity and bone loss of the subchondral plate and subchondral bone, suspicious for an instable osteochondral fragment. Tear of the adjacent posterior superior labrum.
Final Diagnosis
Osteochondral defect of the glenoid fossa
Treatments/Outcomes:
1. Hyaluronic acid injection into glenohumeral joint with no change in symptoms
2. PRP injection into glenohumeral joint with excellent reduction in pain and eventual return to baseline range of motion
3. Physical therapy- rotator cuff strengthening, range of motion exercises, joint mobilization, and manual modalities
4. Returned to full sports 8 weeks following PRP injection. After complete resolution of symptoms, she played volleyball in the following season as a setter.

B-36   Thematic Poster - **Get Up, Get Moving: New Research in Sedentary Behavior**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100C

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631   **Chair:** David W. Dunstan. *Baker IDI Heart and Diabetes Institute, Melbourne, Australia.*
(No relevant relationships reported)

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632   Board #1   May 30 3:15 PM - 5:15 PM
Association Between Exercise And Prolonged Television Viewing Days On Time-use And Physical Activity Energy Expenditure In Older Us Adults

Charles E. Matthews, FACSM[1], Sarah Keadle[2], Pedro Saint-Maurice[1], Steven C. Moore[1], Erik A. Willis[1], Joshua N. Sampson[1], David Berrigan[1]. *[1]National Cancer Institute, Rockville, MD. [2]Cal Poly, San Luis Obispo, CA.*
(No relevant relationships reported)

PURPOSE. Our goal was to estimate the time-use exchanges associated with exercise, prolonged television viewing, and work days on the amount and type of sedentary and physically active behaviors and physical activity energy expenditure. **METHODS.** Participants were 1,020 older adults who completed up to 6 detailed previous-day recalls over 12-months that provided a profile of the use of time in sedentary and physically active pursuits. We predicted time-use and physical activity energy expenditure (PAEE) outcomes for 1) days with and without exercise, 2) days with or without prolonged television (2+h/day), and 3) work vs non-work days. To estimate time-use exchanges we used repeated measures and linear mixed models, adjusting for age, sex, season of the year, and day of the week. **RESULTS.** Exercise days were associated with less sedentary time (-0.37 hrs/d) and light activity (-0.29 hrs/d), and less household, work, and shopping activities. Compared to non-exercise days, the increase in total PAEE on exercise days (2.83 MET-hrs/d) was only about half that expended during exercise (5.98 MET-hrs/d). Prolonged television viewing was associated with an increase in total sedentary time (0.86 hrs/d) and less light (-0.45 hrs/d) and moderate-vigorous intensity activity (-0.41 hrs/d), and thus lower total PAEE (-2.43 MET-hrs/d). Work days were associated with less sleep (-0.91 hrs/d) and an increase in total sedentary time (1.32 hrs/d). **DISCUSSION.** Exercise was associated with an increase in PAEE, but due to reductions in other activities, only about half of the energy expended during exercise trickled-up to total daily PAEE. Prolonged television viewing was associated less PAEE and less moderate-vigorous activity. These findings provide new insights into possible compensation associated with exercise training, and suggest a strong link between television viewing and physical inactivity.

633   Board #2   May 30 3:15 PM - 5:15 PM

Prolonged Uninterrupted Sitting Impairs Vascular Function and Increases Biomarkers of Atherosclerotic Risk in Overweight Adults

Megan S. Grace[1], Rachel E D Climie[1], Michael Wheeler[1], Elisabeth Lambert[2], Carolina Ika Sari[1], Farzaneh Rezai[3], Hamza Ali[3], Gavin Lambert[2], Neville Owen[1], Daniel J. Green[4], Bronwyn A. Kingwell[1], David W. Dunstan[1]. *[1]Baker Heart and Diabetes Institute, Melbourne, VIC, Australia. [2]Swinburne University, Melbourne, VIC, Australia. [3]Monash University, Melbourne, VIC, Australia. [4]University of Western Australia, Perth, WA, Australia.*

(No relevant relationships reported)

Purpose. Prolonged uninterrupted sitting amplifies postprandial glucose, insulin and lipid responses in overweight/obese adults with or without type 2 diabetes; and, impairs lower limb endothelial-mediated vasodilation in healthy adults. It is unknown whether prolonged sitting impairs vascular function or modulates other vascular inflammatory and pro-atherogenic mechanisms in those at heightened risk of cardiometabolic disease. In overweight/ obese adults, we examined the potential pro-atherogenic effects of an acute bout of prolonged sitting, compared to sitting interrupted with brief activity breaks.
Methods. In a randomised crossover trial, following a standardised breakfast meal, 19 (11 Male, 8 Female) overweight/obese participants (BMI 30.6±3.4 kg/m²; age 57±12 years; mean±SD) either: (i) sat uninterrupted for 5h (SIT); or, (ii) interrupted 5h of sitting with 3min light-intensity simple body-weight resistance activities every 30min (SRA). Brachial and femoral artery endothelial-mediated vasodilation were measured using flow mediated dilation (FMD). Circulating levels of vasoactive and pro-atherosclerotic biomarkers (total nitrate+nitrite, ET-1, ICAM-1 and VCAM-1) were measured. Sympathetic nervous activity was also estimated (peroneal microneurography and circulating catecholamines). Data were analysed using generalised linear mixed models controlling for age, sex, BMI, baseline values and treatment order, and are presented as marginal mean±SEM.
Results. Femoral artery FMD was impaired in the SIT condition, compared to SRA (5.1±0.5% vs 9.0±0.5%, respectively, p<0.05). Significantly higher circulating levels of the potent vasoconstrictor and pro-inflammatory mediator ET-1 (1.6±0.1 vs 1.4±0.1 pg/ml) and pro-atherogenic adhesion biomarker VCAM-1 (616±33 vs 564±26 ng/ml) were observed in SIT compared to SRA, respectively (p<0.05). There were no differences between conditions for any other outcomes.
Conclusion. In overweight/obese adults, an acute bout of uninterrupted sitting impaired femoral artery endothelium-mediated vasodilation and increased circulating levels of pro-atherosclerotic biomarkers. Prolonged sitting may have implications for vascular function, leukocyte adhesion and atherogenesis in those at heightened risk of cardiometabolic disease.

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634   Board #3   May 30 3:15 PM - 5:15 PM

Sedentary Behavior and Physical Activity are associated with Sleep Duration and Sleep Quality in Postmenopausal Women

Seth A. Creasy[1], Cynthia A. Thomson[2], David O. Garcia[2], Tracy E. Crane[2], Betsy C. Wertheim[2], Laura Baker[3], Mace Coday[4], Lauren Hale[5], Catherine R. Womack[4], Kenneth P. Wright Jr.[6], Edward L. Melanson, FACSM[1]. *[1]University of Colorado Denver, Aurora, CO. [2]University of Arizona, Tucson, AZ. [3]Wake Forest University, Winston-Salem, NC. [4]University of Tennessee, Knoxville, TN. [5]Stony Brook University, Stony Brook, NY. [6]University of Colorado Boulder, Boulder, CO.* (Sponsor: Edward L. Melanson, FACSM)

(No relevant relationships reported)

PURPOSE: There is a general decline in sleep duration and sleep quality with aging. It is unclear whether lifestyle behaviors such as physical activity and sedentary behavior are related to these declines in sleep health. In this analysis, we evaluated the associations between sedentary behavior (SB), total physical activity (total-PA), light physical activity (LPA), moderate physical activity (MOD-PA), and vigorous physical activity (VIG-PA) with self-reported sleep quantity and quality in a cohort of postmenopausal women.
METHODS: Baseline Data from the Women's Health Initiative Observational Study (N=89,853, age: 63.6±7.4 years, BMI: 27.2±5.8 kg/m², 84% Non-Hispanic White) were used in this cross-sectional analysis. Total-PA, LPA, MOD-PA, and VIG-PA were categorized by metabolic equivalents of the activity (MET-hrs/wk) and were measured using self-reported questionnaire. SB was categorized by hrs/day and was also measured via questionnaire. Logistic regression was used to examine the relationships between these activity variables and the odds of having self-reported short sleep (<7 hours), subjective sleep disturbance, and reduced subjective sleep quality. Odds ratios (OR, 95% confidence intervals) were adjusted for age, race, neighborhood SES, BMI, health status, depressive symptoms, smoking status, alcohol use, hormone therapy, and history of CVD, diabetes, and cancer.
RESULTS: Higher SB (>11 hrs/day) was associated with increased odds of short sleep (1.87, 1.79-1.96), poor sleep quality (2.21, 2.10-2.33), and sleep disturbance (1.56, 1.49-1.64). Conversely, more LPA (>4.5 MET-hrs/wk) was associated with a reduced odds of short sleep (0.96, 0.92-1.00). Furthermore, higher Total-PA (0.90, 0.84-0.97), LPA (0.94, 0.89-1.00), and MOD-PA (0.91, 0.86-0.97) were associated with reduced odds of poor sleep quality.
CONCLUSIONS: In postmenopausal women, physical activity at the light or moderate level was associated with better sleep quality. Whereas, engaging in more sedentary behavior increased the risk for shortened and lower quality sleep. Future investigations may focus on reducing sedentary behavior as a novel method for improving overall sleep health in older women.

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635   Board #4   May 30 3:15 PM - 5:15 PM

Association of Combined Sedentary Behavior and Diabetes Mellitus with All-Cause Mortality in Brazilian Adults

Italo R. Lemes[1], Xuemei Sui, FACSM[2], Bruna C. Turi-Lynch[3], Leanna M. Ross[4], Steven N. Blair, FACSM[2], Rômulo A. Fernandes[1], Jamile S. Codogno[1], Henrique L. Monteiro[5]. *[1]São Paulo State University, Presidente Prudente, Brazil. [2]University of South Carolina, Columbia, SC. [3]São Paulo State University, Rio Claro, Brazil. [4]Duke University, Durham, NC. [5]São Paulo State University, Bauru, Brazil.*

(No relevant relationships reported)

Diabetes mellitus (DM) is associated with increased specific and all-cause mortality in different populations. Although sedentary behavior (SB) has been identified as a modifiable risk factor for DM, cardiovascular disease, and all-cause mortality, investigations regarding the combined effect of DM and SB on all-cause mortality are scarce. **PURPOSE:** To investigate the combined effect of DM and SB on all-cause mortality in adults from the Brazilian National Health System (NHS). **METHODS:** Data were obtained from 970 adults (709 women; mean age 64.7 ± 9.1 years) enrolled in the Brazilian NHS from 2010-2016. Participants were 50 years or older, registered for at least one year in the NHS, and received at least one medical visit in the past six months. SB was estimated via self-reported TV viewing frequency on the Baecke questionnaire and was subsequently classified into thirds: low, middle, and high. For our analysis the low and middle groups were combined to indicate lower level of SB due to the small sample size. Presence of physician-diagnosed DM was assessed via medical record. Mortality was reported by participants' relatives and confirmed via medical records of the Brazilian NHS. Cox regression determined hazard ratios (HRs) and its 95% confidence intervals (95%CIs). Reference group was lower SB without DM at baseline (health status, sociodemographic and behavioural covariates were potential confounders). **RESULTS:** In overall sample, 276 (28%) had DM, 210 (21.6%) had high SB, and 62 (6.4%) had both DM and high SB at baseline (89 deaths were registered). In the adjusted model, the combination of DM and high SB was associated with greater risk of all-cause mortality (HR: 3.38; 95%CI = 1.86-6.13) compared to those without DM who also did not have high SB at baseline. The presence of DM (HR: 1.33; 95%CI = 0.76-2.34) or high SB alone (HR: 1.16; 95%CI = 0.62-2.17) were not significantly different from referent group. **CONCLUSION:** In this sample, the combination of both DM and high SB (but not DM and SB alone) had more than three times greater risk for all-cause mortality compared to those without DM and high SB. Supported by São Paulo Research Foundation (FAPESP) Grant 2015/17777-3 and 2016/11140-6.

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636   Board #5   May 30 3:15 PM - 5:15 PM

Within-Day Trajectories of Sedentary Time at Work Among Sedentary Office Workers

Kristina Hasanaj[1], Meynard L. Toledo[1], Sarah L. Mullane[1], Miranda L. Larouche[1], Sarah A. Rydell[2], Mark A. Pereira[2], Matthew P. Buman, FACSM[1]. *[1]Arizona State University, Phoenix, AZ. [2]University of Minnesota, Minneapolis, MN.* (Sponsor: Matthew Buman, FACSM)

(No relevant relationships reported)

Office workers can spend 70-80% of their workday sedentary; however, little is known about the trajectory of sedentary time over the course of the workday and if it varies by worker characteristics such as age, gender, job type (executive, professional, or clerical), or weight status.
PURPOSE: To understand within-day trajectories of sedentary time by age, gender, job type, and weight status among sedentary office workers.
METHODS: Participants (N=632, 72% female, 71% white, 45 ± 11 years of age) were recruited from 24 worksites in Phoenix and Minneapolis areas to participate in the 'Stand & Move @ Work' cluster randomized controlled trial to reduce sedentary time and increase light-intensity physical activity in the workplace. Participants wore

an activPAL accelerometer/inclinometer on the thigh continuously across workdays (n = 5.8 ± 1.8 days/person) to assess sedentary time prior to any intervention. Work time was segmented using daily work logs and time of day was temporally aligned based on "work time" (i.e., minutes since starting workday) or "clock time" (i.e., minutes since midnight). Mixed-effects regression models (clustered by time within workdays) were used to account for within person time variations and to examine intercept (i.e., main effects) and time trajectory differences by worker characteristics.
RESULTS: Based on work time (min/hour), there was a small negative trajectory for sedentary time (b [SE] = -0.31 [0.12], p=0.010). Women were less sedentary overall (b [SE] = -2.90 [0.62], p<0.001); however, men had greater decreases in sedentary time over the workday (b [SE] = 0.278 [0.10], p=0.002).
Obese individuals were less sedentary than overweight (b [SE] = 4.90 [0.65], p<0.001) and normal weight (b [SE] = 6.61 [0.63], p<0.001) individuals overall; however, overweight individuals (b [SE] = -0.26 [0.10], p=0.006) had greater decreases in sedentary time over the workday relative to obese (whose sedentary time remained stable). These patterns were similar when time was aligned by clock time.
CONCLUSION: Sedentary time was modestly reduced over the work day. This pattern varied by gender and weight status, but not by age or job type. These findings inform potential tailoring strategies by identifying when and for whom to optimally target interventions to reduce sedentary time in the workplace.

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637   Board #6   May 30 3:15 PM - 5:15 PM
Effect Of A Worksite Sedentary Behavior Intervention On Energy Intake In Adult Men And Women

Junia N. Brito[1], Nathan R. Mitchell[1], Sarah A. Rydell[1], Sarah L. Mullane[2], Meynard L. Toledo[2], Miranda L. Larouche[2], Matthew P. Buman, FACSM[2], Mark A. Pereira[1]. [1]*University of Minnesota, Minneapolis, MN.* [2]*Arizona State University, Phoenix, AZ.* (Sponsor: Matthew Buman, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of this study was to investigate the effects of a worksite sedentary behavior intervention on energy intake and perceived appetite in full-time sedentary office workers over the first three months of intervention.
METHODS: Data were derived from the ongoing study 'Stand & Move at Work', a multi-level group randomized trial aimed at reducing employee sedentary time with a socio-ecological approach. Dietary intake was assessed through the online ASA24 24-hr dietary recall, while self-reported appetite was assessed with an ecological momentary assessment measure. Using baseline and 3-month time-point data, linear mixed models, accounting for clustering of individuals within the 24 worksites, were built for each outcome (self-reported total energy intake, macronutrient and fiber intake, and feelings of hunger). Model covariates included age, BMI, ethnicity, gender, education, and income. **RESULTS:** 641 men and women were available for analyses, with mean age (± se) = 44.5 ± 0.44 yr, and 69% overweight or obese. Worksite-level energy intake decreased over time by 132 kcal/day (95% CI: 8 - 256; p <.05). There was a trend towards decreased feelings of hunger over time (p = 0.20). While macronutrient and fiber intake appeared to decrease over time, no differences were observed in macronutrients or fiber after adjusting for energy intake.
CONCLUSIONS: Self-reported energy intake decreased among sedentary workers participating in the 'Stand & Move at Work' intervention over the first three months. Results from fiber and macronutrients suggest the decreased energy intake was not explained by a change in diet quality. Future analysis will incorporate a relative comparison of the intervention arms to explore any differential effects on energy intake, diet composition, and subjective feelings of hunger.

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638   Board #7   May 30 3:15 PM - 5:15 PM
Cardiometabolic Effects of Interrupting Sitting with Resistance Exercise Breaks

Robert J. Kowalsky[1], John M. Jakicic, FACSM[2], Andrea L. Hergenroeder[2], Renee J. Rogers[2], Bethany Barone Gibbs[2]. [1]*Texas A&M University Kingsville, Kingsville, TX.* [2]*University of Pittsburgh, Pittsburgh, PA.*
(No relevant relationships reported)

Research indicates prolonged occupational sitting may have detrimental effects on cardiometabolic health. This may suggest that interrupting prolonged sitting with physical activity may have an acute beneficial effect on cardiometabolic health. However, it is unclear if brief resistance exercise bouts would result in these acute benefits.
PURPOSE: To examine the acute effect of hourly, brief resistance exercise bouts that disrupt prolonged sitting on cardiometabolic health outcomes over a 4-hour simulated work period.
METHODS: Fourteen adults (age 53.4±9.5 years, BMI 30.9±4.8 kg/m^2) completed two 4-hour simulated work conditions in random order and on separate days: prolonged sitting (SIT) and sitting combined with hourly resistance exercise breaks (REX). Prior to the SIT or REX conditions the participants were fed a standardized breakfast. REX consisted of a brief exercise session (approximately 3 minutes)

performed at 0.5, 1.5, 2.5, and 3.5 hours post-meal. Glucose, triglycerides, and blood pressure were measured at baseline 1, 2, 3, and 4 hours post-meal. Pulse wave velocity (PWV) was measured before and following each condition. Linear mixed models evaluated overall condition effects and differences at each hour that was Boneferroni adjusted for multiple comparisons. Cohen's d estimated the magnitude of effects. **RESULTS:** Average glucose across the simulated workday did not differ by condition (β= -0.35 mmol/L, p=0.278, d=0.51). However, pairwise comparisons demonstrated an attenuation of postprandial glucose at 1 hour (β= -0.69 mmol/L, p=0.004, d=1.02) in REX compared to SIT, but not at the other time points. Blood pressure, triglycerides, and PWV did not differ significantly across conditions (all p ≥ 0.102, d = 0.01 to 0.21) or at any time point. **CONCLUSIONS:** Disrupting sitting with a brief resistance exercise bout performed at 0.5 hours after consuming a meal may have beneficial effects on 1-hour postprandial glucose. However, this initial benefit does not appear to be sustained beyond that time point. Moreover, these findings do not support an acute benefit of brief resistance exercise bouts compared to sitting on other cardiometabolic outcomes. Additional research is needed to assess optimal strategies for disrupting sedentary behavior that may have cardiometabolic benefits.

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639   Board #8   May 30 3:15 PM - 5:15 PM
Association between Weather Condition, Ambient Temperature and Objectively Measured Sedentary Time in Chinese Adults

Xu Wen, Bing Yuan. *Zhejiang University, Hangzhou, China.* (Sponsor: STANLEY SAI-CHUEN HUI, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the association between weather condition, ambient temperature and objectively measured sedentary time in Chinese adults.
METHODS: 3,426 Chinese (2,116 men and 1,310 women) users of a brand of smart bracelet from July to October in 2015 were recruited in this study. With a novel algorithm, the gravity component of the acceleration signal collected by the activity monitor was extracted from the raw data to identify different types of activities and determine sedentary time. Using the information of GPS and time, the data of ambient temperatures and weather condition were collected from the meteorological data released by China Central Meteorological Observatory.
RESULTS: Compared with the days with rain, shower, haze and clouds, Chinese adults spent less time in sedentary behaviors in sunny days. There is no significant difference in sedentary time in rainy days in adults with different weight status. However, obese adults had significant longer sedentary time in non-rainy days than their counterparts with normal weight. Chinese women have shorter daily sedentary time when the mean ambient temperature lower than 20 °C, as compared with 20-24°C, 25-29°C and ≧30°C groups, whereas no difference was found in Chinese men.
CONCLUSIONS: Weather condition and ambient temperature are important factors associated with sedentary behaviors. Sedentary time in Chinese adults is longer in rainy days and high ambient temperature as compared with non-rainy days and cool weather. Long sedentary time especially in non-rainy days could be one of the factors contribute to the development of obesity in Chinese adults.

B-37   Thematic Poster - **Health Technology for Physical Activity: Just Do It!**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100C

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640   **Chair:** John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA.*

(No relevant relationships reported)

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641   Board #1   May 30 3:15 PM - 5:15 PM
Evaluation of Free Exercise Apps and Ability to Promote Physical Activity

Cynthia M. Ferrara, FACSM[1], Christopher Burke[1], Allison Fahey[2]. [1]*Merrimack College, North Andover, MA.* [2]*University of Massachusetts Lowell, Lowell, MA.*
(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate free exercise apps and the potential for promoting physical activity. METHODS: Study investigators identified 153 free exercise apps. Written descriptions posted by the app developers were evaluated by two investigators using enabling and reinforcing components of the Precede-Proceed Health Promotion Model as a guide. Six factors (three enabling and three reinforcing) were evaluated, with one point recorded for each factor included in an app. RESULTS: Enabling scores ranged from 0 to 3. One hundred and thirty-

four (87.6%) apps included videos or pictures, while 123 apps (80.4%) included written instructions on how to perform exercises. Thirty-eight apps (24.8%) included the ability to track daily exercise. Reinforcing scores also ranged from 0 to 3. Fifty-five (36%) apps interfaced with a social networking site, while thirty-three (21.6%) provided feedback and support from a personal trainer. Fifteen (9.8%) included rewards for daily exercise. Total scores ranged from 0 to 5. No apps included all six factors. CONCLUSIONS: The present study suggests that the majority of free exercise apps include videos, pictures, or written instructions on how to exercise. Many free exercise apps do not include basic features that may help to maintain an exercise program, including social support, feedback from a personal trainer, or rewards. Additional research is needed on how exercise apps can be utilized to promote physical activity and what features might be most important for success.

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642   Board #2   May 30 3:15 PM - 5:15 PM

The Feasibility of a Gender- and Culturally-Sensitive Weight Loss Intervention Plus Mobile Health Technology for Hispanic Males

David O. Garcia, PhD[1], Luis A. Valdez, PhD, MPH[1], Benjamin Aceves, MPH[1], David Campas, BS[1], Julio Loya, BSN, RN[2], Melanie Hingle, PhD, RD[1], Kyle Humphrey, MS[1], Melanie L. Bell, PhD[1], Marylyn McEwen, PhD, RN[1], Steven P. Hooker, PhD, FNAK, FACSM[3]. [1]University of Arizona, Tucson, AZ. [2]University of Missouri-Columbia, Columbia, MO. [3]Arizona State University, Tempe, AZ. (Sponsor: Steven Hooker, FACSM)
(No relevant relationships reported)

Background: Hispanic males suffer disproportionate rates of overweight and obesity compared to other racial/ethnic groups. However, few weight loss interventions have been developed for this high-risk group. Further, the use of mobile health (mHealth) technologies to support lifestyle behavior changes in weight loss interventions for Hispanic men are untested. **Purpose:** This pilot study examined the feasibility and acceptability of integrating mHealth technology into a 12-week gender- and culturally-sensitive weight loss intervention (GCSWLI) for sedentary, overweight/obese Hispanic males. **Methods:** Eighteen Hispanic males (age: 38 ± 11 years; BMI: 34 ± 5 kg/m^{2}; 56% Spanish monolingual) received a GCSWLI including weekly in-person individual sessions, a daily calorie goal, and prescription of ≥ 225 minutes of moderate-intensity physical activity/week. mHealth technology support included tailored text messaging and behavior and weight self-monitoring support using the Fitbit Charge 2, a consumer-wearable physical activity tracker, and a Fitbit Aria Wi-Fi Smart Scale. Participants were encouraged to use the Fitbit tracker during all waking hours and weigh themselves daily using the provided scale. Participants received biweekly SMS customized to address self-reported barriers to behavior change and in response to objective data collected via tracking tools. Changes in weight from baseline to 12-weeks were estimated using a paired t-test. Descriptive analyses characterized use of the Fitbit and the smart scale. **Results:** Sixteen of 18 participants completed 12-week assessments; overall attrition rate was 11.1%. Mean weight loss at week 12 was 4.7 kg (95% CI [-7.1, -2.3], p < 0.001). Participants wore the Fitbit 71.6% of intervention days and logged body weight using the smart scale 30.5% of intervention days. Participants identified barriers for use of the technology, including strenuous work activities prohibiting them from wearing the Fitbit. In addition, reliable internet access was cited as a barrier to using the smart scale. **Conclusions:** While significant weight loss was achieved integrating mHealth technology into a GCSWLI, the use of technology was modest. Addressing barriers identified in our work may help to refine an mHealth intervention approach for Hispanic men.

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643   Board #3   May 30 3:15 PM - 5:15 PM

Metabolic Cost and Exercise Intensity during Active Virtual Reality Gaming

Dulce H. Gomez, Nicole Bolter, C. Matthew Lee, James R. Bagley, Marialice Kern, FACSM. *San Francisco State University, San Francisco, CA.* (Sponsor: Marialice Kern, FACSM)
(No relevant relationships reported)

PURPOSE: Sedentary behavior remains a critical health promotion target because it increases risk of morbidity and mortality. Virtual reality (VR) exergaming is a new avenue of physical activity that may be preferred over "traditional exercise" in historically inactive populations. Use of active VR games (AVRGs) could be an effective strategy for meeting the ACSM exercise guidelines. To investigate the efficacy of AVRGs, we assessed the intensity of three games on a VR system by measuring oxygen consumption (VO_2) and rating of perceived exertion (RPE) during gaming sessions. A secondary purpose was to compare the exercise intensities of the three games to current ACSM exercise guidelines using percent oxygen consumption reserve (%VO_2R) and metabolic equivalents (METs). **METHODS**: Forty-one [male (n=21); female (n=20)] healthy volunteers [age: 25.2 ± 4.4y; BMI 24.4 ± 3.7kg/m^{2}] were assessed for body composition, completed a graded exercise test to determine maximal VO_2 and familiarization period 3 VR games (Thrill of the Fight [TOF], Audioshield

[AS], and Holopoint [HP]) during visit one. At least 48-hrs later, VO_2 and RPE were measured during 10-min supine rest and 10-min sessions of each game. Data was analyzed by gender and gaming experience and no statistical difference were found by category. **RESULTS**: Compared to resting values (4.5 ± 0.6ml/kg/min), VO_2 was higher during TOF, AS, and HP (30.5 ± 7.1, 19.1 ± 5.8, and 24.8 ± 6.6ml/kg/min, respectively; $p \leq 0.05$). Using %VO_2R 95% Confidence Interval (95%CI), TOF was classified as vigorous, HP was moderate, and AS was light intensity depending on gaming experience. Using METs (95%CI), TOF was classified as vigorous, HP ranged from moderate to vigorous, and AS was moderate intensity. Using RPE (95%CI), TOF was classified as moderate, whereas HP and AS were light intensity. **CONCLUSIONS**: Our data suggests the three VR games examined can elicit least a moderate exercise intensity based on ACSM guidelines. Participants perceived the physical exertion to be lower during the games than their measured exertion, which might allow participants to continue playing AVRGs for longer durations before feeling fatigued. Data on metabolic cost for movement specific games may aid consumers and health/fitness specialists in developing exercise programs with AVRGs.

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644   Board #4   May 30 3:15 PM - 5:15 PM

Interest in Virtual Reality for Injury Rehabilitation and Performance Enhancement Among Collegiate Soccer Athletes

Leilani Madrigal, Makenna Henry, Alison Ede, Tiffanye Vargas. *California State University Long Beach, Long Beach, CA.* (Sponsor: Diane L. Gill, FACSM)
(No relevant relationships reported)

Interventions using virtual reality (VR) in three or two-dimensional, multi-sensory, synthetic worlds have been used to enhance rehabilitation and performance (e.g., combat PTSD in military personal, increase motor control in stroke-recovery patients). VR also has potential as a method for rehabilitation from sporting injuries. **PURPOSE**: To assess athletes' interest in VR as an intervention to enhance performance and injury rehabilitation, and to identify preferred components within a VR world. We also explored gender influences on these preferences. We focused on one collegiate sport, soccer, at three levels (NCAA, NAIA, Junior College). **METHODS**: Sixty-eight collegiate soccer (25 male; 43 female) athletes completed an electronic survey which included demographics, as well as the virtual reality interest survey created to assess VR use, interest and specific factors athletes may find useful in a VR environment. **RESULTS:** Participants' responses on a 10-point Likert-type scale from not interested (1) to extremely interested (10), indicated strong interest in using VR, both in recovery from injury (M=7.06, SD=2.67), and to improve sport performance (M=7.89, SD=2.59). Additional items asked about interest in specific forms of VR with the same 10-point response scale. Athletes indicated strong interest in viewing sport-specific scenarios (M=7.26, SD= 2.66), sport-specific skills (M=6.89, SD=2.73), and physically touching a soccer ball while submerged in a virtual world (M=6.89, SD=2.83). Other items, such as seeing a crowd in the stands, presence of an avatar coach, or viewing a teammate perform a sport skill unsuccessfully, were rated of less interest. In terms of gender, men were more interested than women in using VR both for injury recovery (Male: M=8.24, SD=2.18; Female: M=6.34, SD=2.70) and to enhance performance (Male: M=9.00, SD=1.84; Female: M=7.21, SD=2.77) **CONCLUSION**: VR interest is high among collegiate soccer athletes, both for injury recovery and performance enhancement. The athletes were particularly interested in a VR environment that incorporates sport-specific scenarios and physically touching a soccer ball. Men had stronger interests in VR, but both men and women athletes at all levels indicated interest in engaging in VR to assist in injury recovery and performance enhancement.

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645   Board #5   May 30 3:15 PM - 5:15 PM

Playing Pokemon Go is Associated with Higher Daily Total Energy Expenditure

Tyler Langford. *Middle Tennessee State University, Murfreesboro, TN.*
(No relevant relationships reported)

PURPOSE: To compare daily energy expenditure (DEE) of Pokémon Go (PoGo) players to non-player counterparts. **METHODS:** Upon arrival, a self-reported PoGo usage questionnaire was used to identify "players" and "non-players". Participants then received a SenseWear Armband (SWA), with clear instruction to wear the device for 7 consecutive days. After 7 days, participants returned the SWA and completed an additional set of questionnaires. Mean differences in DEE between players and non-players were examined using a one-way between groups ANCOVA ($p \leq 0.05$). Control variables included in the ANCOVA were on-body time and body weight. Inclusion criteria for use of data included at least 4 days of wear time, with at least 12 hours of data per day. **RESULTS:** Data for 5 participants were excluded based on the previously mentioned criteria. leaving a final sample of 9 players and 11 non-players. Players demonstrated a significantly greater DEE than non-players when controlling on-body time [F (1, 17) = 5.556, p = 0.031] (Figure 1). There was a significant effect

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on DEE for on-body time [F (1, 17) = 4.892, p = 0.041]. When weight was included in the model, there was a trend towards a significant effect on DEE [F (1, 16) = 4.366, p = 0.053]. However, weight was not used for analysis in the main ANCOVA model as it is outside the significance level. **CONCLUSION:** Pokémon Go players exhibited a significantly greater DEE than their non-player counterparts (Players: 2735 ± 666 kcal vs non-players: 2274 ± 474 kcal, p = 0.031).
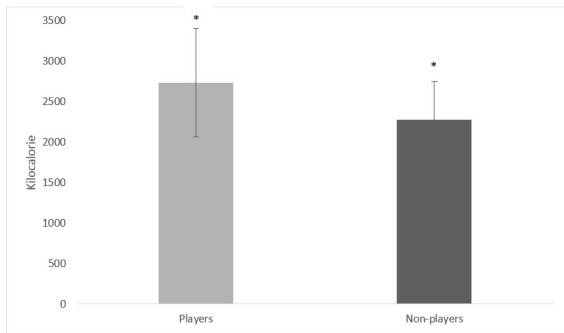
Figure 1. Differences in daily energy expenditure between Players and Non-players. * indicates significant difference (p ≤ 0.05)

Table 1. Demographic data.		
	Players	Non-players
Age (yrs)	27.89 +/- 6.62	25.73 +/- 3.85
Weight (kg)	78.99 +/- 16.00	73.02 +/- 12.35
BMI (Kg/m²)	27.66 +/- 4.20	24.73 +/- 3.69

646   Board #6   May 30 3:15 PM - 5:15 PM
Home-basedexergaming For Preschoolers' Cognition And Health Outcomes: A Randomizedcross-over Study

Zan Gao, FACSM[1], Jung Eun Lee, 55812[2], Zachary Pope, 55455[1], Nan Zeng[1], Xianxiong Li[3], Ying Zhang[4]. *[1]University of Minnesota, Minneapolis, MN. [2]University of Minnesota, Duluth, MN. [3]Hunan Normal University, Changsha, China. [4]Zhejiang Normal University, Hangzhou, China.*
(No relevant relationships reported)

Purpose: The effects of exergaming physical activity (PA) interventions on preschoolers' cognition and health outcomes remain largely unexplored. Therefore, the purpose of this study was to discern the effectiveness of a home-based exergaming intervention on preschoolers' cognition and health outcomes in a randomized cross-over trial.
Methods: Participants were 32 preschoolers (16 girls; 59.4% Asian; M_{age} = 4.72, SD = ± .73) recruited from the Twin Cities area in MN. During baseline testing, preschooler's cognition, cardiovascular fitness, body fat percentage (BFP), and daily energy expenditure (EE) were assessed via validated instruments. Participants were then randomly assigned to 1) an intervention (INT) condition: engaged in home-based LeapTV exergaming at least 30 minutes/session 5 times/week for the first 12 weeks and then resumed their regular PA patterns without exergaming during the second 12 weeks; or 2) a delayed-intervention control (DIC) condition: maintained their regular PA patterns for the first 12 weeks, and participated in the same dose of home-based exergaming during the second 12 weeks. Identical assessments were conducted at the end of the 12th and 24th weeks.
Results: Data were analyzed with PROC GLM in SAS. Results suggested significant interaction effects of treatment by period for cognition, F(1,28) = 2.02, p = 0.04; and BFP, F(1,28) = 16.90, p < 0.01. Significant carry-over (period) effects emerged for fitness, F(1,28) = 15.24, p < 0.01; and EE, F(1,26) = 4.48, p = 0.04. In addition, there was a significant order (sequence) effect for BFP, F(1,28) = 16.90, p < 0.01. No other effects were identified. Detailed descriptive data are shown in table.

	INT group			DIC group		
	0 week	12 week	24 week	0 week	12 week	24 week
Cognition	50.89	59.39	61.65	59	62.36	62
Fitness	10.22	7.56	14.47	10.64	10.57	14.58
BFP	19.20	20.36	19.25	20.12	20.20	19.83
EE	361.70	363.42	340.64	337.69	384.59	392.41

Conclusions: Home-based exergaming may positively impact cognition, fitness, and BPF for some preschoolers, with slight positive effects on EE possible for most preschoolers. Therefore, an exergaming program might be a good option for home-based PA interventions.

647   Board #7   May 30 3:15 PM - 5:15 PM
Effects of Exergaming on College Students' Mood and Energy Expenditure Compared to Traditional Treadmill Exercise

Wenxi Liu[1], Zachary Pope[1], Nan Zeng[1], Jung Eun Lee[2], Zan Gao, FACSM[1]. *[1]University of Minnesota Twin Cities, Minneapolis, MN. [2]University of Minnesota Duluth, Duluth, MN. (Sponsor: Zan Gao, FACSM)*
(No relevant relationships reported)

Purpose: To date, no known research concerning exergaming on young adults' affect is available. Thus, this study examined exergaming's effect on college students' mood and energy expenditure compared with traditional treadmill exercise.
Methods: Sixty college students (30 female; M_{age} = 23.6) participated in three separate 20-minute exercise sessions: 1) Xbox 360 Kinect Reflex Ridge; 2) Xbox 360 Kinect Just Dance; and 3) moderate-intensity treadmill walking (4.0 mph). Mood was assessed via the Brunel Mood Scale (BRUMS)—a 24-item questionnaire containing six subscales: anger, confusion, depression, fatigue, tension, and vigor. Participants completed the questionnaire following each exercise session.
Results: The data indicated participants in treadmill session (M = 174.21) had more energy expenditure (in calories) than Just Dance (M = 91.70) and Reflex Ridge (M = 110.20). Significant differences between the three sessions for mood was only observed for fatigue (F (2, 118) = 12.28, p < 0.01, η_p = 0.172), with post hoc Bonferroni comparisons indicating that participants' perceived fatigue levels were significantly lower during Just Dance compared to Reflex Ridge (p = 0.02) and treadmill walking (p < 0.01). However, Reflex Ridge and treadmill walking were not observed to have significantly different levels of fatigue (p = 0.07). It is also notable that feelings of vigor and depression approached significance (F (2, 118) = 2.694, p = 0.07 and F (2, 118) = 3.18, p = 0.06, respectively), with Reflex Ridge promoting the greatest feelings of vigor and treadmill walking resulting in the greatest feelings of depression.
Conclusion: Findings revealed that even though traditional treadmill exercise performed more energy expenditure, however, exergaming may lead to less perceived fatigue and potentially higher vigor among college students compared to traditional exercise. This finding has important implications as college students may be more likely to participate and maintain in PA when less fatigue is perceived and feelings of vigor upon cessation of gameplay are experienced. Future research should examine other exergames to discern what genre of exergaming is most effective in promoting positive affect among young adults.

648   Board #8   May 30 3:15 PM - 5:15 PM
Effectiveness of Combined Smartwatch and Social Media Intervention on Breast Cancer Survivor Outcomes: Randomized Trial

Zachary Pope, Nan Zeng, Rui Zhang, Hee Y. Lee, Zan Gao, FACSM. *University of Minnesota-Twin Cities, Minneapolis, MN.* (Sponsor: Zan Gao, FACSM)
(No relevant relationships reported)

PURPOSE: Promoting physical activity (PA) among breast cancer survivors (BCS) can improve this population's health and quality of life (QoL). Yet, innovative technology-based PA interventions among BCS remains understudied. This study evaluated the effectiveness of a combined smartwatch and social media PA intervention on BCS's health outcomes.
METHODS: Thirty BCS ($\overline{X}_{age}$ = 52.6 ± 9.3 years; $\overline{X}_{wt}$ = 80.2 ± 19.6 kg) participated in this 10-week, 2-arm randomized trial, with BCS randomized into: 1) intervention group (n = 16): received Polar M400 smartwatch for daily PA tracking and joined a Facebook group where social cognitive theory-related PA tips were provided twice weekly, with a weekly workout program being posted; and 2) comparison group (n = 14): only joined separate, but content-identical Facebook group. Outcomes included PA, physiological, psychosocial, and QoL variables. Specifically, PA and energy expenditure (EE) was assessed by ActiGraph GT3X+ accelerometers, and physiological, psychosocial (e.g., self-efficacy, social support, etc.), and QoL were examined via validated instruments at baseline and post-intervention.
RESULTS: No baseline group differences were observed for any variable. Ten BCS dropped out of the study (intervention = 4; comparison = 6). Compared to completers, dropouts had less private insurance coverage, longer duration since diagnosis, and lower annual income, daily light PA (LPA), moderate-to-vigorous PA (MVPA), EE, and steps. Thus, a per-protocol analysis was performed, revealing significant group differences for changes in social support (t = -2.1, p = 0.05) and barriers (t = -2.2, p = 0.04). Interestingly, the comparison group demonstrated increases for both variables while the intervention group demonstrated slightly decreased social support and no change in barriers. Notably, both groups demonstrated similarly increased daily LPA, MVPA, EE, and steps of 7.7 min, 5.1 min, 25.1 kcals, and 339 steps, respectively, over time.

CONCLUSIONS: Despite extensive user training, several intervention BCS found the Polar M400 difficult to use—possibly decreasing intervention adherence. Future interventions should utilize simpler smartwatches to promote PA among middle-aged clinical/non-clinical populations.

B-38   Thematic Poster - **High Intensity Interval Training**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100H

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649   **Chair:** Tom Hazell. *Wilfrid Laurier University, Waterloo, ON, Canada.*

(No relevant relationships reported)

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650   Board #1   May 30 3:15 PM - 5:15 PM

Blood Lactate Steady state Level Sustained During Rest Time In Moderate Intensity Interval Training

Juan C. Mazza[1], Raúl R. Festa[1], Lisandro Ruffo[1], Patricia Cosolito[1], Sandra L. Prieto[2], Alvaro Gurovich, FACSM[3]. [1]*Biosystem Institute Sports Sciences, Rosario, Argentina.* [2]*Colombia State University, Bogota, Colombia.* [3]*The University of Texas at El Paso, El Paso, TX.*

(No relevant relationships reported)

Blood lactate steady-state level, sustained during rest time, in moderate intensity interval training

Juan C. Mazza[1], Raúl R. Festa[1], Lisandro Ruffo[1], Patricia Cosolito[1], Sandra Prieto[2] and Alvaro Gurovich, FACSM[3]

[1] *Biosystem Institute Sports Sciences, Rosario, Argentina;* [2] *Colombia State University, Bogotá DC, Colombia;* [3] *The University of Texas at El Paso, TX, USA.*

BACKGROUND: Important isotope studies related to lactate metabolism have pointed out that blood lactate level (BLa) is an expression of the balance between Production (RProd), Removal (Rt) and Oxidation (ROx) rates. Also, evidence shows that the relationship between BLa with Rt and ROx rates, is concentration-dependent, close 4 to 7 mmol/l.
PURPOSE: Analyze BLa in the first sec. (BLa-10s) and last sec. (BLa-50s) of 1-min passive rest, during steady-state moderate intensity interval training (IT), considering that BLa is a balance of RProd with Rt and ROx intracellular process. We want to demonstrate that (BLa-10s) and (BLa-50s) levels are similar, so Rt and ROx are maintained, in steady-state conditions, during IT workouts.
METHODS: Ten trained swimmers and eight trained track athletes (19.1±2.6 yr) performed a moderate intensity IT session (BLa: 4 to 7 mmol/l). Swimmer´s protocol was: 10 x 100m, with 60s rest; and Athlete's protocol was: 10 x 400m, with 60s rest. BLa during BLa-10s and BLa-50s were measured with Lactate Plus meter and heart rate (HR) was monitored. Measurements were collected every 2 reps. We compared BLa-10s vs. BLa-50s applying paired t-test with a p<0.05 level, and r between BLa-10s vs. BLa-50s, and BLa-10s vs. HR, in reps. 2-4-6-8 and 10.
RESULTS: We found no significant differences between BLa-10s and BLa-50s. BLa-10s ranged 5.05±1.51 - 6.61±1.10 mmol/l and BLa-50s ranged 5.03±1.80 - 6.71±1.07 mmol/l. Additionally, we found a low r between BLa-10s and HR values (r = -0.06). However, a high r between BLa-10s and BLa50-s values (r = 0.94) was observed.
CONCLUSION: BLa-10s and BLa-50s showed same metabolic steady-state conditions. These results support the evidence that moderate intensity IT produces physiological stress during the whole workout duration (exercise / rest). Also, we determine that HR is not a valid variable to control for physiological demands during IT.
Keyword: Blood Lactate; Endurance Training; Metabolic Stress

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651   Board #2   May 30 3:15 PM - 5:15 PM

Impact Of The Fractioned Distance On Endurance Training In Soccer Players

Raúl R. Festa[1], Juan C. Mazza[1], Lisandro Ruffo[1], Carlos Groppo[1], Patricia Cosolito[1], Alvaro Gurovich, FACSM[2]. [1]*Rosario Central Soccer Athletic Club, Rosario, Argentina.* [2]*The University of Texas at El Paso, El Paso, TX.*

(No relevant relationships reported)

BACKGROUND: The distance covered by outfield players during a soccer match is approximately 11-12 km. However, most of the distance is covered by walking, jogging, or short periods of moderate / high intensity running. Endurance Training (ET) could improve oxidative metabolic profile making players to run these distances more efficiently. However, the training session design might play a role enhancing physiological stress.

PURPOSE: To determine if Endurance Interval Training (EIT) or Endurance Intermittent Training (EIntT) generates more physiological stress to improve the performance of oxidative system in soccer players.
METHODS: Fifteen male soccer players (17.9±0.6 yr) performed 2 sessions of ET with the same absolute volume and intensity but different design, with a 4-day rest period between sessions. Endurance protocols were: a) 8 x 400 m, at 4.5 m/s, with 60s rest between reps. (EIT volume: 3,200 m); b) 8 sets of 6 x 67.5 m (405 m per set), at 4.5 m/s, with 15s:15s work:rest ratio, and 60s rest between sets (EIntT volume: 3,240 m). Blood lactate (La) and heart rate (HR) were collected at the end of repetitions/sets 2-4-6 and 8. We compared La and HR values between EIT and EIntT, applying paired t-test with a p<0.05 level, and Pearson's correlation coefficient (r) between La and HR for each test.
RESULTS: The session average La and HR were different between EIT and EIntT. 4.55±1.46 vs. 1.28±0.41 mmol/l, respectively (p<0.01) and 182±7 vs. 152±10 bpm, respectively (p<0.01). In addition, La and HR at repetitions/sets 2-4-6 and 8 were different between EIT and EIntT: 3.28±0.86 vs. 1.53±0.55; 4.44±0.91 vs. 1.21±0.33; 4.94±1.31 vs. 1.19±0.32; 5.55±1.64 vs.1.18±0.34 mmol/l, p<0.01, respectively. And 179±6 vs. 153±9; 183±6 vs. 152±7; 186±7 vs. 152±9; 184±7 vs. 153±9 bpm, p<0.01, respectively. Additionally, there we found low r between La and HR, in each test (EIT: r= 0.26; EIntT: r= 0.42).
CONCLUSION: The present study showed that EIT is a more metabolic and cardiovascular stressful stimulus than EIntT. Same volume and intensity, but higher fractioned distance might not produce the same physiological adaptations. In addition, the low correlations between La and HR showed that HR might not be a valid and reproducible variable to control metabolic intensity during ET in soccer.
Keyword: Endurance training; Blood Lactate; Soccer.

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652   Board #3   May 30 3:15 PM - 5:15 PM

Effects of Two Types of Exercises on Serum MG53 and Its Relationship with Metabolic Biomarkers

Jing Shao, Naixi Liu, Yingbin Ren, Jinde Fu, Lili Zhou, Baohua Xu, Qi Han, Muqing Yi. *National Research Institute of Sports Medicine, Beijing, China.*

(No relevant relationships reported)

Mitsugumin-53 (MG53), a membrane repair protein, acts as an E3 ligase to induce insulin resistance and metabolic syndrome.**PURPOSE:** To investigate effects of two types of exercises on serum MG53 level, and its relationship with related metabolic biomarkers (testosterone, cortisol, leptin, insulin, glucagon, TG, TC, HDL-C and LDL-C). **METHODS:** Sixteen healthy males (23.1±2.9 yrs, 169.5±6.0 cm in height, 63.2±5.9 kg in weight, 53.2±5.4 ml/min/kg in VO_{2max}) signed the Informed Consent and participated in this study. Subjects performed two trials, high intensity interval exercise (60s*10 with an interval of 4 min, HE) and endurance exercise (65% VO_{2max} for 90 min, EE) with a 3-wk washout before HE. Blood samples were collected at pre-exercise, immediately, 1h, 4h and 24h post-exercise for the measurement of serum MG53 and biomarkers above. **RESULTS:** (1) MG53 significantly elevated immediately post- than pre-exercise in HE, but no statistic difference between HE and EE immediately post-exercise (3.40±2.46 vs. 2.68±2.12 ng/mL, P>0.05). Moreover, serum MG53 showed significant difference among individuals, three ranks of average MG53 can be seen either at pre-exercise (low: 0.58±0.27 ng/mL, n=10; medium: 2.15±1.13 ng/mL, n=12; and high: 4.77±1.34 ng/mL, n=10) or at post-exercise (low: 0.71±0.51 ng/mL, n=40; medium: 2.35±0.90 ng/mL, n=48; and high: 4.95±1.63 ng/mL, n=40). Serum TG, TC, HDL-C and LDL-C demonstrated the maximum immediately post-exercise and then declined in both trails, which is similar to serum MG53 dynamics. (2)MG53 showed a positive correlation with testosterone (r=0.355, P=0.001 in HE; r=0.281, P=0.011 in EE), cortisol (r=0.267, P=0.017 in HE) and TG (r=0.523, P=0.0005 in EE). However, a negative correlation with body mass was seen both in HE and EE (r=-0.459~-0.582, P=0.0000). **CONCLUSION:** High intensity interval exercise, not endurance exercise, induced significantly increased serum MG53. Serum MG53 demonstrated significantly weak positive correlation with some of metabolic biomarkers (testosterone, cortisol, and TG) in HE and/or in EE, a significantly negative correlation with body mass.*Supported by NSFC Grant 31371205 and General Administration of Sport Grant 2011B006

653   Board #4   May 30 3:15 PM - 5:15 PM

Increased Metabolic and Cardiorespiratory Stress with Isoenergetic Long vs. Short-Bout High-Intensity Interval Exercise

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(No relevant relationships reported)

Studies usually compare high-intensity interval exercise (HIIE) protocols of the same exercise bout duration and different exercise-to-interval ratios. Comparisons of HIIE protocols differing in bout duration while having the same exercise-to-interval ratio are missing. **PURPOSE**: To compare the metabolic and cardiorespiratory responses to isoenergetic HIIEs of different bout duration. **METHODS**: Eleven healthy males (age, 28 ± 6 y; height, 1.77 ± 0.07 m; body mass, 70 ± 11 kg; body fat, 9 ± 2 %, all mean $\pm$ SD) performed four trials in random, counterbalanced order, one week apart. Trials included 20 min of cycling with equal mean power output, performed either continuously (CON) or intermittently with 10 s (HIIE10), 30 s (HIIE30), or 60 s (HIIE60) bouts at an intensity corresponding to 100% of VO_2max. Recovery intervals during the HIIE trials were 15, 45 and 90 s, respectively, of cycling at an intensity corresponding to 15% of VO_2max (exercise-to-interval ratio of 1:1.5). Expired air was measured during each trial and venous blood was obtained before, immediately after, and 1 hour post-exercise. Lactate was measured in capillary blood every 5 min during exercise. Results were analyzed using 2-way ANOVA with repeated measures (condition x time) and Tukey's post-hoc test. **RESULTS**: Average VO_2 was similar in the HIIE trials (2.29 ± 0.42, 2.20 ± 0.43, 2.12 ± 0.45 L/min, for HIIE10, HIIE30 and HIIE60, respectively), corresponding to 65-70% of VO_2max. However, respiratory frequency and pulmonary ventilation were significantly higher in HIIE60 compared to HIIE10 and HIIE30 (by 10-19% and 20-23%, respectively, p < 0.01) during the last 10 min of exercise. Blood lactate was higher in HIIE60 compared to HIIE10 and HIIE30 from the 10th min onward (p < 0.01), reaching peak values of 12.5 ± 3.5, 7.2 ± 2.1 and 7.9 ± 2.9 mmol/L, respectively, at the end of exercise. After exercise, white blood cell count (9.7 ± 2.8 x10^9/L), serum urate (0.35 ± 0.10 mmol/L), serum glucose (6.56 ± 1.44 mmol/L), and plasma volume change ($-13.5 \pm 4.4\%$) were greater in HIIE60 compared to all other protocols (p < 0.01). **CONCLUSIONS**: These findings highlight the importance of bout duration in HIIE, since a longer bout resulted in greater cardiorespiratory and metabolic stress compared to shorter bouts despite equal total work, duration, and work-to-rest ratio.

654   Board #5   May 30 3:15 PM - 5:15 PM

High Intensity Functional Training Improves Flexibility in Overweight and Obese Adults

Justin DeBlauw. *Kansas State University, Manhattan, KS.*
(No relevant relationships reported)

HIGH INTENSITY FUNCTIONAL TRAINING IMPROVES FLEXIBILITY IN OVERWEIGHT AND OBESE ADULTS

Justin A. DeBlauw, Pratik M. Patel, Jesse A. Stein, Thomas J. Barstow, FACSM, Craig A. Harms, FACSM, Katie M. Heinrich.
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Sponsor: Craig A. Harms, FACSM

High-intensity functional training (HIFT) has become a popular form of exercise training, however it is unknown how overweight/obese populations may benefit from this type of exercise prescription. **PURPOSE:** To compare the effects of HIFT versus ACSM recommended aerobic and resistance training (A-RT) on physical fitness characteristics in overweight/obese, physically inactive adults. **METHODS:** Twenty-three overweight/obese (BMI 30.3 ± 2.8) and physically inactive (< 30 minutes total activity per week) adults were recruited. Participants were randomized into either 8-weeks of: HIFT (3 d/wk for 60-minute sessions) or A-RT (3 d/wk of aerobic exercise for 50 minutes; 2 d/wk of resistance exercises). Physical fitness was assessed using the Eurofit fitness measures (sit and reach, standing broad jump, vertical jump, 30-seconds of push-ups and sit-ups), 40-meter dash, stork balance test, and peak oxygen consumption (VO_{2peak}) measured using a Modified Balke Protocol. Body composition was determined via dual energy X-ray absorptiometry, with all measures taken at baseline and post-training. Analysis of covariance was used to compare the change in physical fitness between groups while controlling for baseline scores. **RESULTS:** After adjusting for baseline values, there were no significant differences between groups for changes in physical fitness except for flexibility (HIFT = 1.1 ± 2.3cm, A-RT: -0.1 ± 1.1cm, p = 0.05). Additionally, the HIFT group spent 79.3% less time exercising per week than the A-RT group. **CONCLUSION:** Our results indicate that eight weeks of HIFT demonstrate improvements in flexibility in overweight/obese and physically inactive adults. However, longer duration interventions may result in greater

adaptations in physical fitness and health parameters. Future investigations should aim to compare physical fitness adaptations between healthy adults and overweight/obese adults when using a HIFT exercise intervention while monitoring caloric intake.

655   Board #6   May 30 3:15 PM - 5:15 PM

Metabolic Effects of Two Novel High-Intensity Circuit Training Protocols

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(No relevant relationships reported)

ABSTRACT
Circuit weight training (CWT) and high-intensity interval training (HIIT) are two popular exercise formats for stimulating both aerobic and anaerobic benefits in a time efficient manner. While some research has established the benefits of both formats, no research has determined if performing HIIT prior to CWT (HICWT) has a different acute response compared to integrated HIIT with mini-CWT (three-exercise clusters; TRIIT). **PURPOSE**: To examine the physiological effects [energy expenditure (EE), oxygen consumption (VO_2), heart rate (HR), blood lactate (BLa^-), blood pressure (BP), excess post-exercise oxygen consumption (EPOC)] and rating of perceived exertion (RPE) of the sequence order of HIIT with CWT. **METHODS**: Fourteen trained men (25.7 ± 4.4 yr) completed two separate (by ≥ 72 hrs) resistance exercise protocols matched for time and load. Both protocols consisted of six HIIT bouts and three sets of nine exercises (50% one-repetition maximum) in a CWT or mini-CWT format. Oxygen consumption, HR and EE were monitored throughout the protocols, while EPOC, BLa^- (five time points), BP (four time points) and RPE were measured post-exercise. **RESULTS**: Oxygen consumption (1.991 ± 0.224 vs. 1.923 ± 0.225 L/min, $p=.024$), EPOC (62.0 ± 7.8 vs. 57.0 ± 6.2 kcal, $p=.034$) and EE (435 ± 48.8 vs. 420 ± 49.0 kcal, $p=.012$) was significantly higher during the HICWT compared to the TRIIT protocol. BLa^- was significantly higher at all post-exercise time points (immediate post, 5 min, 10 min and 20 min post-exercise) following the HICWT compared to the TRIIT protocol. Mean values for HR and RPE were similar ($p>.05$) for both protocols. **CONCLUSION**: Performing HIIT prior to CWT elicits higher metabolic perturbation compared to the integration of HIIT with mini-circuits. HICWT also required greater energy requirements during and after the protocol compared to TRIIT. However, there may not be a practical difference given the protocols only differed by ~25 kcal.

656   Board #7   May 30 3:15 PM - 5:15 PM

Comparison of Two HIIT Training Formats

Judith A. Ann Juvancic-Heltzel, Mackenzie Conrad, Laura Richardson, Brian Miller. *The University of Akron, Akron, OH.*
(Sponsor: Ronald Otterstetter, FACSM)
(No relevant relationships reported)

High intensity interval training (HIIT) is a safe and effective workout that can be modified to meet all fitness levels. During each session bouts of high intensity exercise are interspersed with active recovery periods. Music has been shown to increase an individual's enjoyment of exercise which may increase adherence. A new HIIT program (SZ) incorporates music with movement using reverse engineered music aligned to match movements. It has been suggested that using music synced with choreographed movement may motivate participants and increase exercise adherence. PURPOSE: To compare HR, RPE, lactate and PACES between two HIIT formats. METHODS: Participants attended two, sixty minute, counterbalanced HIIT sessions – Traditional (T) and SZ. Blood lactate was measured pre and 10 minutes post, while HR and RPE were measured pre, 15, 30, 45 and post session. Physical Activity Enjoyment Scale (PACES) was collected at the end of each session. A 2x2 cross-over design using a repeated measures ANOVA was employed to test for difference by program and pre-post assessment blood lactate, HR, RPE, and PACES with statistical significance set at $p \leq 0.05$. RESULTS: The overall ANOVAs for all factors reached statistical significance (p<0.001). For lactate there was a significant interaction between pre and post assessment by program [$F(1,12) = 6.724$, p<0.001] with SZ having an average adjusted difference of 2.76 ± 3.84mmol/L less compared to T. For HR and RPE, there were no statistically significant differences between SZ and T (p = 0.313 and p = 0.445, respectively). However, there was an overall increase in HR and RPE from pre to post for both programs of 29.18 ± 4.43bpm (p<0.001) and 2.61 ± 0.67 (p = 0.002), respectively. The difference in PACES between programs did not reach statistical significance [$t(13) = 1.097$, p = 0.293] with mean scores of 93.36 ± 16.52 and 87.93 ± 17.47 for SZ and T, respectively. CONCLUSION: Understanding participants perceptions between T and SZ may provide insight for strategies and programming to enhance exercise adherence. The addition of synced music with SZ may motivate participants and promote exercise adherence. Future research on the long term effects of SZ on biometrics is warranted.

B-39   Thematic Poster - **Running Injuries**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100E

657   **Chair:** Allison H. Gruber. *Indiana University Bloomington, Bloomington, IN.*

(No relevant relationships reported)

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658   Board #1   May 30 3:15 PM - 5:15 PM

Peak Braking Force as a Risk Factor for Running-Related Injuries

Christopher Napier[1], Christopher L. MacLean[2], Jack E. Taunton, FACSM[1], Jessica Maurer[2], Michael A. Hunt[1]. *[1]University of British Columbia, Vancouver, BC, Canada. [2]Fortius Institute, Burnaby, BC, Canada.* (Sponsor: Jack Taunton, FACSM)

(No relevant relationships reported)

Kinetic factors have been implicated in the development of several running-related injuries (RRIs). Most research has focused on measures of vertical loading, such as the average vertical loading rate (AVLR), instantaneous vertical loading rate (IVLR), and vertical impact peak (VIP), as they have all been associated with RRI in retrospective analyses. Less studied has been the horizontal braking force exerted on the body during running.
PURPOSE: To prospectively predict the capacity of vertical and horizontal loading variables on RRI risk.
METHODS: 74 healthy female recreational runners ran at their preferred speed on an instrumented treadmill while ground reaction force data and 3D joint kinematics were collected. Main kinetic outcomes were VIP, AVLR, IVLR, active vertical peak, vertical impulse, and peak braking force (PBF). After baseline testing, participants began a 15-week half-marathon training program. Pain and running volume were recorded via a weekly online log. Exposure time (hours of running) was calculated from the start of the training program until onset of injury (INJ) or right-censoring at non-RRI, loss to follow-up, or end of 15-week program (UNINJ). After converting kinetic variables from continuous to ordinal variables based on tertiles, Cox proportional hazard ratios were fit for each kinetic variable independently.
RESULTS: 65 participants were included in the final analysis. 22 were diagnosed with an RRI (mean exposure of 17.46+/-9.81 hours). 33 completed the program without injury (mean exposure of 43.46+/-10.48 hours). PBF was the only kinetic variable significantly associated with increased injury risk when compared to the middle tertile. Participants with a high PBF were injured at 4.87 (95% CI: 1.54-15.44) times the rate of those in the middle tertile of PBF. INJ participants also had a significantly greater (more negative) PBF than UNINJ (-0.27+/-0.04 BW vs. -0.24+/-0.04 BW; p=.002, ES=0.91). Finally, when analysed in a multivariable model, no other kinetic variables made a significant contribution to predicting injury beyond what had already been accounted for by PBF alone.
CONCLUSIONS: Findings from this study suggest PBF is associated with a significant increased risk of RRI in female recreational runners. Future studies should include this variable in their analysis.

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659   Board #2   May 30 3:15 PM - 5:15 PM

A Comparison Of Ground Reaction Forces And Sagittal Plane Ankle Kinematics Between Runners With Achilles Tendinopathy And Healthy Controls

Weijie Fu[1], Julia Reilly[2], Adam Tenforde[2], Steve Jamison[2], Matthew Ruder[2], Irene Davis, FACSM[2]. *[1]Shanghai University of Sport, Shanghai, China. [2]Spaulding National Running Center, Cambridge, MA.* (Sponsor: Irene Davis, FACSM)

(No relevant relationships reported)

Achilles tendinopathy (AT) is one of the most common injuries in distance running with a rate of 8% to 15% of all running injuries and a 52% lifetime incidence in male runners. The biomechanics of running gait associated with AT has not been well-studied.
PURPOSE: To compare the sagittal plane ankle angle kinematics as well as vertical medial, and lateral ground reaction forces and loadrates in runners with and without AT.
METHODS: 22 rearfoot strike (RFS) runners with AT (15M, 7F) and 22 matched healthy RFS runners (CON) ran on an instrumented treadmill, while sagittal plane video and ground reaction force data were collected. Foot angles (FA) and tibia angles (TA) were measured, and ankle dorsiflexion angles (DF) were calculated. Values were determined at the point of footstrike (FS) and peak, with total excursion also being calculated. Additionally, vertical average and instantaneous loadrates (VALR,

VILR) were calculated. Finally, medial and lateral forces (MF, LF) and medio-lateral instantaneous loadrates (MLILR) were extracted. Comparisons between the AT and CON groups were made using independent t-tests ($p < 0.05$).
RESULTS: Overall, there were no differences in FA, TA or DF angle at footstrike or at peak, or in ankle excursions between the AT and CON groups (Table 1). Additionally, no differences were noted in VALR, VILR, MF, LF and MLILR between groups.
CONCLUSION: These preliminary data suggest that runners with AT do not exhibit ground reaction force differences or differences in sagittal plane ankle kinematics compared their healthy counterparts. Future studies need to include other measures such as frontal plane kinematics and ankle joint kinetics, as well as strength and flexibility measures of the ankle.
Table 1. Ankle kinematics and GRF (mean±SD) in runners with AT and CON

	AT	CON	P
Foot angle @ FS (°)	12.0±3.8	11.2±3.9	0.496
Tibia angle @ FS (°)	5.1±2.5	5.1±2.7	0.979
Ankle angle @ FS (°)	6.9±2.2	6.1±2.6	0.286
Pk Ankle angle (°)	25.9±2.1	26.6±2.5	0.314
Ankle excursion (°)	18.9±3.1	20.5±2.8	0.095
VALR (BW/s)	65.6±18.6	61.2±23.7	0.493
VILR (BW/s)	75.1±20.9	70.7±25.7	0.543
VertStiffness (kN/m)	90.4±27.4	82.5±30.4	0.371
Med ILR (BW/s)	12.3±11.3	9.0±5.0	0.221
Lat ILR (BW/s)	12.2±8.3	11.1±7.8	0.638
Pk Med Force (BW)	0.11±0.06	0.12±0.05	0.543
Pk Lat Force (BW)	0.09±0.07	0.07±0.04	0.312

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660   Board #3   May 30 3:15 PM - 5:15 PM

Association Of Isometric Hip And Ankle Strength With Frontal Plane Kinetics In Females During Running

Kathryn Harrison, Bhushan Thakkar, David Pumphrey, Robert Tickes, Gregory Crosswell, D.S. Blaise Williams III, FACSM. *Virginia Commonwealth University, Richmond, VA.* (Sponsor: D.S. Blaise Williams, FACSM)

(No relevant relationships reported)

Frontal plane mechanics have been associated with running-related injuries such as patellofemoral pain. Strengthening and gait retraining programs aimed at reducing hip adduction during running have been shown to be effective at alleviating symptoms, however evidence of their effect on running kinematics is equivocal. It is possible that such programs exert their benefits through altering kinetics rather than kinematics in the frontal plane during running. Further, the contributions of the ankle to frontal plane mechanics have not been well studied. **PURPOSE:** To determine if hip and ankle strength are associated with frontal plane kinetics in female runners.
METHODS: 64 healthy women running at least 16km per week participated in this study. Isometric hip abduction and ankle inversion strength were measured using a handheld dynamometer. 3D gait analysis was conducted as participants ran on an instrumented treadmill at 2.7 m/s. Participants were ranked in order of isometric strength of both the hip and ankle, and divided into tertiles of high, medium and low strength. 2-way MANOVA was used to determine the relationship between strength and peak moment, positive work and negative work in the frontal plane of the hip and the ankle. Tukey post-hoc tests were conducted where applicable (α=0.05).
RESULTS: There was no significant interaction effect, or main effect of hip strength. There was a significant main effect of ankle strength on frontal plane kinetics (p=0.024). Specifically, the strong ankle group compared to the weak ankle group had significantly greater magnitude of peak ankle inversion moment (0.95(0.32) vs 0.68(0.22) Nm/kg, p=0.033), hip abduction moment (-2.78(1.02) vs -1.88(0.24) Nm/kg, p=0.002) and hip frontal plane positive work (0.27(0.19) vs. 0.13(0.03) W/kg, p=0.006).
CONCLUSIONS: Isometric ankle but not hip strength is associated with kinetics in the frontal plane during running in females. Thus ankle strength should not be overlooked in clinical evaluation and treatment of runners.

661   Board #4   May 30 3:15 PM - 5:15 PM

The Role Of Off-axis Force In Running-related Overuse Injury

John J. Davis, IV, Jacob E. Vollmar, Ashley B. Nguyen, Emily G. Wagoner, Naomi E. Frankston, Allison H. Gruber. *Indiana University Bloomington, Bloomington, IN.* (Sponsor: Joe Hamill, FACSM)

(No relevant relationships reported)

Running-related overuse injuries are endemic among active populations. During the stance phase of running, the ground reaction force vector (GRF) and shank are not always aligned. Thus, some portion of the GRF is directed perpendicular to the shank and causes a bending moment, which may be implicated in the etiology of injury. **PURPOSE:** To examine the portion of the GRF that is directed perpendicular to the shank in injured and uninjured runners. **METHODS:** Twenty-seven runners were followed for a minimum of 43 weeks. Fourteen sustained injury. Overground kinetic and kinematic data were collected at 4.0 m/s (normalized to body weight). Using the sagittal plane angle between the shank and the GRF (GRF/SK angle), the sagittal plane GRF was decomposed into two components: one parallel to the shank (on-axis GRF) and one perpendicular to the shank (off-axis GRF). Group differences were assessed with an independent-samples t-test ($\alpha = 0.05$). **RESULTS:** While impact peak was a prominent feature of the on-axis GRF, it was mostly absent in the off-axis GRF. Peak off-axis GRF occurred at midstance for all subjects (Figure 1). Off-axis GRF at impact was similar ($p = 0.52$, Cohen's $d = 0.25$) between injured (0.22 ± 0.13 BW) and uninjured groups (0.20 ± 0.10 BW). Peak off-axis GRF was also similar ($p = 0.11$, $d = 0.63$) between injured (1.24 ± 0.09 BW) and uninjured (1.31 ± 0.13 BW) groups. GRF/SK angle was highly variable (range -25.0° to 25.3°) during initial contact but means were similar between groups (injured $6.08 \pm 13.5°$; uninjured $7.97 \pm 14.4°$; $p = 0.73$, $d = 0.14$). **CONCLUSION:** Concerning running injury, the off-axis GRF may be 1) not a significant contributor to injury, 2) only important when combined with other factors, or 3) related only to specific injuries.
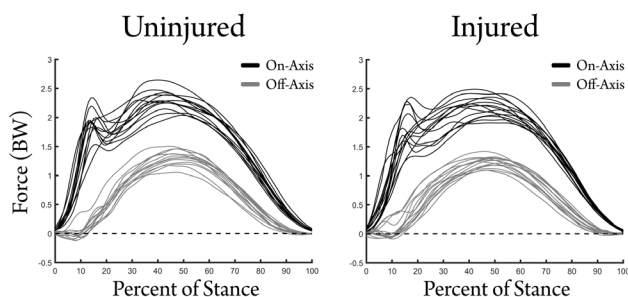
Figure 1. On-axis and off-axis components of GRF relative to the shank during stance in uninjured and injured runners. The impact peak is not a prominent feature of off-axis GRF. Neither off-axis GRF at impact nor peak off-axis GRF differ between groups.

662   Board #5   May 30 3:15 PM - 5:15 PM

Effects Of A 4-week Intervention Using Semi-custom Foot Orthoses On Perceived Pain And Patellofemoral Loading In Targeted Sub-groups Of Recreational Runners.

Jonathan Sinclair. *University of Central Lancahsire, Preston, United Kingdom.*

(No relevant relationships reported)

PURPOSE The current study explored the effects of a 4-week intervention using foot orthoses on pain symptoms, psychological wellbeing and patellofemoral loading in recreational runners. **METHODS** Seventeen (10 males & 7 females) runners were firstly administered 6 clinical assessments, used to separate them into specific subgroups. They were then provided with a pair of semi-custom foot orthoses, which they wore for a period of 4-weeks. Lower extremity kinetics/ kinematics and patellofemoral loading during running at 4.0 m/s were obtained using an eight-camera motion capture system and force platform. In addition, participants self-reported knee pain was examined using the Knee injury and Osteoarthritis Outcome Score-Patellofemoral subscale (KOOS-PF). Data were collected before and after wearing the orthoses for 4-weeks. **RESULTS** The subgrouping revealed that 11 participants belonged to the strong subgroup and 6 to the weak and tight group. Patellofemoral loads were significantly reduced in both genders/subgroups (pre: male/strong=3.35BW, male/weak and tight=3.19BW, female/strong=3.50BW, female/weak and

tight=4.17BW & post: male/strong=3.04BW, male/weak and tight=2.15BW, female/strong=3.17BW, female/weak and tight=3.56BW). Significant improvements were also shown for KOOS-PF in both genders/subgroups (pre: male/strong=62.99, male/weak and tight=53.79, female/strong=65.34, female/weak and tight=52.27 & post: male/strong=71.75, male/weak and tight=74.24, female/strong=71.03, female/weak and tight=71.21), although only improvements in the weak and tight group exceeded the minimum threshold required for clinical relevance. **CONCLUSION** The observations from this study indicate that it may be advisable for male and female recreational runners from the weak and tight subgroup of patellofemoral pain patients, to utilize foot orthoses as a mechanism to reduce their symptoms.

663   Board #6   May 30 3:15 PM - 5:15 PM

Patellofemoral Pain Lead to Greater Joint Motion and Coordination Variability during a Prolonged Run

Jessica A. Mutchler, Klarie Ake, Barry A. Munkasy, Li Li, FACSM. *Georgia Southern University, Statesboro, GA.*

(No relevant relationships reported)

PURPOSE: To examine effects of patellofemoral pain (PFP) on lower extremity kinematics and joint coordination variability during a prolonged run. **METHODS**: Participants included 12 college-aged female runners in two groups: 6 with PFP and 6 healthy (CON), matched by age, height and body mass. Kinematic data was captured at sampling of 100Hz. Sixteen anatomical retroreflective markers, 7 tracking clusters, were placed on the participants' lower extremities for the static trial. Only the clusters remained for the running trial. Participants ran at a self-selected pace on a treadmill until they met exertion or pain criteria. Data for 20 steps from 3 time points (beginning, middle, and end) of the run were processed. Kinematic variability was assessed for each participant by calculating the standard deviation (SD) of peak knee flexion, internal rotation, and adduction angle and their velocities over 20 steps captured at the 3 time points. Continuous relative phase (CRP) mean values were calculated from normalized phase plots for coordination relationships between knee horizontal plane motion and hip sagittal, frontal, horizontal and ankle frontal plane motion. Coordination variability was calculated as the CRP coupling SD over 100% of stance for each time point for each participant. Statistical comparisons were assessed through a 2 (PFP vs CON) x 3 (beginning, middle, and end) repeated measures ANOVA. **RESULTS**: There was an increase in variability for peak knee adduction angle (PFP: 0.6, 0.6, 0.14; CON: 0.5, 0.9, 0.6, group X time interaction: p <.05), peak knee adduction velocity (PFP: 13.1, 14.7, 30.7; CON: 20.4, 13.1, 15.6, group X time interaction: p <.05), hip flexion / knee rotation CRP (PFP: 73.2, 56.7, 125.5; CON: 70.2, 70.0, 57.3, group X time interaction: p <.05), and knee rotation / rearfoot eversion CRP (PFP: 35.4, 47.2, 90.5; CON: 30.7, 27.6, 25.1, group X time interaction: p <.05) over time for the PFP group compared with healthy. **CONCLUSIONS**: The increase in joint kinematics and coordination variability over time observed only in the PFP group may indicate that pain and exertion experienced by the PFP group may decrease movement control towards the end of a prolonged run.

664   Board #7   May 30 3:15 PM - 5:15 PM

The Effect of Base of Gait on Hip and Pelvis Frontal Plane Motion in Collegiate Cross Country Runners

Christa Wille. *University of Wisconsin-Madison, Madison, WI.*

(No relevant relationships reported)

Increased hip adduction and contralateral pelvic drop have been correlated with several running related injuries including iliotibial band syndrome, patellofemoral pain, and tibial stress injuries. A narrow base of gait (BOG), defined as the mediolateral distance between the foot and the body's line of gravity has been suggested as a contributing factor to these increased frontal plane motions of the hip and pelvis. Despite limited investigation into this relationship, narrow BOG is routinely considered an injury risk factor in clinical practice when evaluating running mechanics.
Purpose: To identify the influence of BOG on peak hip adduction and peak contralateral pelvic drop in healthy, collegiate cross country runners at a range of speeds.
Methods: Whole body kinematics were recorded for 56 healthy runners (30 females) at 2.68, 3.35, and 4.47 m/s. The amount of variance in peak hip adduction and contralateral pelvic drop during stance explained by BOG was reported as the adjusted R^2 value using a linear regression model with significance at 0.05. Data across all speeds were included in the model with speed defined as a covariate to ensure validity. Sex was also included as a covariate due to its known effects on running mechanics.
Results: The final model used to predict peak hip adduction angle demonstrated an R^2 of 0.404 (p <0.001) with coefficients as follows: BOG at midstance (B = -0.491, p <0.001), sex (B = -1.69, p <0.001), speed (B = 0.7, p <0.001), and intercept (B = 12.240, p <0.001). This indicates a negative association between BOG and hip adduction, with a decrease in BOG demonstrating an increased hip adduction angle. An R^2 of 0.013 (p = 0.265) resulted from the model used to predict peak pelvic lateral drop with coefficients for BOG at midstance (B = 0.082, p = 0.436), sex (B = -0.242, p = 0.45), speed (B = -0.11, p =0.29), and intercept (B = -5.071, p <0.001).

Conclusion: When controlling for sex and running speed, BOG accounts for 40% of the variance in peak hip adduction, while only predicting <1% of the variance in contralateral peak pelvic drop. The increased peak hip adduction that accompanied a more narrow BOG is likely due to femoral adduction, as contralateral pelvic drop was minimally affected by BOG.

B-40   Thematic Poster - **Vascular Function**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100F

665   Chair: R Matthew Brothers. *University of Texas at Austin, Austin, TX.*

(No relevant relationships reported)

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666   Board #1   May 30 3:15 PM - 5:15 PM

Physical Activity Modulates Blood Pressure Regulation During Controlled Low and High Salt Diets

Austin T. Robinson[1], Kamila U. Migdal[1], Matthew C. Babcock[1], Joseph C. Watso[1], Megan M. Wenner[1], Sean D. Stocker[2], William B. Farquhar, FACSM[1]. [1]*University of Delaware, Newark, DE.* [2]*University of Pittsburgh, Pittsburgh, PA.* (Sponsor: William B Farquhar, FACSM)

(No relevant relationships reported)

Purpose: Increased blood pressure (BP) reactivity and variability are predictive of future cardiovascular events. Excess dietary salt exaggerates neurally-mediated BP reactivity, and BP variability in salt-resistant rodents. Regular physical activity (PA) blunts BP reactivity in rodents. However, the interaction of salt and PA on neurovascular regulation has not been investigated in humans. Therefore, we sought to test the hypothesis that high habitual PA mitigates high dietary salt-induced increases in BP reactivity and BP variability in healthy, young adults. **Methods:** Nine participants (5F/4M, 27±2 yrs, BMI: 23.3±0.9 kg/m²) completed randomized, controlled 10-day diets of low (2.6 g/day), and high (18 g/day) salt. Beat-to-beat laboratory BP was measured via photoplethysmography on day 10 of each diet. BP reactivity was assessed as ΔBP (mmHg) during the final minute of a 2-min hand grip exercise at 40% maximal voluntary contraction compared to a preceding baseline. Average real variability (ARV) index was used to assess BP variability derived from 24-hour ambulatory BP monitoring. Habitual PA was assessed via accelerometry (Actigraph GT3X). Differences in high vs. low salt BP reactivity (ΔBP reactivity) and ambulatory BP variability (ΔBP ARV) were correlated against PA. Twenty four-hour urinary sodium excretion was measured. **Results:** There were no differences in 24-hr mean arterial BP on the high vs. low salt diet (82.9±2.1 vs. 79.8±2.4 mmHg; $p > 0.10$). Urinary Na+ excretion increased on the high vs. low salt diet (256.9±20.5 vs. 39.5±11.2 mmol/24 hours; $p < 0.05$). There was a trend for the high salt diet to augment systolic ($p = 0.08$), but not diastolic BP reactivity during hand grip exercise. Habitual PA was inversely correlated to Δ systolic BP reactivity (r = -0.74, $p = 0.03$), and there was a trend for an inverse correlation with Δ diastolic BP reactivity (r = -0.68, $p = 0.06$) during hand grip exercise. There was a trend for higher 24-hr systolic BP ARV on the high salt diet (10.6±0.8 vs. 8.9±0.6 mmHg; p = 0.09), but there was no correlation between PA with Δ systolic BP ARV (r = -0.29, $p = 0.48$) on the high vs. low salt diet. **Conclusion:** These preliminary data suggest that high habitual physical activity may offset some of the adverse neurovascular effects of high dietary salt in young, healthy, salt-resistant humans.

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667   Board #2   May 30 3:15 PM - 5:15 PM

Particulate Matter Air Pollution and Vascular Function in Older Adults: A Natural Experiment

Jayson R. Gifford[1], Tyler Mangum[2], Joshua Weavil[2], Ashley Nelson[2], Joshua F. Lee[2], H. Jon Groot[2], Ryan Broxterman[2], Matthew Rossman[3], Russell Richardson[2]. [1]*Brigham Young University, Provo, UT.* [2]*University of Utah, Salt Lake City, UT.* [3]*University of Colorado: Boulder, Boulder, CO.*

(No relevant relationships reported)

PURPOSE: The risk of cardiovascular complications in the elderly increases with acute elevations in ambient, fine particulate matter air pollution ($PM_{2.5}$), and may be related to pollution-induced vascular dysfunction. Therefore, the purpose of this study was to utilize the large, episodic swings in ambient $PM_{2.5}$, typical of the Wasatch Front in Utah, as a natural experiment to determine the extent to which acute exposure to ambient $PM_{2.5}$ affects vascular function in healthy, older adults.
METHODS: Vascular function (flow-mediated dilation, FMD; passive-leg-movement-induced hyperemia, PLM), and pulmonary function were measured in 10 old subjects (70.5±2.3 years) during acute episodes of >120 hours of low (3.4±0.8 µg/m³) and

24-96 hours of high (50.0±1.2 µg/m³), naturally-occurring ambient $PM_{2.5}$ (Figures A and B). Markers of systemic inflammation were also assessed in venous blood during each visit.
RESULTS: Notably, high ambient $PM_{2.5}$ exposure was associated with a 34% reduction in vascular function assessed by FMD (Low $PM_{2.5}$: 8.9±1.0%; High $PM_{2.5}$: 5.9±1.0%; $P<0.05$; Figure C), and a 78% reduction in vascular function assessed by PLM (area under the curve: Low $PM_{2.5}$: 145±38 ml, High $PM_{2.5}$: 31±25 ml; $P<0.05$, Figure D). Additionally, acute exposure to high ambient $PM_{2.5}$ was accompanied by an increase in markers of systemic inflammation (*e.g.* Plasma C-Reactive Protein, Low $PM_{2.5}$: 872±143 ml, High $PM_{2.5}$: 1365±220 ng/ml; $P<0.05$), which may contribute to the decrease in vascular function. Interestingly, natural exposure to high levels of $PM_{2.5}$ did not significantly affect pulmonary function (FEV_1/FVC: Low $PM_{2.5}$: 74±2%; High $PM_{2.5}$: 72±2%; $P>0.05$).
CONCLUSIONS: Despite a lack of detectable changes in pulmonary function, acute, natural exposure to elevated ambient $PM_{2.5}$ results in markedly impaired vascular function in older adults, possibly a consequence of pollution-induced systemic inflammation.

* Significantly different from Low PM 2.5 (P<0.05)
# Significant main effect (P<0.05)

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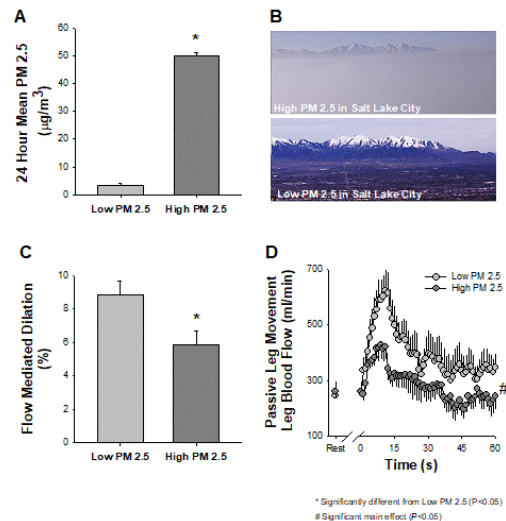
668   Board #3   May 30 3:15 PM - 5:15 PM

Skeletal Muscle Microvascular Permeability After Eccentric Contraction-Induced Muscle Injury: Novel In Vivo Imaging Using Two-Photon Laser Scanning Microscopy

Kazuki Hotta[1], Brad J. Behnke[2], Kazuto Masamoto[1], Rie Shimotsu[1], David C. Poole, FACSM[2], Yutaka Kano[1]. [1]*University of Electro-Communications, Tokyo, Japan.* [2]*Kansas State University College of Human Ecology, Manhattan, KS.* (Sponsor: David C. Poole, FACSM)

(No relevant relationships reported)

Within injured skeletal muscle the capillary bed plays a crucial role in leukocyte invasion through modulations of the endothelial integrity, associated with increased permeability. However, direct observation of altered microvascular permeability and compromised capillary integrity has not been technically feasible. Two-photon laser scanning microscopy (TPLSM) allows three-dimensional *in vivo* imaging that, given the depth of penetration and high resolution of TPLSM, will facilitate measurement of microvascular leakage. **PURPOSE:** We hypothesized that the regulation of capillary permeability *in vivo*, as assessed by real-time TPLSM, is temporally related to acute inflammatory and regenerative processes following muscle injury. **METHODS:** Tibialis anterior muscles of anesthetized male Wistar rats (n=57) were subjected to eccentric contractions (ECC) via electrical stimulation. The skeletal muscle microcirculation was imaged by an intravenously infused fluorescent dye (rhodamine b isothiocyanate dextran, molecular weight 70,000 Daltons) to assess microvascular permeability via TPLSM 1, 3 and 7 days after ECC. Immunohistochemistry on serial muscle sections was performed to determine the percentage of VEGF-A positive muscle fibers in the damaged muscle. **RESULTS:** Compared with non-ECC control, the volumetrically-determined interstitial leakage of fluorescent dye had increased significantly on days 1 and 3 post-ECC (5.1±1.4, 5.3±1.2 vs. 0.51±0.14 µm³x10⁶, $P<0.05$ respectively days 1 and 3 vs. control). However, by post-ECC day 7 interstitial leakage had returned to control values. Damaged muscle fibers were evident on days 1 and 3 (% damaged muscle fiber: 11.7±4.7, 48.4±12.4% vs. 0% $P<0.05$ respectively days 1 and 3 vs. control). Percentage of VEGF-A positive muscle fiber in damaged muscle fiber was significantly higher on days 1 and 3 compared to control (24.9±9.8, 39.3±16.7 vs. 0%, $P<0.05$ respectively days 1 and 3 vs. control). Regenerated

skeletal muscle fibers were found only at 7 days post-ECC. **CONCLUSION:** *In vivo* TPLSM imaging represents a powerful investigative technique for skeletal muscle microcirculatory research. Microvascular hyperpermeability is associated with ECC-induced muscle damage and increased VEGF expression.

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669   Board #4   May 30 3:15 PM - 5:15 PM

Acute Ultraviolet Radiation Exposure Attenuates Nitric Oxide-Mediated Vasodilation in the Cutaneous Microvasculature

S. Tony Wolf, Anna E. Stanhewicz, Tyler B. Garner, Nina G. Jablonski, W. Larry Kenney, FACSM. *Pennsylvania State University, University Park, PA.* (Sponsor: W. Larry Kenney, FACSM)
(No relevant relationships reported)

The bioactive metabolite of folate, 5-methyltetrahydrofolate (5-MTHF), is degraded by ultraviolet radiation (UVR) *in vitro,* and UVR exposure to the skin may deplete bioavailable 5-MTHF in the exposed area. Adequate 5-MTHF is essential for full expression of nitric oxide (NO)-mediated vasodilation of the cutaneous microvasculature through its indirect role in enzymatic coupling of nitric oxide synthase (NOS). **Purpose:** To determine the acute effects of UVR exposure on NO-mediated vasodilation in the cutaneous microvasculature and the role of 5-MTHF on this response. We hypothesized that acute UVR exposure would attenuate NO-dependent vasodilation and that local delivery of 5-MTHF would augment NO-dependent vasodilation after UVR exposure. **Methods:** Two microdialysis fibers were placed in the ventral skin of both forearms in 11 healthy young adults (23 ± 4 y; 5M/6F) for local delivery of lactated Ringers (control) or 5 mM 5-MTHF. One arm was randomly chosen for exposure to 300 mJ/cm^2 UVR while the other served as a non-exposed control (CON). Red cell flux was measured at each site by laser-Doppler flowmetry (LDF). Following a baseline period, a standardized local heating ($42°C$) protocol was used to induce cutaneous vasodilation. Once a stable skin blood flow plateau was achieved, 15mM NG-nitro-L-arginine methyl ester (L-NAME) was perfused at all sites to inhibit NOS. Cutaneous vascular conductance was calculated (CVC = LDF/MAP) and expressed for each phase of the local heating response (initial peak, plateau, NO-mediated vasodilation) as a percentage of maximum (%CVC$_{max}$; 28mM sodium nitroprusside + $43°C$). **Results:** No differences were seen for %CVC$_{max}$ between UVR and CON for the initial peak ($p\geq0.51$) or heating plateau ($p\geq0.58$) across microdialysis sites. UVR exposure blunted NO-mediated dilation in the UVR exposed arm compared to CON (16.4 ± 12.1 vs $33.4\pm17.9\%$; $p=0.02$). Local delivery of 5-MTHF augmented NO-mediated vasodilation compared to the control site in the UVR exposed arm (36.4 ± 19.9 vs $16.4\pm12.1\%$; $p=0.005$). **Conclusion:** NO-mediated vasodilation is attenuated after acute UVR exposure, but is restored with local delivery of 5-MTHF. Acute UVR exposure may impair NO-mediated vasodilation through photodegradation of 5-MTHF.

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670   Board #5   May 30 3:15 PM - 5:15 PM

No Sex Differences in Arterial Stiffness and Hemodynamics Response to Resistance Exercise in Older Individuals

Georgios Grigoriadis[1], Alexander J. Rosenberg[1], Sang Ouk Wee[2], Elizabeth C. Schroeder[1], Garett Griffith[1], Bo Fernhall, FACSM[1], Tracy Baynard, FACSM[1]. *[1]University of Illinois at Chicago, Chicago, IL. [2]California State University, San Bernardino, CA.*
(No relevant relationships reported)

Arterial stiffness (AS) contributes to high blood pressure and cardiovascular disease in both men and women. However, sex differences do exist in the incidences rates of stroke with aging, with older women having a greater risk. These sex differences in older individuals have not been fully explained and an acute hypertensive stimulus (e.g. resistance exercise (RE)) may provide a viable physiological stressor to elucidate potential differences. **PURPOSE:** To determine if sex differences exist for arterial stiffness following acute RE among older individuals. **METHODS:** Ten males (61 ± 6 yrs; 30.9 ± 4.4 kg/m^2) and 15 females (59 ± 6 yrs; 29.5 ± 6.3 kg/m^2) completed 3 sets of 10 reps of maximal isokinetic knee extension and flexion on a force dynamometer. Central AS was evaluated by pulse wave velocity (PWV), obtained from an automated ambulatory BP monitor at baseline, immediate and 30 min post-RE. Hemodynamic variables (cardiac output (Q), cardiac index (Qi), heart rate (HR), stroke volume (SV), mean arterial BP (MAP)), were also acquired from the brachial oscillometric BP waveforms. Local AS was determined by carotid measurements (β-stiffness index, pressure-strain elasticity modulus (Ep) and arterial compliance (AC)) using ultrasonography. **RESULTS:** See Table 1. PWV, Q, HR and MAP increased immediate post-RE similarly in both groups ($p<0.05$). However, females had an overall lower AC and Q compared to older males ($p<0.05$). **CONCLUSION:** No sex differences were observed in arterial stiffness following acute RE. Thus, the AS response to an acute RE bout did not provide insight regarding contributing factors as to why women are at a greater risk of cerebrovascular events.

	Group	Baseline	Immediate	30-min
PWV (m/s)*	Male	8.8 ± 0.9	9.6 ± 1.0	8.9 ± 0.8
	Female	8.5 ± 1.1	9.2 ± 1.1	8.5 ± 1.2
β-stiffness index	Male	10.9 ± 2.9	10.1 ± 2.6	11.2 ± 3.4
	Female	12.6 ± 2.5	12.1 ± 3.5	12.3 ± 2.1
Ep (kPa)	Male	141 ± 32	136 ± 33	147 ± 34
	Female	170 ± 42	168 ± 60	170 ± 30
AC (mm²/kPa)#	Male	0.63 ± 0.15	0.68 ± 0.19	0.60 ± 0.12
	Female	0.47 ± 0.09	0.51 ± 0.18	0.47 ± 0.10
Q (L/min)*#	Male	4.9 ± 0.8	5.9 ± 1.5	5.1 ± 0.6
	Female	4.5 ± 0.4	4.9 ± 0.8	4.7 ± 0.5
Qi (L·min⁻¹·m⁻²)*	Female	2.3 ± 0.4	2.8 ± 0.7	2.4 ± 0.3
	Male	2.5 ± 0.3	2.7 ± 0.4	2.6 ± 0.3
SV (mL)	Male	76 ± 15	82 ± 17	75 ± 10
	Female	74 ± 9	71 ± 10	73 ± 10
HR (bpm)*	Male	65 ± 10	75 ± 12	70 ± 11
	Female	61 ± 8	72 ± 7	65 ± 8
MAP(mmHg)*	Male	107 ± 6	120 ± 10	109 ± 7
	Female	103 ± 10	116 ± 10	106 ± 10

Table 1. All data are mean ± SD, *Time Effect , #Group Effect, *p<0.05*

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671   Board #6   May 30 3:15 PM - 5:15 PM

Moderate-to-Severe Sleep Apnea and Total Body Fat are Inversely Associated with Vascular Function Changes Following Exercise Training

Devon A. Dobrosielski[1], Christopher Papandreou[2], Susheel Patil[3], Hyunjeong Park[1]. *[1]Towson University, Towson, MD. [2]Rovira i Virgili University, Reus, Spain. [3]Johns Hopkins School of Medicine, Baltimore, MD.*
(No relevant relationships reported)

Obstructive sleep apnea (OSA) is associated with increased cardiovascular morbidity in middle-aged men due, in part, to impaired vascular function. Exercise confers cardioprotection by improving vascular health. Whether this beneficial effect is attenuated in the presence OSA is not known. **PURPOSE:** Examine the joint association of OSA severity and total body fat % with brachial artery flow mediated dilation (BAFMD) changes following exercise training in overweight men with and without OSA. **METHODS:** At baseline, all participants underwent overnight polysomnography to determine the presence of OSA, as defined by the apnea-hypopnea index (AHI). Total body fat was measured using dual energy X-ray absorptiometry. BAFMD was assessed using high- resolution ultrasonography before and upon completion of a 6-week (3 sessions/week; 1 hour/session) exercise training program. **RESULTS:** Five men with moderate to severe OSA (+OSA) and five men with no to mild OSA (*OSA) completed the study. Per study design, the AHI of the +OSA group was higher compared to the *OSA group (34 ± 12 events/hour vs. 8 ± 5 events/hour, p=0.009). While no baseline differences were observed between the groups in age (49 ± 6 years vs. 46 ± 9 years, p=0.528) or BMI (36.1 ± 6.2 kg/m^2 vs. 32.6 ± 3.8 kg/m^2, p=0.250), total body fat % was higher in the +OSA group (41 ± 3 % vs. 36 ± 3 %, p=0.009). Stepwise regression analysis revealed that an AHI above 15 events/hour and total body fat % above the median (joint category) [beta coefficient = -2.89, (95% CI -3.59 - -0.71), p=0.040] were significant and independent determinants of the change in BAFMD with exercise, after adjusting for baseline BAFMD, age and BMI. **CONCLUSION:** A combination of moderate-to-severe OSA and high total body fat % was inversely associated with the level of improvement in vascular function following exercise training.

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672   Board #7   May 30 3:15 PM - 5:15 PM

Acute Influence of Caffeine on Arterial Stiffness and Central Blood Pressures Following Aerobic Exercise

Nicholas A. Carlini, Allison H. Steinbeck, Brittany Smith, Brandon Kistler, Bradley S. Fleenor, Matthew P. Harber, FACSM. *Ball State University, Muncie, IN.*
(No relevant relationships reported)

Caffeine ingestion alters blood pressure (BP), however, the interactive effect of caffeine and exercise on central BP is unknown. **PURPOSE:** Examine the acute influence of caffeine and moderate-intensity aerobic exercise on post-exercise

central BP and arterial stiffness. **METHODS:** Ten males (aged 55±5; range 31-71 years) completed two exercise trials after ingestion of caffeine (400 mg) or placebo. Peripheral (brachial) and central (aortic) BP were assessed via pulse wave analysis (PWA) and arterial stiffness via pulse wave velocity (PWV) obtained before and 30 min post-ingestion. Participants performed 40-min of cycling at 70% of HRmax using identical workloads between trials. PWA and PWV were collected again 10 and 30 min post-exercise. Data were analyzed via two-way ANOVA with repeated measures. **RESULTS:** Prior to exercise, compared to placebo, caffeine increased (P<0.05) brachial systolic blood pressure (bSBP) (+12mmHg), brachial diastolic blood pressure (bDBP) (+8mmHg), central systolic blood pressure (cSBP) (+11mmHg) and central diastolic blood pressure (cDBP) (+7mmHg). PWV was higher (0.75 vs. 0.22m/s) 30 minutes post caffeine ingestion, independent of trial (P<0.05) while there was a trend for an interaction (P=0.074), suggesting an increase in PWV with caffeine. Post-exercise, bSBP (-4.8 vs. -6.1mmHg) and PWV (-0.40 vs. -0.74m/s) were higher in caffeine (P<0.05), likely due to the influence of caffeine prior to exercise. cSBP (-5 vs. -6mmHg) and bDBP (-3.5 vs. -1.8mmHg) were lower after exercise, independent of trial (P<0.05) while bSBP (-4.8 vs. -6.1mmHg) and cDBP (-3.1 vs. -1.5mmHg) trended (P=0.07) to be lower after exercise, independent of trial. PWV (-0.11 vs. -0.06m/s) remained higher (P<0.05) after exercise in caffeine compared to placebo but was not influenced by exercise. Accordingly, AP (-2.7 vs. -1.1mmHg) and AIx (-5.5 vs. -1.2%) were lower (P<0.05) after exercise in placebo only. **CONCLUSION**: These findings suggest that the stimulatory effects of caffeine ingestion elevates central hemodynamics and arterial stiffness, which persists even after exercise, exerting a greater afterload on the heart.

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673   Board #8   May 30 3:15 PM - 5:15 PM
Altered Vascular Function in Chronic Kidney Disease: Evidence from Passive Leg Movement

Elissa K. Katulka, Alexandra E. Hirt, Danielle L. Kirkman, David G. Edwards, Melissa A.H. Witman. *University of Delaware, Newark, DE.*
(No relevant relationships reported)

Chronic kidney disease (CKD) is an independent risk factor for the development of cardiovascular disease, with both diseases characterized by reduced nitric oxide (NO) bioavailability and vascular dysfunction. Passive leg movement (PLM) has previously been shown to produce NO-mediated hyperemia in the lower extremity, however this technique has not yet been utilized to assess vascular function in patients with CKD. **PURPOSE:** To assess vascular function in patients with CKD using PLM, in addition to the traditional flow-mediated dilation (FMD) technique. **METHODS:** Assessment of vascular function via PLM and FMD was performed on 12 patients (CKD, 67±3 yrs) and 12 healthy controls (CON, 59±2 yrs). Hemodynamics and artery diameters during PLM and FMD were measured utilizing ultrasound Doppler of the femoral and brachial arteries, respectively. **RESULTS:** Patients with CKD had reduced peak leg blood flow (LBF) (CKD, 384±39 vs. CON, 626±93 mL/min, p<0.05) and a reduced change in LBF from baseline to peak (ΔpeakLBF) (CKD, 153±27 vs. CON, 274±41 mL/min, p<0.05) during PLM compared to CON. Additionally, ΔpeakLBF was significantly correlated with kidney function as assessed by estimated glomerular filtration rate for all participants (r=0.53, p<0.05). As anticipated, FMD was also significantly attenuated in CKD patients compared to CON. **CONCLUSION:** Vascular function as assessed by PLM and FMD is attenuated in patients with CKD compared to controls, supporting a reduction in NO bioavailability in this chronic disease state. Additionally, PLM appears to be a novel and feasible approach to assess NO-mediated vascular function in CKD and is associated with kidney function.

B-41   Free Communication/Slide - Body Composition

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100D

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674   Chair: Cheryl A. Howe, FACSM. *Ohio University, Athens, OH.*

(No relevant relationships reported)

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675   May 30 3:15 PM - 3:30 PM
Influence of Multiple Indices of Body Composition on Cardiometabolic Risk Factors in Adults

Lyndsey M. Hornbuckle[1], Robert Buresh, FACSM[2], Yuri Feito, FACSM[2], Cassie Williamson[2], Brian Kliszczewicz[2], Ayles Herrington[2], Corrine Ellis[3], Leah Tsui[3], Anna Schlupp[3], Kelsey Shepard[3], Stella Volpe, FACSM[3]. *[1]University of Tennessee, Knoxville, Knoxville, TN. [2]Kennesaw State University, Kennesaw, GA. [3]Drexel University, Philadelphia, PA.*
(No relevant relationships reported)

Body composition is an established predictor of cardiometabolic risk. Novel body composition variables may also predict risk and therefore, warrant further examination. **PURPOSE:** To assess the influence of fat to muscle ratio (FMR), percent body fat (%BF), and body mass index (BMI) on cardiometabolic risk factors in healthy adults. **METHODS:** Data were analyzed from 78 women (29.9 ± 13.5 years) and 45 men (25.0 ± 8.5 years). Height, weight, %BF (via dual-energy X-ray absorptiometry), resting blood pressure, and resting heart rate (RHR) were measured. BMI and mean arterial pressure (MAP) were calculated. Fasting total cholesterol (TC), high-density lipoprotein cholesterol (HDL), TC:HDL ratio, low-density lipoprotein cholesterol (LDL), triglycerides (TG), glycosylated hemoglobin (A1c), glucose (GLU), and insulin (INS) were measured. A 2-hour oral glucose tolerance test was conducted, from which 2-hour glucose (2HR-GLU) and 2-hour insulin (2HR-INS) were measured. Insulin sensitivity index (ISI) and homeostasis model assessment for insulin resistance (HOMA) were calculated. The influence of FMR [visceral fat area (cc) · fat free mass (kg)$^{-1}$], BMI (kg · m^{-2}), and %BF on markers of cardiometabolic risk was determined. **RESULTS:** Regression analysis showed that FMR was the strongest predictor of MAP, TC, TC:HDL ratio, LDL, TG, GLU, INS, and HOMA. %BF was the strongest predictor of RHR, 2HR-GLU, 2-HR INS, and ISI. BMI was the strongest predictor of HDL and A1c. One-way MANOVA (above- vs below-75th percentile) showed a significant multivariate (MAP, TG, HOMA) main effect for FMR. Wilks' Lambda = 0.628, F (4,96) = 14.24, p < 0.001, with univariate main effects for MAP (F=22.2, p < 0.001), TG (F = 8.39, p = 0.005), and HOMA (F = 16.27, p < 0.001). MANOVA also revealed a multivariate main effect for BMI (Wilks' Lambda = 0.695, F(4,96) = 10.55, p < 0.001), with univariate main effects for MAP (F = 18.7, p < 0.001) and HOMA (F = 19.5, p < 0.001). MANOVA showed a multivariate main effect for %BF (Wilks' Lambda = 0.770, F(4,96) = 7.17, p < 0.001), with univariate main effects for MAP (F = 13.8, p < 0.001) and HOMA (F = 10.6, p = 0.002). **CONCLUSION:** These data show FMR was a better predictor of several risk factors compared to %BF and BMI. This suggests that this method of calculating FMR may be effective for assessing cardiometabolic risk in adults.

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676   May 30 3:30 PM - 3:45 PM
Changes in Total and Regional Body Composition during the season in Division 1 Football Players

Tyler A. Bosch, Christiana Raymond-Pope, Donald R. Dengel, FACSM. *University of Minnesota, Minneapolis, MN.* (Sponsor: Donald R. Dengel, FACSM)
(No relevant relationships reported)

Purpose: The purpose of this study was to determine the association between changes in weight to changes in total and regional fat and lean mass in a group of division 1 football players.
Methods: A total of 78 players completed a pre-season (June) and Post-season (December) body composition scan using dual x-ray absorptiometry. Absolute and percent (%) changes in total and regional body composition were calculated. Linear regression was used to measure the association between change in weight and change in total lean (TLM) and total fat mass (TFM) for the entire sample and for each position. Linear regression was also used to analyzed the association between %change in TLM and TFM with %change in regional lean and fat mass.
Results: Position did not have a significant effect on the association between change in weight and change in TFM or TLM (p=0.171, p=0.172 respectively). However, change is weight was strongly associated with change in TFM for the entire group (slope $\pm$ SE = 0.8 $\pm$ 0.06, p <0.001 R^2=0.72). Conversely, change in weight was weakly associated with change in TLM for the entire group (slope $\pm$ SE = 0.2 $\pm$ 0.06, p <0.001 R^2=0.14).

Abstracts were prepared by the authors and printed as submitted.

Change in TLM was not significantly associated with change in TFM (slope$\pm$SE = -0.1$\pm$0.06, p=0.125, R^2=0.03). Regionally, the strongest association was between %change in TFM with %change in Android fat mass (1.62$\pm$0.08, p <0.001, R^2= 0.84). For lean mass, both %change in Trunk LM and Leg LM had similar associations with %change in TLM (R^2= 0.43 & 0.38, p<0.001 for both). When comparing each position separately, only RB (n=6) had a strong positive association between change in weight and change in TLM (R^2=0.82, p<-0.001), but, no association between change in weight and change in TFM (R^2=0.006, p=0.879).

Conclusion: These data suggest that changes in weight during a competitive football season are largely driven by changes in fat mass, except for potentially RB. The slopes of the relationship suggest that on average from every 1kg (2.2lbs) of weight increase there is 0.8 kg (1.8lbs) increase in TFM. Additionally, there a higher proportion of fat increase is distributed to the android or abdominal region. Given the relationship between increased fat mass with both reduced performance and injury risk, teams should focus on closely maintaining athlete weight during the season.

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677   May 30 3:45 PM - 4:00 PM

A Comparison of Preseason Body Composition and Phase Angle in NCAA Division I Female Athletes

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(No relevant relationships reported)

Body composition has several implications for the overall health and performance of athletes. Phase angle, a marker of cellular integrity, nutritional status and distribution of intra- (ICW) and extracellular water (ECW) may indicate overtraining and poor nutrition. A phase angle less than 5° is used as a criterion of poor cellular integrity and nutritional status in non-athletic populations. However, limited phase angle, ICW and ECW data exists for collegiate athletes. **PURPOSE:** To evaluate the differences in measures of body composition between NCAA Division I female cross-country (XC), soccer (SOC) and basketball (BB) athletes. **METHODS:** Fifty female athletes (age: 19±1yrs; XC, n=19; SOC, n=19; BB, n=12) were assessed in the preseason. Body composition, including lean mass (LM), fat mass (FM), regional bone mineral density (BMD) of the lumbar spine (L1-L4), and hip (femur) were measured by DXA. Appendicular skeletal muscle adjusted by squared height (ASM index; kg/m^2), LM index (LMI; kg/m^2) and FM index (FMI; kg/m^2) were calculated to compare relative body composition. Bioelectric impedance analysis was used to assess phase angle, ICW (%) and ECW (%). ANOVAs were used to analyze the data. Significance was accepted at p<0.05. **RESULTS:** XC had significantly lower ASMI (6.83±0.5 vs. 7.42±0.5 and 8.07±0.9kg/m^2, p<0.001), FMI (3.85±1 vs. 6.04±2 and 6.07±0.9kg/m^2, p<0.001) and body fat % (18.5±5 vs. 25.5±5 and 27.4±9%, p=0.001) than SOC and BB. There were no differences in ASMI, FMI and body fat % between SOC and BB. LMI was significantly lower in XC (15.3±0.9kg/m^2) compared to SOC (16.2±0.9kg/m^2, p<0.001). XC had significantly greater ICW (58.8±2% vs. 54.3±2%, p<0.001) and lower ECW (41.2±2% vs. 45.7±2%, p<0.001) than BB. The average phase angle was 7.4±0.5° and did not differ between sports. BB had significantly greater lumber spine BMD (p<0.001), left femur BMD (p<0.001) and right femur BMD (p<0.001) than both XC and SOC. **CONCLUSIONS:** Our findings highlight the sport-specific differences in body composition measures that may inform strength and conditioning coaches and athletic trainers. Optimal body composition through quality nutrition and training programs improves performance, increases playing time, injury prevention and helps to assess overall health.

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Caffeine Consumption in Habitual Users Has No Impact on BIA-Derived Measurements of Body Composition

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(No relevant relationships reported)

Bioelectrical impedance analysis (BIA) is often used to estimate total body water (TBW), intracellular body water (ICW), extracellular body water (ECW), and body fat percentage (BF%). A common restriction for BIA analysis is abstinence from caffeine 12-hours prior to testing. However, research has yet to determine whether the consumption of caffeine influences BIA testing results. **PURPOSE:** The purpose of this study was to determine if the consumption of caffeine influences BIA-derived BF% and body water values in habitual caffeine users. **METHODS:** 20 apparently healthy males (26.6 ± 4.1 years) identified as habitual caffeine consumers (≥ one 95mg serving per day ≥ four days per week) participated in this study. Participants came to the lab on three occasions, the first visit serving as the control (CON) with no supplementation. The remaining two visits were performed in a randomized double-blind, cross-over fashion. Participants consumed 200mg of dextrose (PLA) or caffeine (CAF) in capsule form. During each visit, seven multi-frequency BIA measurements

were conducted before (PRE) and after (15-min, 30-min, 45-min, 60-min, 75-min, 90-min) consumption. **RESULTS:** Repeated measures ANOVA revealed BF% for CAF was lower than the CON and PLA conditions at PRE and 15-min (p < 0.001, p = 0.004), but not statistically significant for the remaining time points (i.e. 30-, 45-, 60-, 75-, and 90-min). However, the effect size (ES) of the BF% differences were small. The CON, PLA and CAF conditions had higher PRE ICW values than their associated post time points (i.e., 15-, 30-, 45-, 60-, 75-, and 90-min). However, similar to BF%, the ES of the mean differences for ICW were all marginal. No other differences were observed. **CONCLUSION:** Caffeine consumption in habitual users produced trivial changes in TBW, ECW, ICW, and BF%. Therefore, the pre-testing guidelines for caffeine consumption may be too stringent in habitual caffeine consumers.

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Regional Variations in Physical Fitness and Activity in Ecuadorian Adolescents

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(No relevant relationships reported)

As obesity rates are related to physical inactivity, and physical inactivity is positively related to economic status, it is important to assess the lifestyle habits of adolescents in countries, like Ecuador, who are undergoing significant economic growth. **PURPOSE**: Assessed the physical fitness (PF) and physical activity (PA) levels of adolescents from two different regions of Ecuador and their relationship with peer/familial influence on PF and PA. **METHODS**: Adolescents (N=407) were recruited from 4 schools: 2 from a suburb of Quito (n=217; Northern Sierra region) and 2 from the smaller town of Cariamanga (n=214; Southern Sierra region). Height (cm) and weight (kg) measurements were used to calculate BMI for weight classification. PF was estimate using a post-exercise heart rate following a 3-min step test. A questionnaire was used to assess PA habits (moderate-vigorous PA and sedentary behavior) and perceived peer/familial support for being physically active. T-Tests and ANOVAs assessed differences in outcome variables by sex, weight status and location. Person correlations assessed relationships among PF, PA habits, and perceived peer/familial influence. **RESULTS**: According to IOTF standards, 12.3% of the adolescents were classified as overweight or obese. Overall, PF level was 43.4±8.9 ml/kg/min, with males significantly higher than females (48.3±9.4 vs. 41.1±7.5 ml/kg/min) and Southern Sierra adolescents significantly higher than Northern Sierra (47.1±9.6 vs. 39.7±6.1 ml/kg/min) adolescents. Overweight adolescents had significantly lower PF levels compared to healthy and underweight adolescents **only** in Southern Sierra region (42.3±8.5 vs. 46.9±8.6 vs. 50.5±11.1 ml/kg/min; p<0.0001). Most adolescents reported participating in <60 min/day of moderate-vigorous PA (91.6%) and spending >2 hours/day in sedentary behaviors (79.9%). While perceived peer/familial influence did not correlate well with PF or PA levels (r=-0.18 to 0.20; adj. p>0.05), males perceived greater peer influence for PA participation than females, regardless of weight status or location. **CONCLUSIONS**: While adolescents of Southern Sierra had higher PF levels, these values were impacted by sex and weight status, but not by PA levels or perceived peer or family influence.

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Comparison of Ultrashort Versus Short High-Intensity Interval Training for Body Composition, Anaerobic, and Aerobic Performance

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(No relevant relationships reported)

PURPOSE: This study compared the effects of ultrashort (UH) versus short (SH) high intensity interval training (HIIT) in conjunction with functional training on body composition, anaerobic, and aerobic performance. **METHODS:** Thirty-four recreationally active participants were randomly assigned to SH (8 males and 9 females) and UH (8 males and 9 females) groups and completed 6 cycles of 6 exercises at ~90% of maximal heart rate (i.e. kettle bell snatches; step-up jumps; jumping jacks; front squat; burpees; high knees) 3 days a week for 4 weeks. SH was performed with 20s:10s work-to-rest ratio, and a 2-minute recovery within cycles, while UH was completed with 10s:5s work-to-rest ratio, and 1-minute recovery. Fat mass (FM), fat free mass (FFM), vastus lateralis cross sectional area (VL CSA), Wingate anaerobic capacity (i.e. peak power [PP] and anaerobic power [AP]), and aerobic fitness (i.e. VO$_{2max}$) were measured before and after the training interventions and analyzed with 2-way mixed factorial ANOVAs. **RESULTS:** FM did not significantly (p>0.05) change, however, both groups improved significantly (p<0.05) FFM (UH: 60.8 ± 15.0 to 61.5 ± 15.2 kg, SH: 54.3 ± 11.5 to 55.5 ± 11.0 kg), as well as VL CSA (UH = 24.8 ± 6.2 to 27.1 ± 6.3 cm, SH = 25.6 ± 5.1 to 27.9 ± 5.5 cm). Additionally, anaerobic

(UH: PP = 913 ± 305 to 1033 ± 300 W; AP = 11.5 ± 1.1 to 12.6 ± 1.1 W/kg, SH: PP = 839 ± 162 to 887 ± 181 W; AP = 11.8 ± 1.1 to 12.5 ± 1.2 W/kg) and aerobic capacity (UH: VO_{2max} = 35.8 ± 6.9 to 38.9 ± 6.1 ml/kg/min, SH: VO_{2max} = 39.7 ± 9.3 to 42.6 ± 9.1 ml/kg/min) significantly ($p<0.05$) increased in both groups. There were no significant (p>0.05) differences between groups. **CONCLUSION:** Current literature has shown a 20s:10s work-to-rest ratio to be the shortest, most effective HIIT protocol, as performed by the SH group. However, in the present study, the UH group improved FFM, VL CSA, anaerobic, and aerobic fitness in a similar manner to the SH group. These findings suggest that individuals may be able to achieve similar health benefits as the SH protocol, despite exercising for less total time by performing HIIT with a 10s:5s work-to-rest ratio.

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23 Year Analysis Of Anthropometric Profiles And Long-Term Career Progression Of German Junior Female Rowers

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(No relevant relationships reported)

Standing height (SH) and body mass (BM) are well established determinants of rowing performance, which therefore typically included in most talent identification programs. However, it remains unclear if anthropometric profiles allow for differentiation between subsequent career progression levels already in junior female rowers. **PURPOSE:** We aimed to evaluate the relationship between anthropometric profiles of adolescent junior female rowers and their long-term career progression level. We furthermore described their anthropometric profiles and calculated normative requirements associated with a successful career progression on elite level. **METHODS:** SH, BM and BM-index (BMI) of 399 female rowers (age 17.6 ± 0.58 years) of the German Junior National Team between 1991 and 2014 were retrospectively analyzed using ANOVA with Post-Hoc test. Rowers were grouped exclusively according to their highest long-term career progression level, categorized as participation in U19-, U23-, Senior-World Championships (WCh), or Olympic Games (OG). Normative anthropometric requirements were defined as interquartile range (IQR) of the OG-group. **RESULTS:** We found significant small effects between career progression level and SH (P = .009; η2 = 0.03), BMI (P = .004; η2 = 0.04). Rowers, who never competed higher than U23-WCh were significantly smaller than those who competed in Senior-WCh (-1.30%; P = .036) or OG (-1.34%; P = .049). Differences in BM were not significant (P = .115; η2 = 0.02). Significantly higher BMI was identified for rowers who remained on U19-level compared to those competing in Senior-WCh (+3.87%; P = .003) or OG (+3.28%; P = .039). The same was found for U23-WCh vs. Senior-WCh (+3.32%; P = .034). IQR of SH and BM was 178 - 184 cm and 68 - 73 kg. **CONCLUSIONS:** Advanced anthropometric characteristics partly mirror long-term career progression levels in female Junior National Team rowers, underlining the relevance of anthropometric data for talent identification and development. Interestingly, female rowers tending to a more athletic body type (lower BMI, BM at higher SH) reached higher career progression level, probably due to a better power to body mass ratio. As talent identification and development is multi-dimensional and partly inherently, anthropometric data should not used exclusively.

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Telomere Length Of Middle-aged Sprinters And Endurance Runners: Relationships To Performance And Body Composition

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(No relevant relationships reported)

PURPOSE: The telomere length (TL) of middle aged master runners (RUN) (n = 23, 52.3 ± 8.6 yrs; 12 sprinters, SPT; 11 endurance runners, END) was compared to untrained controls (CON, n = 10; 43.7 ± 9.4 yrs), and the relationships between TL to both master athletes' performance and body composition were analyzed. **METHODS**: Participants had blood samples collected for biomolecular measures. Relative leucocyte telomere length (T/S) was measured through qPCR. ANOVA and unpaired t-tests were applied to compare TL between studied groups, and the Pearson's moment correlation was applied to verify relationships. **RESULTS**: The TL of all RUN (T/S = 1.24 ± 0.73) differ from CON (T/S = 0.515 ± 0.62) (p < 0.01), while the TL of SPT (T/S = 1.495 ± 0.85) trended to be longer than END (T/S = 0.954 ± 0.46) (p = 0.076) with a large effect size (d = 0.72). It was observed a significant correlation between TL and actual performance level as percentage of the current world record for RUN (r = 0.47, p < 0.01), and a negative correlation between TL and body fat for the entire sample (r = -0.447; p < 0.01). Furthermore, a negative correlation between TL and performance decline per decade was observed for the SPT (r = -0.651, p <

0.01). **CONCLUSIONS**: In conclusion, TL of studied master athletes was longer than their untrained peers, and seems to be not only a marker of health status, but also an indicator of sports longevity since both actual performance level, its decrease over years, and body composition were related to TL of studied sample.

B-42   Free Communication/Slide - **Mitochondria and Metabolism in Health and Disease**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-101CD

683   **Chair:** Gordon Fisher, FACSM. *University of Alabama - Birmingham, Birmingham, AL.*

(No relevant relationships reported)

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Tumor Derived Factors Induce Muscle Mitochondria Hyperpolarization And Subsequent Superoxide Production

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(No relevant relationships reported)

Cancer associated muscle wasting (cancer cachexia) negatively affects the prognosis and treatment of cancer. Specifically, 20-40% of cancer deaths are attributable to cancer cachexia, however current treatments for cachexia are ineffective at reducing mortality. More so, it is currently postulated that once cachexia has developed, it may be impossible to halt its progression. Therefore, a more thorough understanding of the early mechanisms contributing to cachexia are necessary to develop effective therapeutics to halt cachexia before significant muscle loss occurs. Mitochondrial function is thought to largely mediate muscle health and may be a key contributor to the development of cachexia. **PURPOSE:** To examine the initial effects of tumor cell-derived factors on measures of mitochondrial function and subsequent cell proliferation. **METHODS:** C2C12 cells were treated with either CON media (1:1 ratio of DMEM to C2C12 conditioned media) or LLC media (1:1 ratio of DMEM to Lewis Lung Carcinoma conditioned media) for 4-72 hrs. Cells were then measured for mitochondrial polarization, superoxide production, and cell proliferation. Results were analyzed by blocked t-tests (CON v. LLC, blocked by experiment repeat). **RESULTS:** After 4 hrs of incubation with LLC media, cells had a ~12% greater mitochondrial polarization compared to CON (p=0.0002, Hedge's g effect size=1.08), with no difference in mitochondrial superoxide production (p=0.78, Hedge's g effect size= 0.10). After 24 hrs of incubation, mitochondrial polarization remained elevated by ~10% compared to CON (p=0.008, Hedge's g effect size =0.69) and mitochondrial superoxide production was increased ~12% compared to CON (p=0.009, Hedge's g effect size =0.99). However, LLC incubation for 24, 48 and 72 hrs did not alter cell proliferation (p=0.89, 0.13, and 0.45 respectively, Hedge's g effect size = 0.05, 0.53, and 0.27 respectively). **CONCLUSIONS:** Tumor-derived factors appear to have dramatic effects on muscle mitochondrial polarization and subsequent superoxide production. However, these alterations do not appear to affect muscle proliferative capacity.
This study was supported by The National Institutes of Health R15AR069913.

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The Impact Of HSP72 On Metabolism And The Mitochondrial Response To Exercise In Female Mice

Amanda J. Lin[1], Zhenqi Zhou[1], Timothy M. Moore[2], Brian G. Drew[1], Vicente Ribas[1], Darren C. Henstridge[3], Mark A. Febbraio[4], Andrea Hevener[1]. [1]*University of California, Los Angeles, Los Angeles, CA.* [2]*University of Southern California, Los Angeles, CA.* [3]*Baker IDI Heart and Diabetes Institute, Melbourne, Australia.* [4]*Garvin Institute of Medical Research, Sydney, Australia.*

(No relevant relationships reported)

Regular exercise improves metabolic health in men and women; however, the molecular adaptations critical for delivering health benefit remain unclear. Heat shock protein (HSP)72 is one of the most highly induced proteins in muscle during exercise, and we have shown that muscle overexpression of HSP72 is protective against diet-induced metabolic dysfunction. By contrast, global deletion of HSP72 promoted glucose intolerance and insulin resistance paralleled by impairment in mitochondrial (mt) function and oxidative capacity. All aforementioned studies were conducted in male animals exclusively.

Abstracts were prepared by the authors and printed as submitted.

WEDNESDAY, MAY 30, 2018

PURPOSE: We studied the effects of HSP72 knockout (KO) on metabolism in female mice to determine whether sex plays a role in phenotypic outcome.
METHODS: We performed a standard metabolic phenotyping evaluation of WT and HSP72-KO female mice fed a normal chow diet (age 3 - 10 months). Additionally, to induce metabolic challenge, WT and HSP72-KO mice performed two exercise protocols. Protocol 1: Chronic voluntary wheel running for 30-days. Protocol 2: Acute treadmill running (90 min, 15 m/min, 5° incline). Comparisons of mean differences were by two-way ANOVA or t-test ($P<0.05$, *a priori*; values presented as mean ± SEM).
RESULTS: In contrast to male HSP72-KO mice, female KO animals were protected against aging-induced metabolic dysfunction and insulin resistance. Moreover, we observed no significant difference in grip strength, run time to exhaustion, latency to fall, or maximum running speed, between the genotypes. Although no differences in metabolic homeostasis or physical performance were detected between the genotypes of female mice, we did observe marked differences in expression of compensatory signaling nodes including transcription factors, the mt proteome, and mt fission-fusion-mitophagy dynamics in HSP72-KO compared with WT. Computational modeling and pathway analysis identified over 100 proteins differentially expressed between the genotypes. We found that ERα is strongly induced in muscle of female HSP72-KOs compared with WT, and we are currently testing whether ERα confers preservation of metabolic function in female vs. male HSP72-KOs.
CONCLUSIONS: Our findings show sex differences related to importance of HSP72 expression for the maintenance of metabolic health and exercise performance.

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Mitochondrial Fusion Is Essential For Regulation Of Adult Skeletal Muscle Mass And Protein Synthesis

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(No relevant relationships reported)

Purpose: Mitochondrial dynamics and the function and health of skeletal muscle are inextricably linked. To preserve proper function, muscle mitochondria undergo constant remodeling through fission and fusion events. Mitochondrial fission is regulated by fission 1 (Fis1) and dynamin-related protein 1 (Drp1), while fusion is regulated by three GTPases; mitofusin 1 and 2 (Mfn1, Mfn2) and optic atrophy 1 (Opa1). However, the role of mitochondrial fusion in adult skeletal muscle mass regulation is not fully understood. We hypothesized that genetic disruption of mitochondrial fusion in adult skeletal muscle will impair muscle function and growth. **Methods:** We therefore developed and characterized adult inducible skeletal muscle specific Mfn1/2 double knockout mice (MFNDKO). Genetic deletion was induced in adult mice and confirmed by qPCR and western blot. Body/muscle size and composition was analyzed gravimetrically and by QMR. Muscle function was assessed by grip test. Interrogation of pathways regulating muscle mass, including atrophy and autophagy were performed by qPCR and western blotting. *In vivo* and *in vitro* protein synthesis rates were evaluated using a puromycin incorporation assay. **Results:** MFNDKO mice exhibited a progressive decrease in body weight (~20% lower than CON, respectively; p < 0.05). This reduction in body weight was associated with a decrease in lean mass, confirmed by QMR, gastrocnemius wet weight and cross sectional area (50% and 36% reduction, respectively; p < 0.05). Gene profiling of pathways that regulate muscle homeostasis revealed upregulation of *FBXO30, FBXO32, MT1* and *CTSL* (p < 0.05, all) suggesting an activation of muscle atrophy. Furthermore, muscles from MFNDKO mice revealed increased markers of autophagy with increased *p62* mRNA and increased LC3II/I and p62 protein levels. Protein synthesis rates were decreased *in vitro* and *in vivo* (14% and 75%; p < 0.05, respectively) in MFNDKO muscle. **Conclusions:** Taken together, these observations suggest that normal mitochondrial fusion is required for maintaining normal adult skeletal muscle mass.

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Skeletal Muscle Mitochondrial Fusion is Required for Exercise Performance and Mitochondrial Oxidative Capacity

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(No relevant relationships reported)

PURPOSE: Endurance exercise has been shown to be a positive regulator of skeletal muscle metabolic function. Changes in mitochondrial dynamics (fusion and fission) have been shown to influence mitochondrial oxidative capacity. We therefore tested whether genetic disruption of mitofusins (Mfns) affected exercise performance in adult skeletal muscle.
METHODS: We generated adult inducible skeletal muscle-specific Mfn1 (iMS-Mfn1KO), Mfn2 (iMS-Mfn2KO) and Mfn1/2 knockout mice (iMS-MfnDKO). We assessed exercise capacity with a treadmill time to exhaustion stress test pre-deletion

and up to 8-weeks post-deletion. We measured individual electron transport chain (ETC) complex activity of both the subsarcolemmal (SS) and intermyofibrillar (IMF) mitochondria by high resolution spectroscopy. We also performed qPCR and western blotting analysis to measure the expression of ETC subunits.
RESULTS: Analysis of either the iMS-Mfn1KO or iMS-Mfn2KO did not reveal an effect on exercise capacity, suggesting a possible functional redundancy between the two Mfns. However, analysis of the iMS-MfnDKO animals revealed a progressive reduction (66% reduction; p <0.05) in time to exhaustion. The decrease in exercise capacity was associated with a reduction in ETC activity in both the SS and IMF mitochondrial fraction for Complex I (70% and 80% respectively; p <0.05) and Complex IV (60% and 80% respectively; p <0.05). Notably only the IMF fraction for Complex II and Complex V exhibited a significant reduction in activity (70% and 67% respectively; p <0.05), while Complex III was completely unaffected. These changes in enzymatic activity was associated with a decrease in protein expression of ETC subunits for Ndufb8 (86%; p <0.05) and MtCOI (50%; p <0.05). We did not observe any significant changes in mRNA expression of nuclear encoded ETC subunits, while mitochondrial encoded subunits (ND2, ND5, CYTb, COX2 and ATP6) were all reduced (77%; p <0.05). These data suggest that the decrease in exercise activity is the result of impaired ETC complex activity and expression.
CONCLUSION: Taken together these results suggest that mitochondrial fusion in adult skeletal muscle is required for normal exercise performance.

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Human Muscle Fiber-Specific Responses of Mitochondrial Fusion Proteins to Sprint Interval and Moderate-Intensity Continuous Training

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(No relevant relationships reported)

Mitochondrial dynamics, a process regulated by mitochondrial fission and fusion, is important for the maintenance of high quality mitochondria and healthy metabolic function. Low-volume sprint interval training (SIT) increases mitochondrial content to a similar extent as moderate-intensity continuous training (MICT); however, limited data are available regarding the effect of these diverse training approaches on mitochondrial dynamics proteins. Research has also relied primarily on whole muscle analyses which may mask fiber-type specific training adaptations.
PURPOSE: To examine changes in mixed whole muscle and fiber-type specific mitochondrial fusion protein abundance following 12 weeks of low-volume SIT and MICT.
METHODS: Sedentary adults performed 32 sessions of SIT (n=8) or MICT (n=9). SIT involved 3 x 20 sec 'all out' cycle sprints against 5% body mass (~500 W) interspersed with 2 min rest and MICT involved 45 min of continuous cycling at ~70% of maximal heart rate (~110 W). Biopsies (vastus lateralis) were obtained before training and 96 h after the final session. The protein contents of optic atrophy 1 (OPA1) and mitofusin 2 (MFN2) were measured in mixed muscle homogenates and pooled segments of type I and II fibers using Western blotting, normalized to total protein content within each sample.
RESULTS: Training increased the mixed whole muscle protein content of OPA1 [1.0 ± 0.3 to 1.5 ± 0.3 arbitrary units (AU)] and MFN2 (1.0 ± 0.2 to 1.1 ± 0.2 AU), with no differences between treatments (p < 0.05, main effect). OPA1 content increased after training (p < 0.05, main effect) in both type I (1.3 ± 0.6 to 1.9 ± 0.8 AU) and type II fibers (1.0 ± 0.4 to 1.4 ± 0.5 AU). MFN2 content increased after training in type I (1.4 ± 1.1 to 2.2 ± 1.5 AU, p = 0.03) but not type II fibers (1.9 ± 1.6 to 2.0 ± 1.1 AU; p = 0.73). Prior to training, OPA1 content was higher in type I versus type II fibers (1.3 ± 0.6 vs. 1.0 ± 0.4 AU, p < 0.01) but there were no fiber-type differences in MFN2 content.
CONCLUSIONS: Twelve weeks of low-volume SIT and MICT induces similar increases in mixed whole muscle and fiber-type specific mitochondrial fusion proteins. The potential of SIT to induce comparable skeletal muscle adaptations as MICT despite a reduced exercise volume may be related to a higher intensity per se and/or the intermittent contractile pattern.

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Exercise As An Intervention To Mitigate Mitochondrial Dysfunction And Impaired Glucose Tolerance Induced By Sleep-loss

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(No relevant relationships reported)

Sleep-loss is emerging as an important risk factor for the development of impaired glucose tolerance, insulin resistance (IR) and, subsequently, type 2 diabetes mellitus. While the mechanisms underlying these changes remain to be fully elucidated, in some instances their development may be associated with reduced mitochondrial function. This suggests sleep-loss may also impair mitochondrial function, but this has not been investigated. Given the possible relationship between mitochondrial function and IR, exercise could be used as a strategy to counteract the detrimental physiological changes induced by sleep-loss; however, this has not been demonstrated. **Purpose:** To investigate the effect of sleep-loss, with or without exercise, on skeletal muscle mitochondrial function and glucose tolerance. **Methods:** Twenty healthy male participants were allocated into one of three experimental groups: a control group (CON, n=7) (8 h sleep opportunity for 5 nights), a sleep-restricted group (SR, n=7) (4 h sleep opportunity for 5 nights), and a sleep restricted and exercise group (SR+EX, n=6) (4 h sleep opportunity for 5 nights and 3 x high-intensity interval exercise (HIIE) sessions). The HIIE bouts consisted of 10 x 60-s intervals at 90% peak power, interspersed by 75 s of active recovery. Oral glucose tolerance tests (OGTT) and muscle biopsies were performed pre- and post-intervention. **Results:** Mean sleep duration per night for CON, SR, and SR+EX was 448 ± 25, 230 ± 13 and 237 ± 5 minutes, respectively. There was a significant reduction in mitochondrial respiratory function (O_2 flux - pmol/s/mg tissue) from pre- to post-intervention in the SR group (80 ± 16 vs 65 ± 24, p<0.05), but this remained unchanged in the CON (70 ± 5 vs 64 ± 12, p>0.05) and SR+EX (78 ± 20 vs 79 ± 28, p>0.05) group. OGTT total area under the curve increased post intervention in the SR group (692 ± 89 vs 832 ± 57 units, p<0.05), but remained unchanged in the CON (741 ± 202 vs 677 ± 184, p>0.05) and SR+EX (645 ± 51 vs 702 ± 83, p>0.05) group. **Conclusion:** Sleep-loss was associated with a reduction in mitochondrial respiratory function and a decrease in glucose tolerance. However, these changes were mitigated by performing HIIE, demonstrating exercise as a potent and cost-effective strategy to alleviate some of the negative metabolic effects of sleep loss.

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Offspring of Mothers with Diabetes have Reduced Muscle Oxidative Capacity Measured by Near Infrared Spectroscopy

Brian A. Irving[1], Timothy D. Allerton[1], Guillaume Spielmann[1], Stefany Primeaux[2], Arnold Nelson, FACSM[1], Dennis Landin[1], Neil M. Johannsen[1]. *[1]Louisiana State University, Baton Rouge, LA. [2]LSU Health Science Center, Baton Rouge, LA.* (Sponsor: Arnold Nelson, FACSM)
(No relevant relationships reported)

Adult offspring of mothers with type 2 diabetes have been reported to have reduced skeletal muscle mitochondrial oxidative capacity (OXPHOS) using *in vivo* ^{31}P-Magnetic Resonance Spectroscopy (^{31}P-MRS). Near Infrared Spectroscopy (NIRS) also has the capability of measuring skeletal muscle OXPHOS, and provides indices of skeletal OXPHOS comparable to ^{31}P-MRS. Moreover, the cost of measuring skeletal muscle OXPHOS by NIRS is substantially less than by ^{31}P-MRS. **PURPOSE**: To determine whether NIRS could detect OXPHOS differences in adult offspring of mothers with type 2 diabetes (n=8) compared to controls (n=9). **METHODS**: Using continuous-wave NIRS (Artinis, Oxymon) coupled with transient arterial occlusions (~ 300 mm Hg, 5 on/5 off x 9, 10 on/10 off x 11), we measured muscle oxygen consumption (mVO_2) in the *vastus lateralis* following a 7 sec maximal isometric knee extension performed in the supine position. We express the mVO_2 as a percent per second (%/s), relative to an ischemic calibration. We fit the recovery mVO2 following the isometric contraction to an exponential curve using custom routines written in MATLAB by Terence Ryan to calculate the time constant (Tc) for the recovery of mVO_2, which is an index of mitochondrial OXPHOS. These routines also help correct for changes in blood volume that occur during the atrial occlusion. We also measured peak oxygen uptake (VO_2peak) using a standardized incremental exercise test with indirect calorimetry on a cycle ergometer. **RESULTS**: Age (21 ± 1 vs. 21 ± 2 y, p>0.05), BMI (24 ± 3 vs. 23 ± 2 kg/m^2, p>0.05), and VO_2peak (32 ± 4 vs. 32 ± 5 ml·kg^{-1}·min^{-1}, p>0.05) were similar between offspring and controls. In contrast, offspring had higher recovery Tc compared to controls (47 ± 24 vs. 28 ± 10 sec, p<0.05) suggestive of reduced OXPHOS. **CONCLUSIONS**: Our results support the use of NIRS to measure expected differences in skeletal muscle OXPHOS between offspring and controls. Of interest, we also found that the Tc measured in the offspring to have a greater degree of variability than controls suggesting the potential for prescribing therapeutic

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691   May 30 5:00 PM - 5:15 PM

Skeletal Muscle DNA Methylation Changes following Gastric Bypass in Women with Type 2 Diabetes

Matthew D. Barberio[1], G. Lynis Dohm[2], Walter J. Pories[2], Evan P. Nadler[1], Monica J. Hubal, FACSM[3]. *[1]Children's National Medical Center, Washington DC., DC. [2]East Carolina University, Greenville, NC. [3]George Washington University, Washington DC., DC.* (Sponsor: Monica Hubal, FACSM)
(No relevant relationships reported)

Purpose: Bariatric weight-loss surgery can resolve or ameliorate type 2 diabetes (T2D). The cellular and molecular adaptations driving this response remain largely unknown, but some evidence points to epigenetic changes in skeletal muscle following surgery. We assessed global skeletal muscle methylation patterns prior to and 1 year after Roux en Y gastric bypass surgery (RYGB) in women with and without T2D to determine if diabetes modifies the response of the skeletal muscle methylome to weight-loss surgery. **Methods**: Global vastus lateralis methylation profiles were generated via Illumina 450k Arrays pre- and 1 yr post-RYGB in black adult females (N=12) with (D; n = 6, age = 51 ± 6 yr, BMI = 53.0 ± 5.8 kg/m^2) and without (ND; n=6, 43 ± 6 yr, 51.0 ± 9.2 kg/m^2) T2D. Clinical values for insulin, glucose, and HOMA were measured at each time point. RM ANCOVA (group*time with age covariate) assessed changes in skeletal muscle methylation profiles in Partek Genomics Suite. Resultant methylation probes were filtered at p<0.001 and uploaded into Ingenuity Pathway Analysis for biological interoperation. **Results:** RYGB reduced BMI (P < 0.01; -62.6% ± 28.3) and HOMA (p = 0.01; -1.9 ± 2.4) 1 yr following surgery; with no differences between groups. ANCOVA detected interaction effects in 9016 methylation sites in 6059 known genes. Overall, 7541 methylation sites in 4557 genes were altered 1 yr following RYGB in ND as compared to 4056 methylation sites in 3245 genes in diabetics. Biological pathway analysis of genes with differential methylation in diabetics identified key metabolic signaling pathways such as AMPK Signaling (80 genes; p = 9.7×10^{-8}), PI3K/AKT Signaling (52 genes; p = 2.7×10^{-7}), and P70S6K Signaling (44 genes; 9.82×10^{-4}). Our analysis also identified hypomethylation in the promoter region of key metabolic genes IRS1 (-4.8% methylated following surgery), SLC2A4 (GLUT4; -2.8% to -3.9%), and GSK3 (-3.4%) following surgery. **Conclusion:** Skeletal muscle DNA methylation 1 year following RYGB suggest epigenetic changes in key metabolic signaling genes that are modified by diabetes. Changes in gene and protein expression of these genes have previously been demonstrated with improved glucose homeostasis. These data identify DNA methylation patterns that may play an important role in diabetes resolution following surgery.

WEDNESDAY, MAY 30, 2018

B-43   Clinical Case Slide - **Foot and Ankle**

Wednesday, May 30, 2018, 3:15 PM - 4:55 PM
Room: CC-200E

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692   **Chair:** Stephen M. Simons, FACSM. *South Bend Notre Dame Sports Medicine Fellowship, Mishawaka, IN.*

(No relevant relationships reported)

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693   **Discussant:** Adam S. Tenforde. *Spaulding Rehabilitation Hospital, Milton, MA.*

(No relevant relationships reported)

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694   **Discussant:** David Smith. *University of Minnesota, Minneapolis, MN.*

(No relevant relationships reported)

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695   May 30 3:15 PM - 3:35 PM
Ankle Injury - Rugby Union (7-players-a-side)

Victor Lopez Jr[1], Eric F. Soto[1], Mario A. Ortega[1], Richard Ma[1], Answorth A. Allen[2]. *[1]Rugby Research and Injury Prevention Group, Inc, Hospital for Special Surgery, New York, NY. [2]Hospital for Special Surgery, New York, NY.* (Sponsor: Robert C. Cantu, FACSM)

(No relevant relationships reported)

HISTORY: A 22-year-old men's club Division I Rugby-7s winger, injured his right ankle post a simultaneous opposing two-player tackle. Tackler-one locked the ball carriers foot in place wrapping the lower leg, and tackler-two changed the direction of the upper body of the player which overcame ankle mortise stability and strength, inducing an ankle inversion. Post-tackle, injured player complained of pain and inability to bear weight. History noted, no ankle supports/brace or tape used, and no previous ankle injury/surgeries. **PHYSICAL EXAMINATION**: Sideline emergency services removed injured foot cleat, found ankle deformity, which was secured for transport. ED exam revealed patient with a medially deformed right foot. Exam noted localized pain and tenderness, post palpation on right ankle deformity and lower leg, plantar flexed and supinated. Mild swelling, no lacerations or open wounds noted. Patient's limited exam secondary to pain, however, reflected no decreased right sided lower extremity sensation, reflexes or strength. Patient was able to flex and extend toes despite extreme pain of deformed limb. Injured limb had a noted palpable dorsalis pedis and posterior tibialis pulse. **DIFFERENTIAL DIAGNOSIS**: 1. Subtalar joint subluxation/dislocation 2. Open sub-talar dislocation 3. Tibial-talar dislocation 4. Fractures of the ankle/foot **TEST AND RESULTS**: Ankle anterior/posterior radiographs: -right posteromedial peri-talar dislocation. Ankle lateral radiographs: -navicular dislocation laterally from talus -rotary subluxation of calcaneus medially from the talus -no associated fractures of the tibia/fibula including malleoli. **FINAL WORKING DIAGNOSIS**: Closed right posteromedial peri-talar dislocation without associated fracture. **TREATMENT AND OUTCOMES**: 1. Emergency. Clearly seen on radiograph. 2. Immediate ED conscious sedation closed-reduction, entailing injured knee flexion to relax gastrocnemius, with traction to heel/forefoot of injured ankle to reduce joint. 3. Short-leg cast post-reduction, PWB for 4 weeks. Rehabilitation post-cast removal, with ROM and heel/calf stretches, progressing to strengthening. FWB at 7 weeks post-injury and cleared for sport. 4. 3-month follow-up, FWB, 7° dorsi-flexion, 32° plantar-flexion, 14° inversion, and 10° eversion with no restrictions.

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696   May 30 3:35 PM - 3:55 PM
Toe Injury - Dance

Julie Han, Andrea Stracciolini, Pierre d'Hemecourt. *Boston Children's Hospital, Boston, MA.*

(No relevant relationships reported)

HISTORY: A 21-year-old female college dancer presented with right great toe injury that occurred in February 2017 when she twisted the toe while pivoting then felt a pop and severe pain. Xrays at the ED were negative for fracture. She was able to continue dancing despite pain and had multiple episodes of re-injury. She was first evaluated in the Sports Medicine clinic in April 2017 after a recent episode of re-injury of first toe medial deviation while dancing with a pop sensation and swelling. Xrays were negative for fracture and she was diagnosed with a first MTP joint sprain treated with a walking boot for 1 month, dancing with buddy taping, and intrinsic foot exercises. By the end of May 2017, she reported near-full recovery with progression back into dancing until suffering the same injury while dancing with subsequent 1st MTP pain and instability.EXAM: Right foot: Normal alignment. No edema. Painful passive end-range 1st MTP joint flexion & extension. Significant laxity with 1st MTP joint varus stress, asymmetric compared to contralateral MTP joint. Discomfort but

no dorsal subluxation with 1st MTP joint drawer test. 5/5 great toe dorsiflexion & plantarflexion strength with discomfort. Lateral 1st MTP joint tenderness to palpation. Minimal fibular sesamoid tenderness to palpation. Intact distal sensation & dorsalis pedis pulse. DIFFERENTIAL DIAGNOSIS: 1. 1st MTP lateral capsule tear 2. 1st MTP lateral collateral ligament tear 3. Adductor hallucis brevis tear IMAGING: MRI right foot: Complete lateral collateral ligament tear of the first MTP joint at the metatarsal attachment. No bony avulsion, normal alignment, normal plantar plate. FINAL DIAGNOSIS: Tear of the first MTP lateral collateral ligament in a dancer with resultant joint instabilityOUTCOME:-Walking boot for 5-6 weeks, without dancing, and improvement of symptoms at follow-up in July 2017-Weaned out of boot, started physical therapy, progressed back into dancing with buddy taping-August 2017, noted 60% improvement of pain but continued 1st MTP joint instability-Referred to Orthopedic Surgeon Dr. Lyle Micheli for surgical opinion with consultation from Dr. William Hamilton, dance medicine expert in New York City-Per recommendations, she underwent two series of PRP injections of the LCL in August and October 2017, follow-up is pending

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697   May 30 3:55 PM - 4:15 PM
Footloose

Julie Shelley. *University of Oklahoma Health Sciences Center, Oklahoma City, OK.*

(No relevant relationships reported)

History:
A 27 year-old minor league baseball player presents to the ER with right ankle pain after sustaining an injury landing on first base. After hitting a ground ball, the player ran to first base and inverted his right ankle after stepping on the first baseman's foot. He had immediate pain and an obvious deformity in the right ankle. He was not able to ambulate due to pain. He was neurovascularly intact. There was no obvious skin puncture. The patient's right foot and ankle were immobilized on the field in a SAM splint, and the player was sent to the ER. He denied any previous injury to this ankle.
Physical Exam:
Examination of the right foot and ankle revealed an obvious deformity of right ankle without laceration or skin puncture. Patient was able to move all toes but unable to move the ankle due to pain. He was neurovascularly intact. Exam was limited due to pain.
Differential Diagnosis:
1. Subtalar Dislocation
2. Talonavicular Dislocation
3. Talus Fracture
4. Tibia Fracture
Test and Results:
Right ankle and foot x-rays: Closed dislocation of the medial subtalar joint and talonavicular joint without obvious fracture.
Final/Working Diagnosis:
Right Medial Subtalar dislocation, Talonavicular Dislocation, Talus Fracture
Discussion:
Consent was obtained, and the patient was taken to the OR for reduction under general anesthesia. After reduction of the right ankle, CT was performed which showed a successful reduction of the medial subtalar and talonavicular dislocations. The CT also revealed a nondisplaced fracture of the medial border of the talus. He was placed in a posterior splint and stirrup and made non-weightbearing. It was not determined why this relatively low impact mechanism caused such rare and significant injuries. Proper reduction was critical in this case to avoid future equinovarus deformity, ankylosis, or severe degenerative arthritis warranting further intervention.
Outcome:
The patient was unable to play baseball for the remainder of the season. However, due to his successful reduction, he did not require further interventional treatment. He was transitioned to a short leg walking boot after being non-weightbearing for 6 weeks and participated in a physical therapy program to regain strength and function of his right ankle. His roster status was changed from "disabled" to "active" 8 weeks after his injury.

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698   May 30 4:15 PM - 4:35 PM
The Bare Necessities of Foot Pain-Running

Alex B. Behar. *University of Illinois at Chicago, Chicago, IL.* (Sponsor: Terry Nicola, FACSM)

(No relevant relationships reported)

HISTORY: 35 year old female presents with left dorsal foot pain beginning 2 weeks prior to presentation noticed at mile 10 of a half marathon. She is an established barefoot runner with no previous injuries. Denies trauma or mechanism of injury to the foot. The pain is 8/10, sharp, and intermittent. It is exacerbated by weight bearing and relieved by non-steroidal anti-inflammatories (NSAIDS) and ice. The pain returns once the medication or modality wears off. She eats a well balanced diet and takes a multi-vitamin daily. Her last menstrual period was 10 days prior to presentation and states

it is regular. Denies changes to her running technique or mileage. X-rays performed prior to presentation demonstrate no fracture or deformities. She denies back pain, weakness, or paresthesias.

PHYSICAL EXAMINATION: Inspection of foot and ankle demonstrates edema on dorsal aspect of left foot without ecchymosis. No pes planus or pes cavus is observed. Tenderness over the left dorsal proximal 2nd metatarsal head is present. Full active range of motion of the ankle, foot, and toes in all planes with pain at the 2nd metatarsal during toe extension and flexion. Sensation intact to light touch in all dermatomes. Strength is 5/5 in all myotomes. Reflexes are 2/4 at L4 and S1.

DIFFERENTIAL DIAGNOSIS: 1) Lisfranc injury 2) Metatarsal stress fracture 3) Forefoot sprain 4) tibialis anterior strain/enthesopathy **TEST AND RESULTS**: **Ultrasound**: Evaluation of 2nd metatarsal using a linear probe demonstrates disruption of periosteum with no subcutaneous edema or disruption of soft tissue. **X-ray:** No evidence of fracture with mild degenerative changes at first MTP joint. **MRI:** Second metatarsal stress reaction without visible fracture line **FINAL WORKING DIAGNOSIS**: Left distal 2nd metatarsal stress fracture in an established barefoot runner.

TREATMENT AND OUTCOMES: Patient is educated on stress fractures in barefoot runners. Continue ice and NSAID's for symptomatic pain control and inflammation. Recommend a short leg off loading boot to decrease stress on the forefoot. She should wean out of the boot and progress to a barefoot running program. Physical therapy to work on foot intrinsic, barefoot gait analysis, and ankle stabilizers. DEXA scan ordered for bone density evaluation. Consider ultrasound instead of MRI for future monitoring of stress fractures.

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699   May 30 4:35 PM - 4:55 PM
Ankle Injury - Football

Sabrina P. Sawlani, Brian McCall. *Presence Resurrection Medical Center, Chicago, IL.* (Sponsor: Poonam Thaker, MD, FACSM)

(No relevant relationships reported)

HISTORY: A healthy Caucasian 12-year-old male presents with right ankle pain after slipping and twisting his ankle during a recreational football game at day camp. Hours after injury, he was seen by his PCP, who ordered plain films and referred him to orthopedic surgery for further evaluation.

PHYSICAL EXAMINATION: Examination in-office revealed mild swelling over the right lateral ankle with tenderness over the anterolateral tibia. Active range of motion was significantly decreased in all directions, and he was unable to bear weight on the right lower extremity. There was good peripheral perfusion, no open wounds or lacerations, and no erythema or ecchymoses.

DIFFERENTIAL DIAGNOSIS:
1. Lateral ankle sprain
2. Triplane fracture
3. Pediatric distal tibial fracture
4. Juvenile Tillaux ankle fracture
5. Incisural ankle fracture
6. Adolescent pilon fracture

TEST AND RESULTS:
XR Right Ankle 3+ Views: On AP view, the fracture is vertical through the epiphysis. On lateral view, the fracture extends posteriorly into the metaphysis.
CT Right Lower Extremity: Comminuted distal tibia fracture with intra-articular extension through posterior malleolus through metaphysis and 3 mm separation. Multiple fractures involving epiphysis. Approximately 3.5 mm separation anteriorly at fracture site. Nondisplaced fracture extending through medial malleolus. Tiny fracture fragment within tibiotalar joint space adjacent to fracture site.

FINAL WORKING DIAGNOSIS:
Triplane fracture of right distal tibia with intra-articular extension

TREATMENT AND OUTCOMES:
1. Open reduction internal fixation of the right distal tibia with intra-articular extension performed by orthopedic surgery under general anesthesia.
2. Intraoperative post-reduction ankle films demonstrated satisfactory alignment and position with postsurgical tissue changes of distal tibial metaphyseal and epiphyseal fractures.
3. 2-week postsurgical follow-up with repeat ankle films demonstrated the fracture to be anatomically reduced with hardware in optimal position. Physical exam had appropriate wound healing and excellent range of motion.
4. Toe-touch weight-bearing while in boot for 4 weeks post surgery.
5. Limited range of motion exercises out of boot during weeks 2 through 4 post surgery.
6. Weight-bearing initiated 4 weeks post surgery.

B-44   Clinical Case Slide - **Knee I**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-200F

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700   **Chair:** Holly J. Benjamin, FACSM. *University of Chicago, Chicago, IL.*

(No relevant relationships reported)

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701   **Discussant:** Scott A. Magnes, FACSM. *Fort Belvoir Community Hospital, Fort Belvoir, VA.*

(No relevant relationships reported)

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702   **Discussant:** Jason Pothast. *MedStar National Rehabilitation Network, Washington, DC.*

(No relevant relationships reported)

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703   May 30 3:15 PM - 3:35 PM
Knees - Skiing

Anna R. King[1], Surein Theivakumar[1], Ramin R. Tabaddor[2]. *[1]New York University, NY, NY. [2]The Warren Alpert School of Medicine at Brown University, East Greenwich, RI.*

(No relevant relationships reported)

HISTORY:
A previously healthy 14-year-old female presents with left knee pain, stiffness, and swelling for one year after hearing a "pop" during a dance move. She is a competitive alpine skier and attends boarding school in Maine to pursue this. She was able to finish her skiing season, though continued to experience symptoms. MRI at that time showed effusion without associated ligamentous damage. Two weeks ago, her right knee began having similar symptoms. Her pain and stiffness in both knees are worse in the morning, after sitting for prolonged periods, and with stairs.

PHYSICAL EXAMINATION:
Patient has an antalgic gait pattern. The left knee has a tense effusion, with no soft tissue swelling, ecchymosis, or skin lesions. She has diffuse tenderness to palpation, especially along the medial femoral condyle. The right knee has a mild effusion and is not quite as tender. Both knees have full ROM, negative Lachman's and Anterior Drawer, and are stable to varus/valgus stress. She has full strength and sensation. Exam is also notable for left elbow fullness, warmth, and decreased extension by 10 degrees, as well as B/L Achilles tendon fullness without associated tenderness.

DIFFERNETIAL DX:
1. Inflammatory arthropathy
2. Synovial chondromatosis
3. Osteochondral defect
4. Lyme disease
5. Autoimmune process

TESTS / RESULTS:
-B/L knee XRs: no obvious abnormalities or defects.
-MRI left knee: large joint effusion with extensive tiny loose bodies (typical appearance of "rice bodies"). No meniscal, chondral, or ligamentous pathology.
-Lyme negative
-CRP and ESR elevated
- (+) ANA
-RF negative

FINAL / WORKING DX:
Juvenile Rheumatoid Arthritis (JRA)

TREATMENT & OUTCOMES:
-Strict activity modification, anti-inflammatories, ice, elevation, pediatric rheumatology referral, arthroscopic debridement of B/L knees with synovial biopsies.
-Rheumatology performed an intra-articular steroid injection of B/L knee joints, initiated DMARD therapy with Methotrexate, and referred for expedited ophthalmology evaluation.
-On post-op f/u, pathology findings were reviewed, which were consistent with JRA.
-At 1 month post-op debridement and 2 months s/p initiation of DMARDs, patient has no swelling or pain and is undergoing progressive return to full activities (including skiing) as tolerated under the guidance of her athletic trainer.

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704   May 30 3:35 PM - 3:55 PM
Using Ultrasound To Diagnose Knee Pain

PATRICK CAREY. *Martin Army Community Hospital, FORT BENNING, GA.*

(No relevant relationships reported)

HISTORY:

16 year old male high school athlete was referred to sports medicine clinic with complaint of intermittent right knee pain exacerbated by cutting maneuvers. Pain began after feeling a strain and pop when pushing off a starting block in track season one year ago. Patient's mother stated that ice, compressions, use of hinged knee brace makes it better and working out without the knee brace makes it worse. The pain usually starts at the medial side of the knee and radiates to the lateral side and is associated with occasional buckling and locking. No change in character of pain after a course of physical therapy and relative rest during the summer. He just completed football season and is currently in middle of basketball season, participation has been limited at times due to pain.
.
PHYSICAL EXAM:
Right knee exam reveals skin intact with minimal effusion. ROM-0-130 degrees with no pain at extremes. +JLT medially-this is more on the condyle then the meniscus. Medial joint line pain with McMurray and Thessaly; however, no palpable click. 1A Lachman. Stable knee to varus and valgus stress at zero and 30 degrees of flexion. Negative Posterior drawer and sag sign. Sensation intact to light touch on all distributions distally. 2+ distal pulses.
DIFFERENTIAL DIAGNOSIS:
1. Osteochondritis dissicans
2. Osteochondral lesion
3. Meniscus tear
TEST AND RESULTS:
The initial diagnostic test available was the ultrasound. There had been no prior imaging.
A limited ultrasound of the RIGHT Knee showed + mild joint effusion and a step off in the lateral portion of the medial femoral condyle.
Impression: + effusion and chondral defect of the lateral portion of the medial femoral condyle.
FINAL/WORKING DIAGNOSIS:
1. osteochondritis dissicans on the lateral portion of the medial femoral condyle
TREATMENT AND OUTCOMES:
He was given instruction to remain non weight bearing using crutches for 8 weeks pending results of imaging to determine stability of lesion.

RIGHT KNEE MFC

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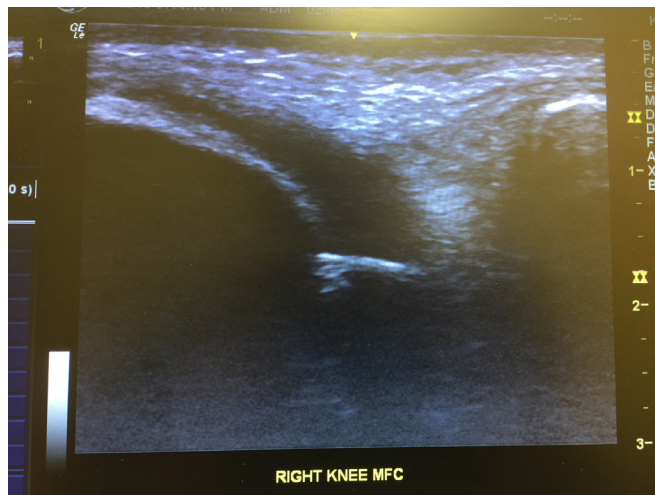
705   **May 30 3:55 PM - 4:15 PM**

Knee Lesions - Treating The Athlete Not The Images

Spencer Kirk, Michael Ladewski. *Presence Resurrection Medical Center, Chicago, IL.*
(No relevant relationships reported)

HISTORY: A 33 year old male runner presented to clinic for evaluation of left knee pain. Pt has had intermittent pain since 14 years old when he was diagnosed with a left medial femoral condyle osteochondral defect. At that time he was a competitive runner and treated with 6 months of rest. He had nearly complete resolution of symptoms. He was able to resume competitive running throughout high school and college. He is currently extremely active with crossfit, marathons, and triathlons. He is seeking activity guidance in preparation for his first ironman triathlon. Current pain described as medial, sharp, 6/10, rarely present but felt after prolonged sitting or with weighted squats, associated difficulty fully extending knee, improves with manual manipulation.
PHYSICAL EXAMINATION: Gait: Normal appearance. Locks knee with heel strike of active phase of walking. Running gait without abnormality. Unable to perform left single leg squat.
Knee PROM: -10 to 140 degrees without subpatellar crepitance

Appearance: No effusion or ecchymosis
Patella: Tracks normally with negative apprehension and compression tests
Tenderness: Absent
Special Tests: Negative Valgus/Varus stress, Lachman's, McMurray's, Wilson's sign
DIFFERENTIAL DIAGNOSIS: 1. Osteochondral defect 2. Patellar Tendonitis 3. Patellofemoral Syndrome 4. Fat Pad Syndrome 5. Medial Plica
TEST AND RESULTS: Left knee MRI with 18.1 x 27.1 x 10.0mm osteochondral lesion of the medial femoral condyle with subchondral fluid consistent with Grade III lesion. Medial femoral condyle with bony edema and subchondral cyst. FINAL WORKING DIAGNOSIS: Osteochondral defect TREATMENT AND OUTCOMES: The worrisome appearance of the patient's MRI was discussed in detail. However, given the relatively benign physical exam and high functionality he was instructed to remain active and avoid surgical intervention as long as possible. He was advised that the traumatic nature of endurance running would likely lead to faster progression of the cartilage defect. Follow-up 6 months later, after completion of his triathlon, without change in symptoms. He remained extremely physically active but with a greater emphasis on swimming and biking.
This case exemplifies the importance of maintaining clinical perspective when treating individuals rather than the severity of their images.

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706   **May 30 4:15 PM - 4:35 PM**

A Case of Bilateral Knee Pain in a Young Male Patient

Oluyemi Ajirotutu, Michael Fong. *Kaiser Permanente Los Angeles Medical Center, Los Angeles, CA.*
(No relevant relationships reported)

HISTORY: A 34-year old male with hypertension reports bilateral knee pain for 6-7 months. He describes the pain as achy and in his anterior knees. The pain is worse in the morning and after being on his feet all day at work. He reports some associated swelling. There was no trauma to his knees. He denies pain in any other joints. His pain is not improved with non-steroidal anti-inflammatory drugs however is improved with oral steroids. There is no family history of autoimmune conditions or joint disease.
PHYSICAL EXAMINATION: Exam performed in sports medicine clinic revealed moderate effusions of bilateral knees, limited flexion of both right knee to 90 degrees and left knee to 110 degrees, negative testing in the patellofemoral compartment, and negative meniscal/ligamentous testing. He was neurovascularly intact.
DIFFERENTIAL DIAGNOSIS:
1. Gout
2. Rheumatoid Arthritis
3. Osteoarthritis
TEST AND RESULTS:
XR Bilateral Knees: Mild bony degenerative changes with slight bilateral medial femoral tibial compartments marginal sclerosis and possible slight joint space narrowing.
ESR 3, RF<10
Aspiration of bilateral knees: 50-60ml of clear yellow fluid removed from each knee. Synovial fluid analysis demonstrated hazy fluid that was possibly inflammatory and was negative for infection or crystals.
MRI Left Knee: Moderate-sized joint effusion with synovitis. Frond-like synovial thickening in the anterior midline of the femorotibial joint that may be related to pigmented villonodular synovitis. Complex tear of the body of the medial meniscus.
MRI Right Knee: Medium-sized joint effusion with evidence of synovitis and possible foci of gradient echo dephasing which may be seen in association with pigmented villonodular synovitis. Complex tear of anterior horn and body of medial meniscus. Partial thickness chondral fissuring in medial patellar facet. Mild medial and lateral femorotibial compartment chondromalacia.
FINAL/WORKING DIAGNOSIS: Pigmented Villonodular Synovitis of Bilateral Knees
TREATMENT AND OUTCOMES:
Knee joint aspiration with intra-articular steroid injection
Rest, ice, compression, elevation
Non-steroidal anti-inflammatory drugs
Physical therapy/home exercise program
Future arthroscopic synovectomy and post-operative radiation

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707   **May 30 4:35 PM - 4:55 PM**

Opening Kickoff Knee Catastrophe in High School Football

Ryan Hunt. *Ohio Health, Columbus, OH.*
(No relevant relationships reported)

Knee Injury – Football
HISTORY
18-year-old senior high school football linebacker sustained a knee injury during the opening kickoff of the season. As he was pursuing the ball, his left leg planted and

hyperextended while being contacted by an opponent, producing forced valgus and lateral rotation. He immediately fell to the ground, required on field medical attention, and was unable to bear weight.

PHYSICAL EXAMINATION

Sideline examination occurred within 5 minutes. Left knee examination revealed a moderate effusion, normal patellar tracking, and no bony deformity. Neurovascular examination normal. Able to perform straight leg raise against light resistance. Active ROM limited to 60° flexion and lacked 10° extension. No bony tenderness. Ligamentous examination revealed a positive Lachman and valgus stress in 30 degrees of flexion. Unable to tolerate compression testing. Left hip and ankle examination normal. Contralateral knee normal.

DIFFERENTIAL DIAGNOSIS

1. Acute ACL tear
2. Acute MCL tear
3. Meniscus tear
4. Patellar dislocation
5. Tibial plateau fracture or contusion

INTERVAL COURSE

Office visit 7 days after injury. Arthrocentesis of the left knee returned 35 mL of blood. Initial treatment included use of crutches, ice, hinged-knee brace, and quadriceps rehab. MRI ordered, however study was delayed about 6 weeks due to gap in parent's insurance.

TESTS AND RESULTS

o Left Knee Radiographs: Normal

o Left Knee MRI:- Marrow contusion of medial, lateral compartments, fibular head, nondisplaced posterior tibial plateau fracture, subchondral impaction injury of lateral femoral condyle and lateral tibial plateau- ACL rupture, acute sprain of MCL, IT band, and LCL- Complex lateral meniscus tear, large fragment from posterior horn flipped anteriorly- Complex medial meniscus tear, vertically through posterior horn

FINAL DIAGNOSIS

Left knee acute ACL rupture, MCL sprain, medial and lateral meniscus tears, bone contusion

TREATMENT/COURSE

1. Referred to orthopedics, underwent arthroscopic ACL reconstruction with hamstring autograft, lateral meniscus repair, and partial medial meniscectomy 8 weeks after initial injury.
2. Significant discussion on post-op rehab and long-term activity modification.

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708   May 30 4:55 PM - 5:15 PM

Unique Surgical Intervention for Patella Baja

Kevin MacIntyre, Christopher Mazoue, Andrea Taylor. *University of South Carolina, Columbia, SC.*
(No relevant relationships reported)

History: Patient is an active 41 year-old female (160 cm and 68 kg) who had a history of left, anterior knee pain with mechanical symptoms while playing tennis. Patient revealed a surgical history including: s/p partial lateral meniscectomy with lateral release, s/p lateral retinacula repair, manipulation under anesthesia (MUA), s/p open quadriceps tendon repair respectively, all within the last two years. Patient complained of continued pain, patella instability and functional deficits.

Physical Examination: Knee alignment and patella tracking was normal. She had 1+ joint effusion. She had significant restricted knee flexion (0-70 degrees). Ligament tests were stable. Neurovascular exam was normal.

Differential Diagnosis:

1. Patella tendon tendinopathy
2. Patellofemoral pain syndrome
3. Patella baja

Test and Results:

X-ray (February 2016): Insall-Salvati Ratio: 0.38; Blackburne-Peel Ratio: .31

MRI: Confirm patella baja; no patella tendon pathology; evidence of previous quadriceps tendon repair

CT: Confirm patella baja with no evidence of patella femoral syndrome

Post-op X-ray (February 2017): Insall-Salvati Ratio: 1.1; Blackburne-Peel Ratio: .98

Final Diagnosis: Patella baja with inadequate extensor mechanism

Treatment and Outcomes:

1. Surgical intervention included: left patella tendon Z-lengthening with patella tendon reconstruction with left hamstring autograft, left quadriceps tendon V-Y shortening and augmentation of medial patellofemoral retinaculum with a dermal graft.
2. Patient was fitted for a T-scope post-operatively with knee restricted to a maximum of 0-30 degrees of knee flexion for the first 2 weeks. The patient was restricted at 0-60 from weeks 2-4 then at 0-90 degrees from weeks 4-6.
3. At 6 weeks post-op, the patient had 65 degrees of active knee flexion.
4. Continued small improvements were present but by week 14 the patient only had 80 degrees of flexion.
5. An MUA was performed and within the first 4 weeks post-op and by October 2016, the patient had been discharged from physical therapy for meeting goals

and was going to the gym autonomously. The patient had 112 degrees of active knee flexion.

6. Patient and surgeon satisfaction were achieved, and patella positioning was maintained throughout the patient's recovery.

B-45   Clinical Case Slide - **Lumbosacral Spine**

Wednesday, May 30, 2018, 3:15 PM - 4:55 PM
Room: CC-Mezzanine M100F

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709   **Chair:** Arthur Jason De Luigi. *MedStar NRH/Georgetown University Hospital, Olney, MD.*
(No relevant relationships reported)

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710   **Discussant:** Joseph Ihm, FACSM. *Shirley Ryan AbilityLab, Chicago, IL.*
(No relevant relationships reported)

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711   **Discussant:** Aaron Lee. *McNeal Hospital, Berwyn, IL.*
(No relevant relationships reported)

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712   May 30 3:15 PM - 3:35 PM

Unusual Cause of Postpartum Back Pain

Jacob Wessels. *Allina Health, St Paul, MN.* (Sponsor: Morteza Khodaee, FACSM)
(No relevant relationships reported)

HISTORY: A 27-year-old G5P0131 delivered an 1800g boy precipitously at 35 0/7 weeks. Her medical history was significant for gestational hypertension, hypothyroidism status post ablation, syphilis during pregnancy, and lumbar disc herniation. Twenty hours later she noted severe pain and inability to move her right lower extremity. She did have a fall or recent trauma. She had no numbness or tingling, normal bowel movements and urination. She did not have a fever, chills or any recent use of new medications.

PHYSICAL EXAMINATION:

Vital Signs: afebrile, other vital signs were unremarkable

Musculoskeletal: Normal back and hip appearance. Not warm. Tender over sacral ridge, right SI joint, piriformis area and thigh. Pain in the sacral/gluteal region worse with hip external and internal rotation (FABER and FADIR positive for pain). Back flexion and extension reproduced pain.

Neurological: Normal sensation and strength testing in lower right leg.

DIFFERENTIAL DIAGNOSIS:

1. Piriformis syndrome
2. Disc herniation
3. SI joint dysfunction
4. Gluteal muscle strain
5. Septic SI joint
6. Sciatica

TEST AND RESULTS:

Post Partum Day 4:

CRP 27 mg/dL, ESR 105 mm/hr

CT abdomen and pelvis:

No ileus or obstruction; normal postpartum uterus, no endometritis or retained products; central disc herniation at L4-5 and subtle effacement of left L5 nerve

Post Partum Day 8:

MRI Spine/Pelvis:

L4-5 disc space annular bulge, mild canal compromise and bilateral recess narrowing. Findings compatible with septic arthritis of the right sacroiliac joint with a small adjacent pericapsular and intramuscular fluid collection, worrisome for an abscess.

Post Partum Day 9:

CT guided aspiration:

Fluid culture positive Group B streptococcus

FINAL/WORKING DIAGNOSIS: right SI joint septic arthritis and iliopsoas abscess due to Group B streptococcus

TREATMENT AND OUTCOMES:

She was initially treated with physical therapy and pain medication. Failing improvement, labs and CT were obtained. CT was unrevealing and patient declined further imaging. After four days, she was agreeable to an MRI that revealed septic arthritis. She was initiated on broad-spectrum intravenous antibiotics and narrowed to ceftriaxone. She continued therapy and antibiotics for five weeks. Her CRP and ESR normalized and she followed up with primary care clinic and infectious disease.

WEDNESDAY, MAY 30, 2018

713   May 30 3:35 PM - 3:55 PM

A 37 Year Old Female Dance Instructor with Leg and Buttock Pain

John Franco, Cara Prideaux. *Mayo Clinic, Rochester, MN.*
(Sponsor: Dr. Karen Newcomer, FACSM)
(No relevant relationships reported)

HISTORY: A 37 year old female dance instructor with a history of stable multiple sclerosis presented with a 5 year history of left buttock and posterolateral thigh pain with radiation to the plantar surface of her foot that began during pregnancy. Pain was minimal at rest and aggravated by prolonged sitting and activities such as dancing, bicycling, and hiking. Pain progressed and now markedly limited activity. She reported tingling of the posterolateral calf and plantar surface of the foot. She denied weakness. Chiropractic care provided no relief. Previously obtained lumbar spine MRI was unremarkable and the patient completed 6 months of physical therapy without improvement.
PHYSICAL EXAMINATION: There was no appreciable deformity, malalignment, or rotation of the lumbar spine, hips, or knees. She walked with a non-antalgic gait, including normal heel and toe walking. Palpation of deep left gluteal muscles reproduced pain with radiation down the left lower limb. Range of motion of the lumbar spine and hips was grossly normal. Manual muscle testing of the lower limbs was normal. Passive hip flexion, abduction, and external rotation, as well as flexion, adduction, and internal rotation of the left hip reproduced pain. Remainder of provocative lumbar spine and hip maneuvers, including straight leg raise, were normal. She was neurovascularly intact.
DIFFERENTIAL DIAGNOSIS:
Chronic Piriformis Strain
Lumbosacral Radiculopathy
Hip Osteoarthritis
Multiple Sclerosis Flare
Sciatic, Tibial, or Peroneal Neuropathy
TEST AND RESULTS:
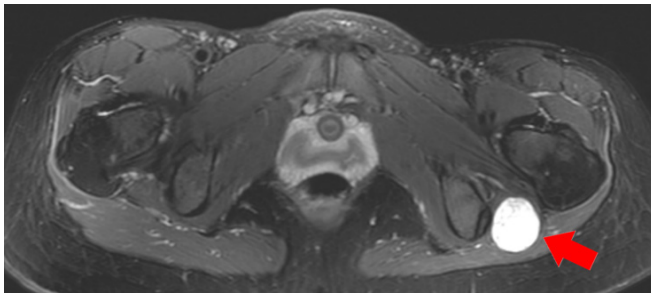
MRI Lumbosacral Plexus: 2.8 X 2.5 X 3.0 cm mass along the left sciatic nerve between the gluteus maximus and quadratus femoris with extension into the ischiofemoral space, consistent with cystic schwannoma
FINAL WORKING DIAGNOSIS: Left sciatic nerve tumor, concern for cystic schwannoma
TREATMENT AND OUTCOMES:
Neurosurgery evaluation
Underwent surgical resection of mass
16 weeks after surgery, reported 100% resolution of her symptoms

714   May 30 3:55 PM - 4:15 PM

Persistent Lower Back Pain In A Gaelic Footballer.

David Keohane. *Cork University Hospital, Cork, Ireland.*
(No relevant relationships reported)

History: A 27 year old, male, high-level, Gaelic Football and Hurling player presented to the Sports Medicine Clinic with a 3-year history of gradually deteriorating lower back pain rated 6/10. The pain was exacerbated by activity and improved by rest. He denied any history of trauma. He denied any radiation or radicular symptoms. Three years prior to presentation MRI had demonstrated a Scheuermann's kyphosis involving T12 with associated disc space narrowing at the T12-L1 level in addition to a transitional S1 vertebra.**Physical Exam**: Visual inspection was unremarkable. There was no pain on palpation over lumbar spine or paraspinal musculature. Lumbar flexion, extension and lateral side flexion were pain free and range of motion was within normal limits. Straight Leg Rise, Schobers and the Femoral Nerve Tension Test were normal. Examination of the hips revealed pain free but restricted internal and external rotation on the right but was otherwise normal. Neurovascular exam of lower limbs was normal.**Differential Diagnosis**: 1)Degenerative disc disease. 2)Lumber disc prolapse. 3)Spondylolisthesis. 4)Fracture of a lumbar vertebral body. 5)Hip pathology. 6)Inflammatory arthritis. 7)Seronegative spondyloarthropathy. 8)Infection.**Tests and**

Results: Bloods were analysed to out rule inflammation or infection. MRI lumbar-sacral spine demonstrated L2-L3 facet joint hypertrophy but no significant thecal sac or nerve root compression and no evidence of sacroiliitis. X-ray of right hip showed significant acetabular dysplagia with uncovering of the femoral head. MRI right hip revealed oedema and multiple small cysts in the right femoral head with remodelling and fragmentation, features consistent with avascular necrosis.**Final/Working Diagnosis:** Idiopathic Avascular Necrosis of the Femoral Head.**Treatment and Outcomes:** The patient was advised to abstain from training and competition. NSAIDs were prescribed for pain and Alendronate 70mg once weekly was initiated to inhibit osteoclastic activity and reduce the risk of femoral head collapse. The patient was referred for an orthopaedic opinion where options included, observation, femoral head core decompression, non-vascularized bone grafting and hip arthroplasty. The decision was ultimately made to pursue a conservative medical approach as outlined above.

715   May 30 4:15 PM - 4:35 PM

Back Injury-Deadlift Weights

Amie Kim, Christopher Gentile, David Matherly, Ronald Alexander Horowitz. *Mount Sinai Icahn School of Medicine Beth Israel Medical Center, New York, NY.*
(No relevant relationships reported)

HISTORY: 35 year old transgender biologically female to male on 12-years high dose testosterone therapy presents with lower back pain for 2 weeks. He was deadlifting weights when noticed delayed left posterior thigh and calf pain. Pain was intermittently throbbing but responsive to acetaminophen. He went to an Urgent Care where a venous duplex was performed which was negative. He was diagnosed with paralumbar muscle strain, and cyclobenzaprine prescribed with little relief. One week later he presented to our emergency department with worsening pain and intermittent numbness in left foot and toes. He denies bladder or bowel changes. **PHYSICAL EXAMINATION:** Uncomfortable appearing. No bony lumbosacral tenderness. Tenderness to palpation left paralumbar muscles, left posterior thigh, calf. Active range of motion limited by pain including flexion/extension/lateral bend. Motor exam of nerve roots IP 4/5 Q 4/5 TA 4/5 EHL 4/5 GS 4/5 FHL 4/5. Sensory intact to light touch L2-S1. 2+ DP pulse. Gait antalgic and limited by pain. **DIFFERENTIAL DIAGNOSIS:** paralumbar strain, rhabdomyolysis, deep vein thrombosis, lumbar radiculopathy, conus medullaris, cauda equina syndrome **TEST AND RESULTS:** Serology including WBC, CPK and D-Dimer within normal values. Radiographs of pelvis / lumbosacral spine without findings. Calf venous duplex without acute thrombus. MRI lumbosacral spine with L4-L5 large left paracentral disc herniation displacing spinal canal with significant compression on the left S1 nerve root and thecal sac. Conus medullaris normal in signal. **FINAL WORKING DIAGNOSIS:** cauda equina syndrome **TREATMENT AND OUTCOMES:** Patient underwent emergent L5-S1 laminectomy with decompression of S1 nerve root, diskectomy with partial facetectomy. Discharged to outpatient therapy. Residual left lower extremity weakness, numbness, and perineal numbness treated with high dose methylprednisolone. Role of high dose testosterone in patient's presentation under evaluation.

716   May 30 4:35 PM - 4:55 PM
Back Pain-hockey

Melanie Kennedy, Anastasia Fischer, FACSM, Reno Ravindran. *Nationwide Children's Hospital, Columbus, OH.*
(No relevant relationships reported)

HISTORY:
A 17 year old male hockey goalie presented with acute left low back pain with radiculopathy after falling on his left side making a save a few days prior. He was unable to continue participation. A non-contrast MRI of his lumbar spine was performed to evaluate for disk pathology/sacroiliac joint inflammation and was negative. He completed 8 weeks of physical therapy to address poor hamstring flexibility and core strengthening with minimal improvement. He attempted to return to hockey but it worsened his pain. At follow up visits, he now had increased bilateral ischial tuberosity pain, and inflexibility of bilateral hamstrings. Pelvic radiographs were negative. Case discussed with PMR for extreme inflexibility but patient elected to continue with therapy transitioning to functional rehabilitation with an athletic trainer. After a few weeks with functional rehab, he had worsening low back and was referred back to clinic. He endorsed alternating between left and right posterior glutes, SI joint pain, quad and calf achiness and occasional shooting pain down left leg to posterior knee. Additionally pain woke him at night; he had morning stiffness, unintentional weight loss and no significant improvement throughout his 13 weeks of therapy. He did have prior issues with back pain in previous years managed by his PCP. Further imaging and lab work were obtained.
PHYSICAL EXAM: Tender within bilateral SI joints and right iliac crest. Poor flexibility of bilateral hamstrings, full range of motion of low back but evidence of somatic dysfunction.
DIFFERENTIAL DIAGNOSIS:
1. Herniated lumbar disk
2. Sacroiliac Joint Dysfunction
3. Functional back pain
4. Muscular strain
5. Spondyloarthropathy
6. SI joint infection/ Osteomyelitis
7. Metastatic Cancer
8. Psychologic Illness
TEST AND RESULTS:
7/5: Lumbar radiographs: Normal
7/11: MRI lumbar spine: Subcentimeter synovial cyst but otherwise negative
9/12: Pelvic radiographs: Normal
10/16: Sacroiliac MRI with/without contrast: Bilateral sacroilitis
Laboratory 10/13: CBC. CMP, ESR, CRP: Unremarkable
FINAL/WORKING DIAGNOSIS: Enthesitis related arthritis
TREATMENT AND OUTCOMES:
1. Prescribed Naproxen twice a day
2. Care transitioned to Rheumatology
3. Additional lab work up
4. Started on methotrexate and anti-TNF therapy
5. Plans to return to hockey next season

B-58   Free Communication/Poster - **Body Composition**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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740   Board #1   May 30 2:00 PM - 3:30 PM
Challenging The Testing Protocol Of The Bod Pod

Eric Shamus, PhD, DPT, Sarah Bengtson, DPT, Sierra Griffin, DPT, Ahmed Elokda, PhD, PT, Liza Malley, BS. *Florida Gulf Coast University, Fort Myers, FL.* (Sponsor: Mitchell L. Cordova, FACSM)
(No relevant relationships reported)

The BOD POD uses air displacement plethysmography to determine an individual's body composition as percentages of fat mass and fat free mass. The BOD POD presents potential use in a clinical setting, but the feasibility is currently unknown. There were no studies found examining the consumption of fluids and pre-urination prior to body composition testing utilizing the BOD POD. **PURPOSE:** The objective was to determine if the BOD POD protocol, as set forth by Life Measurement, Inc., needs to be followed in its entirety to ensure validity of body composition results, where urination and fluid consumption prior to testing were both independently tested. **METHODS:** Thirty-two division 1 male (15) and female (17) soccer athletes were recruited for this research study. Male soccer players weighed 162.6 pounds ($\pm$ 19.03) and female soccer players weighed 133.8 pounds ($\pm$ 10.38). All athletes

were between 18 and 22 years old (Male $\pm$ 1.37 & Female $\pm$ 1.17). Four separate measurements of body composition were taken: pre-urination, standard LMI protocol test re-test, and consumption of water equal to 10% of their body weight in ounces. **RESULTS:** A Pearson product moment correlation between the second condition (post urination) and the third condition (post urination retest) signified a good to excellent relationship between the standard test and the retest conditions (0.977, p < .001). A MANOVA analysis was performed comparing pre-urination and post-urination test/retest indicated that not urinating prior to testing had no significant effect on body composition measurements (p > .05). Consumption of water did have a significant effect on the results of the body composition measurements. It was found that post water consumption, male participants' measurement of fat mass on average had a significant difference of 0.6% and female participants' fat mass measurements on average had a difference of 1.4%, p < .001). **CONCLUSION:** Results did not support the need to urinate prior to BOD POD testing while supporting the need to refrain from water consumption directly prior to testing.

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741   Board #2   May 30 2:00 PM - 3:30 PM
Assessing The Impact Of Body Fat Percentage And Lean Mass On Wingate Performance

Robert T. Sanders[1], Andy Bosak[1], Matthew L. Sokoloski[2], Hannah E. Nelson[1], James Kelly[1], Jared Feister[1]. *[1]Liberty University, Lynchburg, VA. [2]Texas Woman's University, Denton, TX.* (Sponsor: Dr. James Schoffstall, FACSM)
(No relevant relationships reported)

The Wingate test is commonly utilized to assess the anaerobic power capabilities of athletes across various sporting disciplines. Although prior studies have assessed the impact that body composition values have on anaerobic performance in above averagely fit populations, it appears that no study has evaluated the relationship between body fat percentage (BF%), lean leg mass (LLM), and trunk lean mass (TLM) on Wingate performance in no less than averagely fit males. **PURPOSE:** To investigate the relationship between BF%, LLM, and TLM on Wingate performance in no less than averagely fit college-age males. **METHODS:** After having descriptive data recorded, 38 no less than averagely fit college-age males had their BF%, LLM, and TLM assessed via a bioelectrical impedance analyzer. BMI was also analyzed. Subjects participated in an 8 min dynamic warm-up on a leg cycle ergometer, followed by the completion of a maximal effort 30s sprint. Pearson Correlations were then performed between BF%, LLM, TLM, peak power (PP), and mean power (MP) with significant differences determined at p $\leq$ 0.05. **RESULTS:** High to moderately high positive correlations existed between PP and TLM (r = .834, p = .001), LLM (r = .773, p = .001), BMI (r = .657, p = .001) as well as between MP and TLM (r = .904, p = .001), LLM (r = .880, p = .001), and BMI (r = .619, p = .001). However, no relationship occurred between BF% and PP (r = -.064, p = .123) while a low negative relationship occurred between MP (r = -.234, p = .049) and BF%. **CONCLUSIONS:** TLM, LLM, and BMI appear to have a strong positive relationship with Wingate performance in no less than averagely fit males, while BF% appears to have little to no relationship with Wingate performance. Further research may be necessary in order to determine if fitness level, sport specificity, or a different type of body fat percentage measurement technique may play a factor when considering if BMI, BF%, LLM, and TLM has a relationship with Wingate performance.

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742   Board #3   May 30 2:00 PM - 3:30 PM
Comparison Of A-mode And B-mode Ultrasound For Measurement Of Subcutaneous Fat

Dale R. Wagner, Trenton Judd, Joshua Gordon, Casey McPherson, Adrianna Robison. *Utah State University, Logan, UT.* (Sponsor: Edward Heath, FACSM)
(No relevant relationships reported)

With lower cost devices and technological advancements, ultrasound has been undergoing a resurgence as a method to measure subcutaneous adipose tissue. Amplitude (A-mode) ultrasound produces a spike at the interface between subcutaneous fat and muscle, while brightness (B-mode) ultrasound produces an image of the underlying tissues. **PURPOSE**: This study aimed to determine if a low-cost, low-resolution A-mode ultrasound designed specifically for body composition assessment could produce subcutaneous fat thickness measurements comparable to an expensive, high-resolution B-mode device. **METHODS**: Subcutaneous fat thickness was measured on 41 participants (21 female, 20 male; 29.6 ± 11.0 y; BMI 25.3 ± 5.1 kg/m²) at 7 sites (chest, subscapula, mid-axilla, triceps, abdomen, suprailiac, and thigh) with two devices: a 2.5 MHz A-mode ultrasound (BodyMetrix BX 2000), and a 12 MHz B-mode ultrasound (GE NextGen LOGIQ e R7). **RESULTS**: Pearson correlation coefficients between the two ultrasound devices exceeded 0.80 ($P < 0.001$) at all measurement sites. Mean differences in fat thickness were not significantly different between the devices ($P > 0.05$) with the exception of the triceps site ($P = 0.021$); however, the mean difference at this site (0.53 mm) was not clinically relevant. The variability between devices was greatest at the abdomen, the site with the greatest thicknesses. However, Bland-Altman plots revealed no systematic bias between

devices at any site. **CONCLUSIONS**: Given the strong relationships, insignificant mean differences, and lack of systematic bias, the low-cost, low-resolution A-mode ultrasound provides subcutaneous fat thickness measurements similar to the more expensive, high-resolution B-mode ultrasound.

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743   Board #4   May 30 2:00 PM - 3:30 PM

Agreement in Fat and Muscle Estimation between Bioelectrical Impedance and Anthropometry in Youth Athletic Population

Enrique O. Prada, Aldo F. Longo, Néstor A. Lentini, Marcelo L. Cardey, Gustavo D. Aquilino. *CeNARD, Buenos Aires, Argentina.*

(No relevant relationships reported)

PURPOSE: The purpose of this research was to measure the level of agreement in the assessment of the body fat and muscle masses between an anthropometry-based model and the bioelectrical impedance analysis in youth athletes.
METHODS: A sample of 252 subjects was studied (137 boys and 115 girls). The participants covered an age range from 12.5 to 16.6 years (Body mass = 59.1 ± 9.8 kg, BMI = 21.2 ± 2.4 kg·m^{-2}; mean ± SD). Body composition was indirectly achieved by bioelectrical impedance analysis (BIA) and by the anthropometry-based model of De Rose and Guimaraes (1980) (DRG). DRG was updated using the simple regression equations of Withers *et al.* (1987, cited by Norton, 1996) to estimate body density, and Siri formula (1961) was then utilized to calculate the percentage of body fat. The mean values of the body fat and muscle masses given by the two methods were contrasted within each gender stratum, using the Student's *t*-test for correlated samples. The Bland-Altman analysis was employed to estimate 95% limits of agreement. Statistical significance was set at p<0.05.
RESULTS: The differences between DRG and BIA were statistically significant in both genders (p<0.001). In boys, the mean values were, respectively, 7.4 and 7.9 kg for the fat mass, and 28.9 and 31.0 kg for the muscle mass; the 95% limits of agreement were from -3.8 to 2.7 kg, and from -6.0 to 1.6 kg. In girls, the mean values were, respectively, 9.4 and 11.8 kg for the fat mass, and 22.4 and 23.3 kg for the muscle mass; the 95% limits of agreement were from -6.3 to 1.5 kg, and from -4.3 to 2.4 kg. The means for the variables expressed in percentage values were, in boys, 11.5 and 12.4 % for the fat mass, and 45.8 and 49.2 % for the muscle mass; the 95% limits of agreement were from -5.9 to 4.1 %, and from -8.9 to 2.1 %. And in girls, the means were 16.8 and 21.2 % for the fat mass, and 41.7 and 43.2 % for the muscle mass; the 95% limits of agreement were from -11.1 to 2.3 %, and from -7.2 to 4.1 %.
CONCLUSIONS: There was found a negative bias of DRG with respect to BIA for the two variables. In boys, the difference between methods was higher for the muscle mass, and in girls it was higher for the fat mass. The bias between DRG and BIA had a detrimental impact on the limits of agreement.

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744   Board #5   May 30 2:00 PM - 3:30 PM

Normalization For Body Mass Affects The Correlation of Strength Tests To Speed And Agility Tests

Anthony Caterisano, FACSM[1], Mike Gentry[2]. *[1]Furman University, Greenville, SC. [2]Virginia Polytechnical Institution, Blacksburg, VA.*

(No relevant relationships reported)

Previous research has explored the correlation between strength tests and speed-agility tests among athletes with varying results. Much of this can be attributed to differences in reported results based on absolute strength test values versus those normalized to body mass (BM). **Purpose:** This study was to compare the correlation between absolute strength, speed, and agility test results to those normalized using body mass. **Methods**: Varsity Division I male football players (n = 327) were tested during several seasons. Tests for strength included one repetition maximum (1RM) back squat (BS), power clean (PC), and push jerk (PJ). Results were recorded as absolute values as well as normalized values, calculated by dividing each 1RM by the athlete's BM. Tests for speed and agility included 40-yard dash (40YD), 10-yard dash (10YD), 20-yard shuttle run (SR) and standing vertical jump (VJ). A Pearson Product-Moment Correlation analysis was used to determine significant correlations between tests. **Results:** Results are presented below, with the first table displaying the absolute values of the strength tests and the second table showing the normalized values:

	Shuttle Run	10-yd Dash	40-yd Dash	Vertical Jump
Push Jerk	.22*	.11*	.25*	- .08
Power Clean	.09	.02	.12*	.04
Back Squat	.16*	.05	.13*	.00

	Shuttle Run	10-yd Dash	40-yd Dash	Vertical Jump
Push Jerk / Body Mass	- .63*	- .60*	- .66*	.62*
Power Clean/ Body Mass	- .71*	- .64*	- .76*	.68*
Back Squat/ Body Mass	- .59*	- .57*	- .68*	.62*

*P≤0.05

Conclusions: The results suggest that the correlations between 1RM strength test, and speed-agility test results are affected by normalizing to BM. There is a stronger significant correlation between tests when 1RM strength test values are normalized to BM.

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745   Board #6   May 30 2:00 PM - 3:30 PM

Ability of the LeanScreen App to Accurately Assess Body Composition

Kimberly L. Radtke, John P. Porcari, FACSM, Ray Marx, Richard Mikat, FACSM, Scott Doberstein, Abigail Ryskey, Carl Foster, FACSM. *University of Wisconsin - La Crosse, La Crosse, WI.* (Sponsor: John Porcari, FACSM)

(No relevant relationships reported)

Waist-to-hip ratio (WHR) and percent body fat (%BF) are commonly used to assess body composition in health and wellness settings. While there is only one commonly used method for measuring WHR, %BF can be determined many ways. However, the accuracy, cost, and ease of use of these methods vary greatly. The LeanScreen app is a new method designed to determine WHR and %BF using photographs. **Purpose:** This study was designed to assess the accuracy of the LeanScreen app to determine WHR and %BF against laboratory-validated methods. Eighty subjects (40 males; 40 females) participated in this study. Waist-to-hip ratio was manually measured and %BF was determined using the BOD POD. Photographs of each subject were taken from the front and back with the LeanScreen app according to the procedures demonstrated by the program software. **Results:** There was no significant difference in WHR between the LeanScreen app (.81 ± .078) and manual (.81 ± .087) WHR measurement (r=.83). Additionally, it was found that 73 subjects (91%) were within one standard deviation (0.08) of the mean. Overall, %BF was significantly underpredicted by the LeanScreen app compared to the BOD POD (20.2 ± 7.74 vs. 21.6 ± 8.77). Although there was a high correlation between the two methods (r=.82), only 35 subjects (44%) were within ± 3% of BOD POD derived %BF and there was a high degree of variability between methods (SEE=5.1). **Conclusion:** Based upon the results of this study, the LeanScreen app accurately determines WHR, but does not accurately determine %BF on an individual basis.

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746   Board #7   May 30 2:00 PM - 3:30 PM

Validation of New Skinfold Prediction Equation Based on Dual-Energy X-Ray Absorptiometry for Women.

Jillian Barnas, MS, Stephen Ball, PhD. *University of Missouri - Columbia, Columbia, MO.* (Sponsor: Jill Kanaley, PhD, FACSM)

(No relevant relationships reported)

There is a high demand for affordable body composition assessments of body fat and fat free mass. Research has demonstrated that skinfold prediction equations recommended by the American College of Sports Medicine (ACSM) underestimate body fat percentage (%BF). **PURPOSE:** The purpose of this study was to validate an alternative equation for women created from dual energy x-ray absorptiometry (DXA). The DXA criterion (DC) equation is:
%BF= -6.40665 + 0.491946(S3SF) - 0.00126(S3SF)^2 + 0.12515(hip) + 0.06437(age); (S3SF = sum of triceps, suprailiac, thigh; hip = circumference in cm; age = years).
METHODS: Anthropometrics (skinfolds and circumferences) and a DXA scan were completed on 78 women (mean ± SD) [age: 28.0 ± 10.1 yr., height: 165.1 ± 5.9 cm, mass: 63.5 ± 10.5 kg., BMI: 23.2 ± 3.2 kg/m^2]. The three Jackson-Pollock skinfold prediction equations (JP7, JP3a, and JP3b) and the DC equation were compared to DXA %BF. **RESULTS:** Two-way ANOVA with repeated measures detected significant differences (p < 0.05) in the %BF with post hoc-comparisons revealing significant differences among JP7 (21.4 ± 5.8), JP3a (22.3 ± 5.9), and JP3b (22.7 ± 5.7) as compared to the DXA (26.6 ± 5.4). No significant difference existed between DC %BF (26.6 ± 5.9) and DXA %BF (26.6 ± 5.4) (p = 1.0) and the two assessments were highly correlated (R = 0.87). The standard error of the measurement for the DC equation was low (2.98%). **CONCLUSION:** The DC equation more accurately predicted %BF across a general population of women than the recommended ACSM equations. Practitioners should consider its use and exercise caution when using older equations since they may yield lower %BF compared to DXA.

747   Board #8   May 30 2:00 PM - 3:30 PM

Evaluation of Regional Body Composition in Able-Body and Wheelchair Basketball Teams

Judy R. Wilson, FACSM, Sara Kirk, Sarah Poydence. *University of Texas @ Arlington, Arlington, TX.*
(No relevant relationships reported)

BACKGROUND: The differences in maximum oxygen consumption (VO_{2max}) and peak oxygen consumption (VO_{2peak}) between able-bodied athletes and wheelchair athletes has been well documented. Another relationship that has been well established is that of body composition and aerobic or cardiovascular fitness (VO_2). **PURPOSE:** The purpose of this study was to evaluate the regional body composition, as measured by the dual energy x-ray absorptiometry (DXA), between the able-bodied (AB) men's and women's basketball teams and the men's and women's wheelchair (WC) basketball teams and its relationship to VO_2. **METHODS**: 7 WC athletes with a spinal cord injury (SCI, age 21.29 ± 2.29 yrs), 7 WC non-SCI athletes (NSCI, age 20.14 ± 2.14 yrs) and 28 AB athletes (age 19.43 ± 2.57 yrs) participated in the study. The subjects underwent exercise tests to determine VO_{2max} or VO_{2peak}. The AB teams performed the Bruce protocol using a Parvo metabolic cart while the WC teams used their wheelchairs attached to a treadmill using a Cosmed K4b2 portable metabolic machine. Body composition measures, total and regional percent body fat (%BF), were conducted using a GE-Lunar DXA. The regional measures (arms and legs) allowed body composition comparisons between AB and WC teams. SPSS 24 was used to run a linear regression to determine what percent of VO_2 could be attributed to %BF. **RESULTS**: DXA results were total (AB: 19.24 ± 16.06%; NSCI: 36.46 ± 14.34%; SCI: 31.70 ± 19.40%) and regional (AB: 20.40 ± 15.90%; NSCI: 25.67 ± 13.93%; SCI: 22.60 ± 14.70%). VO_{2max} results (AB 44.62 ± 14.98 ml/kg/min) and VO_{2peak} results (SCI: 25.80 ± 10.12 ml/kg/min; NSCI: 24.34 ± 5.51 ml/kg/min) were significantly different ($p < 0.05$). When evaluating WC users, specifically with a SCI, the R^2 value was 0.703 ($p = 0.018$) which showed this method does predict VO_{2max} significantly. When evaluating only the working limbs of the able body group, the R^2 value was 0.233 ($p = 0.009$). **CONCLUSION**: Significant differences were found among the 3 groups (AB, SCI, non-SCI) when evaluating total body fat. However, there were no significant differences when evaluating %BF of the working limb. This suggests that there may be more to the VO_{2max} differences seen between AB and WC athletes than just muscle size and that regional %BF of the working limb should be taken into account with SCI.

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Effects Of Menstrual Cycle On Body Weight And Intracellular And Extracellular Fluid

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(No relevant relationships reported)

Blood concentrations of ovarian hormones, such as estrogen and progesterone, change during each phase of the menstrual cycle. Ovarian hormones can have an effect on fluid retention. Therefore, it has been suggested that the body weight and body composition changes with different phases of the menstrual cycle. **PURPOSE**: The purpose of this study was to compare changes in body weight and intracellular and extracellular fluid levels during the menstrual cycle. **METHODS**: The subjects were eight women (age, 21.6 ± 1.1 y) with regular menstrual cycle who volunteered to participate in this study. Subjects performed 30 min of cycling at an intensity of 60% VO_2 peak at three time points during the menstrual cycle: follicular phase, FP; ovulation phase, OV; luteal phase, LP). Blood samples were collected at rest (0 min), immediately after the exercise (30 min), 30 min after the exercise (60 min), and 60 min after the exercise (90 min). The duration of each menstrual cycle phase was estimated by assessing the levels of ovarian hormones. Blood analyses of ovarian hormones (estradiol and progesterone), renin activity, and aldosterone were conducted. Intracellular fluid and extracellular fluid from each site (upper limb, lower limb, and trunk) were measured before and after exercise. **RESULTS**: Blood concentration of estradiol was greater during the OV and LP than during the FP at all time points (FP, 30.4 ± 12.3 pg/mL; OV, 186.6 ± 139.1 pg/mL; LP, 195.5 ± 118.0 pg/mL, $p < 0.05$). The body weight tended to greater in the LP when compared to the OV (FP, 57.8 ± 2.3 pg/mL; OV, 57.7 ± 2.4 kg; LP, 58.2 ± 2.2 kg, $p = 0.06$). The extracellular fluid from the trunk was significantly higher in the LP than in the FP and OV (FP, 5.49 ± 0.4 L; OV, 5.50 ± 0.4 L; LP, 5.55 ± 0.3 L, $p < 0.05$). A significant positive correlation was found between renin activity and progesterone levels (r = 0.632, $p < 0.05$). **CONCLUSIONS**: The increase in body weight during the LP was induced by an increase in body fluid volume. This study was supported by the JSPS KAKENHI Grant Number 26350768 and Ministry of Education, Culture, Sports, Science and Technology-Japan, Female Athlete Development and Support Project.

749   Board #10   May 30 2:00 PM - 3:30 PM

Body Fat Percent and Relative Intensity in Walking at 2.5 mph among University Students

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(No relevant relationships reported)

Purpose: To better understand the relationship between body composition and aerobic capacity, this study examined how body fat percent (%BF) would be related to heart rate (HR), maximal HR% (%HRmax) and HR reserve% (%HRR) when walking at 2.5 mph among university students. **Methods**: The three-site skinfold measure was administered to 176 university students (mean age: 20.82±1.49; 102 males and 74 females) in the US and converted to %BF using the conversion tables by Jackson et al. (1985). The ACSM %BF satisfactory ranges (2014, 10%-22%BF for men and 20%-32%BF for women) were used to divide participants into three %BF categories: Normal, Lean, and Obese. In addition, using HR monitors (Sigma PC26.14) resting HR (after lying on the floor for five minutes) was measured to calculate HRR, and HR at the end of a three-minute treadmill walking at 2.5 mph was also measured. One-way MANOVA was used to examine differences in HR, %HRmax, and %HRR at the end of the three-minute walking among the three %BF groups. **Results**: There were 90 participants in Normal, 64 in Lean, and 22 in Obese group. No age difference (p > .70) was found among the three %BF groups (Normal 20.71±.90, Lean 20.94±2.79, Obese 20.95±1.50). However, significant differences (p values ranged from .000 to .012) were observed in HR, %HRmax, and %HRR at the end of the three-minute walking at 2.5 mph among the three %BF groups. Specifically, significant differences were identified in HR in all the three pairwise comparisons: Lean (89.90±10.00) vs. Obese (104.77±10.32), Lean vs. Normal (98.39±11.10), and Normal vs. Obese; in %HRmax in all the three pairwise comparisons: Lean (45.18±5.14) vs. Obese (52.64±5.19), Lean vs. Normal (49.37±5.57), and Normal vs. Obese; and in %HRR between Lean (18.71±6.60) and Obese (24.39±6.69) and between Lean and Normal (22.06±6.61). **Conclusion**: Even walking at the threshold of moderate intensity (2.5 mph, a 3-MET activity), lean individuals demonstrate significantly lower HR, %HRmax, and %HRR than normal and obese individuals; and normal individuals show significantly lower HR and %HRmax than obese individuals. The %BF classified with ACSM %BF ranges has significant impact on relative intensity experienced among university students when walking at 2.5 mph.

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Hyperhydration Acutely Increases Bioelectrical Impedance Analysis Body Fat Estimates

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(No relevant relationships reported)

Bioelectrical impedance analysis (BIA) is a common and non-invasive method to evaluate body composition by measuring the electrical impedance of the body. Altering blood electrolyte concentration or blood volume may impact BIA measurements by directly influencing the electrical conductivity of the body. While dehydration and sweat induced electrolyte loss certainly impacts BIA, it is unclear how simultaneous hyperhydration and electrolyte loading effects BIA measurements. **PURPOSE:** To examine the effects of acute hyperhydration and salt loading on the impact of BIA derived body fat estimates. **METHODS:** Each participant ate a standardized meal followed by ≥4hr fast, prior to the experimental visit. Adequate hydration (urine SG ≤1.020) of each participant was confirmed prior to the start of the visit. Tanita TBF-300A BIA and a blood sample were performed at baseline and every 30min for 3hr following the consumption of 3.8 grams of table salt dissolved into 466mL of deionized water (sodium: 1500mg, 140mmol). All urine produced during the 3hr follow-up was collected to assess volume and electrolyte excretion. **RESULTS:** Seven healthy participants (3M/4W, 29±2 years, 67.0±4kg, urine SG 1.007±0.001, hemoglobin 13.7±0.2g/dL, hematocrit 45±1%, serum sodium 140.0±0.5mmol/L) were studied. Participants excreted 646±55mL of urine containing 17.1±6.8mmol of sodium during the 3hr follow-up period. Consumption of the salt water solution increased plasma volume 7.0±0.7% and serum sodium 1.3±0.4% with each statistically elevated above baseline during the time points ≥60min and ≥120min, respectfully (all $p<0.05$). Both body mass (+0.4±0.1kg) and BIA estimated body fat percentage (+0.6±0.2%) (both $p<0.05$) increased immediately and returned to baseline levels by 90min. Leg to leg electrical impedance was not affected by the consumption of the salt water beverage ($p=0.660$). **CONCLUSION:** This preliminary data suggests that when starting in a hydrated state, concurrent consumption of salt and water temporarily increases body mass causing an increase in body fat estimates. However, differences in temporal patterns suggest increased plasma volume with small elevations in electrolyte concentration does not directly affect body fat estimates when using bioelectrical impedance analysis.

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Effects of a Six Week Weight Loss Challenge on Body Composition and Cardiovascular Health

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(No relevant relationships reported)

Regular exercise and a healthy diet are associated with significant changes throughout the body including improved body composition and enhanced cardiovascular health. A local gym recruits individuals to participate in a six-week twenty pound weight loss challenge and provides participants with a structured diet and exercise plan. **PURPOSE:** The purpose of this study was to determine if a primarily weight loss driven program would also result in an improvement in body composition and enhance cardiovascular health. **METHODS:** Total weight, body fat, lean muscle mass, waist and hip circumference, resting metabolic rate (RMR), total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, fasting plasma glucose (FPG), triglycerides (TG), resting blood pressure (BP), and resting heart rate (RHR) were assessed before and after the six-week program in thirty four sedentary adults (M_{age} =38.24, SD=9.93). Subjects were required to participate in a vigorous boot camp program a minimum of five days per week for fifty minutes and follow a structured diet plan. **RESULTS:** There was a significant decrease in total body weight following the six-week challenge (197.1 ± 7.76 lbs vs. 187.8 ± 7.16 lbs; P < 0.001). There was a decrease in body fat (38.6 ± 1.52% vs. 36.2 ± 1.52%; P < 0.001) as lean muscle mass increased (61.4 ± 1.52% vs. 63.8 ± 1.52%; P < 0.001). Participants successfully lost 1 inch off their waists and hips (P < 0.01). A significant decrease in TC (189.2 ± 6.81 mg/dL vs. 173.4 ± 6.65 mg/dL, P < 0.001) and LDL (115.0 ± 7.25 mg/dL vs. 107.0 ± 6.05 mg/dL, P < 0.05) were seen following the weight loss program. Unfortunately, neither RBP nor RHR were significantly altered by the program. **CONCLUSIONS:** These data suggest that this particular weight loss driven program is effective in significantly improving body composition and reducing TC and LDL. However, this program did not statistically improve resting metabolic rate or decrease resting cardiovascular measures. While this study emphasizes the health-related advantages of incorporating physical activity and a healthy diet into a sedentary lifestyle, further research can contribute to training specificity and the impact both cardiovascular and weight training have in junction with a structured weight loss program.

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Evaluation Of Body Composition Measurements Obtained Using Whole-body Plethysmography

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(No relevant relationships reported)

Purpose: Body composition assessments provide important health information, as excess body fat percentage (BFP) in relation to lean body mass can increase risk of cardiovascular disease and diabetes. While dual-energy x-ray absorptiometry (DXA) is a gold standard measurement of body composition, faster alternatives that do not expose participants to radiation, such as bioelectrical impedance (BIA), can promote awareness and be used to determine training efficacy. In this study, we compared body composition measurements obtained using whole-body plethysmography by the Airmetrix Whole-Body Self-Service Analyzer to those obtained via multifrequency BIA analysis and DXA scanning.
Methods: Twenty-six volunteers (17 female, 36.7 ± 12.3 years of age) were tested on two visits. On the first visit, body composition was assessed under fasted conditions by one Biospace InBody 770 analysis, one DXA scan (GE Lunar iDXA), and at least two Airmetrix tests. The second visit was performed at least 24 hours later, at a different time of day, and after the participant had consumed a meal. Body composition was assessed by one InBody analysis and at least two Airmetrix tests. For all tests, participants wore clothing that was tight and minimal with long hair tied up to minimize extra volume that may interfere with measurements. Shoes, keys, jewelry, and other accessories were removed.
Results: The Airmetrix system showed good precision, with a within-visit retest mean range of 0.04 lbs and 0.51% for weight and BFP, respectively. Although there were statistically significant absolute changes in weight and BFP between visits, there was no systematic direction and was therefore likely due to normal physiological fluctuation. Comparing devices, InBody and average Airmetrix BFP measurements were significantly lower than DXA BFP measurements for both visits (p<0.001). Although the Airmetrix system had slightly greater absolute mean percent error compared to InBody (18.8-19.4% vs. 16.8-17.1%, respectively), the difference in errors between devices was not statistically significant (p=0.067).

Conclusion: The Airmetrix system assess weight and BFP with good precision. Overall, the Airmetrix and InBody devices produce similar results, and both significantly underestimate BFP compared to DXA.

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Large Exercise-induced Weight Loss on Fat Distribution and Metabolic Risk Factors in Young Obese Males

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(No relevant relationships reported)

There has been a lack in research on the effects of large exercise-induced weight loss of more than 10 kg on fat distribution and metabolic profile of obese males. **PURPOSE:** To examine large exercise-induced weight loss on fat distribution and metabolic risk factors, and their improvements associated with coronary heart disease. **METHODS:** A total of 20 obese males (age: 19.3 ± 1.30 yrs) completed in the institutionalized regimented training (IRT) held over 16 weeks. Anthropometric, dual x-ray absorptiometry scan and resting metabolic rate (RMR) measurements were taken in the laboratory, while computerized tomography scan, fasting venous blood samples, and a 2-hour oral glucose tolerance test were completed at a local hospital. Daily activities and dietary habits were self-recorded over 2 weekdays and 1 weekend day. **RESULTS:** IRT resulted in an average weight loss of 13.4 ± 3.70 kg (p < 0.001), significantly reducing body fat percentage and body mass index (p < 0.001). There were significant reductions in total cholesterol (Pre: 4.79 ± 0.92 mmol.L^{-1}, Post: 4.12 ± 0.82 mmol.L^{-1}, p < 0.001), triglycerides (Pre: 1.19 ± 0.57 mmol.L^{-1}, Post: 0.74 ± 0.30 mmol.L^{-1}, p < 0.001), low density lipoprotein cholesterol (LDL-C) (Pre: 3.04 ± 0.83 mmol.L^{-1}, Post: 2.51 ± 0.74 mmol.L^{-1}, p < 0.001), Plasma Apolipoprotein (Apo) A-1 (Pre: 133.3 ± 13.1 mg.dL^{-1}, Post: 120.4 ± 14.5 mg.dL^{-1}, p < 0.001), Apo B (Pre: 88.1 ± 25.7 mg.dL^{-1}, Post: 70.1 ± 18.2 mg.dL^{-1}, p < 0.001), Total/high density lipoprotein cholesterol (HDL-C) (Pre: 4.00 ± 1.01, Post: 3.26 ± 0.81, p < 0.001), and LDL/HDL-C (Pre: 2.54 ± 0.82, Post: 2.00 ± 0.72, p < 0.001). A 45% decrease in the insulin area/glucose area ratio was compatible with an increase in insulin sensitivity. Daily RMR decreased by 138.0 ± 164 kcal.day[-1] (p < 0.05). RMR/Weight increased (Pre: 20.5 ± 3.30, Post: 21.9 ± 2.70, p < 0.01) while RMR/Fat free mass ratio decreased (Pre: 30.70 ± 4.5, Post: 29.10 ± 3.20, p < 0.05) after training. Reported total daily physical activity increased by 33%, which was associated with reductions in body weight (r = 0.39, p < 0.05). **CONCLUSION:** Large exercise-induced weight losses significantly reduced metabolic risk factors for disease and abdominal fat in young obese males. Therefore, large weight losses through exercise may be an effective strategy for maximizing health benefits to obese individuals.

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Sport-Specific Changes to Bone and Lean Mass Proportionalities among College Athletes

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(No relevant relationships reported)

Interest in the morphological characteristics of athletes has been growing in recent years. A Darwinian model suggests that some athletes may naturally gravitate to a sport based on their specific morphological characteristics. However, comparisons between male and female athletes in similar sports have not been fully explored. **PURPOSE**: To compare morphological distributions of regional bone mineral content (BMC) and lean mass (LM) between men and women athletes in comparable sports.
METHODS: NCAA Division-II male (n = 87) and female athletes (n = 60) in four sports [soccer (SOC), basketball (BB), cross-country (XC), and baseball/softball (BS)] were measured for regional BMC and LM using dual-energy X-ray absorptiometry (DXA). Inactive men (n = 23) and women (n = 27) served as a control group (CON). Ratio of BMC to LM for arms, legs, and trunk was calculated to indicate regional proportionalities.
RESULTS: Men were taller and heavier than women and had lower %fat (p<0.001). BB was taller (p<0.05) than other sports and CON. Men had significantly greater total LM/Ht (35.3 ± 4.4) than women (26.5 ± 2.6). LM/Ht was significantly greater in BS and BB than in XC, CON, and SOC which did not differ significantly among those groups. Sex x sport multivariate ANOVA revealed women had a greater arm BMC:LM than men (p<0.005) but total body, trunk, and legs BMC:LM were similar. Leg BMC:LM was greater in SOC (6.6 ± 0.5) and BB (6.5 ± 0.5) than in BS (6.1 ± 0.5), XC (6.4 ± 0.3), or CON (6.2 ± 0.7), which were not different. Trunk BMC:LM was significantly lower for XC (3.3 ± 0.2) and CON (3.5 ± 0.5) that for SOC (3.8 ± 0.4), BS (3.8 ± 0.5) and BB (3.9 ± 0.4. Total and arm BMC:LM was not significantly different among groups. Sex x sport interactions were not significant.

CONCLUSIONS: Sports and sport-specific training appears to impact LM and BMC accrual differently. Men and women athletes in sports that required more intense running and perhaps more weight lifting had greater legs BMC:LM than sports that apparently do not place the same degree of stress on bones and/or LM. The degree of stress on bones for the arms does not seem sufficient to differentiate among these sports or inactive individuals, but may be more related to differences in regional LM and specific strength training programs.

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Body Fat Differences Between Skinfold, Impedance, And Dexa Measurements

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(No relevant relationships reported)

Measurement of body fat can be performed using two, three, and four compartment models. Determining which technique to use in different populations is still being debated based on reliability, validity, ease of use, and subject safety. **PURPOSE:** To determine the differences between percent body fat measured by Dual X-ray Absorptiometry (DEXA), leg-to leg bioelectrical impedance, and 7-site skinfold techniques in college age students. **METHODS:** Students were recruited from undergraduate exercise science and dietetics classes, and graduate athletic training, exercise science, and nutrition classes. Sixty-one students (M age 21.7 ± 2.5 y, M wt. 71.1 ± 14.9 kg) (43 females (M age 21.3 ± 2.5y, M wt. 67.1 ± 13.4 kg), 18 males (M age 22.4 ± 2.2 y, M wt. 80.7 ± 14.3 kg) provided informed consent and completed the DEXA Screening Questionnaire, then had their body composition measured by the three different techniques. Subjects were asked to dress in t-shirts and shorts, and on the day of the appointment to do no vigorous physical activity, take no vitamin or mineral supplement, be well hydrated, not to eat 4-5 hours prior or consume alcohol or caffeine 24 hours prior. Females were screened for pregnancy. Once height and weight were measured, a 7-site skinfold measurement, a leg-to-leg electrical impedance measurement, and a whole body DEXA scan were performed. Comparisons between the techniques were done using repeated measures ANOVA, with Fisher's least significant differences post hoc test to determine differences. Significance was noted if $p<0.05$. **RESULTS:** Significant differences in percent body fat were noted between the three techniques ($p<0.0001$). DEXA ($26.7 \pm 7.5\%$) was significantly greater ($p<0.0001$) than both impedance ($24.9 \pm 7.5\%$) and skinfolds ($20.1 \pm 6.9\%$). Impedance was significantly greater ($p<0.0001$) than skinfolds and significantly lower ($p<0.0001$) than DEXA. Skinfolds were significantly lower ($p<0.0001$) than both DEXA and impedance. **CONCLUSION**: With the significant differences noted, care should be used when measuring and interpreting body fat composition.

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Characterization Of Fat-free Mass Index And Body Fat Mass Index: Relationship To Strength Performance In Resistance-trained Females

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(No relevant relationships reported)

Fat free mass index (FFMI) and body fat mass index (BFMI) are valuable tools to compare body composition in individuals that differ in height. Currently there are no published ranges for FFMI or BFMI in trained females. **PURPOSE**: To characterize FFMI and BFMI in resistance trained females. A secondary aim evaluated the relationship between FFMI, BFMI, and lean mass (LM) with strength performance in females with normal, overweight, and obese body mass index (BMI). **METHODS**: Forty-seven resistance-trained females (Mean $\pm$ SD; Age: 20.4 ± 2.2 yrs; Height: 165.4 ± 6.0 cm; Weight: 66.7 ± 11.0 kg) participated in the study. Body composition was determined using dual energy X-ray absorptiometry (DEXA) and used to calculate FFMI. FFMI (kg/m^2) was calculated by dividing the sum of lean mass (kg) and bone mineral content (kg) by height (m) squared. BFMI (kg/m^2) was calculated by dividing fat mass (kg) by height (m) squared. Performance was evaluated by one repetition maximum testing on the leg and bench press (LP1RM and BP1RM, respectively). Participants were stratified by BMI classification (normal (18.5-25 kg/m^2), overweight (25-30 kg/m^2), and obese (>30 kg/m^2)). **RESULTS**: Average FFMI in this sample was 16.7 ± 2.2 kg/m^2, with a range of 13.3-25.5 kg/m^2. Average BFMI was 7.5 ± 2.2 kg/m^2, with a range of 4.8-15.2 kg/m^2. In females with a normal BMI (n=33), FFMI and LM were both significantly correlated with LP1RM (R=0.873, p<0.001; R=0.779, p<0.001) and BP1RM (R=0.838, p<0.001, and R=0.791, p<0.001), respectively. For the overweight cohort (n=9), FFMI and LM were significantly correlated with LP1RM

(R=0.730, p=0.025; R=0.747, p=0.021) and BP1RM (R=0.883, p=0.002; R=0.757, p=0.018). In the obese cohort (n=5), FFMI neared significance for both LP1RM (R=0.846, p=0.071) and BP1RM (R=0.862, p=0.060); LM was not significantly correlated with LP1RM (R=0.845; p=0.072) or BP1RM (R=0.666, p=0.219). BFMI was not significantly related to performance for any BMI cohort (p>0.05). **CONCLUSIONS**: FFMI may be an adequate predictor of strength performance across all BMI ranges. LM was also significantly correlated with performance in both normal and overweight BMI cohorts, indicating that height may not be a moderating factor in this population.

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757   Board #18   May 30 2:00 PM - 3:30 PM

Body Composition Varies by Position in Female NCAA Division 1 Lacrosse Players

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(No relevant relationships reported)

There is limited scientific literature on women's lacrosse players, especially for body composition measurements. Understanding the relationship between body fat percentages and player position can benefit both the team and individual players. **PURPOSE**: To determine if body composition in female NCAA Division I lacrosse players differs between player position. **METHODS**: 58 female NCAA D1 lacrosse players underwent whole body DEXA scans. Height and body mass of each player were measured on a stadiometer before each scan. A linear mixed effects model was used to determine whether body fat percentage differed by player position. Position was entered as a fixed factor, and height and body mass were included as covariates into the full factorial model **RESULTS**: The final model demonstrated significant main effects for position (p=0.015), body mass (p=0.001), height (p=0.001), and the interaction between position and body mass (p=0.009). Post-hoc analyses revealed attack ($30.8 \pm 4.2\%$) had significantly greater body fat than defense ($29.8 \pm 3.3\%$, p=0.021) and midfield ($28.5 \pm 3.9\%$, p=0.045). There were no other statistically significant differences in body between positions. Attack (61.8 ± 7.7 kg) had a statically significant lower body mass than goalies (76.0 ± 4.1kg, p=0.012). Midfielders (60.4 ± 14.8kg) had a significantly lower body mass than defense (67.3 ± 6.2kg, p=0.044) and goalies (p=0.007). **CONCLUSIONS**: Positions differed in mean body composition, with the attack position having the greatest body fat percentage. Body mass was also significantly different by position. It was unexpected that the attack position had a greater body fat percentage, despite having one of the lower mean weights (although only statistically less than goalies). There were few data points for goalies (n=4), which may have limited statistical power. It is a limitation that these data are from one university team across multiple seasons. The style of play for this team influences aerobic demand and may differ from that of other teams. Because there is limited data on body composition in women's lacrosse, further comparisons across other teams is needed.

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Does the Body Composition of Collegiate Male Lacrosse Players Differ by Position?

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(No relevant relationships reported)

There are distinct roles for each playing position in men's lacrosse, which often results in apparent anthropometric differences between playing positions. However, little research has examined whether body composition, namely body fat percentage, differs by playing position. **PURPOSE**: To determine whether or not the body composition of collegiate male lacrosse players differs across playing positions. **METHODS**: 71 NCAA Division I competitive male lacrosse players (age 18-23y) participated in the study. Athletes underwent a whole body dual energy x-ray absorptiometry (DEXA) scan to measure whole body lean and fat mass. Total body fat percentage was then computed. A linear mixed effects model was used to determine whether body fat percentage differed by playing position. Playing position was entered as a fixed factor, and height and body mass were included as covariates into the full factorial model. **RESULTS**: Mean $\pm$ standard deviations were: height 180.5 ± 6.6cm, body mass 84.3 ± 8.2kg, and body fat percentage $18.2 \pm 3.5\%$. Body fat percentage did not differ by position (main effect: p=0.318; attack: $18.9 \pm 4.4\%$, midfield: $18.2 \pm 3.7\%$, defense: $18.3 \pm 2.8\%$, goal: $17.0 \pm 2.5\%$). However, body fat percentage was dependent upon height (p<0.001) and body mass (p<0.001). Further analysis revealed no significant differences across playing positions for height (p=0.087; attack: 177.3 ± 3.9cm, midfield: 180.2 ± 6.6cm, defense: 183.4 ± 6.8cm, goal: 179.4 ± 6.9cm) or total body mass (p=0.072; attack: 79.6 ± 8.2kg, midfield: 85.0 ± 8.5kg, defense: 86.9 ± 6.6kg, goal: 81.2 ± 8.0kg). **CONCLUSIONS**: Although not statistically significant, there were trends for height and body mass to differ between positions. It is possible that there was insufficient

statistical power to detect position-specific differences between these parameters. This data might be slightly skewed because the sample included more midfielders (n=34) than attack (n=11), defense (n=19), or goal (n=7) players. Nonetheless, no clear position-specific trends were observed for body fat percentage. However, statistically significant covariates indicate that heavier and shorter players tended to have greater body fat percentages. Further research is needed to determine if body composition differs between lacrosse players across a larger cohort from multiple teams.

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759   Board #20   May 30 2:00 PM - 3:30 PM

Effects of an Acute Strength and Conditioning Bout on Dual Energy X-ray Absorptiometry Results

Jason R. Lytle, Steve E. Martin, John S. Green, FACSM, Stephen F. Crouse, FACSM. *Texas A&M, College Station, TX.*
(Sponsor: Stephen F. Crouse, FACSM)
(No relevant relationships reported)

Dual Energy X-ray Absorptiometry (DXA) scans to assess body composition have become increasingly popular, especially in athletic populations. Acute factors, such as hydration status and food intake have been shown to alter DXA results (Tinsley, MSSE 2016). It is currently not known if prior strength and conditioning bouts may alter fat mass, lean mass, and bone density results. **PURPOSE:** To determine if a strength and conditioning (S&C) bout, similar to what athletes regularly engage in, will alter the fat mass, lean mass, and bone content results of a DXA scan. **METHODS:** Fourteen strength-trained subjects (10 men, 4 women, age 24 ± 2 yrs, height 176.7 ± 8.1 cm, weight 88.8 ± 14.7 kg) who were enrolled in an athletic strength and conditioning course volunteered to participate in this study. Each subject underwent two DXA scans on the same day. The first scan was performed prior to the S&C bout. The second scan was completed within 45 minutes after completion of the S&C bout. Participants were instructed to consume their normal, free living breakfast prior to scan one. A food and water log was distributed during the informed consent process and was maintained by the participants for 24 hours prior to all DXA scans. Nutritional information was analyzed via a commercial nutrition software for macronutrients, micronutrients, and hydration status. All DXA scans were performed and analyzed by the same trained technician. After the first scan, subjects were instructed to avoid all food intake until completion of the second scan. Subjects were encouraged to drink water ad libitum during the S&C bout from individually assigned 1-liter bottles; the volume consumed during the bout was measured by weight. **RESULTS:** No significant difference was found (correlated t-test $\alpha = 0.05$) on any of the body composition measures between pre and post DXA body composition measurements after a S&C bout (changes pre to post: fat mass 46.5-46.0 kg, lean mass 64.8-64.9 kg, bone content 3.3-3.3 kg). **CONCLUSION:** Based on the results of the present study, S&C bouts do not need to be considered to ensure accuracy when performing DXA scans. The physiological changes that occur in response to a single S&C bout do not affect body composition analysis of DXA scans.

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760   Board #21   May 30 2:00 PM - 3:30 PM

The Effect of Pretest Instructions and Between Day Test-Retest Reliability of Air Displacement Plethysmography

Emily Dunston, Shelby Chriest, Sayer Avena, Katrina Taylor, Annika Vahk. *Eastern Washington University, Cheney, WA.*
(Sponsor: Wendy Repovich, FACSM)
(No relevant relationships reported)

Air displacement plethysmography (ADP) is considered a valid estimate of body composition. However, pretest instructions are often not followed by the general population which is imperative for tracking body composition via multiple testing sessions. **PURPOSE**: To determine the reliability of ADP measurements with and without pretest instructions both between days and on the same day. **METHODS**: Participants (n=19; 14 females, 5 males, age 20.8±1.4 years, weight 69.2±12.5 kg) completed four testing sessions across two days. ADP testing on day one occurred in the morning (T1) and afternoon (T2) and 48-hours later another morning (T3) and afternoon (T4) test were completed. For T1, participants were not provided with pretest instructions and were asked to maintain normal activities. Standard pretest instructions were provided for all subsequent visits. At each session, a standard ADP measurement was completed with participants wearing manufacturer-approved clothing and lab-issued swim cap. Data were analyzed using paired samples t-tests to determine the effect of pretest instructions and Pearson correlations to determine test-retest reliability with an alpha level set at 0.05. **RESULTS**: Pretest instructions did not change body volume (BV; T1 66.3±12.4 vs. T2 66.2±12.4 L; p=0.33) or body fat (BF; T1 23.4±6.9 vs. T2 23.6±7.1 %; p=0.54) across same day measures. However, differences were detected for BV (T1 66.3±12.4 vs. T3 65.7±12.2 L; p<0.01) and BF (T1 23.4±6.9 vs. T3 22.7±7.3%; p=0.04) for measures completed on different days. Test-retest reliability for BV and BF was high across different days (r≥0.97, p<0.01). **CONCLUSIONS**: Pretest instructions did not change ADP measures on the same day, suggesting they may not be necessary to attain measurements within standard error of

estimate for ADP. However, differences were found between scores across different days, although these were also within ADP standard error. Between day test-retest reliability was high for BV measurements and BF estimations, with greater variability noted in BF. Future research would be important to ascertain how varying amounts of food and fluid consumption, as well as participation in exercise prior to testing can affect the reliability of ADP measures. Quantifying these factors may provide insight on threshold measures to follow.

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761   Board #22   May 30 2:00 PM - 3:30 PM

Relationship Between Sarcopenia Classification Methods, Relative Fat Mass, and Skeletal Muscle Mass

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(No relevant relationships reported)

Sarcopenia has been identified using muscle mass normalized by height squared (SMIh), similar to BMI, and by total mass(SMIm). As there is not a single agreed-upon definition, it is important to examine the relationships between the various methods of defining sarcopenia, body fat percentage (BFP), and skeletal muscle mass (SMM). **PURPOSE:** The purpose of this study was to examine the relationships between skeletal muscle index (SMI) normalized for SMIh, SMIm, BFP, and SMM. **METHODS:** Participants (n = 62, 42 F, 20 M; 26.4 +/- 8.3 yrs) were tested using bioelectrical impedance analysis (BIA). The BIA provided information on fat mass, fat-free mass, BFP, and SMM. Skeletal muscle mass index (SMI) was calculated by dividing SMM (kg) by height squared (m^2) (SMIh) and by dividing SMM (kg) by total mass (kg) (SMIm). Data were analyzed using standard spreadsheet and statistical analysis software. Pearson product-moment correlations were calculated using statistical analysis software. Significance was set at $p < .01$ to control for the number of tests. **RESULTS:** There were significant correlations between SMIm and SMIh ($r = 0.49$, $p = 0.00$), SMIm and BFP ($r = -0.93$, $p = 0.00$), SMM and SMIm ($r = 0.50$, $p = 0.00$), SMM and SMIh ($r= 0.95$, $p = 0.00$). The correlation between SMIh and BFP was not significant ($r = -0.20$, $p = .11$). **CONCLUSIONS:** It is important to look at both muscle mass and body fat. Both methods of identifying sarcopenia should be used as using a single method gives an incomplete picture. Ideally body fat percentage and both methods of determining sarcopenia would be used to account for individuals of differing leanness.

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762   Board #23   May 30 2:00 PM - 3:30 PM

A Comparison Of Methods Used To Determine Percent Body Fat And Minimum Wrestling Weight

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(No relevant relationships reported)

The accurate measurement of percent body fat (%BF) is important in the determination of a wrestler's minimum wrestling weight (MWW) under the National Collegiate Athletic Association (NCAA) Wrestling Weight Management Program (WMP). Currently, skinfold measurements (SF), air displacement plethysmography (ADP), and hydrostatic weighing are the only approved methods of assessing body composition for the WMP. While dual energy x-ray absorptiometry (DXA) is considered a criterion method and type-A ultrasound (US) may serve as an alternative method, to our knowledge, no previous study has examined DXA or US in the determination of a wrestler's MWW. **PURPOSE**: To compare %BF and MWW determined using SF, ADP, US, and DXA. **METHODS**: Twenty-three college-aged men (21.1±0.8 yrs) participated. As per NCAA WMP guidelines, participants reported to the lab in a euhydrated state (Urine specific gravity/Usg<1.020). %BF was estimated using SF, ADP, DXA, and US and the wrestlers' MWW was calculated for each assessment method. **RESULTS**: Body mass and Usg values were 83.2±13.2 kg and 1.005 ± 0.004, respectively. There was a significant difference between methods for both %BF (p<0.001) and MWW (p<0.001). %BF values (SF=15.7±5.2%; ADP=18.1±6.4%; DXA=21.2±6.2%; US=15.2±5.2%) and MWW (SF=73.3±8.4kg; ADP=71.1±7.5kg; DXA=68.5±8.2kg; US=73.8±8.9kg) were significantly different between all methods except SF and US (p=0.594 and p=0.586, respectively). When comparing the MWW determined by DXA to those determined by SF, the use of DXA would have allowed 57% of participants to reach one weight class lower and an additional 30% of participants to reach two weight classes lower. Compared to ADP, DXA would have allowed 48% of participants to reach one weight class lower and an additional 9% of participants to reach two weight classes lower. **CONCLUSION:** These data indicate that US may provide an alternative to the SF procedure when determining the MWW of a wrestler. However, when compared with two WMP-approved methods of assessment, DXA would permit approximately 57% (ADP) to 87% (SF) of wrestlers the opportunity to certify at a lower weight class. Given these preliminary

findings, future research should further examine if the currently approved methods of assessment during the NCAA WMP put a wrestler at a disadvantage by restricting weight loss.

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763   Board #24   May 30 2:00 PM - 3:30 PM

Comparison of Methods Assessing Body Composition in Young Adults

Maura L. Jegerski, Baruch Vainshelboim, Gabrielle M. Brennan, Henry Piascik, Sara D. Dieterich, Patricia Fitzgerald, Stephen LoRusso, Kristofer S. Wisniewski. *Saint Francis University, Loretto, PA.*

(No relevant relationships reported)

Maura L. Jegerski, Baruch Vainshelboim, Gabrielle M. Brennan, Henry Piascik, Sara D. Dieterich, Patricia Fitzgerald, Stephen LoRusso, Kristofer S. Wisniewski, Saint Francis University, Loretto, PA.
Previous studies have shown that bioelectrical impedance analysis (BIA) is a simple and reliable noninvasive way to measure body composition. However, the results differ in accuracy compared to other methods. **Purpose:** To compare the validity of different BIA devices against the Bod Pod (BP) for estimating percent body fat (%BF) and lean body mass (LBM) in young adults. **Methods:** Eighty-seven subjects (45 males, 42 females) aged 20.3 ± 1.6 years with BMI 25.1 ± 5.2 kg m^{-2} were assessed for %BF and LBM using BodPod, Tanita TBF-300A [both Athletic (TA) and Standard (TS) modes], and InBody770 (InB) in counterbalanced order in one session. Subjects followed the most stringent pre-testing instructions outlined for the InB. Pearson's correlations and Repeated measures ANOVAs were utilized. **Results:** Results for each method (mean ± SD) and correlations are displayed in Table 1. ANOVA showed TA significantly underestimated (p<0.001), and TS significantly overestimated (p<0.001) %BF compared to BP. There was no significant difference between BP and InB (p=0.701) %BF. ANOVA showed TA significantly overestimated (p<0.001) LBM, and the LBM from TS (p=0.197) and InB (p=0.825) were not significantly different from BP. **Conclusions:** The results show that each method is strongly correlated with the BP. However, there were significant differences between Tanita scale values and the BP. Therefore, BIA devices using both hand and feet sensors and multiple frequencies may be more accurate at estimating body composition than devices using feet and one frequency only.

	%BF	Correlation with BP (%BF)	LBM (kg)	Correlation with BP (LBM)
BP	21.1 ± 11.3		59.8 ± 14.2	
TA	18.3 ± 9.9	r=0.922, p<0.001	62.6 ± 14.8	r=0.928, p<0.001
TS	22.5 ± 9.3	r=0.925, p<0.001	59.0 ± 12.9	r=0.921, p<0.001
InB	21.3 ± 10.9	r=0.932, p<0.001	59.9 ± 14.4	r=0.956, p<0.001

Table 1. Comparison of Body Composition Methods

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Lifestyle Behaviors and Body Composition in Young Adults

Stephen LoRusso, Gabrielle M. Brennan, Henry Piascik Piascik, Sara D. Dieterich, Maura L. Jegerski, Kristofer S. Wisniewski, Baruch Vainshelboim, Patricia I. Fitzgerald. *Saint Francis University, Loretto, PA.*

(No relevant relationships reported)

Physical inactivity, prolonged sitting and poor body composition are established cardio- metabolic risk factors. However, their association in young adults has not been well characterized. **PURPOSE:** To assess the association between physical activity, sitting time and body composition in young adults. **METHODS:** Ninety-four participants (20.2 ± 1.6 years, 46 men, 48 women) were assessed for weekly physical activity (PA), average daily sitting time (Global Physical Activity Questionnaire) (ST) and body composition measurements (BodPod). Pearson correlation and t-tests were performed. **RESULTS:** Means are: ST (M: 5.7 ± 2.7 hours/day, F: 6.8 ± 2.8 hours/day, p=0.059), PA (M: 10,977.6 ± 11,068.3 MET-min/week, F: 7,181.9 ± 4,481 MET-min/week, p=0.043), %Fat (M: 15.2 ± 9.2 %, F: 27.4 ± 9.9 %, p=0.000), and LBM (M: 69.9 ± 10.5 kg, F: 47.7 ± 5.7 kg, p=0.000). Sitting time was mildly correlated with body composition measurements, but not with PA in the total sample (Table 1). In subgroup analysis of men and women separately, the correlation between ST and LBM and %Fat were significant only among women (LBM: r=-0.478, p=0.001, %Fat: r=0.309, p=0.047). PA mildly correlated with LBM, but not with %Fat. No correlation between physical activity and body composition measurements was observed in the subgroup analysis. **CONCLUSION:** Prolonged sitting time is associated with higher %Fat and lower LBM in young women, suggesting a negative impact on body composition. Higher physical activity levels are associated with higher LBM in both genders, but were not associated with ST or %Fat. These results support the independent association between physical activity, sitting time and body composition, and their importance in evaluation of lifestyle behaviors for primary cardio-metabolic disease prevention.

Table 1.

	Sitting Time (hours/day)	Lean Body Mass (kg)	%Fat	Physical Activity (MET-min/week)
Sitting Time (hours/day)	1	r= -0.300 p= 0.006*	r= 0.310 p= 0.005*	r= -0.033 p= 0.767
LBM (kg)	r= -0.300 p= 0.006*	1	r= -0.365 p= 0.001*	r= 0.276 p= 0.011*
%Fat	r= 0.310 p= 0.005*	r= -0.365 p= 0.001*	1	r= -0.162 p= 0.143
Physical Activity (MET-min/week)	r= -0.033 p= 0.767	r= 0.276 p= 0.011*	r= -0.162 p= 0.143	1

*=significant

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765   Board #26   May 30 2:00 PM - 3:30 PM

Validation Of The Inbody 770 For The Assessment Of Percent Body Fat In Young Adults

Joseph L. Andreacci, FACSM[1], Vncenzo Nocera[1], Chelsea Wenrich[1], Andrea J. Fradkin, FACSM[1], Curt B. Dixon, FACSM[2]. *[1]Bloomsburg University, Bloomsburg, PA. [2]Lock Haven University, Lock Haven, PA.*

(No relevant relationships reported)

Multi-frequency bioelectrical impedance analysis (MFBIA) is a rapid, non-invasive, and relatively inexpensive method of assessing body composition that has been suggested as an alternative to laboratory methods including dual energy X-ray absorptiometry (DXA) and hydrostatic weighing. **PURPOSE**: To determine the accuracy of a commercially-available MFBIA analyzer for the assessment of percent body fat (%BF) in young adults.
METHODS: Three hundred eighty-four (209 women; 175 men) subjects volunteered to participate in this study (age = 20.8 ± 2.1 years). %BF was assessed using MFBIA (InBody 770, Biospace Co.) and DXA (GE Lunar Prodigy) within the same visit. **RESULTS**: When compared to DXA, MFBIA significantly (p<0.001) underestimated %BF (men = 16.8 ± 6.5% *vs.* 19.4 ± 8.0%; women= 28.8 ± 7.8% *vs.* 32.7 ± 8.3%). Linear regression analyses revealed significant correlations (men = 0.92, women = 0.93; *p*<0.001) and standard error of estimate values (men = 3.2%; women = 3.1%) rated as 'very good' between methods. However, Bland-Altman plots revealed a weak bias for %BF (*r* = 0.36, *p*<0.001) and a large percentage of the subjects (women = 53%, men = 41%) were outside the ± 3.5% minimally acceptable standard for accuracy. **CONCLUSIONS**: When compared to DXA, the InBody 770 underestimated %BF by greater than 3.5% in approximately half of the subjects tested in this study. Given this consistent underestimation, we recommend interpreting the %BF values produced by the InBody 770 with caution.

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Association between Segmental Lean Body Mass and Muscular Strength

Joshua D. Graham. *Saint Francis University, Loretto, PA.*

(No relevant relationships reported)

Previous studies have shown lean body mass (LBM) is positively correlated with muscle strength in older and younger individuals. Studies have also shown a strong correlation between grip strength when muscle mass is adjusted for height. However, previous studies have not looked into young adults. **Purpose:** The purpose of this study was to examine the relationship between segmental LBM and various measures of muscular strength in healthy young adults. **Methods:** 48 subjects (23 females, 25 males) aged 20.4 ± 1.9 years underwent bioelectrical impedance analysis using the InBody770 to determine total LBM, legs LBM (sum of both legs), right arm LBM, left arm LBM, and arms LBM (sum of both arms). Strength tests included 1RM bench press, 1RM leg press, maximal voluntary contraction (MVC) handgrip, and MVC deadlift. Standard 1RM protocols were used to assess 1RM for bench press and leg press. Maximal handgrip scores were measured for each arm independently and added together for the summed handgrip strength. MVC deadlift was measured using a Baseline Back, Legs, and Chest Dynamometer. **Results:** Correlation analyses showed a moderate correlation between total LBM and MVC deadlift (r = 0.557, p < 0.001), legs LBM and 1RM leg press (r = 0.520, p < 0.001), right arm LBM and right handgrip strength (r = 0.428, p < 0.001), left arm LBM and left arm handgrip strength (r = 0.425, p < 0.001), and arms LBM and summed handgrip strength (r = 0.441, p < 0.001). A

strong correlation was observed between arms LBM and 1RM bench press (r = 0.763, p < 0.001). **Conclusion:** **S**egmental LBM assessed using the InBody770 showed a moderate-to-strong correlation with various measures of muscular strength. The findings suggest segmental LBM may play a significant role in overall body strength and arm LBM may have a significant role in 1RM bench press.

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767 Board #28 May 30 2:00 PM - 3:30 PM

Alphabet Soup: BMI, WC, ADP - What Measures Provide Adequate Estimates Of Obesity In Aging Adults?

Amy L. Morgan, FACSM[1], Mary-Jon Ludy[1], Edward T. Kelley[1], Sarah G. Kearney[1], Matt Laurent[2]. *[1]Bowling Green State University, Bowling Green, OH. [2]Tarleton State University, Stephenville, TX.*

(No relevant relationships reported)

It is well accepted that body fat increases with aging, and that obesity contributes to a number of negative health concerns. Clinically, body mass index (BMI) and waist circumference (WC) are the preferred measures for a quick estimate of adiposity, but it is not clear if these measures are accurate estimates in aging individuals. **PURPOSE:** The purpose was to investigate if BMI or waist circumference (WC) are adequate measures of adiposity in those aged 50 and older. **METHODS:** Participants were 38 men (60±7.7 years) and 62 women (57±7.3 years) who reported to the laboratory on one occasion. BMI was calculated using height and weight (kg/m²). WC was measured using a Gulick tape at two anatomical points; narrowest waist (WCN) and the umbilicus (WCU). Percent fat was analyzed via air-displacement plethysmography (ADP; Bod Pod, COSMED) and bioelectrical impedance (BIA; InBody 230, Biospace Inc). ADP was used as the criterion measure of body composition. Correlations were calculated to examine relationships between all measures (of weight related health risk and body composition). Sensitivity and specificity analyses were conducted to classify participants into categories (true positive, true negative, false positive, and false negative) to assess if WC and BMI provide correct categorization when compared to body composition by ADP. **RESULTS:** Correlations indicated moderate to strong relationships between ADP and WCN (r=0.408), WCU (r=0.527), BMI (r=0.565), and BIA (r=0.888, p<0.05 for all). For the measures of WC, sensitivity was considerably higher for WCU (All=70%, W=86.2%, M=47.6%) than WCN (All=46% all, W=58.6%, M=28.6%). For BMI, sensitivity was slightly higher in women (86.2%) than men (81.0%). **CONCLUSION:** These results suggest that, in addition to being easy to measure in the clinical setting, BMI and WC are also adequate indicators of obesity in adults aged 50 and over. Training and standardization of WC measurement techniques are warranted, since WCU was more strongly correlated with ADP than WCN, suggesting that the optimal site for WC measurement is the umbilicus.

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768 Board #29 May 30 2:00 PM - 3:30 PM

Validity of Ultrasound and Skinfolds for the Measurement of Body Composition in Collegiate Basketball Players

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(No relevant relationships reported)

Body composition (BC) is a frequently assessed component of health-related fitness. Many different field methods are used to measure BC including bioelectrical impedance analysis and skinfolds (SKF). Recently, a portable computer based ultrasound (US) system has become commercially available for estimating BC. **PURPOSE:** The purpose of this study was to determine the validity of a portable computer based US system and skinfolds (SKF) for estimating percent body fat (%fat) in male collegiate basketball players. **METHODS:** Participants' %fat was estimated using US (3 site) and SKF (3 site), then compared to dual-energy X-ray absorptiometry (DXA), which served as the criterion estimate. Participants were 50 male collegiate basketball players [age = 20 (1) yrs., height = 1.89 (0.08) m., body mass = 87.9 (10.9) kg, and BMI = 24.5 (2.3) kg/m²]. The ethnicity of the participants was 41 African Americans and 9 Caucasians. All participants were tested in the hydrated state [1.014 (0.009), Urine Specific Gravity]. The validity of the US and SKF %fat estimates was based on the evaluation of each method versus the criterion value from the DXA by calculating the mean, SD, coefficient of determination (r²), and standard error of estimate (SEE) from linear regression analysis. To assess the average deviation of individual scores from the line of identity, total error (TE) was calculated for each field method. Paired sample t-tests determined pair-wise differences between measurements using an alpha level of <0.05. **RESULTS:** The mean %fat results were as follows: US = 12.5 (4.0), SKF = 9.2 (4.5) and the DXA = 12.5 (5.1). %fat differences [mean (95% CI)] were observed between DXA and SKF [3.3 (2.5, 4.1), p=0.001] but not between DXA and US [-0.04 (-1.4, 1.4), p=0.951]. The r² values were 0.159 for US and 0.699 for SKF; SEE values for %fat were 4.7 for US and 2.8 for SKF; and total error (TE) values for %fat were 5.03 for US and 4.36 for SKF. **CONCLUSIONS:** In this study, neither the US nor SKF estimates provided a valid assessment of %fat. When

compared to the criterion (DXA), both SKF and US produced TE values outside of the acceptable range of 4%. Relative to the DXA, neither estimate can be recommended for estimating %fat in collegiate basketball players.

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769 Board #30 May 30 2:00 PM - 3:30 PM

Efficacy Of Ketogenic Diet On Body Composition During Resistance Training In Trained Men.

Vargas Salvador[1], Ramón Romance[2], Jorge L. Petro[3], Diego A. Bonilla[4], Ismeal Galancho[5], Sergio Espinar[6], Rick B. Kreider, FACSM[7], Javier Benitez-Porres[2]. *[1]EADE-University of Wales, Málaga, Spain. [2]University of Malaga, Málaga, Spain. [3]University of Córdoba, Málaga, Spain. [4]University, Bogotá, Bogota, Colombia. [5]Better by Science, Málaga, Spain. [6]BetterbyScience, Málaga, Spain. [7]Texas A & M University, Málaga, Spain.* (Sponsor: Richard Bruce Kreider, FACSM)

(No relevant relationships reported)

Nowadays, ketogenic diet (KD) is widely used in body aesthetics for changing body composition, even though there is a lack of research regarding to the possible benefits on muscle hypertrophy.**PURPOSE**: The purpose of this study was to evaluate the efficacy of an 8-week KD during energy surplus and a resistance training protocol on muscle hypertrophy in trained men. **METHODS**: 24 healthy men (age 30 ± 4.7 years; weight 76.7 ± 8.2 kg; height 174.3 ± 19.7 cm; > 2 years of consecutive training experience) performed an 8-week resistance training (RT) program with similar hypertrophy training variables. Participants were randomly assigned to either a KD (10:20:70, n=9), or a non-ketogenic diet (55:20:25, n=10, NKD), or a control group (n=5, CG) in hypercaloric condition (39 kcal · kg⁻¹ · d⁻¹). Body composition changes were measured by dual energy X-ray absorptiometry (DXA) before and after each nutritional intervention and training program in all participants. Compliance with the ketosis state was monitored by measuring urinary ketones weekly. Statistical evaluations to determine significant differences between groups and substantive significance were performed with paired t-test, where critical α was $p<0.05$, and Cohen's d effect size (ES), respectively. **RESULTS**: There was a significant reduction in fat mass (Δ= -10.4%, p =0.030, ES = 0.46) and abdominal visceral adiposity in KD (Δ= -16.3%, p =0.008; ES = 0.84); while no significant changes were observed in the NKD and CG groups. Muscle mass significantly increased after 8 weeks of RT program in the NKD group only (Δ=+2.1%, p <0.01, ES = 0.31). **CONCLUSIONS**: Our results suggest that KD can be helpful for decreasing abdominal visceral adiposity and fat mass, but not to increase muscle mass during positive energy balance in men undergoing RT. This study shows the relevance of macronutrient manipulation in RT programs, in order to improve body composition parameters focusing on training goals (fat reduction and/or increase of muscle mass) in trained men. Supported by University of Málaga (Campus of International Excellence Andalucía Tech).

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770 Board #31 May 30 2:00 PM - 3:30 PM

Bioelectrical Impedance Analysis Versus Dual-Energy X-ray Absorptiometry Body Fat Percentage Measurements in Collegiate Basketball Players

Michelle L. Otte. *Southeast Missouri State University, Cape Girardeau, MO.* (Sponsor: Joe Pujol, FACSM)

(No relevant relationships reported)

Body composition (BC) is an important component of health-related fitness and is also related to athletic performance. There are many quick, cost efficient, accessible, and user-friendly ways to assess BC. Field measurement methods, including body mass index, waist circumference, skinfolds, and bioelectrical impedance analysis (BIA). Criterion methods for measuring BC, which are more expensive and generally less accessible, include techniques like dual-energy X-ray absorptiometry (DXA). DXA is commonly used to assess body fat percentage (BF%) (i.e., fat vs. lean mass) in clinical settings due to its standard deviation (±2-4%). The manufacturer of the Direct Segmental Multi-frequency InBody230 BIA, which uses eight separate contact points with two electrical frequencies, claims a similar BF% accuracy range to DXA. **PURPOSE:** To assess the reliability of the InBody230 BIA to DXA BF% values in college-aged, male basketball players. **METHODS:** Participants were 72 male collegiate basketball players (age=20.51±1.32 yr; wt=89.35±10.68 kg; ht=183.96±5.97 cm; BMI=27.50±3.02 kg/m²). The participants had BF% assessed, in the early morning, using the InBody230 BIA in the standing position followed by a total-body DXA scan which served as the criterion value. **RESULTS:** A paired samples t test revealed a significant difference in BF% between the InBody230 (31.22±14.64) and DXA (20.55±6.13) (p<0.001). **CONCLUSIONS:** While the two modes of BF% were significantly different, the standard deviation (SD) (i.e., reliability) of the InBody230 BIA was more than double the DXA. This SD difference is supported by past research using athletes of similar age and BMI. However, research finding significant differences between modes with lower SD values have utilized varying sample sizes of non-athletes, including both genders and children. Future research needs to be conducted comparing the InBody230 BIA to DXA using various populations to assess the InBody230 manufacturer accuracy claim of (98±3-5%).

771   Board #32   May 30 2:00 PM - 3:30 PM

Anthropometric and Performance Statistics Comparisons in Baseball Batters: A Longitudinal Study

Vishak Vinod[1], Thejasvi Reddy Anantasagar[2], Richard A. Karasch[2], James G. Disch[2], Zacharias Papadakis[2]. *[1]University of Houston, Houston, TX. [2]Rice University, Houston, TX.* (Sponsor: Peter W. Grandjean, FACSM)
(No relevant relationships reported)

Appropriate stature and adequate somatotype is believed to be some of the most important prerequisites for sports participation and success. In baseball, there is scarce evidence on players' anthropometric profiles, such as body weight (BW), body height (BH), and body fat % (BF%) and their association with baseball performance statistics (PS) which has led to form anecdotally based beliefs. **PURPOSE**: To compare BW, BH, and BF% and selected baseball-specific PS, such as batting average % (b/avg%), slugging % (slg%), and on-base % (ob%) in NCAA Division I batters; to examine the relationship between BW, BH, BF% and baseball-specific PS. **METHODS:** During a 5-year period, 232 collegiate batters (age 19.7 ± 1.3 yr; weight 87.9 ± 7.7 kg) were assessed for body weight (BW), body height (BH), and body fat % (BF%). Batters' respective specific-baseball PS were collected with regards to b/avg%, slg%, ob%. BW, BH, BF%, and PS were normalized to z-scores. Missing data were estimated from least squares prediction from non-missing variables. Forward multiple stepwise regression was used to evaluate the relative impact of BW, BH, and BF% on PS (JMP® Pro 13). **RESULTS:** From the selected anthropometric variables, only BF% is significantly negative correlated with both b/avg% (r=-0.19, p=0.0043) and slg% (r=-0.17, p=0.0103). Slg% was selected as the independent variable with the highest goodness of fit significantly correlating with BF% (p=0.0007) and BW (p=0.0151) with adjusted R^2=0.04. **CONCLUSIONS:** The results indicate that leaner batters have higher b/avg% and slg%. BF% and BW appeared to provide the greatest predictive power of slg%. Slg% is a measure of the batting productivity of a hitter and only 4% of this productivity can be explained by anthropometric variables, such as BF% and BW. The common anecdotal belief that heavier players are better batters, no matter their motor skill abilities, is not justified from the results of this study. Practitioners want to improve their batters' hitting productivity. Therefore, they may need to focus on other factors than anthropometrics, for instance agility, speed, power, and lower-body performance.

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Comparison of Overall and Segmental Body Composition in Collegiate Track Athletes Using BIA and DXA

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(No relevant relationships reported)

Anthropometric and body composition measurements can offer insight into athletes' health as well as assist in developing training or diet regimens to enhance competitive potential. Valid and reliable assessments of these measures are vital. **PURPOSE**: The purpose of this analysis was to compare overall and segmental body composition data of collegiate track athletes using bioelectrical impedance analysis (BIA) and dual energy X-ray absorptiometry (DXA). **METHODS**: Participants visited the Human Performance Laboratory once for measurement of anthropometric data (ht via stadiometer) and body composition assessment by BIA (via InBody 570) and DXA (via GE Healthcare Lunar Prodigy Advance). Contraindications were addressed and jewelry was removed prior to testing. Athletes were instructed to remove their socks; thereafter, they followed verbal instructions provided by the InBody 570. Body weight (lbs.) determined by the InBody 570 was converted to kilograms (kg) and used in the DXA analysis, for consistency. Relative body fat (%BF) and regional lean mass in the arms (ArmsLean), legs (LegsLean), and trunk (TrunkLean) (kg) were compared between methods, by sex, using paired-samples t-tests. **RESULTS (females)**: Twenty-four females (age: 19.6±1.0 yr, ht: 168.8±7.9 cm, and wt: 65.0±13.7 kg) volunteered for testing. There were statistical differences (ordered by BIA and DXA) for %BF [19.8±6.4 vs. 25.0±7.9%, p < 0.0001] and TrunkLean [22.10±3.72 vs. 21.11±2.42 kg, p = 0.038]. No statistical differences were found for ArmsLean [5.18±1.23 vs. 5.03±0.92 kg, p = 0.163] or LegsLean [15.73±2.33 vs. 16.32±2.35 kg, p =0.070]. **RESULTS (males)**: Thirty males (age: 20.5±1.9 yr, ht: 179.9±5.7 cm, and wt: 80.2±16.8 kg) volunteered for testing. There was a statistical difference (ordered by BIA and DXA) for ArmsLean [8.02±1.54 vs. 8.65±2.17 kg, p = 0.026], while %BF was at the statistical cut-point [11.2±4.7 vs. 13.0±6.7%, p = 0.05]. No statistical differences were found for LegsLean [21.23±2.53 vs. 22.31±4.95 kg, p = 0.115] or TrunkLean [30.36±4.42 vs. 29.87±3.65 kg, p = 0.231]. **CONCLUSIONS**: Clearly, differences exist in the estimation of overall and segmental body composition depending on the method utilized. If pre-post or serial evaluations are to occur, switching assessment methods would not be appropriate.

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Longitudinal Changes In Skinfold Thicknesses In Relation To Body Fat Changes Assessed with DXA

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(No relevant relationships reported)

The assessment of skinfold thicknesses is a widespread anthropometric technique to evaluate body composition. However, little is known about the relation between the changes through time in body fat assessed with only skinfolds compared with DXA. **PURPOSE**: To determine the relation between changes in body fat through time assessed with DXA and the changes of skinfold thicknesses. **METHODS**: We analyzed the data for 66 professional male soccer players. Subjects' body composition was evaluated two times with a time difference of one to five years between them. Ten skinfold thicknesses (10SKF, triceps, subscapular, biceps, chest, mid-axilla, iliac crest, supraspinal, abdomen, thigh, calf) were evaluated by anthropometry, and body fat (BF) by a DXA scanning (Hologic QDR4500). The changes between evaluation 1 and 2 were calculated for both 10SKF and BF for every subject. Then the determination coefficient (assuming a zero intercept), slope and SEE for the slope were calculated, where the changes in 10SKF predicted the changes in BF. We also calculated the changes in BF related to initial BF (CBF= [BF evaluation 1 - BF evaluation 2]/ BF evaluation 1). The mean ±SD, [min-max] is reported. **RESULTS**: The 10SKF (in mm) at evaluations one and two were 84 ± 31 and 89 ± 27 respectively (Δ 5 ± 22 [-57 to 74]). The BF (in kg) at evaluation one and two were 10 ± 3 and 11 ± 3 (Δ 1 ± 2 [-6 to 8]). The %BF at evaluation one and two were 14 ± 3 and 15 ± 3 (Δ 1 ± 3 [-7 to 9]). The CBF (expressed as percentage) was 14 ± 25 (-40 to 92). There were a strong relationship between the changes in skinfold thicknesses and the changes in absolute and relative BF, but the best estimation was observed with Δ%10SKF - %CBF. **CONCLUSIONS**: The changes in BF (kg, % and CBF) were well estimated with the changes in 10SKF and %10SKF through time. The Δ%10SKF had a ≈1% of change for every 1% in %CBF, which is an easier relationship to remember. However these changes had an error estimate threshold to overcome for increasing the chance to assess a significant change.

Table 1. Determination coefficient and slope for skinfold thicknesses and body fat changes			
	R^2	Slope	SEE
Δ10SKF - ΔBF	0.81	y=0.11x	0.93
Δ%10SKF - ΔBF	0.78	y=0.08x	1.16
Δ10SKF - %CBF	0.66	y=1.11x	11.95
Δ%10SKF - %CBF	0.80	y=0.94x	10.44
Δ10SKF - Δ%BF	0.78	y=0.11x	1.19
Δ%10SKF - Δ%BF	0.76	y=0.09x	1.36

Δ10SKF: Changes in the sum of 10 skinfolds (mm).
Δ%10SKF: Percentage of changes in the sum of 10 skinfolds.
ΔBF: Changes in body fat (kg).
%CBF: Percentage of changes in body fat relative to the initial body fat.
Δ%BF: Changes in body fat percentage.

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Hydration and Electrolyte Status of Brazilian Olympic Athletes

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(No relevant relationships reported)

Weight based sports categories induces detrimental behaviors on health and perfomance. Dehydration and nutritional deficiencies may lead to acute and chronic risks, deteriorating fitness level and health integrity. **Purpose:** The purpose of this study was to evaluate hydration and electrolyte status of elite athletes of Judo and Boxing fron the Olympic National Team. **Methods:** Blood samples were taken from 27 Boxing and Judo elite athletes (18 males and 9 females; 26.4±3.7years) pre and post maximal specific protocol (3x3 minutes round/1minute interval for Boxing and 5 minutes of Handori for Judo) for hydration and eletrolyte status: Osmolality (Osmol), Haematocrit (Ht), Sodium (Na⁺), Potassium (K⁺) and Calcium (Ca⁺⁺) levels. **Results:** Before tests were performed, 100% of the athletes would be considered dehydrated: Osmol 304±62mOsmol.kg⁻¹ (Normal range: 285-295mOsmol.kg⁻¹) and Ht 45.9±6.1%. Sodium, Potassium and Calcium values were 143,3±12.7mmol.L⁻¹; 6,4±1.6mmol.L⁻¹; 9,9±2.3mg.dL⁻¹. After specific sport protocol, Osmol, Ht, Na⁺, K⁺ and Ca⁺⁺ levels were 302.4±73mOsmol.kg⁻¹, 44,7±3.2%, 142,4±14.6mmol.L⁻¹, 6,1±1.1mmol.L⁻¹ and 10,1±3.3mg.dL⁻¹. **Conclusions:** Weight based category sports athletes should focused

on acquiring ideal body weight on a long-term period to avoid dehydration and others short-period strategies that may lead to detrimental aspects of physical fitness and health risks. Re-Hydration must be guided by electrolyte status to avoid major risks issues such as cardic arrhythmias, hyponatremia and aedema. These strategies should be encourage by coaches leagues and federations worlwide.

B-59   Free Communication/Poster - **Contact Sports**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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775   Board #36   May 30 2:00 PM - 3:30 PM

Injury Monitoring and Player Education, a Survey of Current Practices in Irish Amateur Rugby Union

Caithriona A. Yeomans, Thomas M. Comyns, Roisin Cahalan, Giles D. Warrington, FACSM, Andrew J. Harrison, Kevin Hayes, Mark Lyons, Mark J. Campbell, Ian C. Kenny. *University of Limerick, Limerick, Ireland.* (Sponsor: Dr. Giles D Warrington, FACSM)
(No relevant relationships reported)

Rugby Union is one of the most played and watched collision sports worldwide, with high injury incidences widely reported in the literature. Participation rates in Rugby Union are rising with increasing popularity, particularly in Ireland with 224 amateur clubs and approximately 190,400 players currently registered. Internationally, the Irish men's team is currently ranked in the top five in the world. **PURPOSE**: To evaluate injury monitoring and player education practices in Irish amateur Rugby Union. **METHODS**: A survey was designed and distributed to coaches and medical staff of 58 clubs. These clubs represent the highest level of amateur Rugby Union in Ireland. The survey consisted of 27 questions, with five sections: 1) Club demographics, 2) Monitoring, 3) Education, 4) Staffing and 5) Injuries. **RESULTS**: Forty-nine clubs responded to the survey. Five surveys were incomplete and excluded from analysis. The overall response rate was 75.9% representing current practices of 4,843 amateur players (mean 110±57 players per club). Injuries were monitored in 91% of clubs, with medical staff recording data in 75% of cases, using paper records (52.5%), Excel spreadsheets (37.5%) or online resources (7.5%). Training load was monitored in 36% of clubs mainly by the strength and conditioning coach (37.5%). All clubs operated return to play protocols, with 64% for all injuries and 36% for concussion only. Twenty-three% conducted pre-season concussion screening and 82% educated players on concussion. Seventy-one% educated players about injury prevention. **CONCLUSIONS**: Injury monitoring is crucial in collision sports such as Rugby Union, where injury risk is substantial. While comprehensive monitoring systems are prevalent in professional sport, injury monitoring is often infrequent and inconsistent in amateur settings. In order to minimize injury risk, it is the duty of care of governing bodies to implement monitoring systems in both amateur and professional cohorts. In Ireland, 91% of clubs monitor injuries by various means. The implementation of a centralized monitoring system in Irish amateur Rugby would allow injury trends to be effectively tracked and used to guide evidence-based injury prevention strategies. **Funding:** The Irish Rugby Injury Surveillance Project is funded by the Irish Rugby Football Union**.**

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Optimal Cooling Periods For Rugby League In Hot/ humid Conditions

Grant Lynch, Connor Graham, Timothy English, Ollie Jay, FACSM. *University of Sydney, Sydney, Australia.* (Sponsor: Dr Ollie Jay, FACSM)
(No relevant relationships reported)

PURPOSE: The current extreme heat policy for the National Rugby League (NRL) recommends 1-min cooling breaks mid-way through each half to permit greater fluid ingestion as the primary strategy to mitigate heat stress. The present study aims to assess the effectiveness of the current policy relative to an extended halftime break for mitigating thermal strain.**METHODS**: Six trained males (age: 24±4 y, height: 177±11 cm, weight: 90.8±14.2 kg) undertook four counterbalanced experimental trials in a climate chamber simulating hot/humid conditions (36.5±0.4°C, 51±2% RH), consisting of 80 min of intermittent running on a treadmill matching the demands of a professional rugby league game. Participants completed a regular game (RG) with a 12-min half-time break, an extended (20-min) half-time break (EH), a regular game with a 1-min (R1C) cooling break and an extended game with a 1-min cooling break (E1C) 20 mins into each half. Change in core temperature (ΔT_c), change in thermal sensation (TS) and whole-body sweat rate (WBSR) were measured. **RESULTS:** End-trial ΔTc were RG: 1.90±0.14°C, R1C: 1.75±0.52°C, EH: 1.70±0.18°C, E1C: 1.68±0.36°C, with the ΔTc from the start to end of halftime reported as: RG: 1.11±0.20°C, R1C: 1.09±0.36°C, EH: 0.97±0.15°C, E1C: 1.00±0.23°C. The length

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of in-play break duration (i.e. 1-min or 3-min) had no influence on rise in core temperature by the end of the first half (p=0.88) or the second half (p=0.66). However, there was a greater reduction in core temperature during EH compared to RG (p=0.05). This blunted rise in core temperature with EH persisted to the end of exercise with lower end-trial values in EH compared to RG (p=0.02). TS was also cooler at end-trial after EH (p=0.02) with no additive effect of in-play breaks (p=0.96). There were no differences (p=0.40) in WBSR between trials (RG: 1.25±0.25 L/h, R1C: 1.17±0.19 L/h, EH: 1.19±0.18 L/h, E1C: 1.23±0.25 L/h). **CONCLUSIONS**: Preliminary data indicate that extending halftime from 12 to 20 min in Rugby League is effective at reducing thermal strain whereas in-play cooling breaks of up to 3 minutes may not provide any additional benefit. These findings may also be applicable to all field based team sports (e.g. American football, soccer and Australian football (AFL)).**FUNDING:** This research was funded by the National Rugby League (NRL), Australia

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Wearable Sensors to Quantify Performance and Fatigue during Tournament Competition among Elite Developmental Ice Hockey Players

Ken Martel, Andrea Workman, Davor Stojanov, Stephen J. McGregor. *Eastern Michigan University, Ypsilanti, MI.* (Sponsor: Andrew R. Coggan, Ph.D., FASCM, FACSM)
(No relevant relationships reported)

At the highest performance levels of ice hockey (e.g. senior/professional), rules govern the number of successive competition days and prevent multiple competitions on a single day. Yet, some youth leagues run weekend showcase events that include multiple competitions per day. It is generally assumed that multiple competitions per day and several competitions over multiple days will impart excessive fatigue and impair performance, but there is no evidence directly related to ice hockey. **PURPOSE**: Use player-worn sensors (PWS) to compare accelerations (ACC) and heart rate (HR) over 4 games in 3 days among elite youth ice hockey players in order to establish changes in cardiovascular stress and physical exertion associated with fatigue. **METHODS**: 33 elite, youth ice hockey players in two age categories (18U: N=17, 18.2 yrs ± .92 & 16U: N=16, 16.4 yrs ± 1.1) on two teams in a league showcase consented to procedures approved by the EMU-HSRC. Bioharness-3 (Zephyr, MD) recorded HR and ACC at 1 Hz over the 4 games (G1-G4) in the 3- day event. Peak ACC across multiple time frames (10, 15, 20, 30,··· 90, sec and 2, 2.5, 3, 5, 10, ···, 45 min) were quantified and analyzed and HR was quantified and used in conjunction with ACC to determine exertion profiles for each on-ice session. MANOVAs for peak ACC and HR at each time point across G1 -G4 with Bonferoni *post hocs* and multiple games per day (M1, M2) for magnitude and time as main effects were performed using SPSS 23.0 (IBM, NY; α=0.05). **RESULTS**: HR (bpm) decreased G1 v G4 at 3 (187.5 ± 2.8 v 176.1 ± 2.8), 5 (178.7 ± 3.0 v 165.7 ± 3.0), 10 (170.4 ± 3.1 v 157.6 ± 3.1), 15 (167.1 ±3.0 v 153.3 ± 2.9) and 20 min (164.3 ± 3.0 v 150.5 ± 2.9)(p<.05). In addition, HR also decreased G1 v G3 for 10 (170.4 ± 3.1 v 158.5 ± 3.0), 15 (167.1 ±3.0 v 154.5 ± 2.9) and 20 min (164.3 ± 3.0 v 152.4 ± 2.9)(p<.05), although ACC were not different. Peak ACC (g's) were lower for M2 vs M1 at 60 (0.632 ± 0.012 v 0.592 ± 0.012), 90 (0.551 ± 0.01 v 0.520 ± 0.01), 120 (0.495 ± 0.009 v 0.469 ± 0.009) and 180 sec (0.412 ± 0.009 v 0.386 ± 0.009)(p<.05). **CONCLUSIONS**: The decline in HR, but not ACC across games over 3 days indicates a cardiovascular adaptation as opposed to overt fatigue. On the other hand, the reduced ACC from 60 - 180 sec between games 1 and 2 in a day indicate reduced shift capacity and an overall decline in performance indicative of fatigue during the second contest.

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Movement Deficiencies in Division II Male Football Athletes as it Relates to Class and Position

Taylor A. Taraski, Jenny A. Martinez, Christopher C. Winter, Jeremy E. Glaser, Brandon M. Fjerstad, Jeremy L. Knous. *Saginaw Valley State University, University Center, MI.*
(No relevant relationships reported)

The NCAA Division II Student-Athlete population may be subject to numerous mobility and stability deficiencies as it relates to sport and training requirements. Deficiencies must first be identified prior to prescription of sport performance training modalities. **PURPOSE:** Identify movement deficiencies in Division II male football athletes and investigate differences among specified groups. **METHODS:** Forty-three athletes (weight 103.1 ± 19.9 kg, height 183.3 ± 6.6 cm) underwent 11 screening exercises assessing deficiencies in 15 evaluation areas. Data was collected by trained evaluators who scored athletes on a pass/fail system with failure defined as compromised mobility or stability during exercises. Scores were compiled into evaluation areas determining deficiencies. For analysis, athletes were dichotomized into Upperclassmen (UC) n = 22 and Lowerclassmen (LC) n = 21 and stratified into position groups: Skill (n = 15), Big Skill (n = 15), and Bigs (n = 13). Descriptive statistics and comparative analysis, T-Test and ANOVA, were performed using SPSS (version 22.0) with significance set at p ≤ 0.05. **RESULTS:** All athletes displayed deficiencies, but comparative analysis identified significant differences between UC

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and LC in lower body strength (UC = 1.9 ± 1.4, LC = 3.1 ± 0.9; F = 11.9, p = 0.001) and single leg strength (UC = 3.8 ± 1.9, LC = 5.1 ± 1.2; F = 6.5, p = 0.02). Within position groups, Bigs (6.9 ± 1.7; 13.2 ± 2.8; 2.6 ± 0.5, 1.9 ± 0.9) presented greater deficiencies in posterior chain (F = 6.4, p = 0.004), core stability (F = 5.4, p = 0.01), hip girdle endurance (F = 3.6, p = 0.04) and posterior shoulder girdle strength (F = 3.6, p = 0.04) compared to Skill (3.7 ± 2.7, p = 0.001; 9.9 ± 3.3, p = 0.01; 1.8 ± 0.9, p = 0.01; 1.3 ± 0.9, p = 0.06) and Big Skill (4.3 ± 2.9, p = 0.01; 10.0 ± 2.8, p = 0.01; 1.8 ± 0.9, p = 0.37; 1.1 ± 0.8, p = 0.01). **CONCLUSION:** Identification of individual and group deficiencies allows for utilization of targeted training protocols with the goal of enhancing overall performance.

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Physical Demands of NCAA Division I Hockey Training and Competition Using Microtechnology

Bryce V. Murphy, Donald R. Dengel, FACSM, Julian Wolfson, Calvin C. Dietz, Corey S. Petersen, Tyler A. Bosch. *University of Minnesota, Minneapolis, MN.* (Sponsor: Donald R Dengel, FACSM)

(No relevant relationships reported)

PURPOSE: Wearable technology has gained popularity to measure external workloads during practices and games in sport. Most often a tri-axial accelerometer, combined with a magnetometer and gyroscope measures directional movement in three planes of motion. This study investigated the external loads of collegiate hockey practices and games by period. **METHODS:** External workload (i.e. Player Load™ [PL]) and workload intensity, PL per minute (PL/m), were measured in 18 NCAA Division I Hockey athletes [11 forwards (FWD) and 7 defenders (DEF)] using OptimEye S5 monitoring devices (Catapult Sports, Melbourne, Australia) during the 2016-2017 season. Measurements were recorded during games and practices. Linear mixed effects models with random intercepts for player and date were used to test the effect of position on each variable. Effect sizes were calculated to determine the magnitude of differences between groups. **RESULTS:** The PL for Period (PD) 1 was 2.27 PL higher than PD 3 (95% CI: 0.61, 3.93; p = 0.007; d = 0.48). The PL/m for PD 1 was 0.13 PL/m higher than PD 2 (95% CI: 0.09, 0.17; p < 0.001). The PL/m for PD 1 was 0.18 PL/m higher than PD 3 (95% CI: 0.14, 0.23; p < 0.001). The PL/m for PD 2 was 0.05 PL/m higher than PD 3 (95% CI: 0.01, 0.10; p = 0.0147). There were no differences within PD by position (p = 0.198). The PL for practices was 19.43 PL lower than games (95% CI: -35.19, -3.69; p = 0.018). The PL/m for practices was 0.28 PL/m higher than games (95% CI: 0.20, 0.36; p < 0.001; d = 0.9). The PL for FWD was 29.2 PL higher than DEF during practice (95% CI: 12.6, 45.8; p = 0.003; d = 1.65). There were no differences in PL between FWD and DEF during games (p = 0.167). The PL/m for FWD was 0.36 PL/m higher than DEF across practice and games (95% CI: 0.18, 0.55; p = 0.002). **CONCLUSION:** Within this study we observed: 1) player workload intensity decreasing as the game progresses; 2) higher PL/m for practice compared to games; and 3) higher PL for FWD compared to DEF during practice. However, these differences are relatively small in absolute terms and may not be meaningful considering individual variation between players. Playing time, penalties, and minor injuries may affect positional averages throughout the course of a game. Future studies should examine the effect of individual variation within and between weeks and by drill type.

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Physical Skills of Teen Student-Athletes of Combat Sports: A Comparative and Correlational Analysis

Aldo F. Longo, Gustavo D. Aquilino, Marcelo L. Cardey, Néstor A. Lentini, Enrique O. Prada. *CeNARD, Buenos Aires, Argentina.*

(No relevant relationships reported)

PURPOSE: To analyze comparatively the performances of elementary and high school athletes of combat sports in a set of tests of conditional abilities. **METHODS**: Data from 518 male and female teenagers who took part in inter-provincial competitions of Judo, Taekwondo and Wrestling were studied (age range: 11.9 to 14.9 years). A battery of field tests was carried out: Handgrip strength (HAST), Abalakov, Countermovement and Squat jumps (ABJ, CMJ and SQJ), 0-10 m Sprint acceleration (0-10SA) and Sit and reach flexibility (SARF). Pearson's r was used to test correlations among the physical skills. ANCOVA models were run to evaluate the performances in HAST, ABJ, 0-10SA and SARF, which included Gender, Sport and their interaction, and Age as a covariate. Feasible weighted least squares was applied on HAST and ABJ, to account for heteroscedasticity. *Post hoc* Tukey-Kramer tests were conducted for multiple comparisons. The statistical significance level was fixed at p<0.05. **RESULTS**: The correlations were high among the jumps (0.82 to 0.91; p<0.001), and from moderate to marked among HAST, 0-10AS and any of the jumps (0.50 to 0.65; p<0.001). SARF showed very low correlations (0.05 to 0.15; 0.0007≤p≤0.25). The interaction term was not statistically significant in the models analyzed. Gender was a significant factor in the four models, and Sport was significant in the models for ABJ

and SARF. Boys exhibited higher performances than girls in HAST, ABJ and 0-10SA, and lower in SARF. *Post hoc* comparisons between sports revealed that judokas and taekwondists had higher values than wrestlers in ABJ, and that taekwondists had higher values than wrestlers in SARF. In boys, the mean responses of HAST (kgf), ABJ (cm), 0-10SA (m·s^{-2}) and SARF (cm) were 28.8, 31.7, 4.7 and 5.1 for judokas; 28.0, 32.8, 4.7 and 5.7 for taekwondists; and 27.0, 29.9, 4.7 and 3.0 for wrestlers. And in girls, the mean responses were, respectively, 23.9, 25.4, 4.1 and 9.4; 23.6, 25.3, 4.0 and 10.8; and 23.6, 23.6, 4.0 and 8.2.
CONCLUSIONS: Flexibility evidenced the lowest associations with the rest of the physical skills. The differences between boys and girls appeared to remain constant across sports. Averaged over both genders, martial arts athletes showed higher performances in ABJ, and taekwondists revealed to be more flexible than wrestlers.

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Differences in Velocity Output in the Back Squat, Bench Press, and Deadlift Among Collegiate Hockey Players

Chris Pitsikoulis, Chad Trudo, Josh Kieffer, Ryan Goochey, Josue Argueta, Guillermo Blano. *Aurora University, Aurora, IL.*

(No relevant relationships reported)

Resistance-training loads are commonly assigned as a percentage of an individual's one-repetition maximum (1-RM). Unfortunately, repetition maximums do not account for an athlete's current state of readiness (training state). The use of velocity-based training (VBT) provides objective data about training state, and is an effective and reliable method of examining an athlete's movement efficiency. Currently, there is insufficient evidence regarding velocity profiles of exercises that are body-weight dependent (BWD) such as the free-weight back squat (BS) and deadlift (DL) compared to non-body-weight dependent (NBWD) such as the barbell bench-press (BP). **PURPOSE**: To determine velocity profiles for the BS, BP and DL in Division III collegiate male hockey players. **METHODS**: Fourteen Division III male collegiate hockey players, (age 21.3 ± 1.5 years; height 181.2 ± 5.0 cm; mass 88.6 ± 8.8kg) completed this study. Prior to velocity testing, body composition via air displacement plethysmography (BodPod) and one repetition maximum (1RM) for the BS, BP, and DL were measured. On separate days, subjects performed nine repetitions each of the BS, BP and DL (10, 20, 30, 40, 50, 60, 70, 80, and 90% of their 1RM). Average velocity was measured with a Tendo Power Analyzer (Tendo Sports Machines, Slovak Republic). A repeated measures ANOVA was used to investigate the impact of exercise on mean velocity (alpha level of p ≤ 0.05). **RESULTS**: Subject anthropometric measurements included: BMI (26.95 ± 2.0 kg/m^2) and percent body fat (17.12 ± 3.4 %). 1-RMs for the BS, BP, and DL were 146.0 ± 13.1 kg, 103.7 ± 15.3 kg, and 156.84 ± 14.9 kg), respectively. A significant exercise x %1-RM interaction was found (p < .05). Mean velocity for the BP was significantly greater at 10%, 20% and 30% of 1-RM compared to the BS and DL and 90% compared to the DL (p <.017). There were no significant differences in mean velocity between the BS and DL. **CONCLUSIONS**: The BS and DL, BWD exercises, demonstrated significantly slower average velocities at various levels of %1-RM compared to the BP, a NBWD exercise. While the differences were not seen throughout the entire range of %1-RM, practitioners should account for body-mass when using VBT with BWD exercises.

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Evaluation Of The Health And Physical Fitness And Factors Influencing Retention Of Scholastic Sports Officials In The Sport Of American Football

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(No relevant relationships reported)

PURPOSE: As the competitive level and skill level of the athletes increases, so does the demand and elevation in expectation of that official's performance. There is currently a dearth of information and data as it relates to the official's capacity and ability to perform their job. The purpose of this study was to evaluate the health and physical fitness status as well as job satisfaction of officials in the sport of American football. **METHODS**: Eighteen National Federation of High Schools certified officials in the sport of American football participated in the study. Participants completed an Adult Health History Questionnaire to risk classify for cardiovascular disease (CVD) according to American College of Sports Medicine (ACSM) standards (ACSM, 2017). Also, each participant completed a Minnesota Satisfaction Questionnaire (1977) related to their current officiating responsibilities. In addition, each participant had body mass index (BMI) assessed using standard scales.

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RESULTS: Descriptive statistics showed that the mean age of the participants was 47.7 ± 13.2 years old with a mean BMI of 29.0 ± 5.0 kg/m². 50.0% of participants were classified as High Risk for CVD, 27.8% Moderate Risk, and 16.7% Low Risk. A significant correlation was found between age and total sports officiated ($r = -.505$, $p = 0.046$) and while the correlation between BMI and extrinsic satisfaction ($r = -.493$, $p = 0.062$) was not significant, it did imply a moderate correlation. A one-way ANOVA exhibited a significant difference between ACSM risk classification and the number of sports officiated ($p = 0.044$). A post-hoc Tukey test indicates that individuals who are High Risk officiate significantly more sports ($p = 0.046$) than those who are Moderate Risk. However, High Risk was not significantly different from Low Risk and Low Risk was not significantly different from Moderate Risk ($p > 0.05$).
CONCLUSIONS: Based on the results of the current study, it appears that the data can confirm that as officials get older they tend to drop out of officiating. In addition, a large degree of officials (77.8%) were considered either Moderate or High Risk for CVD, implying that the physiological stress that officiating typically entails could place these individuals at an increased risk of experiencing a cardiovascular event.

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Hydration Status in Division III Female Hockey Players Prior to Competition

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(No relevant relationships reported)

Voluminous sweating and collegiate athletes share an association, especially during competition. The accountability is on the athlete to arrive to the venue euhydrated and it is paramount for optimal performance. For the collegiate hockey player it has been reported that improper hydration will most likely cause headaches, dry mouth, sluggishness, malaise, and reduced performance. **PURPOSE:** To elucidate the hydration status in a group of DIII collegiate female hockey players prior to competition. **METHODS:** Sixteen intercollegiate athletes from a NCAA Division III Women's Hockey team (age = 19.9 ± 0.7 yrs, height = 168.7 ± 8.2 cm, mass = 62.6 ± 9.1 kg) participated in this investigation. During an eight week span over two seasons, 16 skaters randomly provided a sample moments before competition. Urine samples were collected in a sterile 4oz specimen container and measured with a pen refractometer (ATAGO model 3749-E04) to determine urine Standard Gravity (SG). Data were analyzed using a one sample t-test against established optimal hydration levels at or below 1.020 SG. **RESULTS:** Mean(x) SG score was 1.0239 ± 0.0027 ($p < 0.05$). Three out of sixteen subjects met the criteria of the 1.020 SG or lower number. Thirteen measured between 1.022 and 1.031. **CONCLUSION:** This reveals a significant difference above the population standards and indicates that the majority of athletes were slightly dehydrated in that, only 16.7% were properly hydrated by SG guidelines. Thus, revealing that the typical DIII female hockey player is not adequately hydrated prior to competition and would benefit from additional guidance and preparation.

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This Study Provides Quantification Of Positional Physical Demands Of Selected Positions

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(No relevant relationships reported)

Global positioning tracking comparisons of selected NCAA Division I football player positions during conference games
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Global positioning (GPS) tracking of Division I (DI) football players is a relatively new method of assessing total distance covered, velocities and accelerations during practices and games.
PURPOSE: To compare differences in distance traveled, maximum velocity, high accelerations, among DI football players during competition. **METHODS:** NCAA DI football players (N=21) wore GPSs monitors during four randomly assigned conference games to track selected variables of each athlete. Athletes were grouped by playing position; skilled = wider receiver (WR) and defensive back (DB) and line = offensive linemen (OL) and defensive linemen (DL). Dependent variables included total distance covered (m), maximum velocity m·s⁻¹), and high acceleration (>3ms⁻²) distances. Oneway ANOVAs were used to compare differences among groups and Newman-Keuls post hoc tests to determine location of significant differences. **RESULTS:** For total distance, DBs traveled significantly ($p<0.05$) further than WR and OL, but not DL. There was no significant differences between DL and any other positions. DBs and WR had significantly greater maximum velocities than OL and DL and DL had significantly greater velocity than OL. There was no significant difference between DBs and WRs. For high acceleration, DBs had significantly greater distance than all other groups. WRs had greater distance than DL and OL. No difference was found between OL and DL. **CONCLUSION**: This study provides quantification of

physical demands of selected DI football positions by determining that defensive player traveled further than offensive players did and that skilled players noted greater velocity and acceleration distances than linemen. Fatigue is related to duration and exertion, which is also associated with potential injury. With factual data regarding these variables, it may be possible to avoid over-reaching, hence reducing injury susceptibility.
Tracking, velocity, athletes

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Relationship between Body Composition, Cardiorespiratory Fitness, and Position in DII Collegiate Male Rugby Union Players

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(No relevant relationships reported)

Different aspects of body composition such as fat-mass (FM), fat-free mass (FFM), percentage of body fat (BFP), and body mass (BM) have been identified as affecting cardiorespiratory fitness ($VO2_{max}$) in children and young adults. In the sport of rugby union, different positions have been found to benefit from different body compositions based on their roles. Forwards have been found to have greater FM, FFM, BFP, and BM than backs. **PURPOSE:** To determine if FM, FFM, BFP, and BM had any relationship with $VO2_{max}$ among positional groups in collegiate male rugby union players. **METHODS:** Twenty-nine participants (20.34 ± 1.52 years) agreed to perform a 20m multi-stage shuttle-run until volitional failure with the aim of estimating their $VO2_{max}$. FM, FFM, BFP, and BM, were estimated through air-displacement plethysmography via a BODPOD. Players were split into 2 groups based on their general position (forwards, n=16 and backs, n=13). **RESULTS:** An independent samples t-test comparing FM, FFM, BFP, BM, $VO2_{max}$, between forwards and backs revealed that the forwards had a significantly higher BM ($t(27) = 5.64$, $p < .001$), FM ($t(27) = 2.69$, $p < .05$), and FFM ($t(27) = 4.9$, $p < .001$). A Pearson correlation coefficient was calculated for the relationships between estimated $VO2_{max}$ and FM, FFM, BFP, and BM for each positional group. Strong negative relationships were found between $VO2_{max}$ and FM ($r(14) = -.767$, $p = .001$), BFP ($r(14) = -.740$, $p = .001$), and BM ($r(14) = -.699$, $p = .003$) in the forwards. As for the backs, no significant relationships were found between $VO2_{max}$ and FM, FFM, BFP, or BM.
CONCLUSION: The higher amounts of FM, FFM, and BM in forwards likely benefits them during play as they spend a large amount of time in contact with the opposition. However, the increased amount of FM, BFP, and BM may negatively affect the forwards' cardiorespiratory fitness as they are required to move a heavier amount of mass.

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Longitudinal Observation Of Cardiac Adaptation In Junior Rugby Players Using Echocardiography

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(No relevant relationships reported)

PURPOSE: The purpose of this study is to conduct a 3-year longitudinal study of cardiac adaptation in junior and senior high school athletes who play rugby with echocardiography in an effort to examine how continuous practice of rugby during the growth period affects ventricular volume expansion and ventricular septum thickening.
METHODS: Subjects were 34 male junior high and 79 senior high school rugby players with top-level game power. Subjects engaged in rugby-related training approximately 3 hours a day, 6 days a week continuously for 3 years. We measured height, body weight, blood pressure and took electrocardiogram and echocardiography measurements once a year for 3 consecutive years in these subjects. Echocardiography measurements were taken by portable ultrasonic measurement apparatus on B mode to measure left ventricular end-diastolic dimension (LVDd) and posterior left ventricle wall thickness (PWT). As a substitute for the control group, we estimated predicted values for each subject based on their height to make a cross-sectional comparison with the actual measured values.
RESULTS: A cross-sectional comparison of LVDd and PWT measured in junior high schoolers exhibited a significant increase between the 1st and 2nd grade (equivalent of American 7th and 8th grades, respectively) ($p<0.01$). A cross-sectional comparison of the predicted and actual LVDd values for each year of junior high school revealed a significant difference in 2nd year students ($p<0.01$). In contrast, there was a significant difference between predicted and actual PWT values in the 2nd and 3rd (equivalent of American 9th) grade students ($p<0.05$). In senior high schoolers, LVDd increased significantly between the 1st and 2nd grade as well as between the 2nd and 3rd grade, and PWT increased significantly between the 1st and 2nd grade ($p<0.01$). In senior high school, there was a significant difference between actual and predicted values of

LVDd and PWT in all three grades (p<0.01). **CONCLUSIONS**: Continuous practice of rugby in junior and senior high school was associated with marked expansion of left ventricular volume and thickening of the left ventricular septum.

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Characteristics of Female Collegiate Ice Hockey Players

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(No relevant relationships reported)

PURPOSE: The purpose of this research is to examine the physical characteristics and fitness levels of ACHA Division 1 collegiate female hockey players by examining data collected from various fitness tests including vertical jump, anaerobic step test, the Cooper Run test, anaerobic cycling (Wingate) and body composition testing (BodPod). **METHODS:** Twelve ACHA female hockey players visited the lab on three separate visits to complete the three day testing protocol. On the initial visit, percent body fat was assessed using the BodPod (BP). Also height as well as weight, blood pressure, age, sit and reach, vertical jump (using the Vertec), and anaerobic power output through the anaerobic step test were assessed. On day two, the athletes performed a 1.5 mile aerobic run (Cooper Run Test). On day three, an anaerobic cycling test (Wingate) was performed. **RESULTS:** Percent body fat as assessed by BP (29.7 ± 8.2; range: 19.6-43.3%), height (162.3 ± 6.2; 150-170cm), weight (70.6 ± 12.1; 50.1-95.2 kg), resting systolic blood pressure (119 ± 5; 110-130 mmHg), resting diastolic blood pressure (77 ± 6; 68-88 mmHg), age (21.3 ± 4.2; 18-34 years), sit and reach (32.5 ± 6.4; 23-41.5 cm), vertical jump (18.7 ± 3.1; 13.25-23.5 inches), anaerobic step test (46.5 ± 12.6; 31-74 steps; mean power 254 ± 72; 624-1295 watts), aerobic capacity (VO_2 max) as assessed by the Cooper Run Test (46.6 ± 10.3; 33-65.4 ml^{-1}*kg^{-1}*min). The Wingate mean power was (3743 ± 981; 4965-8057 Watts) and total repetitions were (45.7 ± 4.7; 38-53 repetitions). **CONCLUSION:** These tests present a unique fitness profile for an understudied group of athletes. This profile can be useful for coaches, players and trainers within this sport, ACHA Div.1 Women's Ice Hockey.

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Comparison Of Heart Rate, Speed, And Sprints Performed By A Division I College Female Field Hockey Team Using Game Data

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(No relevant relationships reported)

Heart rate (HR) monitoring, GPS tracking, and accelerometry are new techniques for evaluating players' activity levels during competition. Results from live tracking can help the coaches with practice schedules and game strategies. To date, there are few data available from these tracking modalities within NCAA varsity women's field hockey. **PURPOSE:** Our purpose was to determine descriptive information related to players' game performance, and analyze the results by player position. **METHODS:** A team HR monitoring system was used to evaluate in-game HR responses and movement patterns of women field hockey players from a single NCAA Division I team. Players were divided into 3 groups based on position (back, midfielder, forward). Data were collected and averaged among 15 women who played in 3 games, and 95% confidence intervals were computed. HR max was determined through a continuous graded treadmill test with increases in intensity every 2 min. Given that field hockey is fast-paced game, variables of interest in this preliminary investigation included time spent at HRzone 4 (80-90%HRmax) and HRzone 5 (>90%HRmax), maximum speed achieved, and number of sprints performed. **RESULTS:** On average, players spent 31.3% of game time in HRzone 4 and 49.2% in HRzone 5. Differences were seen according to player position as backs spent less time in HRzone 4 (22%) compared to midfielders (34.9%) and forwards (37.1%); P<0.05. In contrast, forwards spent less time in HRzone 5 (35.6%) compared to backs (57.6%) and midfielders (54.5%); P<0.05. Midfielders spent significantly more time >80%HRmax (89.4%) compared to forwards (72.7%); P<0.05. Max sprint speed was not statistically significant by position, midfielders (435±56.2 m/min), backs (401±42.2 m/min) and forwards (393±31.9 m/min). Backs engaged in fewer sprints (0.4±0.08 sprints/min) compared to midfielders (0.7±0.27 sprints/min) and forwards (0.6±.58 sprints/min); P<0.05. **CONCLUSIONS:** Heart rate data show clearly that field hockey is played under very intense aerobic conditions, with high burst interval runs being performed throughout the competition. Our data suggest that backs achieve their HR values using less short bursts and likely, more constant movement, while overall aerobic intensity (according to HR response) appears greatest among the midfielders.

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Validity & Reliability Of A New Hockey-Specific Test In Elite Ice Hockey Players

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(No relevant relationships reported)

A valid and reliable method of assessing hockey-specific physiological performance is warranted as elite hockey players compete for scholarships and professional contracts. The Hockey-Specific Test (HST) is an on-ice, position-specific assessment that integrates competition specific, multi-planar movement patterns and is generalizable to hockey players at the highest level of competition. Generalizability in the use of published on-ice tests is problematic due to small sample sizes and the use of recreational youth and non-elite players. More importantly, they don't include hockey-specific movement patterns (e.g., turns, deceleration, skating backward). **PURPOSE:** The purpose of this study was to determine the validity and reliability of the new assessment. **METHODS:** 54 male players (National Hockey League = 16; American Hockey League = 23; Under 17 USA National Team = 15) gave informed consent and minor assent to participate in both the HST and a 30-second Wingate Test (WAnT) with a resistance of 0.075 kg/kg body weight. The HST consists of 6 on-ice trials interspersed with 30-seconds active rest. All players wore full gear and carried a stick. Measurements included 15 m peak acceleration (m/s^2), 166 m total trial speed (m/s), percentage of age-predicted maximum heart rate (APMHR$_\%$), and post-exercise blood lactate (BLA$_{post}$) as markers of maximal effort and physiological capacities. **RESULTS:** A strong correlation exists between WAnT peak power and HST trial speed ($r = .765, p < 0.001$) and 15 m acceleration ($r = .716, p < 0.001$) in elite players, demonstrating construct validity. Intra-class correlation coefficients (*ICC*) for all participants verified within and between trial reliability for 15 m acceleration, $F(50) = 0.67, p < 0.001$ and trial speed, $F(50) = 0.85, p < 0.001$. Multinomial logistic regression for predicting WAnT peak power (w) from results of the HST = 27.98 - (18.05 x trial 1 time) + (11.04 x weight) + (25.69 x age). Adjusted peak power, APMHR$_\%$, and BLA$_{post}$ were 1023±108, *SEE* = 26±6; 89.3±3.6 and 91.2±4.5; 10.6±2.0 and 11.2±1.7 for the WAnT and HST, respectively. These values coincide with a test that sufficiently taxes the glycolytic energy pathway. **CONCLUSION:** The HST appears to be a valid and reliable test for determination of physiological performance in elite hockey players.

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Updating the Skating Multistage Aerobic Test for VO_2max Prediction Including Skating Economy in Ice-Hockey Players

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(No relevant relationships reported)

Purpose: In ice hockey, the aerobic metabolism is responsible for up to 30% of total energy expenditure and thus, is considered as an important performance factor. Recently, a number of field tests, including the Skating Multistage Aerobic Test (SMAT) have been developed to predict VO_2max in hockey players. When it was developed, the SMAT determined energy expenditure using the retro-extrapolation of the O_2 recovery curve at time 0 method. With the development of portable metabolic analyzers, it would be relevant to update the VO_2 values using this more precise device. In addition, the SMAT, like most field tests, assumes that participants who reach a given stage have the same oxygen cost, which is not usually true. Thus, the objectives of this research are to update the VO_2 values during the SMAT using a portable breath-by-breath metabolic analyzer and to propose a simple index of skating economy to improve the prediction of O_2 uptake. **Methods:** Twenty-six elite hockey players (age 15.8±1.3 years) participated in this study. The oxygen uptake was assessed using a portable metabolic analyzer (K4b2) during an on-ice intermittent maximal multistage shuttle skate test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to 3.5m·s^{-1} and at each stage, speed increased by 0.2m·s^{-1}. In order to develop an index of skating economy (SSI = # Strides · Body Mass^{-1}), the number of skating strides was compiled for each stage of the test. **Results:** The SMAT enabled the prediction of the VO_2max (ml·kg^{-1}·min^{-1}) from the maximal velocity (m·s^{-1}) and the SSI (at Stage 4, which corresponds to 4.1m·s^{-1}) using the following regression equation: VO_2max = 13.86·(maximal velocity)+(3.23·SSI)-19.95 (r=0.95, SEE=1.96). **Conclusion:** This research allowed for the update of the oxygen uptake values of the SMAT test and proposed a simple measure of skating efficiency for a more accurate evaluation of VO_2max in elite hockey players. By comparing the highest and lowest observed SSI scores in our sample for a given stage, it was noted that the VO_2 values

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Abstracts were prepared by the authors and printed as submitted.

can vary by up to 5 (ml·kg^{-1}·min^{-1}). Our results suggest that movement economy should be included in the prediction of VO$_2$max in field tests requiring high technical skills in order to improve prediction accuracy.

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Do Metrics Between Back-to-Back National Hockey League Away Games Indicate a Presence of Fatigue?

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(No relevant relationships reported)

PURPOSE: The purpose of this investigation was to estimate the fatigue caused by game one of a set of back-to-back games (away) as indicated by play-by-play metrics. **METHODS**: The R package, nhlscrapr, was used to acquire the 2015-2016 National Hockey League play-by-play database. First, the database was filtered for all regular-season, full-strength events with no pulled goalies. Next, all back-to-back games were identified and coded as being either away-away, home-home, home-away, and away-home. Only away-away back-to-back games were analyzed. Finally, the data were filtered so each back-to-back team had a frequency count for games one and two of the following variables: goals for, goals against, shots on goal for, shots on goal against, missed shots for, missed shots against, shots for blocked, shots against blocked, hits for, penalties against, and penalties for. All metrics were analyzed using mixed models, with random effects for team and fixed effects for game number. Goals, penalties, and blocked shot models were fit using Poisson distributions, and all other models were fit using Gaussian distributions. Alpha was set at 0.05. **RESULTS**: 186 away-away pairs of games were identified; teams had anywhere from 1 to 10 pairs. There was a significant effect of game number on goals for (game 1=1.8±1.3; game 2=1.5±1.2; p=0.035), shots against (game 1=20.8±5.5; game 2=22.0±6.2; p=0.04), and missed shots against (game 1=8.9±3.7; game 2=9.9±4.0; p=0.011). There was no significant effect of game number on goals against (game 1=1.8±1.2; game 2=1.7±1.3; p=0.46), shots on goal for (game 1=20.8±6.0; game 2=19.9±5.5; p=0.14), missed shots for (game 1=8.8±3.6; game 2=8.8±3.7; p=0.95), shots for blocked (game 1=10.9±4.5; game 2=11.4±4.7; p=0.13), shots against blocked (game 1=10.4±4.2; game 2=10.5±4.7; p=0.92), penalties against (game 1=2.9±1.5; game 2=2.8±1.4; p=0.86), penalties for (game 1=2.8±1.5; game 2=2.6±1.5; p=0.10), and hits for (game 1: 21.4±8.9; game 2 20.7±7.6; p=0.31). **CONCLUSIONS**: Hit data indicates that physicality is likely not as affected by game 1 fatigue. However, teams give up a greater number of total shot attempts in game 2's and score fewer goals in game 2's. Thus, game 1 fatigue may result in lower-quality shots for and generally poorer defensive play by skaters.

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Comparison of Muscular Strength and Reactive Strength Index between Football Linemen and Backs

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(No relevant relationships reported)

Ability to generate force quickly is a primary evaluation protocol for assessing athletic potential. Jumping indices have become major indicators of potential or judging training improvement. However, there is limited information concerning these indices for college football players. **PURPOSE:** To compare two forms of reactive strength index (RSI) between college football linemen and backs. **METHODS:** Linemen (n = 11) and backs (n = 12) from an NCAA D-II program were tested for one-repetition maximum (1RM) squat (SQ), paused squat jump (SJ) and drop-jump vertical jump (DVJ) determined from reach height. Flight time during SJ and ground contact time (GCT) were measured using an automated contact mat. Each player performed 3 trials of each jump. Relative 1RM SQ was expressed allometrically (SQ/kg$^{0.67}$). RSI was calculated as a ratio of DVJ to GCT (RSI-1) and Ft/GCT (RSI-2). Data were analyzed with ANOVA and significance was accepted with p<0.05. **RESULTS:** Linemen were significantly taller (186.7 ± 3.6 cm) and heavier (117.3 ± 15.7 kg) than backs (180.1 ± 6.0 cm and 90.1 ± 5.3 kg, respectively). 1RM SQ was greater in linemen (200.0 ± 26.7 kg) than backs (182.7 ± 28.4 kg), but relative SQ was similar (linemen: 8.20 ± 1.05; backs: 8.99 ± 1.32). Reliability for GCT (ICC = 0.922), Ft (ICC = 0.990), DVJ (ICC = 0.960), and SJ (ICC = 0.991) was high. RSI-1 (2.12 ± 0.52) was greater than RSI-2 (2.04 ± 0.54), although they were highly correlated (r = 0.93). RSI-1 and RSI-2 were greater in backs (2.33 ± 0.38 and 2.42 ± 0.46, respectively) than in linemen (1.67 ± 0.49 and 1.91 ± 0.48, respectively) with large effect sizes (ES = 1.52 and 1.07, respectively). Relative SQ was moderately correlated with RSI-1 (r = 0.63) and RSI-2 (r = 0.59), but there was no relationship with 1RM SQ (r = 0.06 and 0.13, respectively). RSI-1 and 1RM SQ correctly classified 80% of linemen and 85% of backs to the proper position. **CONCLUSION:** Ratios utilizing contact time appear more effective at evaluating reactive strength than measurements of strength or simple jump performance (jump height). The relationship between relative strength and

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reactive jumps suggests that players who have greater relative strength can move more effectively in reactive situations which may more accurately identify performance potential in college football players.

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Effect Of Rapid Weight Loss On Strength In Mma Fighters

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(No relevant relationships reported)

PURPOSE: The aim of this study was to verify the effect of the rapid weight loss (RWL) induced by the restriction of fluids at different moments on the manual grip strength in mixed martial art (MMA) athletes. **METHODS**: Twenty-seven male amateur MMA athletes (age 24.0 ± 5.3 years, height 175 ± 8.2 cm, body mass 76.0 ± 14.66 kg) and twenty-three women (age 19,0 ± 6,9 years; height 164,0 ± 6,1 cm; body mass 66,0 ± 6,70 kg) participated in this study. All athletes had BM, handgrip strength, and hydration status assessed at baseline (10 days before the onset of RWL), the official match weigh-in, and again 24 h later (match time). **RESULTS**: A repeated measures ANOVA showed for men and women, basal body weight (male: 75,0 ± 2,0; female: 66,1 ± 6,7) was significantly higher than at the time of weighing (male: 65,2 ± 2.1; woman: 56,9 ± 4,9) and match time (male: 68,5 ± 2,1, female: 59,6 ± 6,1). Density for males was higher at baseline (1.039 ± 0.1) compared to 24 h later (1.018 ± 0.1). However, women presented a difference in density for the three moments (baseline: 1,040 ± 0,2 > 1,030 ± 1,0 > 1,017 ± 0,1). In the handgrip for men it was evidenced difference between baseline (44,2 ± 13,8) and weighing (40,3 ± 17,7); however for women not found difference. **CONCLUSIONS**: Rapid weight loss showed to reduce significantly manual grip strength. In addition, was observed that this technique leads the athlete to dehydration. This would possibly interfere in a negative way in the performance of the athletes. In this way, the subjective criterion of a supposed advantage in the reduction and supercompensation of the weight must be well planned so that there is no deleterious effect on the performance and health of the athlete.

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Changes In Elite Canadian Collegiate Hockey Player'S Body Compositions And Physiologic Tests Across Playing Careers

Nathan Chiarlitti, Patrick Delisle-Houde, Ryan RE Reid, Alex Sirois, Cory Kennedy, Ross E. Andersen, FACSM. *McGill University, Montreal, QC, Canada.* (Sponsor: Ross Andersen, FACSM)

(No relevant relationships reported)

The combined athletic and academic demands place a significant burden on collegiate hockey players. Numerous cross-sectional studies have been conducted with professional hockey players assessing body composition and skeletal fitness; yet, no research has investigated the longitudinal physiologic changes among elite collegiate athletes. **PURPOSE**: To examine changes in body composition and physiologic tests across a player's collegiate hockey career. **METHODS:** Over three seasons, six elite male Canadian university hockey players (age = 21.35 ± .28 years, weight = 84.53 ± 7.26 kg , height = 179.48 ± 7.60 cm, body fat percentage = 15.55 ± 1.68% at baseline) participated in the study at the beginning of their hockey seasons. All participants underwent physical testing (as outlined in the 2016 NHL combine) and a day after testing, one total body dual energy x-ray absorptiometry (DXA) scan to measure body composition. **RESULTS:** A repeated measures ANOVA was used to track body composition and physiologic performance variables over a three-year period. Players gained body weight (1.66 ± 1.96 kg), total body fat percentage (2.83 ± 1.91%), visceral adiposity (.16 ± .15 kg), upper fat mass (1.57 ± 1.20 kg), and lower fat mass (.52 ± .36 kg) (p < .05 for all comparisons). Total and regional lean tissue mass stayed relatively constant throughout their careers. There were no significant changes in agility scores, left grip strength, long jump distance or impulse generated in the vertical jump as all of these assessments stayed relatively consistent throughout the seasons. As players progressed through their careers, they achieved significantly more bench press repetitions, pull-ups, and had higher Wingate peak power scores (p < .05 for all comparisons). **CONCLUSIONS:** Pilot findings suggest that as players progress through their collegiate hockey careers, they gain weight, total and regional body fat, and are typically stronger in respects to some fitness tests. With this knowledge, strength and conditioning coaches can work in tandem with food scientists

and nutritionists to optimize meal plans in an effort to prevent weight and adipose tissue gain which may enhance on-ice play and player health across their three-year university careers.

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795   Board #56   May 30 2:00 PM - 3:30 PM

The Association Among Body Composition, Explosive Leg Power and Aerobic Capacity in Male Varsity Hockey Players

Sebastien Beauregard[1], Nathan A. Chiarlitti[1], Patrick Delisle-Houde[2], Ryan E. Reid[1], Ross E. Andersen[1]. [1]*Mcgill University, Montreal, QC, Canada.* [2]*Mcgill University, bromont, QC, Canada.* (Sponsor: Ross Andersen, FACSM)
(No relevant relationships reported)

The Association Among Body Composition, Explosive Leg Power and Aerobic Capacity in Male Varsity Hockey Players.
Author Block: Sebastien Beauregard, Nathan A. Chiarlitti, Patrick Delisle-Houde, Ryan E. Reid, Ross E. Andersen, FACSM. *McGill University, Montreal, QC, Canada.* (Sponsor: Ross E Andersen, FACSM)
Abstract:
Fitness testing and body composition assessments in sports are ubiquitous and rapidly becoming an indispensible resource for strength and conditioning coaches. Previous research has shown that higher amounts of lean tissue mass have been associated with increased power outputs and lower levels of body fat percentage have been associated with improved aerobic fitness. **PURPOSE:** To examine the relationship between body composition and lower body power and aerobic fitness in elite collegiate hockey players. **METHODS:** Sixteen elite male Canadian university hockey players (age = 22.194 ± 0.99 years, weight = 85.74 ± 5.80 kg, height = 182.25 ± 6.67 cm), participated in the study at the beginning of their hockey season. All participants completed the long jump and the beep-test and a day after testing, one total body dual energy x-ray absorptiometry scan to measure body composition. Simple linear regression was used to explore the relationship between body fat percentage, visceral adipose tissue, and abdominal adipose tissue with aerobic fitness evaluations and leg lean with lower body power. **RESULTS:** On average body fat percentage was 16.6 ± 3.0%, fat mass 13.7 ± 2.8 kg, abdominal adipose tissue 0.9 ± 0.3 kg, leg lean mass 23.8 ± 1.97 kg, long jump 2.67 ± 0.16 m, beep test 12.8 ± 1.32 min. Visceral adipose tissue explained 24.5% of the variance in the test of aerobic fitness (p .05), while other adiposity measures were non-significant. Body fat percentage and lower lean mass did not significantly contribute to aerobic fitness and lower body power respectively (all p > .05). **CONCLUSIONS:** Despite a lack of inter-relationships among field tests and body composition, these variables should remain part a test battery to allow strength and conditioning coaches to better tailor training programs for elite hockey players. Keywords: body composition, hockey, Fitness testing

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796   Board #57   May 30 2:00 PM - 3:30 PM

Comparison Of Direct And Indirect Vo$_{2max}$ Test In Mexican College Football Players.

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(No relevant relationships reported)

Football is considered an anaerobic sport, therefore anaerobic evaluations are usually the main tests performed. Nonetheless, due to the number of plays and the duration of the game, the evaluation of the aerobic system through the measurement of the maximum oxygen consumption (VO$_{2max}$), becomes an important variable in the sport performance. The direct evaluation of the VO$_{2max}$ can be expensive due to the equipment and special laboratory conditions needed to perform it. Normally, most Mexican coaches perform indirect estimation of the VO$_{2max}$, through field test. **PURPOSE**: To determine direct VO$_{2max}$ of a sample of a Mexican College football team and compare the measurements with two different indirect methods. **METHODS**: Twenty voluntary Mexican College football players participated in the study. Informed consents were signed. Athletes were divided according to their play position into two groups: Lineman (LM) and No-Lineman (NL). Direct VO$_{2max}$ was measured through open-circuit spirometry by indirect calorimetry during a maximal graduated exercise test, using the Bruce protocol. The first indirect measurement (FIM) was performed using the Bruce protocol equation [VO$_{2max}$ (mL . kg^{-1} . min^{-1}) = 14.8 - 1.379 (time in min) + 0.451 (time^2) - 0.012 (time^3)] for a maximal graduated exercise test. The second indirect measurement (SIM) was taken using the ACSM´s running metabolic equation [VO$_{2max}$ (mL . kg^{-1} . min^{-1}) = 0.2 (speed) + 0.9 (speed) (fractional grade) + 3.5)] in the 1.5-mile run test. VO$_{2max}$ comparisons were made using Sperman´s correlation coefficient test. **RESULTS: :** LM´s direct VO$_{2max}$ (34.77 ± 10.41 mL . kg^{-1} . min^{-1}) was lower than NL´s direct VO$_{2max}$ (46.82 ± 4.41 mL . kg^{-1} . min^{-1}). Regarding, FIM of LM (32.56 ± 7.67 mL . kg^{-1} . min^{-1}) and SIM of LM (36.87 ± 5.18 mL . kg^{-1} . min^{-1}) both of them were lower than FIM of NL (42.56 ± 3.74 mL . kg^{-1} . min^{-1}) and

SIM of NL (45.96 ± 4.84 mL . kg^{-1} . min^{-1}). Correlations between direct VO$_{2max}$ and indirect VO$_{2max}$ were as follows: LM´s FIM= 0.79 (p<0.05), LM´s SIM= 0.63 (p<0.05), NL´s FIM= 0.78 (p<0.05) and NL´s SIM 0.73 (p<0.05).
CONCLUSIONS: Indirect measurements of VO$_{2max}$ can be used reliably to determine Mexican College football player's aerobic capacity when it is not possible or feasible to measure VO$_{2max}$ direct.

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797   Board #58   May 30 2:00 PM - 3:30 PM

Relationship between Acceleration Profiles and Game Statistics among Members of a National U18 Ice-Hockey Team

Khristian Burke, Devon J. Erps, Davor Stojanov, Dakota J. Burke, Andrea Workman, Kenneth Martel, Stephen J. McGregor. *Eastern Michigan University, Ypsilanti, MI.*
(No relevant relationships reported)

The use of player-worn sensors (PWS) has become increasingly common in team sports. We have previously shown a relationship between PWS metrics during on-ice sessions and laboratory measures in ice hockey. It is not clear, though, if metrics derived from PWS are indicative of player performance in terms of performance results based metrics (e.g. goals, assists, etc.). **PURPOSE: :** To determine if on-ice measures obtained from PWS relate to player in-game statistics: plus/minus, goals, assists, or shots on goal.
METHODS: 19 members of the US National Team Development Program ice hockey team (17.5+.21 y, 1.82+0.8 m, 83.1+7.6 kg) consented to procedures approved by the EMU-HSRC. Zephyr Bioharness-3 (Zephyr, MD) PWS measured triaxial accelerations and heart rate for games. Data was downloaded to Omnisense (Zephyr, MD) and exported to database for mean maximal acceleration (MMA) determination. MMA from 10 - 90 sec at 10 sec intervals and from 2 - 60 min were calculated and used to determine relationships to game statistics. Game statistical data for each player for 10 games was obtained from USA Hockey, including plus/minus, goals, assists and shots on net. Pearson product correlations for game statistics and linear stepwise regressions were performed for game statistics vs. MMA using SPSS 22.0 (IBM, NY; α=.05).
RESULTS: Goals were correlated with shots (r = .35; p<.01), while plus/minus was correlated to goals (r = .24; p<.01) and shots (.14; p<.05). Linear regressions showed that goals were significantly related to 3 min MMA (β= .139; p =.02). Assists were related to 2 min (β= .135), 30 min (β= -.37), and 60 min (β= .226) MMA (p<.05). Shots were related to 3 min MMA ((β= .135; p<.05). No variables were accepted into the regression for plus/minus vs MMA.
CONCLUSIONS: Some metrics derived from PWS during on-ice sessions are related to game performance statistics. In particular, 2 and 3 min MMA would be indicative of a combination of anaerobic and aerobic energy system contributions and appear important for all scoring metrics.

B-60   Free Communication/Poster - Perception

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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798   Board #59   May 30 2:00 PM - 3:30 PM

Lowest Perceived Exertion In The Late Morning Due To Effects Of The Endogenous Circadian System

Saurabh S. Thosar, Maya X. Herzig, Sally A. Roberts, Alec M. Berman, Noal A. Clemons, Andrew W. McHill, Nicole P. Bowles, Miki Morimoto, Matthew P. Butler, Jonathan S. Emens, Steven A. Shea. *Oregon Health & Science University, Portland, OR.*
Reported Relationships: S.S. Thosar: *Salary; NIH F32 award.*

INTRODUCTION
There are daily variations in the rate of perceived exertion (RPE) during exercise, with lower RPE in the beginning of the night as compared to the early morning. Whether these variations are caused by effects of the internal circadian system or daily variations in the environment or behavioral patterns is not known. It is important to determine whether the endogenous circadian system affects RPE as this could influence sports performance when athletes experience prior jetlag.
METHODS
10 healthy adults (6 females, aged 52±2years [mean ± SEM]) participated in a protocol in dim light where all behaviors, including exercise, meals and sleep periods were evenly spread across the circadian cycle. After a normal night of sleep and baseline testing, participants underwent ten recurring 'behavioral cycles' of 2-h 40-min sleep opportunities and 2-h 40-min of standardized waking episodes. Approximately one hour after each sleep episode, participants performed cycle-ergometer exercise for 15-min at 50% predicted maximal heart rate (Karvonen's formula). The speed and resistance were identical across each cycling bout. Participants rated their exertion

using Borg RPE scale after 3, 8 and 13 minutes of exercise. Salivary melatonin was used as the circadian phase marker ($0°$ = the dim-light melatonin onset). RPE data were normalized within each participant (Z-scored), sorted into $60°$ (~4 h) circadian phase bins and compared across phases using repeated-measures ANOVA.
RESULTS
The circadian system significantly affected RPE, with lowest RPE in the late morning (circadian phase $210°$, ≈10:45 AM) and highest RPE during the biological night ($90°$ ≈3:45 AM).
CONCLUSION
We have uncovered an endogenous circadian effect on RPE with least perceived exertion in the late morning. This finding leads to the intriguing possibility of shifting the circadian phase of athletes (e.g. with bright light) to maximize performance, and has great relevance to athletes who experience jet lag.
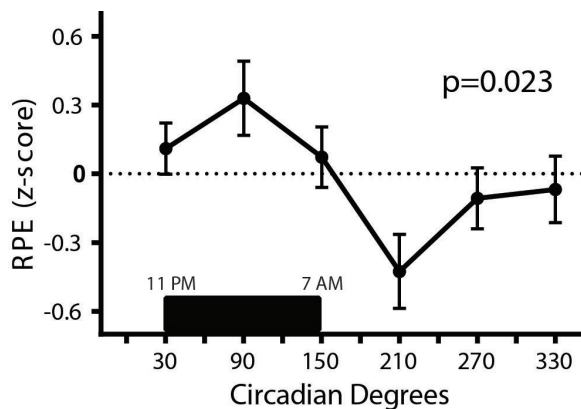
799   Board #60   May 30 2:00 PM - 3:30 PM
Time Perception, Pacing And Exercise: Intensity Distorts The Perception Of Time
Andrew M. Edwards, Alister McCormick. *Plymouth Marjon University, Plymouth, United Kingdom.*
(No relevant relationships reported)

Currently there are no data examining the impact of exercise on the perception of time which is surprising as optimal competitive performance is dependent on accurate pacing using knowledge of time elapsed. **PURPOSE:** The purpose of this study was to examine whether or not differential, self-selected exercise intensities influenced the perception of time elapsed during both short duration and endurance exercise. Specifically, the experiment tested the hypothesis of whether maximal exercise distorts the perception of time. **METHODS:** With institutional ethics approval, 12 recreationally active adult participants (f=7, m=5) undertook both 30s Wingate cycles and 20min (1200s) rowing ergometer bouts as short and long duration self-paced exercise trials, in each of three conditions on separate occasions: 1) light exertion: RPE 11, 2)heavy exertion: RPE 15, 3) maximal exertion: RPE 20. Participants were unaware of exercise duration and were required to verbally indicate when they perceived (subjective time) 1) 25%, 2) 50%, 3) 75% and 4) 100% of each bout's measured (chronological) time had elapsed. **RESULTS:** In response to the Wingate task, there was no difference between durations of subjective time at the 25%, nor at the 50% interval. However, at the 75% and 100% intervals, the estimate for the RPE 20 condition was shortest (P<0.01). In response to rowing, there were no differences at the 25% interval, but there was some evidence that the RPE 20 condition was perceived shorter at 50%. At 75% and 100%, the RPE 20 condition was perceived to be shorter than both RPE 15 (P=0.04) and RPE 11 (P=0.008) conditions. **CONCLUSION:** This study is the first to empirically demonstrate that exercise intensity distorts time perception, particularly during maximal exercise. Consequently external feedback of chronological time may be an important factor for athletes undertaking maximal effort tasks or competitions.

800   Board #61   May 30 2:00 PM - 3:30 PM
Establishment of a Non-Exercise Questionnaire Using Physical Activity Exertion Perception to Predict Maximal Oxygen Uptake in Adults
Emily W. Flanagan, Craig P. Flanagan, Graham D. Salmun, Vanessa Lara, Wesley N. Smith. *University of Miami, Coral Gables, FL.* (Sponsor: Arlette Perry, FACSM)
(No relevant relationships reported)

Maximal oxygen uptake (VO_2max) is an important diagnostic variable for health and fitness status. ACSM has published several sub-maximal VO_2max prediction equations. Non-exercise VO_2max prediction equations currently exist, often requiring

variables obtained by a fitness professional. The equation published by Uth *et. al* (USOP) is often used to predict VO_2max from age and RHR measures. No validated models incorporate perceived exertion of physical activities. Non-exercise predictions of VO_2max may provide a quick, valuable alternative to sub-maximal assessments for healthcare providers in order to stratify disease risk and prescribe aerobic exercise. **Purpose**: The purpose of the study was to explore the efficacy of a non-exercise VO_2max assessment using a combination of perception of activities, body mass index (BMI), gender, and age. **Methods**: Twenty-seven subjects (ages 19-49) performed a maximal graded exercise test (GXT) and the Forestry Step Test (FST). Subject anthropometrics were assessed and all subjects completed a questionnaire in which perceived exertion was estimated for 15 well known physical activities. VO_2max estimations were derived from each of the activity items by dividing the metabolic equivalent by the percentage of perceived exertion. The USOP prediction of VO_2max used both RHR and the Tanaka MHR equation. Data was entered into a statistical software package where five activity items with the highest correlation to GXT VO_2max were used in a linear regression model to create a prediction model (PEQ). This was then compared to both the FST and USOP prediction equations. **Results**: Mean GXT VO_2max were 48.50 ± 1.74 ml/kg/min^{-1}. PEQ correlated most strongly with GXT ($F_{(8,18)}=6.159$, r=0.856, p=.001), followed by FST ($F_{(1,25)}=28.635$, r=.0731, p<0.001) and USOP ($F_{(1,25)}=8.575$, r=0.505, p=0.007). A model using age, gender, and BMI alone yielded a Pearson correlation of 0.791. **Conclusion**: The inclusion of exertion perception in VO_2max prediction models may strengthen the validity of non-exercise estimations. Future research should elucidate the most predictive activity items across populations. Given their ability to be self-administered, VO_2max prediction surveys can provide valuable information to large populations where traditional evaluation methods are impractical to perform.

801   Board #62   May 30 2:00 PM - 3:30 PM
Perceived Exertion As A Monitoring Strategy During Crossfit®: Useful Or Useless?
Derek Crawford, Nicholas Drake, Michael Carper. *Pittsburg State University, Pittsburg, KS.*
(No relevant relationships reported)

Perceived Exertion as a Monitoring Strategy during CrossFit®: Useful or Useless?
Facing harsh criticism of potentially causing injury, CrossFit® (CF) may benefit from the inclusion of appropriate monitoring strategies. Rate of perceived exertion (RPE) is a monitoring strategy commonly used for both quantification and modulation of workloads during exercise and sports training. Despite its widespread use in CF investigations, the validity of RPE as a monitoring strategy in CF training remains untested. **PURPOSE:** To assess the utility of RPE as a monitoring strategy during CF training. **METHODS:** Six males (height, 182.8±8.6 cm; weight, 84.3±12.4 kg; and age, 25.0±5.4 years) participated in three weeks (5 days/week) of CF training. Following each training session, RPE, workout duration (Dura), and immediate post-exercise heart rate (THR) were recorded. Dura and THR were used to quantify the workload (WL) for each session. Means for RPE, Dura, THR, and WL were calculated for week 1 and week 3 of training. The Profile of Mood States (POMS) questionnaire was administered pre-week 1 and post-week 3. A repeated measures MANOVA with Tukey post-hoc adjustments was used to assess differences in training session variables between weeks 1 and 3. Linear regression of mean RPE and WL were compared between weeks 1 and 3. POMS outcomes were compared between weeks 1 and 3 using magnitude-based inferences of each subscales' minimum clinically important difference (MCID). **RESULTS:** There are increases in mean session THR (%Δ=+6.2%; F=1.19, p=0.324), Dura (%Δ=+17.3%; F=4.55, p=0.086), and WL (%Δ=+23.9%; F=8.14, p=0.036) from week 1 to 3. In contrast, mean session RPE decreased (%Δ=-4.9%; F=1.42, p=0.183) between these weeks. RPE was a better predictor of WL during week 3 compared to week 1 (week 1: r=0.364, R^2=13.5%, p=0.048; week 3: r=0.614, R^2=37.7%, p=0.001; ΔR^2=+24.2%). For POMS outcomes, total mood disturbance (2.69 foldΔ; 87.6% likelihood), tension-anxiety (3.13 foldΔ; 90.7% likelihood), and vigor-activity (3.25 foldΔ; 94.9% likelihood) subscales most likely highlight meaningful negative changes. **CONCLUSION:** RPE has the potential to be a useful monitoring strategy for incorporation into CF training. Questions still remain as to whether or not RPE is sensitive enough to detect early signs of overreaching during CF training.

802   Board #63   May 30 2:00 PM - 3:30 PM
Effect Of Progressive Fatigue On Session Rpe
Carl Foster, FACSM, William Sustercich, Keegan Edgerton, Richard P. Mikat, FACSM, Matthew Andre, John P. Porcari, FACSM. *University of Wisconsin-La Crosse, La Crosse, WI.*
(No relevant relationships reported)

Introduction: The Session Rating of Perceived Exertion (sRPE) is an accepted surrogate measure of exercise intensity. The purpose of this study was to examine the effect of progressive fatigue from heavier than normal training on sRPE. **Methods**: Twelve moderately fit college age students completed 30-min or 60-min interval

workouts on a cycle ergometer, with the sequence of sessions designed to test the hypothesis that sRPE for a given exercise bout would increase with progressive fatigue, whether from a longer bout, or from successive days of harder than usual bouts. The workouts were Monday through Thursday for two weeks. The first week was three 30-min sessions (e.g. normal training) followed by a 60-min session (30-min session repeated 2x) (e.g. heavier than usual training). The second week was three 60-min sessions followed by a 30-min session. sRPE was measured 30-min post exercise, and RPE and HLa were measured at 10 min intervals during exercise. **Results**: The 30-min sessions in week 1 had sRPE that was significantly less than the 60-min session $(4.3\pm1.7, 4.3\pm1.4, 4.5\pm1.7 \& 5.3\pm1.8)$. During week 2 the 60-min sessions became progressively harder, before the recovery 30-min session on day 4 $(5.3\pm1.4, 5.9\pm1.6, 6.0\pm2.1 \& 4.5\pm1.6)$. The mean RPE/HLa during the exercise bouts, a potential index of glycogen depletion mediated fatigue, followed a relatively constant course in week 1 $(0.7\pm0.2, 0.9\pm0.4, 0.8\pm0.4 \& 0.9\pm0.4)$ and an increasing course in week 2 $(0.8\pm0.4, 0.9\pm0.4, 1.0\pm0.4 \& 0.9\pm0.4)$. **Conclusion**: The results suggest that in addition to being a surrogate of exercise intensity, sRPE reflects accumulated fatigue during periods of increased training.

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803   Board #64   May 30 2:00 PM - 3:30 PM

Perceptions of Employers of Personal Trainers: A Pilot Survey

Marla Jones, William Russell, Justin Kraft, FACSM, Kenneth G. Kriewitz, Tiffany Domon, Cassidy Chappell. *Missouri Western State University, Saint Joseph, MO.* (Sponsor: Justin Kraft, FACSM)
(No relevant relationships reported)

The American College of Sports Medicine (ACSM) developed its certified personal trainer (CPT) exam based on a job task analysis (JTA) of a trainer's day-to-day job-related tasks. To competently perform the duties of a personal trainer, one should possess certain knowledge, skill, and abilities (KSAs) identified by the JTA. **PURPOSE**: The purpose of this study was to determine employer perceptions of the importance of various KSAs identified by ACSM's JTA. **METHODS**: A 42 item survey was developed based on ACSM's 153 KSAs and also included questions regarding demographics and hiring preferences. Selection of KSAs was based on their generalizability to personal trainers working in various settings. Employers were asked to use a 1-5 Likert scale (1= not important and 5 = very important) to rank their perception of how important it is for personal trainers to possess the KSAs. The survey was distributed online and in person to approximately 80 employers. A total of 20 surveys were completed and returned. The KSAs in the survey were divided into the eight ACSM categories. Qualtrics was used to determine mean responses to each of the survey items and provided frequency data for demographics and hiring preferences. **RESULTS**: Overall mean for each category and KSA was determined. The category with the highest overall mean (4.63) was Safety, Injury Prevention, and Emergency Procedures. The category with the lowest overall mean (4.24) was Human Behavior and Counseling. The KSA with the highest overall mean (4.76) was the ability to modify exercises based on age and physical condition (1.7.29). The KSA with the lowest overall mean (3.65) was the ability to determine training heart rate (1.7.25). Only 50% of respondents stated that personal trainers should possess a degree in Exercise Science or a related field. Sixty-five percent stated personal trainers should be certified through a nationally recognized certifying agency. The top two preferred certifying agencies were ACSM and NSCA. **CONCLUSIONS**: Employers are most concerned with knowledge and abilities related to safety, injury prevention, and emergency procedures and least concerned with knowledge and skills associated with behavior change and counseling. Respondents emphasized professional certification over a degree in Exercise Science or related field when hiring.

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804   Board #65   May 30 2:00 PM - 3:30 PM

Relationship between Self-Regulation of Perceive Exertion and Heart Rate using Games Concept Approach

Peggy Boey[1], Govindasamy Balasekaran, FACSM[1], Visvasuresh Victor Govindaswamy[2], Yew Cheo Ng[1], Jolene Lim[1]. *[1]Nanyang Technological University, Singapore, Singapore. [2]Concordia University Chicago, Chicago, IL.*
(No relevant relationships reported)

There is a lack of research on the use of OMNI Rate of Perceived Exertion (RPE) scale with Heart Rate (HR) during Physical Education (PE) lessons. **PURPOSE**:To examine the relationship between OMNI RPE scale and HR on primary school children in Singapore using the Games Concept Approach (GCA) of teaching during PE lessons. **METHOD**: A total of 18 healthy subjects, 9 boys (age: 10 ± 0.00 yrs, height: 138 ± 5.94cm, weight: 34.56 ± 7.30kg) and 9 girls (age: 10 ± 0.50 yrs, height: 135 ± 8.00cm, weight: 33 ± 10.45kg) were randomly separated into experimental (EG) and control group (CG) with 9 subjects each. The intervention was conducted over 6 weeks, each lasting 45 minutes. Every session comprised of a warm up, modified game (MG) and cool down. The MG was conducted using GCA for the EG and skills based approach

(SA) for the CG. HR and RPE were recorded every 15 minutes of each session. Parental consent was obtained and orientation procedures on the use of OMNI RPE scale were administered prior to intervention. Self-regulation of RPE by subjects was at RPE 1-3 for both warm up and cool down, and RPE 4-6 for the MG. A 1.6km fitness run test was conducted pre- and post- intervention to assess their aerobic fitness. Physical activity was kept constant throughout the intervention by a physical activity questionnaire, verbal emphasis and monitoring. **RESULTS**: HR values were significantly different during MG (EG: 159.03 ± 12.22beats.min^{-1}, CG: 129.99 ± 17.23beats.min^{-1}, p = 0.001). Percentage of HR_{max} was higher in EG (75.73%) than CG (61.9%). No significant difference was observed between the RPE values during the MG for both groups (EG: 4.30 ± 1.16, CG: 3.73 ± 1.72, p = 0.426). Significant difference was observed between EG and CG in the pre- (EG: 693.67 ± 98.03sec, CG: 817.11 ± 92.98sec, p = 0.015) and post- (EG: 614.89 ± 74.18sec, CG: 712.00 ± 68.51sec, p = 0.011) 1.6km run timings. **CONCLUSION**: Improvement in aerobic fitness was reflected in the 1.6km post-test results for EG and CG. HR recorded from EG was slightly higher than 50-70% of HR_{max} but range of RPE during MG was kept consistent within the ventilatory breakpoint of RPE 4-6, which suggests their ability to self-regulate within the safe intensity. The GCA approach is recommended to PE teachers for students to work at a higher HR to achieve aerobic fitness while having fun utilizing motor skills.

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805   Board #66   May 30 2:00 PM - 3:30 PM

Comparison of Borg Rpe and CR-10 Scales in Incremental Exercise

Reese A. Glover[1], Blaine E. Arney[1], Cristina Cortis[2], Jos J. de Koning, FACSM[3], Andrea Fusco[2], Salvador Jaime[1], Richard Mikat, FACSM[1], John P. Porcari, FACSM[1], Teun van Erp[3], Carl Foster, FACSM[1]. *[1]University of Wisconsin-La Crosse, La Crosse, WI. [2]University of Cassino and Lazio Meridionale, Cassino, Italy. [3]Vrije Universiteit-Amsterdam, Amsterdam, Netherlands.*
(No relevant relationships reported)

The Borg Rating of Perceived Exertion (RPE) and Category Ratio (CR-10) scales are the most well-known and frequently used scales for quantifying subjective intensity during exercise. However, limited data exists comparing the intra-individual correlations among the Borg RPE and CR-10 scales. **PURPOSE:** To evaluate the intra-individual variability between the Borg RPE and CR-10 scales during incremental exercise. **METHODS:** 5 males (20.4±1.14 years) and 5 females (22.0±0.71 years) completed two graded exercise tests (GXTs) on an electronically-braked cycle ergometer with a 48-hour interval in between. Each GXT included 2-minute stages with increments of 25 Watts/stage to volitional fatigue. Heart rate (HR), oxygen consumption (VO_2) and power output (PO) were measured. Subjective responses were recorded at the end of each stage using Borg RPE and CR-10 scales with a randomized order between the GXTs. Pearson's correlation with 95% Coefficient Intervals (95% CI) was used to examine the relationship between the Borg RPE and CR-10 scales. **RESULTS:** Maximal values during GXT were: VO_2max = 48.0±8.13 ml/kg/min, HRmax = 191.0±6.65 bpm; Peak PO = 238.1±56.83 Watts; RPEmax = 18.7±0.95; CR-10max = 9.1±1.28). There was a significant (p<0.0001) and very strong correlation coefficient (r=0.94, 95% CI: 0.91-0.96). **CONCLUSION:** Results from this study showed that the Borg RPE and CR-10 scales are related in a highly regular and predictable way.

WEDNESDAY, MAY 30, 2018
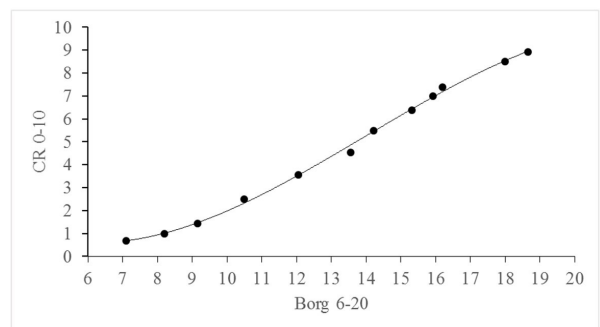
806   Board #67   May 30 2:00 PM - 3:30 PM
Self-Confidence is Positively Related to Rating of Perceived Exertion During a Maximal Squat Test

Colby A. Sousa[1], Michael H. Haischer[1], Daniel M. Cooke[1], Joseph P. Carzoli[1], Amber M. Shipherd[2], Trevor K. Johnson[1], Edward P. Davis[1], Dan J. Belcher[1], Robert F. Zoeller[1], Michael Whitehurst, FACSM[1], Michael C. Zourdos[1]. [1]*Florida Atlantic University, Boca Raton, FL.* [2]*Texas A&M University-Kingsville, Kingsville, TX.*

(No relevant relationships reported)

Often, rating of perceived exertion (RPE) is assessed during a one-repetition maximum (1RM) strength test to validate that a true 1RM has been reached. Recently, data have indicated variance in reported RPE at 1RM across individuals. However, it is not known what accounts for this variation. Two proposed traits which may affect an individual's RPEs are self-confidence and acute anxiety. **PURPOSE**: Therefore, the purpose of this investigation was to examine the relationship between self-confidence, somatic anxiety, and cognitive anxiety with RPE at a 1RM in the back squat. **METHODS**: Fifty-eight resistance-trained males (n=41) and females (n=17) (age: 23±3yrs; body mass: 80.64±16.49 kg) completed the Revised Competitive State Anxiety Inventory-2 (CSAI-2) questionnaire prior to performing a 1RM back squat. Additionally, participants completed a perceived self-efficacy (PSE) questionnaire in which participants stated what they believed they were 100%, 75%, and 50% confident they could squat for a 1RM. Next, following a 5-minute dynamic warm-up, subjects completed a validated 1RM back squat protocol. At all 1RM attempts subjects recorded an RPE value using the repetitions in reserve (RIR)-based RPE scale. Pearson's product moment correlations were then utilized to determine the relationship between the self-confidence, somatic, and cognitive anxiety subscales of the CSAI-2 with RPE at 1RM. **RESULTS**: Self-confidence was positively and significantly related to RPE at 1RM (r=0.26, p=0.05). However, neither somatic anxiety (r=0.01, p=0.97) nor cognitive anxiety (r=0.19, p=0.16) were significantly related to RPE at 1RM. **CONCLUSIONS**: These results indicate that increased self-confidence is associated with higher reported RPE during a 1RM squat test, while heightened anxiety does not alter the perceptual response during a maximal strength test. It is possible that those with high self-confidence chose higher loads and reached a true 1RM accounting for the high RPE.

807   Board #68   May 30 2:00 PM - 3:30 PM
Effects of Performance Foam on Perceived Exertion and Recovery in High-Intensity Functional Exercise

Justin M. Goins, Toni M. Torres-McGehee, Tim Bailey, Samantha Weber, Jacob Kay. *University of South Carolina, Columbia, SC.*

Reported Relationships: J.M. Goins: *Contracted Research - Including Principle Investigator; Funded by Avadim Technology - C0-PI Toni M. Torres-McGehee.*

Performance foam, when used as an adjunct to training, may positively affect thresholds within the muscle allowing for more intense training, longer training sessions, possible muscle recovery, and a decrease in delayed onset muscle soreness symptoms. **PURPOSE:** To evaluate the effectiveness of a performance foam on perceived exertion and self-reported recovery on performance in adults participating in a high-intense functional exercise program. **METHODS:** Thirty adults (age: 31.2 ± 8.1; males: n = 12, 176.9 ± 6.2 cm, 89.5 ± 15.1 kg; females: 164.7 ± 7.1 cm, 69.9 ± 11.1 kg) participated in a randomized counter-balanced and double blind trial over a 2-week period. Randomized experimental conditions (ExCon) consisted of performance foam (PF) or placebo (P) foam. Participants completed 5 workouts each week and applied either PF or P to the primary muscles used before and after each daily workout and before going to bed. Rating of perceived exertion (RPE) was assessed after each workout, and self-reported recovery was assessed using the perceived recovery scale (PRS) the following day. Four repeated measure ANOVAs examined differences in PRS and RPE between experimental conditions (PF and P) for all participants and across gender. **RESULTS:** A main effect was revealed for **RPE** and ExCon (F_1=4615.2, P < 0.01, n²=0.99) for all participants. Interactions existed between days (P ≤ 0.01) with no interaction found between ExCon and days. A main effect was revealed for **PRS** and ExCon (F_1=1624.6, P ≤ 0.01, n²=0.98) for all participants with no interactions between days and ExCon and days. Across gender, a main effect was revealed for **RPE** and ExCon (F_1=4279.9.8, P < 0.01, n²=0.99) with no interactions between days and ExCon and days. Similarly, a main effect was found for **PRS** and ExCon (F_1=1579.8, P < 0.01, n²=0.98) with no interactions between days and ExCon and days. **CONCLUSIONS:** RPE declined at the end of 5-day regimen using PF compared to P and participants' average PRS was higher throughout the week using the PF compared to P. Participants felt more recovered from the previous workout when using PF and felt as if they were not exerting as much effort the following workout. The decrease in RPE allows for one to continue exercising longer at the same intensity or increase their intensity levels, leading to a greater improvement in training results.

808   Board #69   May 30 2:00 PM - 3:30 PM
Comparison Of HR And RPE During Self-selected And Prescribed Exercise Bouts In College Students

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine if there were differences in heart rate (HR) and ratings of perceived exertion (RPE) between self-selected and calculated exercise intensities. **METHODS:** Subjects (n=47) were instructed to complete moderate (M) and vigorous (V) intensity exercise bouts for 20 minutes each on a treadmill ergometer. Subjects selected M and V speed and grade, and kept intensity constant throughout each bout. Subjects next completed a graded maximal exercise test using one of five Boer treadmill protocols. Finally, subjects completed exercise bouts at 60% and 80% of their calculated VO_2 reserve for 20 minutes. HR (Polar FT1) and RPE (OMNI scale) were collected at minute 2 and 20 of each bout. A repeated measures ANOVA was completed with Bonferroni post hoc comparisons to evaluate differences between corresponding intensities (Mx60% and Vx80%) by time and between minute 2 and 20 for each bout. **RESULTS:** There were no statistically significant differences (p>0.05) for HR between M and 60% (2min: 126.3±25.8 and 134.2±27.8; 20min: 142.5±31.2 and 161.7±5.8, respectively) or between V and 80% (2min: 154.1±28.1 and 153.6±28.6; 20min: 179.8±26.9 and 184.7±24.6, respectively) There were no statistically significant differences (p>0.05) for RPE between M and 60% (2min: 2.9±2.7 and 1.9±1.1; 20min: 4.3±2.8 and 4.8±1.8, respectively) or between V and 80% (2min: 4.3±2.1 and 3.1±1.6; 20min: 7.2±1.8 and 7.8±1.5, respectively). HR and RPE increased significantly from minute 2 to 20 during each bout (p<0.0001). **CONCLUSION:** HR and RPE did not differ between self-selected and calculated exercise bouts, but drifted significantly within all sessions. While subjects showed aptitude at selecting proper intensities, caution must be used when prescribing exercise based on HR or RPE.

809   Board #70   May 30 2:00 PM - 3:30 PM
Effect of Spotters on State Anxiety and Self Confidence During Maximal Squatting Among Male High School Athletes

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(No relevant relationships reported)

The ideal performance state is manifested by optimal psychological and physiological efficiency. The effects of anxiety and self-confidence have been shown to alter psychological and physiological efficiency and hence performance. **PURPOSE:** This study attempted to identify the state anxiety and self-confidence of high school athletes just prior to a one repetition maximum (1-RM) back squat and determine if the number of spotters affects an athlete's level of state anxiety and/or self-confidence. **METHODS:** Male high school athletes (10th and 11th grades) were randomly separated into two experimental groups who performed the 1-RM back squat (BSQ) with either 1 spotter (1SG: n=52) or 3 spotters (3SG: n=54). Following a dynamic warm-up period and several progressive BSQ warm-up sets, and just prior to attempts at a 1-RM BSQ, the participants completed the revised Competitive State Anxiety Inventory-2 (CSAI-2R). The CSAI-2R included the number of spotters (1 or 3) that would be present during the subsequent 1-RM BSQ attempts. The CSAI-2R is a17-question instrument with three subscales (self-confidence, somatic anxiety, and cognitive anxiety). The subscale scores were compared between the 1SG and 3SG with an independent t-test (alpha≤0.05). **RESULTS:** Competitive State Anxiety Inventory-2 scores were 1SG (self-confidence=30.2±6.1, somatic anxiety=17.0±4.7, and cognitive anxiety=20.1±5.6) and 3SG (self-confidence=28.4±6.8, somatic anxiety=16.5±5.1, and cognitive anxiety=19.0±5.7). None of the subscales (self-confidence, somatic anxiety, and cognitive anxiety) were significantly different between the 1SG and 3SG experimental groups (p>0.05). **CONCLUSION:** Within the parameters of this study, the number of spotters present during the execution of the 1-RM BSQ had no practical or statistical impact on self-confidence, somatic anxiety, and cognitive anxiety. Coaches and athletes could use this information in the training environment in order to make best use of personnel (assigned to spotting tasks), physical resources (ex. squat racks), and time management.

810   Board #71   May 30 2:00 PM - 3:30 PM

Comparing Training Load and Intensity Perceptions Between Female Distance Runners and Their Coach

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(No relevant relationships reported)

The ability of athletes and coaches to adapt training in order to improve athletic performance and prevent injuries is the cornerstone of modern sports medicine. Overtraining syndrome occurs when training consistently occurs at or above lactate threshold without appropriate recovery. It is critical that the coach's perceptions of effort and intensity of training are similar to what the athlete experiences. **PURPOSE:** The purpose of this study was to evaluate the training regimen fidelity and quantify training load and intensity in female division I collegiate distance runners. **METHODS:** An observational descriptive longitudinal design was utilized. The duration of the data collection was 14 weeks. The subjects were six collegiate female track and field distance athletes (≥18yrs of age) who ran >800 meter events. Baseline pre-training heart rate and blood lactate levels were recorded during a custom six stage treadmill test. Blood lactate, duration, rate of perceived exertion (RPE), average heart rate for each training session and hours slept nightly were recorded. **RESULTS:** Average training intensity (duration x RPE) over the course of the competitive season as prescribed was 159.56. The mean value was 144.5 and results ranged from 126.21 to 156.62. Coach intended training load (duration x blood lactate average) was 170.75; athletes ranged 73.25 to 140.66; mean = 109.36. Hours of sleep averaged 7.8 the day before a meet and 7.3 the day after. Easy training days (intended RPE of 1.5 out of a possible 10) showed a discernible difference with actual RPE higher than the target value (mean 3.4 ±1.2, range 2.7- 4.26). Intermediate training days (intended RPE of 4.3) had a lower RPE than target with a mean of 3.9 ±1.6 (range 3.0 - 4.8). Hard training days (intended RPE of 8.16) showed the most marked difference from target with a mean of 6.24 ±1.4 (range 4.94 - 7.25). **CONCLUSIONS:** Similar to male athletes, female athletes perceived easier workouts as more difficult and harder workouts as easier than their coaches intended. Average training intensity and training load (duration x blood lactate average) were measurably less than their coach intended. The combination of poor adherence to their coach's training regimen and potentially inadequate recovery may be some of the etiologies for increased overuse injuries in female athletes.

811   Board #72   May 30 2:00 PM - 3:30 PM

Rating Of Perceived Exertion In The Squat Until Muscle Failure Versus Non-failure In Women

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(No relevant relationships reported)

PURPOSE: The objective of this study was to compare the rating of perceived exertion (RPE) and the volume of repetitions in women performing the parallel squat in the Smith machine in two different situations, repetitions until failure or non-failure. **METHODS**: A randomized, crossover trial was performed, involving twelve women (24.93 ± 5.04 years, 59.29 ± 11.28 kg) with previous experience in strength training (4.5 ± 4.23 years). Participants were randomized to either muscle failure (MF) or non-muscle failure (NF) groups. The RPE (OMNI-RES 0-10) and the total volume of session repetitions in the MF and NF situations in the parallel squat in the Smith Machine were evaluated. The protocol consisted of: 4 sets of 10 RM (determined by the 10 RM test), with 2 min rest interval between sets, at the highest intentional movement speed, until muscle failure or until loss of 20% of the median propulsive velocity (MPV). All participants performed the two methodologies with interval of two to three days of rest. Movement velocity control was provided by the linear transducer T-Force® System (Ergotech, Spain). Descriptive analyzes were given by mean and standard deviation, using repeated measures ANOVA (2:4) with Tukey post hoc and independent t test for the total volume of repetitions. **RESULTS**: A higher RPE was observed in the MF versus NF (1 set: 9.67 ± 0.78a vs 5.91 ± 1.68c; 2 set: 10a vs 6.75 ± 1.86bc; 3 set: 10a vs 7.33 ± 1.72bc, 4 set: 8.08 ± 1.16b, p <0.0001), respectively. No differences were observed between the total volume of repetitions (MF vs NF: 26.25 ± 3.47 vs 24.5 ± 3.65, respectively, p = 0.19). **CONCLUSIONS**: In women, performing the parallel squat on the Smith Machine, at the highest intentional speed, until 20% drop in MPV produced similar total volume of repetitions and lower RPE when compared to its execution until muscle failure.

B-61   Free Communication/Poster - **Blood Flow**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

812   Board #73   May 30 3:30 PM - 5:00 PM

Effects of High-Intensity Interval Training on Plasma Volume

William B. Trimble, II, Jerita Mitchell, Olivia D. Hocevar, Tyron'E Hawkins, Robert R. Kraemer, FACSM. *Southeastern Louisiana University, Hammond, LA.* (Sponsor: Dr. Robert R Kraemer, FACSM, FACSM)

(No relevant relationships reported)

High-intensity interval training (HIIT) has been shown to be an effective form of training to improve aerobic fitness. Plasma volume shift has the potential to contribute to acute fatigue via temporary reduction of blood volume. There is a lack of data regarding the acute effects of HIIT on plasma volume shifts over the course of an HIIT protocol. **PURPOSE:** The purpose of the study was to determine the effects of a bout of HIIT on changes in plasma volume during and after the protocol. **METHODS:** Eight participants (1 female, 7 males) completed a preliminary session to collect anthropometric data and determine cardiorespiratory fitness, followed by an experimental session. During the experimental session, a modified Tabata HIIT protocol on a cycle ergometer was completed: six 15-second sprints at maximum effort against a resistance proportional to lean body mass with two minutes of active recovery between sprints. Hematocrit was determined using a microhematocrit method and hemoglobin was determined using a hemoglobin meter. Plasma volume shifts were determined using hematocrit and hemoglobin concentrations. **RESULTS:** A repeated measures ANOVA was used to determine changes in oxygen consumption (VO_2), mean arterial pressure (MAP), heart rate (HR), and minute ventilation (V_E); t-tests were used for post-hoc analysis. Additionally, shifts in plasma volume were compared using a paired T-test. A significant ($P < 0.05$) change from pre- to mid-HIIT occurred for HR (80.625±4.52 to 173.50±3.78 b/min), VE (26.75±2.87 to 69.85±6.95 L/min), VO2 (11.68±1.45 to 27.49±3.59 ml/kg/min), MAP (93.08±1.65 to 122.75±2.86 mmHg), and plasma volume shift (-12.28±2.14%) with significantly ($P < 0.05$) greater changes in HR from mid- to post-exercise (173.50±3.78 to 181.00±3.15 b/min) but not VE, VO2, MAP or plasma volume shift (-2.69±1.85%). **CONCLUSION:** Findings revealed that 13 min of HIIT increases cardiorespiratory stress and results in large plasma volume reductions from pre- to mid-exercise with smaller reductions from mid- to post-exercise. These acute reductions in plasma volume are similar to reductions that have been reported after running a marathon.

813   Board #74   May 30 3:30 PM - 5:00 PM

Cardiovascular Responses to Blood Flow Restriction and Very Low Load Resistance Exercise in the Upper Body

J Grant Mouser, Kevin T. Mattocks, Scott J. Dankel, Samuel L. Buckner, Matthew B. Jessee, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. *The University of Mississippi, University, MS.*

(No relevant relationships reported)

Blood flow restriction (BFR) applied as a percentage of arterial occlusion pressure (AOP) combined with low load resistance exercise in the upper body elicits a cardiovascular response that, compared to high-load resistance exercise, appears dependent upon the load as well as the cuff pressure. The response to very low load resistance exercise (15% 1RM) combined with BFR is unknown. **PURPOSE:** To investigate the cardiovascular and hemodynamic responses to very low load resistance exercise combined with BFR, and compare these to high load resistance exercise in the upper body. **METHODS:** Sixty-six (50% men) participants (18-35 yrs) were recruited and, following 1RM testing, were randomly assigned to either high load (HL) at 70% 1RM or very low load at 15% 1RM. Very low-load conditions were no restriction (VLL0), 40% AOP (VLL40), or 80% AOP (VLL80) applied using a 5cm cuff. Four sets of unilateral biceps curls were performed to failure or 90 repetitions, whichever occurred first. Blood pressure (SBP/DBP) was taken before and after. Ultrasound measures of blood flow (BF) were taken at rest, following Set 2, and 1 minute after exercise. Repeated measures ANOVA tests were performed to determine whether differences occurred across time and condition. Results presented as mean (SD). **RESULTS:** Participants were 1.72 (0.1) m tall, weighed 72.0 (13.8) kg, with a 1RM of 15.9 (7.4) kg, and AOP of 103 (73) mmHg. There were no interactions for SBP ($p = 0.416$), DBP ($p = 0.414$), but an interaction existed for BF ($p < 0.0005$). Main effects of time found that SBP [change of 10 (10) mmHg] and DBP [change of 6 (13) mmHg] increased. BF increased following Set 2 in all conditions except for VLL80 (p=0.129), which remained similar to pre until 1 minute post deflation [change of 378 (256) ml·min^{-1}]. Following set 2, BF was similar between VLL0 [547 (244) ml·min^{-1}] and HL [465 (269) ml·min^{-1}]; both were greater than VLL40 [365 (189) ml·min^{-1}]

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and VLL80 [128 (75) ml·min^{-1}]. At 1 minute post, there were no differences in BF between VLL0: 438 (227), VLL40: 470 (248), VLL80: 464 (290), and HL: 364 (239) ml·min^{-1}. **CONCLUSIONS**: The hemodynamic response to very low load resistance exercise combined with BFR at different pressures is similar to high load resistance exercise when performed in the upper body, although the BF response differs per the cuff pressure.

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814   Board #75   May 30 3:30 PM - 5:00 PM

Novel Gene Variant Associated with Exercise Pressor Reflex Responsiveness

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(No relevant relationships reported)

PURPOSE: Activation of thinly myelinated and unmyelinated afferents innervating contracting skeletal muscle elicits the exercise pressor reflex. We hypothesized that single nucleotide polymorphisms (SNPs) of genes encoding ionotropic and metabotropic receptors commonly found on skeletal muscle afferents might account for part of the typical variation in blood pressure responses to exercise. **METHODS**: 101 healthy, college age, men and women of European ancestry participated. Multivariate modeling of the mean arterial pressure response to post-exercise circulatory arrest following 3-min of static handgrip exercise (30% of maximum) was used to stratify subjects into quartiles. Subjects from the highest (N=33) and lowest (N=25) quartiles provided buccal mucosa cells. DNA was extracted, amplified, and analyzed for common (minor allele frequency >20%), non-synonymous SNPs of genes with functional associations to autonomic disorders. We evaluated selected variants of the TRP (N=18), ASIC (N=3) and P2X (N=4) receptor families (real-time PCR, custom OpenArray™) and used contingency table analysis to compare the frequency of homozygotes and trait allele carriers between the two groups. **RESULTS**: Trait allele carriers of rs8065080, a T-to-C missense mutation of TRPV1, were more frequent in the high response group (73% vs 48%, P<0.1). Frequencies of all other SNPs did not differ between groups. **CONCLUSIONS**: Data from this pilot investigation suggest that intra-subject variation in mean arterial pressure during post-exercise circulatory arrest may associate with SNPs of genes putatively linked to the metabolic component of the exercise pressor reflex. Additional work is warranted to confirm these observations and explore the mechanistic role of TRP channels in exercise pressor reflex responsiveness. Supported in part by the Huck Institutes of the Life Sciences and the College of Health and Human Development.

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815   Board #76   May 30 3:30 PM - 5:00 PM

Acute Hemodynamic Response to Very Low Load Resistance Exercise With or Without Blood Flow Restriction

Kevin T. Mattocks, J Grant Mouser, Matthew B. Jessee, Scott J. Dankel, Samuel L. Buckner, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. *The University of Mississippi, University, MS.*

(No relevant relationships reported)

Although lifting a load at 30% one-repetition maximum (1RM) to failure elicits an increase in muscle size similar to high load resistance exercise, it is unknown if an individual can reach failure when lifting loads <20% 1RM. Applying blood flow restriction (BFR) can cause blood flow to be artificially reduced which may help create an environment necessary to induce fatigue when exercising with a load <20% 1RM. **PURPOSE**: To determine changes in blood pressure and blood flow following exercise with and without different levels of BFR (based on arterial occlusion pressure (AOP)) while using a very low load (15% 1RM) and compare those changes with high load (70% 1RM) exercise. **METHODS**: Sixty-nine participants were randomized into one of four conditions: 1) 15% 1RM, no BFR (15/0), 2) 15% 1RM, 40% AOP (15/40), 3) 15% 1RM, 80% AOP (15/80), and 4) 70% 1RM, no BFR (70/0). Following 1RM testing in one leg (randomized) and 10 min of seated rest, resting blood flow of the exercising limb was measured at the posterior tibial artery followed by blood pressure. AOP was determined using a 10cm wide cuff in the BFR conditions. Participants then exercised for 4 sets to failure (up to 90 repetitions) with 30 (15% 1RM) or 90 (70% 1RM) seconds of rest. Blood flow and blood pressure [Systolic (SBP), Diastolic (DBP)] were measured immediately after exercise. A repeated measures ANOVA with a between subject factor of group was used to determine differences between groups. Significance was set at p ≤ 0.05 and data presented as mean (SD). **RESULTS**: There was an interaction for SBP. There were no differences between groups at pre (p=0.874) or post (p=0.064) and all conditions increased from Pre-Post [overall average change of 15 (10) mmHg]. However, the 15/80 condition [125 (14) mmHg] tended to have lower SBP values than the 15/0 [138 (14) mmHg] and 70/0 [136 (14) mmHg] conditions. There was no interaction for DBP (p=0.485) or blood flow (p=0.088) but there were main effects of time with an increase from Pre to Post [DBP: 3 (5) mmHg;

blood flow: 3 (13) ml·min^{-1}]. **CONCLUSIONS**: Very low load exercise to failure with or without BFR induces a similar hemodynamic response (i.e. blood flow and blood pressure) compared to high load resistance exercise. This suggests that applying BFR does not augment the cardiovascular response over that observed with traditional resistance exercise.

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Comparison of Exercise-induce Endothelial Shear Stress Between Poiseuille'S Law and Womersley'S Approximation

Francisco J. Morales[1], Brycen J. Ratcliffe[2], Caleb D. Harrison[2], Evan J. Bockover[2], Sierra Crowe[2], Colin R. Carriker[3], Alvaro N. Gurovich, FACSM[1]. *[1]The University of Texas at El Paso, El Paso, TX. [2]Indiana State University, Terre Haute, IN. [3]High Point University, High Point, NC.*

(No relevant relationships reported)

Purpose
Endothelial dysfunction is the first step for the development of atherosclerosis, and one protective regulatory mechanism is exercise-induced endothelial shear stress (ESS). To quantify ESS, most clinical studies employ Poiseuille's law rather than Womersley's approximation, although Poiseuille's law underestimate the dynamic properties of blood flow. The aim of this study is to compare ESS calculated by Poiseuille's law to EES estimated by Womersley's approximation during exercise.

Methodology
Twelve young healthy subjects (age 13-31, 10 males and 2 females) were recruited to perform two exercise tests on a cycle ergometer. The first test was a maximal incremental test to establish the workloads for the next test, according to lactate levels. The second one, performed at least 48 hours after the first exercise test, was a three 5-minute workload steady-state test at lactate levels of 0-2, 2-4, and >4 mmol/L. Blood flow patterns of the brachial artery were recorded via Doppler ultrasound. For Poiseuille's law ESS was determined during anterograde and retrograde blood flows using $ESS=\mu*SR$ and $SR=2*V/D$, where μ is blood viscosity, SR is shear rate, V is peak systolic or diastolic blood flow velocities, and D is artery diameter. For Womersley's approximation $ESS=\mu*SR$ and $SR=2K*V/D$ were used, where K is a complex factor dependent on Womersley parameter (α), and $\alpha=(D/2)*(\omega/(\mu/\rho))^{1/2}$, where ω is the angular frequency of the flow pulsation ($\omega=freq*2\pi$), and ρ is blood density. Statistical analysis included paired t test to compare ESS from both estimations.

Results
EES was significantly higher for Womersley's approximation in comparison to Poisueille's law at rest and during all exercise intensities for anterograde flow (basal: 34.7±5.8 vs. 13.1±2.6 dynes/cm^2; 0-2 mmol/L: 41.1±13.7 vs. 15.3±4.8 dynes/cm^2; 2-4 mmol/L: 44.1±17.2 vs. 16.5±7.2 dynes/cm^2; >4 mmol/L: 57.0±21.6 vs. 21.0±8.0 dynes/cm^2; all p<0.05) and retrograde flow (basal: 6.9±3.9 vs. 3.1±1.5 dynes/cm^2; 0-2 mmol/L: 11.5±5.6 dynes/cm^2 vs. 4.3±2.0 dynes/cm^2; 2-4 mmol/L: 17.4±9.2 vs. 6.4±.5 dynes/cm^2; >4 mmol/L: 19.6±8.4 vs. 7.2±3.0 dynes/cm^2, all p<0.05).

Conclusion
Exercise-induced ESS is underestimated by Poiseuille's law. Womersley's approximation might be a better approach to estimate ESS in resting conditions and during exercise.

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Influence of High-Intensity Exercise on Aortic Stiffness and Femoral Artery Shear Patterns

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(No relevant relationships reported)

Influence of High-Intensity Exercise on Aortic Stiffness and Femoral Artery Shear Patterns
Jacob P. DeBlois, Wesley K. Lefferts, Kevin S. Heffernan. Syracuse University, Syracuse, NY
Aortic stiffness is linked to atherogenic retrograde and oscillatory shear patterns in peripheral arteries. High-intensity exercise may increase aortic stiffness. Whether such acute changes in aortic stiffness detrimentally affect peripheral shear patterns remains unknown. **PURPOSE:** Determine if acute changes in aortic stiffness negatively influences superficial femoral artery (SFA) shear rates (SR) and stiffness following high-intensity cycling. **METHODS:** 20 adults (27±5 yrs; 10 women) underwent arterial assessment at baseline (BL), after a 5-min time control period (TC), and following a 30-sec bike sprint against 7% body mass (POST). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cfPWV). SFA diameter, blood velocity, and stiffness (β stiffness and Young's elastic modulus, ϵ) were measured via Doppler ultrasound. Diameters and blood velocities were used to determine SFA antegrade and retrograde SR as well as the oscillatory shear index (OSI). **RESULTS:**

BL and TC were not different for any measures (*p*>0.05). cfPWV increased POST compared with BL and TC (*p*≤0.01). SFA retrograde SR and OSI were reduced POST compared with BL and TC (*p*≤0.001). SFA stiffness was unchanged by exercise (*p*≥0.06). The change in cfPWV from pre-exercise to POST was not associated with changes in retrograde SR (r = 0.03, *p*=0.90), OSI (r = 0.13, *p*=0.58), β (r = 0.07, *p*=0.78), or ε (r = 0.08, *p*=0.73). **CONCLUSION:** Acute high-intensity exercise increases aortic stiffness while concomitantly reducing oscillatory shear in the SFA. High-intensity exercise-mediated increases in aortic stiffness appear independent from downstream atherogenic shear patterns in the exercised vasculature.

Table 1. Arterial stiffness and shear patterns before and after high-intensity cycling exercise.

	Baseline	Time Control	Post
Stiffness Measures			
Aortic cfPWV (m·s⁻¹)	5.8 ± 0.6	5.7 ± 0.6	6.8 ± 1.3†
SFA β Stiffness (aU)	11.2 ± 2.8	13.6 ± 6.0	13.8 ± 4.6
SFA ε (kPa)	135.1 ± 7.8	157.0 ± 19.9	168.5 ± 12.7
Shear Patterns			
Primary Antegrade Shear Rate (s⁻¹)	216.1 ± 68.7	200 ± 58.7	255.4 ± 55.5†
Retrograde Shear Rate (s⁻¹)	88.4 ± 30.4	89.9 ± 25.5	41.2 ± 25.9*
Secondary Antegrade Shear Rate (s⁻¹)	43.9 ± 8.8	42.1 ± 7.8	47.4 ± 36.1
Oscillatory Shear Index	0.25 ± 0.05	0.27 ± 0.04	0.11 ± 0.08*
cfPWV, carotid-femoral pulse wave velocity; SFA, superficial femoral artery; †Significantly different from pre-exercise (p<0.05); *Significantly different from pre-exercise (p≤0.001).			

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818   Board #79   May 30 3:30 PM - 5:00 PM

Acute Resistance Exercise Effects on Blood Flow in Resistance-Trained Versus Untrained Individuals

Alaina Glasgow, Kathryn Geither, Jason C. Parks, Erica M. Marshall, Leslie Sensibello, Yu Lun Tai, J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.*
(No relevant relationships reported)

Data suggests that an acute bout of resistance exercise (ARE) increases forearm blood flow (FBF) and vasodilatory capacity compared to rest. However, the effects of training status on FBF and vasodilatory capacity at rest and during recovery from ARE are uncertain. PURPOSE: To compare the effects of resistance exercise training status on measures of vascular function at rest and recovery from ARE. METHODS: Fifteen resistance-trained (RT) individuals, and seven untrained (UT) individuals volunteered to participate. Measurements were taken after a 10min supine rest and 20min after ARE, or a control. Venous occlusion plethysmography was used to measure FBF and vasodilatory capacity, with 5min of occlusion (220mmHg) to induce reactive hyperemia. Area under the curve (AUC) was utilized to determine differences in blood flow. The ARE consisted of 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) on the leg press, leg curl, leg extension, lat pulldown, and chest press, with 2min of rest between sets and exercises. A 2x2x2 repeated measures ANOVA was used to evaluate group (RT, UT) across condition (ARE, control) and time (rest, recovery). If the ANOVA was significant, t-tests were used for post-hoc comparisons. RESULTS: Groups were similar (p>0.05) for age, height, and BMI, but not for weight (RT: 74.5±13.0kg; UT: 61.9±10.8kg, p=0.04). The 1RMs for chest press, leg curl, leg press, and lat pulldown were significantly different between groups (p<0.05), but not for leg extension (p=0.26). The total volume of exercise for the ARE was similar between groups (p=0.10). There were no significant (p>0.05) group differences at rest for FBF or vasodilatory capacity. There were no significant (p>0.05) 3-way interactions for FBF or vasodilatory capacity. There was a significant condition by time interaction for FBF (RT: rest: 2.9±1.1ml/100ml of tissue/min, recovery: 8.9±4.0ml/100ml of tissue/min; UT: rest: 3.1±1.1ml/100ml of tissue/min, recovery: 8.9±2.9ml/100ml of tissue/min; p<0.001) and AUC (RT: rest: 56.8±20.2units, recovery: 139.0±66.5units; UT: rest: 53.8±20.2units, recovery: 116.6±25.1units; p<0.001). CONCLUSION: These data demonstrate that acute resistance exercise significantly increases forearm blood flow and vasodilatory capacity regardless of training status. <!--EndFragment-->

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819   Board #80   May 30 3:30 PM - 5:00 PM

Chronic Effects Of Replacing Workplace Sitting With Upright Activities On Human Popliteal Artery Shear Rate

Diego J. Arguello[1], Alvin Morton, III[2], Gregory Cloutier[1], Dinesh John[1]. *¹Northeastern University, Boston, MA. ²University of Tennessee Knoxville, Knoxville, TN.*
(No relevant relationships reported)

Previous work has shown that a single bout (i.e, 10 min- 3hrs.) of static upright posture decreases lower-limb arterial peak shear rate (PSR). **Purpose**: To examine if long-term replacement of workplace sitting with short (10-30 min) intermittent standing and/or stepping bouts results in PSR adaptations in the popliteal artery. **Methods**: Sixty-six sedentary (SED) overweight office workers (mean ± SD: age= 45.3 ± 12.3 years, BMI= 32.4 ± 5.8 kg/m²) were cluster randomized to a sitting control (C), a sit-to-stand desk (D), or a treadmill desk (T) group. Popliteal artery PSR was calculated from Poiseuille's Law as 4 x (mean blood velocity/internal diameter) using Doppler ultrasonography at baseline (B), and after 3 (M3), 6 (M6) and 12 months (M12). Daily SED, stand, and step time was measured over 7 days at each time-point with an ActivPal. Change (Δ) in PSR and physical behavior (PB) within groups across measurement time points were evaluated using mixed linear models (p<0.05). The PSR model was adjusted for demographics (age, gender, race, ethnicity) and systolic blood pressure, and PB models were adjusted for demographics, avg. daily monitor wear-time and total wear-days. **Results**: Between B and M3, both the D and T groups significantly reduced SED time [T: mean ± SD of Δ for daily proportion=-17.0% ± 3.2%; D: mean ± SD of Δ for daily proportion= -8.5% ± 3.0], and increased stand time [T: mean ± SD for Δ for daily proportion= 14.9% ± 3.3%; D: mean ± SD for Δ for daily proportion= 6.7% ± 3.1%]. Neither D nor T groups significantly increased step time. Changes in PB (B to M3) for D and T returned to baseline levels by M6. In conjunction with the PB change (B to M3), popliteal PSR decreased significantly between B and M6 in group D (mean Δ (95% CI)= -307.1 s⁻¹ (-478.4 to -135.7) and T [mean Δ (95% CI), p: -210.0 s⁻¹ (-378.3 to -41.7)]. These changes were sustained to M12. **Conclusions**: A few months of increasing workplace standing using workstation-based strategies may yield chronic reductions in PSR that extend beyond the duration of the PB change. Given the greater likelihood of atherosclerotic lesions developing in vasculature with low shear stress, increasing workplace standing may have a negative atherogenic effect. Further studies are needed to see if replacing sitting with stepping, rather than standing, increases shear rate.

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820   Board #81   May 30 3:30 PM - 5:00 PM

Inferior Vena Cava Diameter Reductions Precede Changes in Traditional Vital Signs during Simulated Blood Loss

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(No relevant relationships reported)

Hemorrhage is a leading cause of trauma deaths. Many of these deaths could be prevented with early detection and appropriate treatment. Traditional vital signs such as heart rate (HR) and mean arterial pressure (MAP) can remain relatively normal despite the central hypovolemia that occurs during blood loss. Ultrasound measurements of the inferior vena cava diameter (IVCD) have been used clinically as gross indicators of central hypovolemia. However, it is not known if reductions in IVCD occur prior to changes in traditional vital signs during blood loss in humans. **PURPOSE**: To test the hypothesis that reductions in IVCD occur prior to changes in traditional vital signs during central hypovolemia. **METHODS**: Blood loss was stimulated using lower body negative pressure (LBNP) in fourteen healthy men (22±2 years). Pressure within the LBNP chamber was reduced by 10 mmHg every four minutes until the pressure reached -80 mmHg or subjects experienced pre-syncopal signs. Sagittal view images of maximum and minimum IVCD were obtained using B-mode ultrasonography between minutes two and four of each stage. The mean HR (ECG), MAP, pulse pressure (PP) and stroke volume (SV) (photoplethysmography) were obtained during the last minute of each stage. **RESULTS**: Maximum IVCD was lower than baseline (1.5±0.4 cm) at -20 mmHg (1.0±0.3 cm, P<0.01) and throughout LBNP (P<0.01). Minimum IVCD was lower than baseline (0.9±0.3 cm) at -20 mmHg (0.5±0.3 cm, P<0.01) and throughout LBNP (P<0.01). HR was only higher than baseline (70±16 bpm) at the final stage of LBNP (94±19 bpm, p<0.01). MAP was only lower than baseline (91±7 mmHg) at the final stage of LBNP (78±17 mmHg, p<0.0001). PP was lower than baseline (62±5 mmHg) starting at -40 mmHg (53±9 mmHg, P=0.03) and throughout LBNP (P<0.03). SV was lower than baseline (93±28 ml) starting at -50 mmHg (65±14 ml, P=0.01) and throughout LBNP (P<0.01). **CONCLUSIONS**: Reductions in maximum and minimum IVCD preceded changes in tradition vital signs during graded simulated blood loss. IVCD may be a useful tool to identify blood loss and guide treatment in patients prior to the development of vital sign abnormalities.

Abstracts were prepared by the authors and printed as submitted.

821   Board #82   May 30 3:30 PM - 5:00 PM

Calf Venous Compliance in College Age Male Smokers and Non-smokers

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(No relevant relationships reported)

Smoking causes endothelial damage and autonomic dysfunction which leads to decreases in arterial compliance. Similar to changes in arterial compliance with fitness and aging, calf venous compliance improves with higher fitness and declines with increasing age. While previous studies have compared smokers and non-smokers for changes in arterial wall properties, no research to date has investigated the impact of smoking on limb venous compliance. **PURPOSE**: To determine the calf venous compliance differences in college age smokers (S) versus non-smokers (NS). **METHODS**: 7 S's (2-12 years of smoking; mean of 4 pack years; age = 22 ± 4 yrs; mass = 83.7 ± 18.4 kg; ht = 181.1 ± 9.5 cm; BMI = 25.4 ± 4.4 kg/m²; calf volume = 2485.4 ± 482.1 ml; VO_2 max = 34.3 ± 7.8 ml/kg/min) and 7 NS's (age = 23 ± 2 yrs; mass = 76.6 ± 5.8 kg; ht = 176.2 ± 4.7 cm; BMI = 24.7 ± 2.0 kg/m2; calf volume = 2242.1 ± 450.8 ml; VO_2 max = 38.0 ± 4.1 ml/kg/min) volunteered for this project. Participants underwent anthropometric assessment, a graded exercise test, and assessment of calf venous compliance. Utilizing venous occlusion plethysmography, calf pressure-volume relations was determined using the quadratic regression equation [Δ limb volume) = $\beta_0 + \beta_1$*(cuff pressure) + β_2*(cuff pressure)²]. Calf venous compliance was calculated as the first derivative of the pressure-volume relation during cuff pressure reduction [Compliance = $\beta_1 + (2 * \beta_2 *$ cuff pressure)]. Differences in anthropometric, fitness, and compliance variables between S & NS were analyzed with a simple ANOVA. **RESULTS**: There were no significant differences between S & NS in anthropometric variables or fitness except the smokers were significantly higher in body fat % ($19.2 \pm 6.5\%$ vs. nonsmokers at $12.3 \pm 2.7\%$). There were no significant differences between S & NS in calf volume or compliance [S; Δ volume = $0.8093 \pm 1.401 + 1.0184 \pm 0.06123$ * (cuff pressure) - 0.0010 ± 0.00082* (cuff pressure)² vs. NS; Δ volume = $.0874 \pm 1.39718 + 0.1211 \pm 0.06413 - 0.0011 \pm 0.00069$ (cuff pressure)²]. **CONCLUSIONS**: College age male smokers have similar calf venous compliance to non-smokers. It is likely that the chronic effects of smoking that would alter the vessel wall and subsequently decrease venous compliance have not had enough time to influence venous wall structure in men in their early 20's.

822   Board #83   May 30 3:30 PM - 5:00 PM

Combined Effects Of Heat And Altitude Exposure On Cutaneous Microvasculature Responses During Submaximal Exercise

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(No relevant relationships reported)

Exposure to hot environments augments cutaneous vasodilation during exercise, whereas exposure to hypoxia can have both direct vasodilator and indirect (reflex) vasoconstrictor influences in the skin. PURPOSE: To test the hypothesis that hypobaric hypoxia will have a modulating effect on forearm cutaneous circulation during steady state (SS) exercise in the heat. METHODS: Seven participants (2 F, 5 M) completed 30 min of SS exercise on a cycle ergometer at 50% of respective VO_{2peak} during four separate environmental conditions, 1) Sea Level Thermoneutral (SLTN; 250 meters (m), 20°C, 30-50% RH), 2) Sea Level Hot (SLH; 250 m, 35°C, 30% RH), 3) Altitude thermoneutral (ATN; 3,000 m, 20°C, 30-50% RH), and 4) Altitude Hot (AH; 3,000 m, 35°C, 30% RH). Skin blood flow was recorded using laser-Doppler flowmetry on the ventral forearm. SS cutaneous vascular conductance (CVC = laser-Doppler flow/mean arterial pressure; %max) was calculated as the average of min 20-25 during exercise. After exercise, participants completed 30 min of local warming (42°C) of the skin for calculation of maximal CVC. A one-way repeated measures ANOVA was performed comparing %max CVC during SS exercise across the four conditions. RESULTS: AH CVC ($63\pm31\%$) and SLH CVC ($52\pm19\%$) were significantly higher than both SLTN CVC ($20\pm9\%$, P < 0.001) and ATN CVC ($25\pm12\%$, P < 0.05), but were not different from each other (P > 0.05). CONCLUSION: As expected, ambient heat increased CVC during exercise; counter to our hypothesis, hypoxia appeared to have no net effect on CVC. Any potential local effects of hypoxia to cause additional cutaneous vasodilation during SS exercise may have been offset by simultaneous hypoxia-mediated activation of sympathetic vasoconstrictor nerves. Disclaimer: Authors views are not official U.S. Army or DoD Policy.

823   Board #84   May 30 3:30 PM - 5:00 PM

The Effects Of Cuff Width On Hemodynamics In The Legs During Blood Flow Restriction

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(No relevant relationships reported)

Blood flow restriction allows individuals to exercise with low loads while producing similar increases in muscle size as high load resistance training. It has been suggested that the pressure should be made relative to the individual (as a percentage of their arterial occlusion pressure), but it remains unknown if a given pressure results in a similar reduction in blood flow, and further, whether this differs based on the width of the cuff being applied. **PURPOSE**: To examine hemodynamic responses to various relative pressures in the supine position using two commonly used cuffs (10 cm and 12 cm). **METHODS**: Participants (men=17, women=14) came to the laboratory for two visits. One cuff (10 cm or 12 cm) was randomly applied to the right proximal thigh for each visit and arterial occlusion pressure was measured. Ultrasound measures of blood flow, mean blood velocity, peak blood velocity, and artery diameter were taken from the posterior tibial artery at rest and during the application of 10% increments of the arterial occlusion pressure. A repeated measures ANOVA was used to examine differences across conditions. **RESULTS**: There was no significant interaction or overall difference between the 10 cm and 12 cm cuff relating to blood flow [-0.501 (7.9) ml•min⁻¹, p = 0.728], mean blood velocity [-0.168 (1.7) cm•sec⁻¹, p = 0.590], peak blood velocity [0.586 (11.7) cm•sec⁻¹, p = 0.783], or artery diameter [0.003 (0.02) cm, p = 0.476]. There was a main effect of pressure for blood flow (p < 0.05), mean blood velocity (p < 0.05), peak blood velocity (p < 0.05), and artery diameter (p < 0.05), with each decreasing with increasing pressures. Peak blood velocity increased until 60% of arterial occlusion pressure before decreasing with increased pressure. The 80% and 90% arterial occlusion pressures reduced blood flow by 69.4% and 79.3% respectively when collapsed across the 10 cm and 12 cm cuffs. No other pressures differed significantly between the relative applied pressure and amount of blood flow restricted. **CONCLUSIONS**: Provided relative pressures are applied, cuff width appears to have little to no effect on the blood flow response at rest. Importantly, relative pressures may not indicate the magnitude of blood flow being reduced (e.g. 80% arterial occlusion may not reduce 80% of blood flow), particularly at higher arterial occlusion pressures.

824   Board #85   May 30 3:30 PM - 5:00 PM

Manipulation of Retrograde Shear in the Superficial Femoral Artery in Recreationally Active & Exercise-Trained Men

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(No relevant relationships reported)

Retrograde shear stress increases with age and contributes to atherosclerosis. Habitual exercise has been shown to ameliorate the effects of age on cardiovascular disease possibly due to favorable vascular remodeling and reductions in retrograde shear. **PURPOSE:** Examine whether the vascular remodelling from habitual exercise training affects retrograde shear at rest and during a manipulation designed to alter shear (lower limb compression) in young adults. **METHODS:** Doppler ultrasound was used to measure superficial femoral artery (SFA) diameter and retrograde shear rate in 11 exercise-trained men (Division I track athletes; 20 ± 3 years of age, body mass index 21 ± 2 kg·m⁻²) and 18 recreationally active controls (23 ± 5 years of age, body mass index 23 ± 2 kg·m⁻²). Measures were made at rest and during a shear manipulation: inflation of a pneumatic cuff applied to the calf to 5 mmHg (sham) and 60 mmHg (experimental) in a randomized order. **RESULTS:** All results are displayed in Table 1. SFA diameter was larger in exercise-trained men versus controls ($P < 0.05$). Retrograde shear was similar between the exercise-trained men and controls at baseline and during the sham condition ($P > 0.05$). Exercise-trained men had lower retrograde shear during the experimental condition ($P < 0.05$). Group differences during the experimental condition remained after co-varying for resting retrograde shear and body mass index ($P < 0.05$). **CONCLUSION:** Manipulation of retrograde shear using lower limb compression reveals differences in shear patterns not detected at rest. Exercise-trained men have a more optimal, anti-atherosclerotic shear pattern (i.e. less retrograde shear) in comparison to recreationally active men.

Table 1. SFA diameter and shear at rest and during lower limb compression.

	Exercise-Trained	*Control*
Rest Diastolic diameter (cm) Antegrade shear rate (s^{-1}) Retrograde shear rate (s^{-1})	0.64 ± 0.06 170.8 ± 41.2 75.6 ± 26.6	0.57 ± 0.06# 181.8 ± 41.7 84.4 ± 23.3
5 mmHg Condition (Sham) Diastolic diameter (cm) Antegrade shear rate (s^{-1}) Retrograde shear rate (s^{-1})	0.64 ± 0.04 172.1 ± 41.5 81.8 ± 14.6	0.58 ± 0.06# 174.8 ± 44.7 89.7 ± 18.2
60 mmHg Condition (Experimental) Diastolic diameter (cm) Antegrade shear rate (s^{-1}) Retrograde shear rate (s^{-1})	0.64 ± 0.06 208.1 ± 36.9 88.6 ± 17.1*	0.58 ± 0.06# 227.1 ± 46.9 106.4 ± 19.6#*

 # different from exercise-trained (p<0.05)
* different from rest (p<0.05)

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825   Board #86   May 30 3:30 PM - 5:00 PM

Various Cuff Pressures During Blood Flow Restriction Exercise on Blood Flow During and After Exercise

Tyler J. Singer. *Kent State University, Kent, OH.*
(No relevant relationships reported)

Title: Various Cuff Pressures During Blood Flow Restriction Exercise on Blood Flow During and After Exercise
**
Blood flow restricted (BFR) exercise has emerged as an intervention that increases muscle size and strength during low intensity resistance training. Although the cuff pressures prescribed for this intervention are typically based on pressures required to occlude blood flow at rest, the impact on blood flow during and after exercise is unclear. **PURPOSE:** To determine how various cuff pressures impact blood flow and tissue perfusion during and post exercise. **METHODS:** Seven healthy male participants completed four sets of a knee extension exercise (30 reps per set at 30% of max torque, 15 minutes recovery between sets). Four different cuff pressures were used during each set (0%, 60%, 80%, and 100% of arterial occlusion pressure). Doppler ultrasound was used to measure superficial femoral blood flow and NIRS was used to measure tissue saturation index, oxygenated and deoxygenated hemoglobin at rest, during and post exercise. EMG was also recorded for the vastus lateralis during exercise. **RESULTS:** Blood flow during exercise decreased as cuff pressure increased however there was still blood flow during exercise at 100% AOP. Tissue saturation showed greatest decrease during the100% occlusion trial (62± 5, 39± 5; p=. 001) followed by 80% (62±8, 40±8; p=. 001), 60% (63±12, 45±12; p=. 012), and the control (66±9, 52±9; p=. 019). Deoxygenated hemoglobin increased the most at 100% occlusion (2.0±7, 31±7; p=. 001) followed by 80% (1.1±7, 27±7; p=. 002), 60% (-0.7±14, 15±14; p=. .029) and the control (-5.0±8, 11±8; p=. 02). Oxygenated hemoglobin decreased the most in the 100% condition (5.0±12, -14±12; p=. 002) followed by 80% (6.0±14,-12±14;p=.007), 60% (7.0±15, -9.0±15;p=.023) and the control (4.0±11, -7.0±11;p=.014). There was no difference in total hemoglobin during those time points. EMG showed the largest change in the 100% condition (10±9,23±9;p=.002) compared to the control followed by 80% (9±14,19±14;p=.002) and 60% (18±13,23±13;p=.03). **CONCLUSION:** This data suggests that during dynamic exercise 100% of AOP still allows some blood flow and tissue perfusion during and post exercise but it still results in the greatest fatigue compared to lower cuff pressures.

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826   Board #87   May 30 3:30 PM - 5:00 PM

The Effects of Upper- and Lower-body Blood Flow Restriction Exercise on Vascular Function

Leslie Sensibello, Yu Lun Tai, Erica M. Marshall, Alaina Glasgow, Kathryn Geither, Jason C. Parks, Ramon Oliveira, J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.*
(No relevant relationships reported)

Previous studies indicate acute resistance exercise (ARE) improves vascular function, primarily forearm blood flow (FBF) and vasodilatory capacity. However, the effects of acute upper- and lower-body RE with and without blood flow restriction (BFR) on vascular function are unknown. **PURPOSE**: To determine the differences between UB and LB ARE with and without BFR on vascular function in resistance-trained individuals. **METHODS**: Twelve individuals were assessed on a one-repetition maximum (1RM) for the UB on the lat pulldown and chest press, and for the LB knee extension and knee flexion. Vascular function was assessed using venous occlusion plethysmography with five minutes of occlusion at 220mmHg to induce reactive hyperemia. Forearm blood flow and area under the curve (AUC) were assessed at Rest, and during recovery at 15 (R15) and 45 (R45) min. The BFR protocol consisted of 4 sets of 30, 15, 15,

and 15 repetitions at 30% of 1RM. BFR was applied at a pressure of 40% of arterial occlusion pressure during each exercise, and was released for 2min between exercises. For the non-BFR protocol, participants performed 4 sets of 8 repetitions at 70% 1RM. A 2x2x3 repeated measures ANOVA was used to examine the effects of condition (BFR, non-BFR) and group (UB, LB) by time (Rest, R15, R45) on vascular function. **RESULTS**: There were no 3-way interactions for any variable, and no effect of condition. There was a significant (p=0.001) group by time interaction for FBF (UB: Rest: 2.8±1.2ml/100ml/min; R15: 9.3±4.5ml/100ml/min; R45: 5.3±2.7ml/100ml/min; LB: Rest: 3.3±2.0ml/100ml/min, R15: 4.3±2.5ml/100ml/min, R45: 4.2±2.2ml/100ml/min) such that FBF was elevated at R15 compared to Rest, and was higher after UB than LB at R15. There was also a significant (p=0.02) group by time interaction for AUC (UB: Rest: 65.1±21.6ml/100ml/min, R15: 144.7±50.2ml/100ml/min; R45: 91.0±27.8ml/100ml/min; LB: Rest: 61.9±10.3ml/100ml/min; R15: 113.1±32.4ml/100ml/min, R45: 88.6±32.3ml/100ml/min) such that it was augmented at R15 and R45 compared to Rest, with greater augmentation at R15 after UB compared to LB. **CONCLUSIONS**: While there were no differences between BFR and non-BFR, our data demonstrate that acute upper-body resistance exercise has a greater effect than acute lower-body resistance exercise on forearm blood flow and vasodilatory capacity.

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827   Board #88   May 30 3:30 PM - 5:00 PM

Examining Peripheral Hemodynamics During Handgrip Exercise in Varsity Rowers

Kevin Decker, Austin Hogwood, Jennifer Weggen, Ruhi Maniyar, Ashley Darling, Austin Michael, Ryan Garten. *Virginia Commonwealth University, Richmond, VA.*
(No relevant relationships reported)

PURPOSE: This study sought to examine the impact of upper arm aerobic training on peripheral hemodynamics during exercise. **METHODS**: Seven young male trained rowers (20±1 yrs) and seven male recreationally active controls (24±1 yrs) with no history of upper limb aerobic training were recruited for this study. Subjects performed three minute bouts of progressive rhythmic handgrip exercise (4, 8, and 12 kg). Brachial artery diameter and velocity (Doppler ultrasound), heart rate (ECG), and blood pressure (Tango M2) were continually measured at rest and during each workload. **RESULTS**: Resting values for brachial artery diameter, blood flow, mean arterial pressure, and heart rate were not different between rowers and controls (p>0.05). During exercise, the rowers reported significantly reduced brachial artery blood flow [4 kg (146 vs 243 ml/min); 8 kg (249 vs 417 ml/min); 12 kg (356 v 536 ml/min) p<0.05] and shear rate [4 kg (289 v 470 s^{-1}); 8 kg (439 v 720 s^{-1}); 12 kg (478 v 797 s^{-1}) p<0.05] across all workloads when compared to controls. Brachial artery dilation, when normalized for shear rate, was significantly greater in rowers than controls during 8 and 12 kg workloads (p<0.05). Exercising heart rate and mean arterial pressure were not different between groups (p>0.05). **CONCLUSIONS**: The results from this study revealed rowers have improved vasoreactivity to a given shear rate stimulus when compared to untrained controls. These findings suggest that upper limb aerobic training results in improved efficiency of blood flow regulation during exercise.

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828   Board #89   May 30 3:30 PM - 5:00 PM

Muscle Oxygenation and Metabolic Regulations During Low and Moderate Intensity Exercise with Blood Flow Restriction

HYEJUNG HWANG, Sahiro Mizuno, Nobukazu Kasai, Chihiro Kojima, Daichi Sumi, Nanako Hayashi, Kazushige Goto. *Ritsumeikan University, Shiga, Japan.*
(No relevant relationships reported)

A number of studies have shown that low-intensity exercise with blood flow restriction (BFR) increases oxygen uptake and heart rate during exercise compared to normal exercise without BFR. However, it is currently unknown about the influence of moderate-intensity exercise with BFR on systemic and peripheral metabolic regulations.
Purpose : To investigate the effect of endurance exercise with BFR under either low (25% of VO$_2$max) or moderate (40% of VO$_2$max) intensities on muscle oxygenation, energy metabolism and endocrine responses.
Methods : Ten male subjects conducted three trials on different days (with a cross over design). All subjects performed three different trials consisting of moderate intensity (40% of VO$_2$max) exercise without BFR (NORMAL) or with BFR (MOD) and low intensity (25% of VO$_2$max) exercise with BFR (LOW). The exercise was designed as a 15 min of pedaling exercise. During the exercise in MOD and LOW, 2 min of cuff pressure (160mmHg) was applied repeatedly for proximal cites of both legs followed by 1 min of release. Muscle oxygenation for vastus lateralis muscle was evaluated using near-infrared spectroscopy (NIRS). Respiratory and venous blood samples were also collected during exercise.
Results : The oxygen consumption (VO$_2$) did not differ significantly between NORMAL and MOD, but LOW revealed significantly lower VO$_2$. Carbohydrate

Abstracts were prepared by the authors and printed as submitted.

oxidation rate was significantly elevated in MOD (Mean±SD, 25.6 ± 8.6 mg/kg/min), with no difference between NORMAL and LOW (10.6 ± 4.8 and 8.7 ± 2.8). There were no significant differences among three trials for blood glucose and serum growth hormone levels. Blood lactate and serum cortisol levels were significantly higher in MOD than those in the other two trials. Oxyhemoglobin (oxy-Hb) for vastus lateralis muscle was significantly lower in MOD than the other two trials. In addition, deoxyhemoglobin (deoxy-Hb) was significantly increased in both MOD and LOW (vs. NORMAL), and MOD showed highest value of total hemoglobin among three trials. **Conclusion :** Moderate intensity (40% of VO_2max) exercise with BFR caused profound elevations of deoxy-Hb with lower oxy-Hb and augmented carbohydrate oxidation. Furthermore, carbohydrate oxidation during low-intensity (25% of VO_2max) exercise with BFR was similar moderate intensity exercise without BFR.

B-62   Free Communication/Poster - **Cardiac**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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829   Board #90   May 30 3:30 PM - 5:00 PM

Usefulness Of Two-Dimensional Echo Strain In Evaluation Of Cardiac Function In Elite Athletes

Benedetta Tosi, Beatrice Leone, Loira Toncelli, Giorgio Galanti, FACSM. *University of Florence, Florence, Italy.*

(No relevant relationships reported)

Purpose: Cardiovascular adaptation to sport training is influenced by many factors, including the intensity and the kind of sport practiced. The "Morganroth hypothesis" asserted that a static exercise characterized by a pressure load and dynamic (isotonic) exercise which involves a volume load to the heart lead to different myocardial adaptation patterns. More recent studies revisited this hypothesis, showing that left ventricular (LV) remodelling observed in both resistance and endurance trained athletes, presented similar aspects. Although morphological modifications secondary to exercise have been largely studied, less is known on myocardial systolic function in LV remodeling patterns in different elite athletes. Two-dimensional strain analysis allows a complete study of the contractile function in different myocardial regions of interest in left and right ventricle. In this study we aim to underline possible differences in contractile myocardial function with strain analysis in two groups of elite athletes, trained with different loads and playing different sports (football and cyclism). **Methods**: We enrolled 47 male athletes: 23 football players and 24 cyclists, belonging to same football or cyclism team (mean age in both groups 18±3 years old). The athletes were evaluated with echocardiography at the beginning of the sports season. We assessed LV contractile function using speckle-tracking echocardiographic global longitudinal strain (GLS) and global circumferential strain (GCS). We also analysed right ventricular function by strain echocardiography. **Results:** Cyclists showed a significantly augmented indexed LV mass and TAPSE. No significant differences were found in GLS data between the two groups (23.4±0.02 in football players and 24.1±0.02 in cyclists), whereas a significantly higher GCS was found in cyclists compared to football players (31.2±0.04 and 27.2±0.05 respectively, p< 0.005). The cyclist group showed a significant increase in right ventricular strain compared to football players (26.3±0.04 and 23.2±0.04, respectively, p< 0.05). **Conclusions**: Our preliminary data suggest that a dynamic exercise, which involves a volume load, like cyclism, lead to a sensible increase in systolic function in elite athletes especially in right ventricle contractility.

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HR, %HRmax, %HRR, SPM In Moderate-Intensity Walking Among University Students By Sex And Resting HR

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(No relevant relationships reported)

PURPOSE: This study was intended to examine how heart rate (HR), maximal HR% (%HRmax), HR reserve% (%HRR), and steps per minute (SPM) would be related to sex and resting HR (HRrest) when walking at 2.5 mph among university students. **METHODS**: HRrest was measured after lying on the floor for five minutes to 186 university students (mean ages: 20.97±1.24; 108 males, 78 females) in the US. Males and females were divided into three equal-size groups respectively based on the ranking of the HRrest: low HRrest (LR), medium HRrest (MR), and high HRrest (HR). In addition, participants walked on treadmills for three minutes wearing HR monitors (Sigma PC26.14) and pedometers (Yamax SW-200), and HR and steps were recorded at the end of the walking. The HR, %HRmax, %HRR, and SPM in walking at 2.5 mph and the HRrest were compared between sexes and among the three HRrest groups for males and females separately with one-way MANOVA.

RESULTS: While no difference was found in age between sexes (p > .05), significant differences (p values: .00 to .01) were identified between sexes in HR (M, 92.36±10.77 vs. F, 102.61±11.34), %HRmax (M, 46.42±5.49 vs F, 51.49±5.72), %HRR (M, 20.07±6.82 vs. F, 23.06±6.86), and SPM (M, 98.24±9.53 vs. 105.89±9.12) in walking at 2.5 mph, and in HRrest (M, 65.48±9.46 vs. F, 73.47±11.68). As for the three HRrest groups, significant differences were found in all the three pairwise comparisons for males (p values: .00 to .01) in walking HR (LR 85.89±9.01, MR 96.61±8.15, HR 100.80±9.43), in walking %HRmax (LR 43.07±4.65, MR 46.56±4.07, HR 50.75±4.77), and in HRrest (LR 55.78±4.73, MR 65.11±2.44, HR 75.83±6.30); and for females as well (all pairwise p values < .01) in walking HR (LR 93.12±9.18, MR 103.6±8.76, HR 111.04±8.27), in walking %HRmax (LR 46.68±4.61, MR 52.07±4.43, HR 55.69±4.19), and in HRrest (LR 60.84±5.13, MR 72.81±3.48, HR 86.77±5.96). No differences were found in age or other variables among the HRrest groups for either sex.

CONCLUSIONS: Sex is closely related to HR, %HRmax, %HRR and SPM in walking at 2.5 mph and to HRrest as well with males having significant advantage over females. When comparisons are made among the HRrest groups, both male and female university students with lower HRrest have significantly lower HR and %HRmax in walking at 2.5 mph than those with higher HRrest.

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Passive Heat Stress Attenuates the Rise in Blood Pressure During Face Cooling

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(No relevant relationships reported)

The rise in mean arterial pressure (MAP) during the cold pressor test is attenuated by passive heat stress (HS). However, it is not known if HS attenuates the rise in MAP during face cooling (FC). **PURPOSE:** Test the hypothesis that HS attenuates the rise in MAP during FC. **METHODS:** FC was performed on ten healthy subjects (23±2years, 1 woman) during thermoneutral (TN) conditions and during HS induced by a water perfused suit. Subjects rested supine for 10 min while 34°C water was perfused through the suits. Then a 0°C bag of water was placed on the forehead, eyes, and cheeks for 15 min (FC). Subjects were then given 10 min to recover from FC before 50°C water was circulated through the suit until intestinal temperature (telemetry pill) was 1.0°C greater than TN. Five min of data were collected before FC was repeated. Heart rate (ECG), MAP (photoplethysmography), and forearm skin blood flow (SkBF; laser Doppler) were continuously collected. Forearm cutaneous vascular resistance (CVR) was calculated. Face pain (0 = no pain, 10 = worst pain imaginable) was obtained immediately after FC. Change from TN and HS baseline data were analyzed across 1 min intervals for the first 3 min and every 3 min thereafter during FC. **RESULTS:** Baseline HR (71±14 vs. 93±17 bpm) and SkBF (22±14 PU vs. 127 ± 35 PU) were greater and MAP (88±14 vs. 81±6 mmHg) and CVR (4.9±1.8 vs. 0.7±0.3 mmHg/PU) were lower during HS (P<0.05 for all). FC caused a greater decrease in HR during HS (largest difference at 12 min of FC: -7±3 vs. -15±11bpm, P=0.02). FC caused a greater increase in MAP during TN (largest difference at 6 min of FC: 20±10 vs. 1±6 mmHg; P<0.01). FC did not change SkBF across time (P=0.31) nor was there a difference between TN and HS (P=0.61). FC caused a greater increase in CVR during TN (largest difference at 6 min of FC: 1.4±1.2 vs. 0.0 ± 0.0 mmHg/PU; P<0.01). Face pain was not different between trials (TN: 6±3 vs. HS: 4±3; P=0.06). **CONCLUSION:** Passive HS attenuates the rise in MAP during FC. The impaired ability to increase CVR appears to contribute to the attenuated rise in MAP during HS with FC.

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Alcohol and Cardiovascular Health: Acute Alterations Versus Chronic Adaptations

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(No relevant relationships reported)

Alcohol abuse is a risk factor for disease but moderate use may be beneficial. Mechanisms for this contrast remain speculative. Differences may be explained by acute alterations rather than chronic adaptations. **PURPOSE:** To compare cardiovascular health markers in patients with and without a history of heavy drinking, and patients who are currently intoxicated. **METHODS:** Health outcomes of patients treated at a U.S. hospital were analyzed; 2,033 were sober, 273 tested positive for alcohol, and 131 reported a history of alcohol abuse. Dependent variables were systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), hemoglobin, oximetry, and disease incidence. Independent variables were age, sex, anthropometry, and use of alcohol. Independent-samples t tests and chi-square tests evaluated differences between patients with and without a history of alcohol abuse. Linear and logistic regressions tested the effects of alcohol on dependent variables. **RESULTS:**

Among sober patients, each year of age predicted 0.3 mmHg higher SBP (p<0.001) but no change in DBP (p=0.137). Across the total sample, current intoxication predicted 8.6 mmHg lower SBP (p<0.001), 8.7 bpm higher HR (p<0.001), and 1.0 g/dL higher hemoglobin (p<0.001). Linear regression found patients who tested positive for alcohol to have 4.6 mmHg lower SBP (p=0.002; 95% CI: -7.6 to -1.6) holding confounders constant. Among sober patients, a history of alcohol abuse associated with an elevated HR (p=0.001), lower pulse pressure (p=0.002), lower oximetry (p=0.018), and a trend for reduced SBP (p=0.056) with no difference in DBP (p=0.404). Linear regression found a history of alcohol abuse to lower pulse pressure (p=0.009) and oxygen saturation (p=0.012) and raise HR (p<0.001). Among sober patients, a history of alcohol abuse did not affect the odds of having a myocardial infarction (p=0.805), congestive heart failure (p=0.712), peripheral vascular disease (p=0.997), stroke (p=0.691), diabetes (p=0.107), or dementia (p=0.905); it did associate with a 15-fold increase in the odds of cirrhosis (p<0.001). **CONCLUSIONS:** Sober patients with a history of alcohol abuse mimic the cardiovascular profile of intoxicated patients. This suggests that both short and long-term alcohol ingestion may confer modest cardiovascular benefits.

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Cardiac Structure-function And Aerobic Capacity In Individuals With A Competitive Sports History

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(No relevant relationships reported)

Athletes (A) conduct intense physical training to attain peak performance. Intense training is associated with cardiac remodeling and electrical abnormalities. Although certain ECG abnormalities are considered benign, these changes have been linked to sudden cardiac death in A. **PURPOSE:** to investigate cardiac structure-function and electrocardiographic changes relative to aerobic capacity (Vo₂max). **METHODS:** A cross-section of individuals consented for this university IRB approved study. The population consisted of controls (C; n=21; high school sports (n=8 women, 9 men) or active, no organized sports (n=3 women, 1 man)), college A (CA, completed career <3 years ago; n=9, 5 women, 4 men), and A (presently competing, n=22, 6 women, 16 men). Measurements included anthropometric assessment (DEXA), resting 12-lead ECG, and graded exercise test (GXT) with echocardiography/Doppler ultrasound performed before and following the GXT. An incremental treadmill GXT was conducted (6 mph) to Vo₂max with respiratory gas measurements (open-flow, indirect calorimetry). **RESULTS:** CA and A had greater fat-free mass, but bone density was greater in A. While resting heart rate was lower in A and CA, blood pressure, stroke volume (A=87±19 ml; CA=83±23 ml; C=77±18 ml) and cardiac output (A=4.8±1.3 $L·min^{-1}$, CA=5.2±1.5 $L·min^{-1}$; C=4.8±1.3 $L·min^{-1}$) were similar among groups. Left ventricular (LV) end-diastolic dimension and posterior and septal wall thickness provided evidence of cardiac remodeling (eccentric hypertrophy-EH, concentric hypertrophy-CH, concentric remodeling-CR) in C (EH n=3, CR n=4), CA (EH n=1, CR n=2), and A (EH n=2, CH n=1, CR n=4). Overall, ECG analysis showed PVC's (n=3), LV hypertrophy voltage criteria (n=10), peaked T-waves (n=7), J-waves (n=4), U-waves (n=5), wandering pacemaker (n=4), early repolarization (n=5), short PR (n=1), Wenckebach (n=1), small Q waves (n=13). Vo₂max (C=44.7±9.8 $ml·kg^{-1}·min^{-1}$; CA=44.7±8.2 $ml·kg^{-1}·min^{-1}$, A=49.9±9.3 $ml·kg^{-1}·min^{-1}$) and maximal heart rate (C=187±91 $b·min^{-1}$; CA=194±7 $b·min^{-1}$, A=187±9 $b·min^{-1}$ were not different. **CONCLUSION:** Given similar, moderate levels of Vo₂max and cardiac function, presence of cardiac remodeling and ECG abnormalities among each group raises questions regarding the genesis of these changes relative to training history.

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Free-Weight Resistance Exercise Versus Weight Machines on Pulse Wave Reflection

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(No relevant relationships reported)

Acute resistance exercise (ARE) has a large effect on pulse wave reflection, but the data are limited when examining these responses after free-weight (FW) versus weight-machine (WM) exercises. **PURPOSE:** To evaluate alterations in pulse wave reflection after FW exercise compared to WM exercise in resistance-trained individuals. **METHODS:** Individuals volunteered to participate in either FW (n=25) or WM (n=16) resistance exercises. Data were collected at rest, and 10-15min after ARE. The FW group completed 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) on the squat, bench press and deadlift, while the WM group completed 3 sets of 10 repetitions at 75%1RM on the leg press, lat pulldown, leg extension, chest press, and the leg curl. A 2x2x2 analysis of covariance (ANCOVA) was used to analyze the effects of group (FW, WM) across condition (ARE, control) and time (rest, recovery) with workload as a covariate. **RESULTS:** The groups were similar for anthropometrics

(p>0.05), but differed in years spent training (FW: 7±4 yrs; WM: 4±2 yrs, p=0.0001). There were no differences at rest for any measures of pulse wave reflection. Neither group nor condition had an effect on brachial or aortic blood pressure. There was a significant 3-way interaction for heart rate (FW: rest: 59±8bpm, recovery: 88±13bpm; WM: rest: 65±9bpm, recovery: 89±13bpm, p=0.04) such that it was augmented during recovery from resistance exercise in the FW group compared to the WM group. There were also significant 3-way interactions for the augmentation index (FW: rest: 116±8.4%, recovery:121.2±9.5%; WM: rest: 116.8±8.4%, recovery: 113.7±5.5%, p=0.006), augmentation pressure (FW: rest: 5.0±2.9mmHg, recovery: 8.4±5.9mmHg; WM: rest: 4.3±4.0mmHg, recovery: 3.8±3.6mmHg, p=0.029), and the augmentation index normalized at 75bpm (FW: rest: 4.9±8.1%, recovery: 24.1±14.5%; WM: rest: 8.7±12.3%, recovery: 16.8±8.2%, p=0.015) such that they were increased in the FW group compared to the WM group during recovery from ARE, which differed from the control. **CONCLUSION:** These data demonstrate that recovery from free-weight resistance exercises has significant effects on pulse wave reflection that supersede those of weight machine resistance exercises in resistance-trained individuals, despite no differences in brachial or aortic blood pressures.

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Accuracy of a Smartphone Application to Measure Heart Rate Variability in Adult Females

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(No relevant relationships reported)

Heart rate variability (HRV), a non-invasive measurement of the autonomic nervous system, has been associated with incidence of diseased states to overtraining in athletes. HRV monitoring has become popular due to the ease of measurement with a number of commercially available devices. **PURPOSE:** The purpose of the study was to determine the accuracy of a smartphone app (APP) to measure resting HRV versus a commercially available bio-harness (BH). **METHODS:** Forty-seven females (age = 23.5 ± 4.4 y; height = 1.6 ± .05 m; mass = 73.8 ± 18.5 kg) volunteered to participate in the study. After arriving in the laboratory, participants rested in a supine position for 20 minutes. A BH was used to measure indices of HRV during a five-minute interval while the APP was used during the last 3 minutes. Time measurements included R-R interval (NN), standard deviation of the NN intervals (SDNN), root mean square of the successive differences (RMSSD), and percent of NN intervals over 50 ms (pNN50). **RESULTS:** There were no significant differences between the BH and APP with respect to NN (883.1 ± 126.1 vs 894.3 ± 129.8 ms; *p* = .12), SDNN (72.9 ± 29.9 vs 71.8 ± 29.9 ms; *p* = .77), and pNN50 (38.8 ± 21.9 vs. 40.8 ± 20.6 %, *p* = .24). HRM and APP RMSSD were significantly different (66.8 ± 33.0 vs 74.4 ± 30.1 ms; *p* = .014). Significant correlations were observed between BH and APP for all variables: NN, r = .93, *p* < .001, SEE = 48.8 ms; SDNN, r = .61, *p* < .001, SEE = 23.9 ms; RMSSD, r = .79, *p* < .001, SEE = 18.5 ms; and pNN50, r = .86, *p* < .001, SEE = 10.6%. **CONCLUSIONS:** The APP provided an accurate assessment of HRV when compared to the BH in the supine position. Moderate to strong correlations were observed for all indices of HRV with no statistical differences between the variables with the exception of RMSSD. The APP could provide an economical, valid method of measuring HRV in adult females.

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Effects of AMPK α2 Gene Deficiency on Exercise Induced Cardiac Hypertrophy in Mice

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(No relevant relationships reported)

PURPOSE: The purpose of this study is to explore the role of AMPK α2 in exercise induced cardiac hypertrophy by using AMPKα2 knock out mice and treadmill running model.**METHODS:** AMPK α2 knock out(KO)and wild type (WT) mice were randomly divided into four groups as wild type control (WT+Ctr, n=6),wild type exercise (WT+EX, n=12), AMPK α2 KO control (KO+Ctr, n=6) and AMPKα2 KO exercise (KO+EX, n=12). WT+EX and KO+EX group mice were applied to treadmill running for 7 weeks at 20m/min for 90 minutes to induce cardiac hypertrophy. Cardiac fibrosis and myocyte size was evaluated by Sirius red staining and WGA staining separately. The protein expression in heart tissue was analyzed by Western blots. **RESULTS:** 1. AMPKα2 gene deficiency had no effect on ratio of heart weight to body weight (HW/BW, mg/g, 3.89±0.22 vs 3.77±0.13, p>0.05) and cardiomyocyte cross section area (CSA, um2 , 220±36 vs 229±27, p>0.05) under control condition. After 7 weeks exercise training, WT+EX and KO+EX group mice had greater HW/BW (4.34±0.19, 4.52±0.21) and cardiomyocyte CSA (306±27, 355±11) as compared to their control mice (p<0.05), and KO+EX group were significant higher than WT+EX group(p<0.05).2. There were no significant difference on cardiac fibrosis among four groups (p>0.05).3. Seven weeks exercise training significantly increased cardiac tissue

AMPKα and p-ACC protein expression in both WT+EX and KO+EX as compared to their control groups(p<0.05), while AMPKα2 protein expression only significant increase in WT+EX as compared with WT+Ctr group. 4. Seven weeks exercise training significantly increased cardiac tissue p-Akt protein expression in both WT+EX and KO+EX as compared to their control groups (p<0.05), and in KO+EX was significant decrease as compared with in WT+EX group (p<0.05). **CONCLUSIONS**: 1.Seven weeks treadmill running could induce cardiac hypertrophy in mice with increased heart weight and myocyte size. 2.AMPKα2 gene deficiency significantly amplified exercise induced cardiac hypertrophy in mice.3.Seven weeks treadmill running induced cardiac hypertrophy was not founded with cardiac fibrosis.4.AMPKα2 might play some important role in exercise induced cardiac hypertrophy through Akt signal pathway.

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Validation Of The Non-invasive Assessment Of Cardiac Output Via The Closed-circuit Acetylene Rebreathing Technique

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(No relevant relationships reported)

Accurate assessment of cardiac output (Qc) is critical to the diagnosis and management of various cardiac disease states; however, the clinical standards of direct Fick and thermodilution (THD) are invasive. Non-invasive alternatives, such as acetylene rebreathing (RB), warrant validation. **PURPOSE:** Validate the non-invasive, closed-circuit acetylene rebreathing (RB) technique for measuring Qc. **METHODS:** Acetylene is an inert, soluble gas that enters the blood stream via pulmonary diffusion but, does not bind to hemoglobin and thus its concentration decreases during rebreathing at a rate proportional to Qc**.** We retrospectively analyzed 10 clinical studies and all available cardiopulmonary exercise stress tests performed in our laboratory that included RB and either direct Fick or THD. Studies included healthy individuals and patients with clinical disease (mostly HFpEF). For accuracy and precision analyses, simultaneous Qc measurements were obtained under normo-, hypo-, and hypervolemic conditions, as well as submaximal and maximal exercise. **RESULTS:** A total of 3,198 measurements in 519 patients were analyzed (mean age 59 years, 48% women). The RB method was more precise than THD in healthy subjects with nearly half the typical error (TE)=0.34 l/min, Pearson r=0.92, and coefficient of variation (CV)=7.2% vs THD TE=0.67, r=0.70, and CV=13.2%. In healthy subjects during supine rest and upright exercise, RB correlated well with THD (supine r=0.84, TE=1.02; exercise r=0.82, TE=2.36). In patients with clinical disease during supine rest, RB correlated well with THD (r=0.85, TE=1.43). Sensitivity analyses showed the agreement of the RB method was similar to, or better than, THD compared to direct Fick in healthy adults (RB rest r=0.85 and TE=0.84, RB exercise r=0.87 and TE=2.39; THD rest r=0.72 and TE=1.11; THD exercise r=0.73 and TE=2.87). Additionally, RB had an excellent correlation with direct Fick in patients with clinical disease during upright exercise (r=0.89, TE=1.14). **CONCLUSION:** The acetylene rebreathing method is much more precise than, and as accurate as, the THD method in a variety of patients and under a range of conditions. These data support the clinical use of RB derived Qc.

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Holter Ecg In Sports People: 20 Years Of Monitoring

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(No relevant relationships reported)

Purpose: Arrhythmias are a common finding in the population that practices sports activity and sometimes their clinical interpretation is not easy. Thus, we aimed to analyze and follow up the recordings in a group of subjects who underwent a 24-hour or weekly Holter ECG monitoring to assess the presence of arrhythmias in a large cohort of sportsmen.
Methods: Since April 1997 to April 2017, 6172 unselected and consecutive subjects (35±22 years) were enrolled. Revision analysis was performed by Holter Analysis System (Spacelabs Healthcare, LLC, California) on a sample of 10903 Holter ECG registrations, focusing on the ECG features, such as arrhythmias (origin, number, complexity), conduction delays and channellopathies. We then divided the population with follow ups by sex and into three age groups to follow the trend of arrhythmias (age<18; age=18-35; age>35).
Results: The subjects were 68,6% male and 31,4% female. The 27,8% of them (n=1716) had a semiannual or yearly Holter ECG follow-up, composing the 58,7% of the total amount of recordings. AV blocks were found 13,1% recordings (mainly AVB I and II-degree type 1) and other blocks in the 3,2%. Ventricular pre-excitation was recorded in 3,2% cases, whereas channellopathies in the 0,4% (BS or LQTS). Supraventricular arrhythmia was found in the 80% of recordings (<100 ectopic beats in 24h=76,0%), while ventricular arrhythmia in the 69,3% of exams (<100 ectopic beats in 24h=62,3%).

Conclusions: In the Holter recordings examined, we found that there was a clear prevalence of arrhythmias (91,4%) compared to conduction delays (16,3%) and channellopathies (0,4%). Analyzing in detail the features of the arrhythmias we observed that the 41,5% of the population of the study had more than 100 ectopic beats/24h and more than one fourth of the subjects had complex supraventricular (28,0%) or ventricular (23,9%) arrhythmias. Analyzing the follow ups, we found that older athletes had higher complexity and prevalence of arrhythmias, whereas younger people had higher frequency of arrhythmias in the 24h recordings. Arrhythmic peaks in each of the three age groups were found respectively at 14±2 years, 24±4,5 years and 58±11,1 yrs. These findings lead us to say that in sports population arrhythmias are a common event and they are often compatible with sports practice.

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The Effects Of High Intensity Interval Training On Heart Rate Variability In Physically Inactive Adults

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(No relevant relationships reported)

High intensity interval training (HIIT) is a type of exercise that involves repeated intense exercise with active or passive recovery. Heart rate variability (HRV) analysis has been widely used to measure cardio-autonomic functions. **PURPOSE**: The purpose of this study was to examine the effects of HIIT on heart rate variability (HRV) in physically inactive adults. **METHODS**: This study was conducted with a randomized and controlled design. Thirteen physically inactive male adults (27.5 ± 3.80 years) were randomly assigned to HIIT (N = 7) or moderate intensity continuous training (MICT, N = 6). The HIIT program consisted of 20 min of interval training with work to rest ratio (10/50 sec) at 90% HR$_{peak}$ while the MICT program consisted of 40 min of continuous training at 60-75% HR$_{peak}$. Both groups completed 8 sessions of cycle training over a period of two weeks. Height, body weight, blood pressure, and body composition were measured. HRV was measured for 20 minutes in sitting position with Actiwave-Cardio (CamNtech, UK). Time domain (R-R interval, IBI, RMSSD) and frequency domain (high frequency, low frequency, and LF/HF ratio) variables were analyzed by actiwave analyzer. A natural logarithmic transformation of all frequency domain variables was performed to meet the assumptions of parametric statistical analysis. Rrepeated measures ANOVAs were applied to analyze interaction effects on HRV variables and the significant level was set at .05. **RESULTS**: Significant time effects on R-R interval (F = 8.437, p < 0.05) and IBI (F = 9.611, p < 0.05) were observed with both HIIT and MICT groups decreasing over time. lnLF/HF ratio was significantly decreased in the HIIT group while the MICT group did not change (F = 4.875, p < 0.05). **CONCLUSIONS**: The present study suggests that the HIIT program improves sympathovagal (lnLF/HF ratio) activity following only 8 sessions of HIIT. Health professionals or fitness trainers could consider this time efficient exercise program (HIIT) for improving cardio-autonomic function in adults who are physically inactive.

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Autonomic Modulation in Response to Three Different Autonomic Reflex Tests in Women with Fibromyalgia

J. Derek Kingsley, FACSM, Kathryn Geither, Alaina Glasgow, Erica M. Marshall, Jason C. Parks, Leslie Sensibello, Yu Lun Tai. *Kent State University, Kent, OH.*
(No relevant relationships reported)

PURPOSE: To evaluate autonomic modulation in response to three different autonomic stressors, including isometric handgrip with post-exercise circulatory occlusion (IHG/PECO), the cold pressor test (CPT) and head-up tilt (HUT) in women with Fibromyalgia (FM) compared to healthy controls (HC). **METHODS:** Participants previously diagnosed with FM (n=37) and HC (n=25) were randomly assigned to an autonomic test. Baseline ECG recordings were completed during 5 minutes of seated (IHG/PECO and CPT) and supine rest (HUT). For IHG/PECO, participants completed 2 minutes of IHG at 30% maximal voluntary contraction followed by 2 minutes of PECO. For the CPT, circulated cold water hand immersion (10C) lasted for 2 minutes. For HUT, participants completed 5 minutes of 70-degree head-up tilt followed by 5 minutes of supine recovery. Heart rate variability measures included normalized low-frequency (LFnu) and normalized high-frequency (HFnu) powers as markers of sympathetic and parasympathetic modulation, respectively. A 2 x 3 repeated measures ANOVA was used to compare the effects of group (FM and HC) across time for IHG/PECO (rest, IHG, and PECO) and HUT (rest, HUT, and recovery). A separate 2 x 2 repeated measures ANOVA was used to compared of group (FM and HC) across time for the CPT (rest and CPT). Paired t-tests were used for post-hoc testing if the ANOVA was significant. **RESULTS:** Age, weight and height were similar (p>0.05) between groups. There were no significant differences between groups at rest for any measure of autonomic modulation. There were no changes in autonomic modulation in response to the IHG/PECO in either group. For the CPT, there were significant main

effects of time for LFnu (Rest: 42.5±20.9%; CPT: 61.1±20.6%, p=0.003) and for HFnu (Rest: 50.4±26.8; CPT: 37.3±20.0, p=0.03) such that they increased and decreased, respectively, during the CPT. During the HUT, there were significant group by time interactions (p=0.041) such that LFnu increased (FM: 136%; HC: 64.3%) and HFnu decreased (FM: 51.0%; HC: 24.0%). Measures of autonomic modulation during the recovery from the HUT were similar between groups. **CONCLUSION:** These data suggest that perhaps the hypotensive stress elicited by HUT is a stronger predictor of autonomic dysfunction then either IHG/PECO or the CPT in women with FM.

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841   Board #102   May 30 3:30 PM - 5:00 PM

Heart Rate Variability Response To Altitude Exposure In College-aged Students In Nepal

Alex Claiborne, Helaine M. Alessio, FACSM, Mark Walsh, Eric Slattery, Arden McMath, Byran Smucker. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)
(No relevant relationships reported)

Altitude places a burden on cardiovascular homeostasis, and heart rate variability (HRV) may serve as a biomarker for altitude stress. PURPOSE: HRV was studied at different altitudes in college-aged students of varying fitness levels, trekking in Nepal. METHODS: 10 min resting HRV data and heart rate (HR) were measured in college aged students (n=17,9F age=20±1.7yrs, BMI 23±3kg•m2) at 300m in Oxford Ohio,1900m, and 4500m above sea level in Nepal. 1 min average oxygen saturation (pO2) was measured at 4500m via fingertip pulse oximetry. Root-mean-squared of the successive differences (RMSSD ms), percent of successive R-R intervals varying>50ms (pNN50), and Poincare-plot SD1(ms) and SD2(ms) describe time variation between adjacent R-wave-to-R-wave intervals. Low-Frequency and High-Frequency Power Spectral Analysis (LFP,HFP), which describe the balance of sympathetic and parasympathetic drive to the heart, were other HRV variables of interest. RESULTS: RMSSD and pNN50 were highly correlated (r=0.90). Most HRV variables responded similarly to altitude, decreasing at 1900m and partially returning towards baseline as the trek continued to 4500m. Initial graphical analysis revealed an apparent relationship between log(RMSSD) and heart rate at 1900m and 4500m, though the relationship was less pronounced at 300m. Linear mixed effects modeling of log(RMSSD) provided evidence of a fairly strong interaction between altitude and HR (p=0.005 for 1900m vs. 300m; p=0.002 for 4500m vs. 300m). This model predicts that for lower HR (e.g. 75 bpm) RMSSD increases as a function of altitude, while at median (82.5 bpm) and higher (90 bpm) HR, RMSSD is lower at 1900m than at the other two altitudes. Oxygen saturation mean was 87±3 at 4500m. CONCLUSIONS: Evidence of a substantial altitude by HR interaction on log(RMSSD) suggest that HRV is sensitive to an altitude stressor, but also that subjects with lower resting heart rates at altitude presented with more favorable HRV.

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842   Board #103   May 30 3:30 PM - 5:00 PM

Ageing Alters Right Ventricular But Not Left Ventricular Myocardial Mechanics

Glenn Stewart[1], Bruce Johnson[1], Bryce Balmain[2], Kenji Shino[2], Akira Yamada[2], Norman Morris[2], Jonathan Chan[3], Surendran Sabapathy[2]. *[1]Mayo Clinic, Rochester, MN. [2]Griffith University, Gold Coast, Australia. [3]The Prince Charles Hospital, Brisbane, Australia.*
(No relevant relationships reported)

Introduction: Ageing is associated with a progressive stiffening of the pulmonary vasculature that causes an increase in pulmonary vascular resistance and a decrease in compliance. It remains unclear if right ventricular myocardial mechanics adapt in response to age-related remodeling in the pulmonary vasculature. **Purpose:** Accordingly, this study examined global and transmural longitudinal myocardial tissue deformation (strain) in a cohort of healthy young and middle-aged men to characterize age-related changes in myocardial tissue mechanics. **Methods:** Two-dimensional echocardiography was used to measure left (LV) and right (RV) ventricular strain in 10 young men (YM; Age: 27 ± 2yr, BMI: 23.2 ± 2.4m²) and 10 middle aged men (MAM; Age: 61 ± 7yr, BMI: 25.9 ± 3.2m²). A transmural strain gradient was calculated as the difference between endocardial and epicardial strain as an index of regional non-uniformity. **Results:** Systemic blood pressure was similar in young and middle aged men (YM: 118 ± 4mmHg vs MAM: 122 ± 4mmHg, p > 0.05), while echocardiographic estimates of pulmonary blood pressure via the tricuspid regurgitation pressure gradient were greater in middle aged men (YM: 17 ± 4mmHg vs MAM: 25 ± 6mmHg, p < 0.05). LV and RV dimensions were similar (p > 0.05) in young (LV EDV: 118 ± 19mL; RV EDA: 18.3 ± 2.2cm²) and middle aged men (LV EDV: 118 ± 17mL; RV EDA: 17.3 ± 3.8cm²). LV global longitudinal strain (YM: -17.5 ± 1.0% vs MAM: -18.0 ± 1.0%, p > 0.05) was similar in young and middle aged men, while RV global longitudinal strain (YM: -27.3 ± 1.8% vs MAM: -22.5 ± 1.7%, p<0.01) was lower in middle aged men. LV transmural strain gradient (YM: -4.6 ± 0.4% vs MAM: -4.6 ± 0.4%, p > 0.05) was similar in young and middle aged men, while RV transmural strain gradient (YM: -1.1 ± 0.4% vs MAM: -5.5 ± 0.5%, p<0.01) was higher in middle aged men. **Conclusion:** Ageing was associated with global and regional alterations in RV myocardial

mechanics, while LV function was unaltered. Specifically, ageing resulted in a decrease in RV global strain and an increase in transmural non-uniformity (i.e., increased transmural strain gradient). Differences in LV and RV myocardial architecture and age-related changes in the pulmonary vasculature are possible explanations for opposing LV and RV functional remodeling in response to ageing.

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843   Board #104   May 30 3:30 PM - 5:00 PM

Risk Factors of Hypertension Among Different Adult Groups in the Tujia-nationality Settlement of China

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(No relevant relationships reported)

PURPOSE: Hypertension as a well-known major independent risk factor for cardiovascular disease and stroke has had great impact on health outcomes. However, few studies focus on the different risk factors of hypertension among various age groups in the Tujia-Nationality settlement of China. The study aimed to investigate the different risk factors of hypertension among different adult groups in this area. **METHODS:** Demographics questionnaires and fitness tests were utilized to identify the risk factors of hypertension among different adult groups in the years 2010 and 2014 in China's southwest province of Hubei. **RESULTS:** Of the 5,646 individuals aged 20-69 years (age=42.7±13.7 years) people, 1,219 were classified as hypertensive, giving an overall prevalence of hypertension of 21.6%. The prevalence of hypertension was 13.5% in 2010, before doubling to 29.0% by 2014. For all age groups, testing time (i.e., 2014) and overweight/obesity were significant factors associated with hypertension. In addition, the risk factors for the young adult group (31.9±7.2 yr, n = 2039?) included age, gender (men>women), lower level of education, and lower cardiorespiratory function (CRF), with ORs of 1.214 (CI, 1.116-1.320), 0.365 (CI, 0.285-0.466), 0.720 (CI, 0.625-0.829), and 0.603 (CI, 0.498-0.731), respectively, and for the middle-aged group (51.7±4.3 yr, n = 1795), included Tujia nationality, white collar workers, and lower CRF, with ORs of 1.076 (CI, 1.056-1.095), 1.612 (CI, 1.390-1.871), and 0.780 (0.631-0.963), respectively. **CONCLUSIONS:** The prevalence of hypertension increased dramatically in this area during 2010-2014. BMI was the common risk factor of hypertension in all adult groups. For both young and middle-aged adults, low CRF was a common risk factor associated with hypertension.

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Risk of Cardiovascular Disease in American Firefighters: An Intervention is Warranted

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(No relevant relationships reported)

Cardiovascular disease (CVD) is the most common cause of job-related mortality among firefighters in the United States. Although age, family history, and work environments cannot be controlled, other predictors are modifiable. If solutions are to be implemented, it is important to know which health parameters are responsible for the elevated CVD risk in this population. **PURPOSE:** To examine the cardiovascular health of California firefighters. **METHODS:** We measured physiological CVD risk factors in 35 firefighters from Northern California. Assessments were age, anthropometry, blood lipids, blood pressure, and blood glucose. Risk factors were summed according to the American College of Sports Medicine guidelines. We evaluated the frequency of individual risk factors and used regression analyses (logistic, negative binomial, and linear as appropriate) to test the effect of age on risk. **RESULTS:** Firefighters were 33.5 ± 11.8 years old, had a body mass index (BMI) of 26.6 ± 3.4, body fat percent (BF%) of 21.2 ± 6.0%, waist circumference (WC) of 90.3 ± 10.4 cm, and waist-hip ratio of 0.87 ± 0.10. Systolic blood pressure (SBP) was 122.5 ± 8.0 mmHg, diastolic pressure (DBP) was 78.1 ± 10.3 mmHg, fasted blood glucose (FBG) was 98.5 ± 14.3 mg/dL, LDLs were 128.9 ± 40.1 mg/dL, HDLs were 31.6 ± 12.5 mg/dL, triglycerides were 116.8 ± 90.3, and the average number of risk factors was 1.8 ± 1.2. There were 32 firefighters (91.4%) with ≥ 1 risk. The proportion of at-risk firefighters for each variable was: lipid profile (77.1%), obesity (65.7%), FBG (37.1%), blood pressure (34.3%), and age (14.3%). Most of the lipid profile was met by low HDLs (65.7% of all firefighters). Age was a significant predictor of BMI (p=0.001), BF% (p=0.003), WC (p=0.001), and waist-hip ratio (p=0.047), but not SBP (p=0.553), DBP (p=0.590), FBG (p=0.961), HDLs (p=0.369), LDLs (p=0.593), or triglycerides (p=0.688). Increased age significantly predicted an increased number of CVD risk factors (p=0.003). **CONCLUSION:** As firefighters advanced in age, they experienced elevations in CVD risk, mostly as a consequence of increasing adiposity. Weight loss interventions aimed at improving lipid profile, blood glucose, and blood pressure may help reduce job-related CVD mortality in American firefighters.

845   Board #106   May 30 3:30 PM - 5:00 PM

Effectiveness of Three-Dimensional Echocardiography for Asian Postural Orthostatic Tachycardia Syndrome during Exercise Therapy

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(No relevant relationships reported)

PURPOSE: Postural tachycardia syndrome (POTS) is a form of chronic orthostatic intolerance characterized by an excessive increase in heart rate in the absence of orthostatic hypotension. It is known that women are more likely to suffer from this disorder with 5:1 female to male ratio. Previous studies have reported that POTS is characterized by reduced stroke volume (SV) caused by reduced left ventricular (LV) mass due to cardiac atrophy. Moreover, previous studies indicated that exercise training for POTS patients improved their symptoms and increased LV mass and SV. In the clinical setting, magnetic resonance imaging (MRI) is widely accepted as the gold standard to quantify LV mass and SV. However, probably because it is too expensive to perform MRI very frequently, there have been few studies that intermittently evaluate LV mass and SV changes over exercise therapy. Recent development of three-dimensional transthoracic echocardiography (3D-TTE) may enable us to accurately measure LV mass and SV. The primary purpose of this study was to assess LV mass and SV changes in an Asian POTS patient over exercise therapy by using 3D-TTE. **METHODS:** We diagnosed a 27-years-old Asian woman as POTS in Kyorin University Hospital. We prescribed exercise therapy in which she trained 3 times per week for 30 minutes per session by using a recumbent bike with target heart rate equivalent to 60% of maximum (130-140bpm). We performed 3D-TTE (EPIC 7C, Philips)and analyzed LV mass and SV by using 3D speckle-tracking software (Analysis 3.1, TomTec) before and every 3 months after exercise training. **RESULTS:** Her symptom started to gradually improve 3 months after exercise training. LV mass and SV gradually increased during exercise training; LV mass was 90g, 98g and 114g, and SV was 39.3ml, 48.5ml, and 43.6ml before exercise, 3 and 6 months after exercise training, respectively. **CONCLUSIONS:** We revealed that exercise training for an Asian POTS patient improved her symptom and increases in LV mass and SV were able to be assessed by using 3D-TTE, indicating the effectiveness of 3D-TTE to assess LV mass and SV for POTS patients.

846   Board #107   May 30 3:30 PM - 5:00 PM

Left Ventricular Hypertrophy: New Indexation With Body Cell Mass

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(No relevant relationships reported)

Purpose Cardiac adaptation to intense physical training is determined by many factors. Eliminate the fat mass from the indexing of left ventricular parameters seems to better explain some heart modifications, characterizing the so-called "athlete's heart". Fat free mass also contains the extracellular mass which does not represent a metabolically active compartment. The aim of this study is to verify a new left ventricular indexation with the metabolically active tissue of the body as body cell mass in elite athletes. **Methods** 18 females (F) were matched with 18 elite male (M) soccer players (F=26.2±2.4 yrs, M=26.9±2.5 years; p=NS). An accurate body composition analysis (skinfold and bioimpedance) and an echocardiography were performed. **Results** Greater relationship were found between left ventricular mass and body cell (r=0.827, r^2=0.684, p<0.001) compared to fat free mass (r=0.822, r^2=0.676, p<0.001). Differences in body composition were confirmed (hip circumference/height: F=0.55±0.03, M=0.52±0.02, p<0.01; fat mass index: F= 3.7±0.7 kg/m², M=2.4±0.4 kg/m², p<0.001), no difference were found in extra cellular mass index (F=7.1±1.2 kg/m², M=7.6±0.4 kg/m²; p=NS). There are no differences in systo-diastolic parameters between sexes. Left ventricular dimension show higher values in males also with body cell indexation (F=126.62±16.08 g/m², M=142.87±13.48 g/m² ; p<0.001). **Conclusions** Analyzing body composition in three compartments appears a solution that physiologically can explain some aspects of the athlete's heart. These results could be considered a preliminary data in order to create a new indexation.

847   Board #108   May 30 3:30 PM - 5:00 PM

Parasympathetic Modulation At Rest, During Exercise And Recovery From Maximal Exercise, In Boys And Men

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(No relevant relationships reported)

PURPOSE: Assess heart rate variability (HRV) to examine the parasympathetic nervous system (PNS) response from rest to light- (LIE) to moderate-intensity exercise (MIE) and recovery from maximal exercise in pre- (n = 10; maturity offset (MO) = -3.0 ± 1.2 yrs; age = 10.1 ± 1.9 yrs), mid- (n = 9; MO = -0.1 ± 0.6 yrs; age = 13.7 ± 1.0 yrs), and post-pubertal (n = 10; MO = 1.9 ± 0.6 yrs; age = 15.6 ± 1.2 yrs) boys and men (n = 10; age = 24.1 ± 2.0 yrs). **METHODS**: Subjects completed seated rest, LIE (50% HR$_{max}$) and MIE (65% HR$_{max}$). Intensity was then ramped to elicit maximal HR, followed by a 25-min seated recovery. HRV (root mean square of successive differences [RMSSD] and high-frequency power [HF]) was assessed during the last 3 min of rest, LIE and MIE and 3-min epochs ending at 10, 15, 20 and 25 min in recovery. RMSSD and HF were natural log transformed (ln) due to non-normal distribution. Significance was established if p ≤ 0.05. **RESULTS**: In each group, lnRMSSD and lnHF were similar at rest and decreased from rest to LIE to MIE. During LIE, lnRMSSD was greater in pre (3.4 ± 0.3 ms) than men (2.8 ± 0.5 ms) but similar to mid (3.1 ± 0.5 ms) and post (3.0 ± 0.5 ms). During MIE, lnRMSSD was similar between groups (pre = 2.1 ± 0.4 ms; mid = 1.9 ± 0.5 ms; post = 1.7 ± 0.5 ms; men = 1.8 ± 0.6 ms). Pre had greater lnHF than men during LIE (5.4 ± 0.7 ms² vs 4.0 ± 0.9 ms²) and MIE (2.8 ± 1.0 ms² vs 1.4 ± 1.0 ms²), but similar to mid (LIE = 4.8 ± 1.2 ms²; MIE = 2.3 ± 1.7 ms²) and post (LIE = 4.9 ± 0.9 ms²; MIE = 2.2 ± 0.8 ms²) at each intensity. In recovery, groups increased lnRMSSD from 10 (pre = 3.2 ± 0.8 ms; mid = 2.4 ± 0.6 ms; post = 1.8 ± 0.8 ms; men = 1.9 ± 0.5 ms) to 25 min (pre = 3.8 ± 0.6 ms; mid = 3.4 ± 0.6 ms; post = 2.8 ± 0.8 ms; men = 2.7 ± 0.8 ms). For lnHF, all groups increased from 10 (pre = 4.9 ± 1.8 ms²; mid = 3.4 ± 1.2 ms²; post = 2.2 ± 1.8 ms²) to 25 min (pre = 6.5 ± 1.3 ms²; mid = 5.6 ± 1.5 ms²; post = 4.1 ± 1.7 ms²), except men (2.5 ± 1.0 ms² vs 3.9 ± 1.6 ms²; p = 0.09). At all points, lnRMSSD and lnHF were greater in pre compared to post and men. Also, mid and post had different lnRMSSD at 15 min (2.9 ± 0.7 ms vs 2.0 ± 0.7 ms) and lnHF at 20 min (5.5 ± 1.4 ms² vs 3.7 ± 1.2 ms²). **CONCLUSIONS**: The primary findings were PNS withdrawal was reduced in pre-pubertal boys than men during LIE and MIE (HF only). Otherwise, MO did not affect PNS response from rest to MIE. Throughout recovery, PNS reactivation was greater in pre-pubertal boys compared to post-pubertal boys and men.

848   Board #109   May 30 3:30 PM - 5:00 PM

Link Between Left Ventricle Mass And Body Composition In Young Male And Female Athletes

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(No relevant relationships reported)

Purpose Competitive sports induce gradual cardiac adaptations in young athletes. During growth, changes occur in their body composition. The purpose of this study is to provide the left ventricular parameters indexed for body composition during young athletes' growth. **Methods** 220 young athletes, 110 females and 110 males aged from 8 to 19 years old were enrolled. An accurate body composition analysis (skinfold and bioimpedance) and echocardiography were performed. The left ventricular parameters were then indexed to the body surface area formula with the data related to body composition (fat-free mass and body cellular mass). **Results** The left ventricular and body composition parameters increased continuously during growth and no differences between the sexes were found before puberty. Higher fat mass was found in females from 12 years old (Fat Mass Index: Female=4.8±1.8kg/m2, Male=3.6±0.9 kg/m2; p<0.05). Cardiac differences started at 13 years old, with a greater left ventricular mass in males (Female=128.7±23.7 g, Male=110.9±20.2 g; p<0.05). The indexing of the left ventricle to the body composition parameters increased the age of onset of these cardiological differences to 14 years old with fat-free mass (Female=91.8±18.7 g/m2, Male=105.0±19.5 g/m2; p<0.05), or to 15 years old with body cell mass (Female=124.3±17.9 g/m2, Male=145.8±28.5 g/m2; p<0.05). **Conclusions** Differences between the sexes appear to start after puberty. The above indexing was used in order to normalize the differences between the sexes according to body composition. This study reports the reference values for age and gender of the left ventricular parameters indexed for metabolically active mass.

WEDNESDAY, MAY 30, 2018

849   Board #110   May 30 3:30 PM - 5:00 PM

Sex Differences In Aortic Stiffness, 24-hour Blood Pressure, And Cardiac Deformation In Marathon Runners

Jacqueline A. Augustine[1], Wesley K. Lefferts[1], Jacob P. DeBlois[1], Tiago V. Barreira[1], Kan Liu[2], Beth A. Taylor[3], Kevin S. Heffernan[1]. [1]*Syracuse University, Syracuse, NY.* [2]*SUNY Upstate Medical University, Syracuse, NY.* [3]*University of Connecticut, Storrs, CT.* (Sponsor: Bo Fernhall, FACSM)

(No relevant relationships reported)

Endurance exercise reduces risk for cardiovascular disease. Excessive endurance exercise may be detrimental to cardiovascular health. Interestingly, these detrimental cardiac adaptations may be more prevalent in male marathoners. Sex differences in the effect of marathons on cardiac function may be related to differences in aortic stiffness and blood pressure (BP). **PURPOSE:** 1) Examine sex differences in aortic stiffness, BP and cardiac function; 2) Explore associations between aortic stiffness, BP and cardiac function in marathoners. **METHODS:** Sixteen experienced marathoners had peak aerobic capacity, aortic stiffness, BP and cardiac function measured on 3 separate days. Aortic stiffness was measured as carotid-femoral Pulse-Wave Velocity (cfPWV) obtained using applanation tonometry. An ambulatory oscillometric blood pressure cuff was used to measure 24-hr systolic blood pressure (BP). Cardiac function was measured using 3-dimensional deformation echocardiography (3DE). Left ventricular (LV), longitudinal, circumferential, area, and radial strain were used as indices of cardiac function. **RESULTS:** cfPWV and 24-hr aortic BP were higher and 3DE longitudinal and area strain were lower in males compared to females (p<0.05). cfPWV was associated with longitudinal (r=0.58, p=0.04), circumferential (r=0.71, p=0.01), area (r=0.66, p=0.01), and radial strain (r= -0.66, p=0.02). **CONCLUSION:** Among marathoners, males have higher aortic stiffness, BP and lower cardiac function when compared to females. Higher aortic stiffness may be associated with lower cardiac function in experienced marathoners.
Supported by: Sydney Young Student Research Award; Syracuse University School of Education, Creative Grant Competition.

Table 1	Males (n=7)	Females (n=9)	p-value
Age (years)	45±4	43±3	0.53
VO$_2$ max (ml/kg/min)	52.8±11.8	47±6.2	0.27
Resting Heart Rate (bpm)	52±7	56±9	0.31
Body Mass Index (kg/m²)	29±5	22±3	0.00
Body Fat (%)	20.7±10	23±6	0.59
cfPWV (m/s)	8.1±1.0	6.5±1.2	0.02
Brachial 24-hr Systolic BP (mmHg)	124±4	112±7	0.01
Aortic 24-hr Systolic BP (mmHg)	113±4	104±8	0.05
3DE Longitudinal Strain (%)	-10±5	-16±4	0.04
3DE Circumferential Strain (%)	-11.3±4.2	-15.6±4.3	0.10
3DE Area Strain (%)	-18.8±7.1	-26.9±6.3	0.05
3DE Radial Strain (%)	29.2±12.2	46.0±17.1	0.07

Significance level, p<0.05. cfPWV, Carotid-femoral Pulse Wave Velocity; BP, Blood Pressure; 3DE, 3-dimensional Echocardiography

850   Board #111   May 30 3:30 PM - 5:00 PM

Influence of Cuff Pressure on Cardiovascular Responses to Knee Extension Exercise with Blood Flow Restriction

Sarah G. Kearney[1], Tyler Singer[1], Jon Stavres[1], Steven J. Elmer[2], Matt A. Kilgas[2], John McDaniel[1]. [1]*Kent State University, Kent, OH.* [2]*Michigan Technological University, Houghton, MI.*

(No relevant relationships reported)

Blood flow restriction (BFR) exercise is a growing exercise modality in which blood flow to the muscle is occluded during low intensity exercise. Recent reports indicate that BFR training leads to increase muscle strength and hypertrophy, however the acute cardiovascular responses to BFR exercise are not as clear. **PURPOSE:** The purpose of this study is to examine the effects of various occlusion pressures on cardiac output (CO), mean arterial pressure (MAP), and heart rate (HR) before, during and post exercise. **METHODS:** Eight healthy male participants completed 4 sets of knee extension exercises. Participants performed 30 repetitions per set at 20% max torque with 15 minutes of recovery between each set. Four different cuff pressures were administered with each set (0%, 60%, 80% and 100% of arterial occlusion pressure). CO, MAP, and HR were analyzed across 5 time points: baseline, after cuff inflation (prior to exercise), last five seconds of exercise, 30 seconds post exercise (prior to cuff deflation), and two minutes post cuff deflation. **RESULTS:** Repeated measures

ANOVA indicated a main effect of time point (p<0.001) and cuff pressure (p=0.018) on HR as well as a significant interaction (p<0.001). HR at the end of exercise was 97±22, 128±27, 135±24, and 148±24 bpm for 0%, 60%, 80% and 100% respectively. The 0% condition was significantly different than the other three occlusion pressures as well as 60% being different than 100%. There was a significant main effect of time point (p>0.001) on CO in that it was greatest during exercise, however there was no main effect of cuff pressure (p=0.805). Finally, MAP also significantly increased with exercise (p>0.001) but there was no main effect of cuff pressure (p=0.058). **CONCLUSION:** During BFR knee extension exercise greater cuff pressure resulted in greater HR response despite the fact that external workload was the same. This is likely due to the accumulation of metabolic by-products in the limb and greater exercise-pressor reflex with blood flow occlusion.

B-63   Free Communication/Poster - **Cardiac Rehabilitation**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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851   Board #112   May 30 3:30 PM - 5:00 PM

Does UK Cardiac Rehabilitation Provide An Effective Stimulus For Change?

Said Ibeggazene[1], Chelsea Moore[2], Michelle Swainson[2], Theocharis Ispoglou[2], Costas Tsakirides[2], Karen Birch, FACSM[1]. [1]*University of Leeds, Leeds, United Kingdom.* [2]*Leeds Beckett University, Leeds, United Kingdom.* (Sponsor: Professor Karen Birch, FACSM)

(No relevant relationships reported)

Purpose: The efficacy of cardiac rehabilitation (CR) in reducing mortality and rehospitalizations has been questioned. UK CR typically consists of 6 weeks biweekly circuit-type exercise at 40-70% of heart rate (HR) reserve (HRR). This study aims to characterise the exercise performed in UK CR and explore relationships between exercise dose and changes in physiological variables.
Methods: 48 patients (35 M/13 F 33-80 y) were recruited following referral to local outpatient CR. HR was recorded continuously during exercise sessions throughout the programme (Table 1). Assessments of incremental shuttle walk test distance (ISWD), blood pressure (BP), brachial artery flow-mediated dilatation (FMD), carotid artery compliance, and habitual physical activity (PA) were measured prior to and following CR completion.
Results: ISWD increased following CR (439 ± 116 m vs 632 ± 213 m, p < 0.001) and was strongly associated with the change in peak HR achieved between tests (r = 0.56, p < 0.001), baseline ISWD (r = 0.51, p < 0.001) and age (r = -0.51, p = 0.001). Spending >1 min above 55% HRR at the start and middle of the programme was associated with greater change in ISWD (χ2 = 3.9, p = 0.047; χ2 = 4.7, p = 0.03). Time spent exercising > 55% HRR increased between the start and end (8.4 ± 14.1 vs 11.5 ± 14.7 min, p = 0.02) but not the middle and end of the programme (11.9 ± 13.6 vs 11.5 ± 14.7 min, p = 0.87). PA, body mass, diastolic BP, FMD and arterial compliance were unchanged following CR (p > 0.05). Systolic BP decreased following CR (129 ± 20 vs 124 ± 20 mmHg, p = 0.01), and correlated only with the volume of light activity performed at baseline and following CR (r = 0.34, p = 0.04 & r = 0.41, p = 0.03).
Conclusion: Patients in current UK CR may not accumulate sufficient exercise time above 55% HRR to drive health gain. Large improvements in ISWD do not reflect the lack of change in PA, FMD and arterial compliance. Strategies to increase the dose and progression of time spent above 55% HRR are needed to enhance UK CR effectiveness.

Table 1: % of participants achieving a total of 8 min above threshold			
HRR threshold	Start (n=44)	Mid (n=40)	End(n=39)
40%	66	77	74
50%	41	60	54
55%	27	42	38
60%	27	22	36
65%	23	22	31
70%	9	20	18

852 Board #113 May 30 3:30 PM - 5:00 PM

Changes in Functional Capacity and Hemodynamic Responses in Costa Rican Cardiac Rehabilitation Patients

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(No relevant relationships reported)

PURPOSE: To examine changes in walking distance and hemodynamic responses (HED) following a 12-week exercise-based CR program in Costa Rican cardiac patients. **METHODS**: Six-min walking distance (6MWD) and HED variables - systolic blood pressure (SBP), diastolic blood pressure (DBP), post-6MWD heart rate (FHR), post-6MWD recovery heart rate (REC), post-6MWD SBP (PSBP), and post-6MWD DBP (PDBP) were measured before and after CR in three-hundred and eleven (237 males and 74 females) patients (age = 57.7 ± 13 yr.). Using age as a covariate, two by two (gender x measurement) ANCOVAs determined differences in 6MWD and HED variables. Pre-to-post CR intervention changes (Δ) in 6MWD and HED variables were correlated to the number of CR exercise sessions attended by age-quartile (Q_n) within genders. **RESULTS**: Patients underwent 33.0 ± 5.1 CR sessions. Males walked a longer distance than females (males = 493.5 ± 5.6 vs. females = 429.0 ± 9.9 m; $p \leq 0.001$) from pre-to-post CR program (males pre = 429.3 ± 6.2 vs. post = 557.6 ± 5.8 m, $p \leq 0.001$; females pre = 374.9 ± 11.2 vs. post = 483.2 ± 10.3 m, $p \leq 0.001$). Both genders reduced DBP following the CR program (males pre = 67.01 ± 0.7 vs. post = 65.6 ± 0.5 mmHg, $p = 0.034$; females pre = 69.2 ± 1.2 vs. post = 65.0 ± 1.0 mmHg, $p = 0.001$), and increased FHR following a 6MWD test after the CR program (males pre = 97.7 ± 1.2 vs. post = 112.7 ± 1.4 bpm, $p \leq 0.001$; females pre = 100.7 ± 2.1 vs. post = 110.2 ± 2.5 bpm, $p \leq 0.001$). Males increased SBP immediately after 6MWD test (pre = 122.8 ± 1.3 vs. post = 133.6 ± 1.3 mmHg; $p \leq 0.001$). Significant correlations between CR sessions completed were found in males in Q_1 (age ≤ 49.9 yr.) for ΔDBP ($r = -0.328$; $p = 0.013$), Q_2 (age 50 to 59.9 yr.) for ΔFHR ($r = 0.407$; $p = 0.001$), ΔREC ($r = 0.286$; $p = 0.030$), and Q_4 (age ≥ 67 yr.) for ΔREC ($r = -0.310$; $p = 0.016$), but none for males in Q_3 (age 59 to 66.9 yr.). For females in Q_4 (age ≥ 67 yr.), significant correlations were found between CR sessions and ΔDBP ($r = 0.474$; $p = 0.040$) and Δpost-6MWD SBP ($r = 0.510$; $p = 0.022$). No significant correlations were found between CR sessions on Q_1 (age ≤ 51.9 yr.), Q_2 (age ≤ 52 to 59.4 yr.), Q_3 (age ≤ 59.5 to 66.9 yr.) for 6MWD or any HED variable. **CONCLUSION**: Both men and women improved functional capacity as observed in the 6MWD and HED variable adaptations to exercise following a 12-week CR program.

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Comparison of Outcomes Related to Dietary Behavioral Changes in Phase II Cardiac Rehabilitation

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(No relevant relationships reported)

PURPOSE: Study aim was to compare pre and post dietary survey scores and waist circumference measurements of Phase II Cardiac Rehabilitation (CR) participants receiving an individual, one-hour dietary counseling session from a registered dietitian (RD). **METHODS:** A retrospective comparative design was used to compare 104 Phase II CR program participants who completed ≥ 12 sessions between May 2015 and August 2017 at a hospital-based nationally certified CR program. The Rate Your Plate (RYP) (target score ≥ 58), a general dietary assessment survey of usual eating habits prior to cardiac event, was administered to all participants during the initial session and two sessions prior to program discharge. Individual dietary scores were compared among participants receiving and not receiving a one-hour dietary counseling session. A medical record review was conducted to collect completed dietary survey scores, attendance of dietary session, waist circumference, gender, and age. ANOVA, paired T-tests and generalized linear model were used for analysis. **RESULTS:** 104 participants completed a pre and post RYP survey. Seventy-three males (mean age = 66.4 years) and 31 females (mean age = 66.9 years) participated. 78 participants met with the dietitian and 26 declined. Mean dietary scores for all participants significantly increased post program (mean pre = 54.8, mean post = 60.2; p<.001). Participants meeting with the RD significantly increased their RYP scores (mean pre = 54.4, mean post = 60.2, p<0.001). There was no correlation between dietary score and waist circumference. **CONCLUSION:** Preliminary data suggest CR participants meeting with a RD are more likely to improve dietary scores. There may be gender differences, but a larger female sample size is needed to further explore these differences. In previous studies, dietitian services are associated with improved diet related patient outcomes. Weight management intervention for male patients with waist circumference > 40 inches and > 35 inches in women supports a multidisciplinary approach in CR programs to achieve overall cardiovascular risk reduction.

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Influence of Metabolic Syndrome on Response to Cardiac Rehabilitation

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(No relevant relationships reported)

Metabolic syndrome (MS) and its hepatic manifestation non-alcoholic fatty liver disease (NAFLD), are independently associated with cardiovascular disease. The metabolic impact of these conditions may influence exercise tolerance and response to exercise interventions. This is relevant to patients undergoing cardiac rehabilitation (CR) who are expected to have high prevalence for MS and NAFLD. We compared performance measures and self-reports from patients receiving CR with/without MS to investigate whether those with MS had different baseline characteristics and CR outcomes.
Methods: We assessed the independent associations between MS, having met 3 criteria, exercise performance measures (peak METs), anthropometrics and self-reports (PROs) for patients pre and post CR. PROs included DASI METs (activity), CESD (depressive symptoms), COOP (motivation/well being). Anonymized data were collected from a CR registry; and an IRB approved protocol for personal health data from hospital medical records. We used parametric and non-parametric tests.
Results: 181 participants, 132 males, mean age 62, 76 STEMI, 91 had MS. Baseline means: BMI = 29, peak METs = 3.4, DASI = 7, CESD = 8, COOP = 19. At baseline, peak METs were significantly lower in those with MS as compared to non-MS patients (adjusted for age and gender, p=.003). For every unit increase in initial peak METs, the probability of having MS decreases by 64% (OR= 0.36, p =.001. Age (r=-.4), COOP(r=-.42), DASI(r=.37), diabetes (OR 4.3) and female gender (OR = 5.36, p <.001) were associated with lower baseline peak METs. The change in peak METs following CR was not significantly different between the two groups. Significant increases in peak METs were associated with number of sessions attended (r .27, p<0.01) and DASI (r=.4, p <.001. High initial COOP (r -.34, p<.001) and older age (r -.4, p<.001) were associated with less increase in peak METs.
Conclusion: Patients with MS receiving CR have lower peak METs and higher BMI at baseline than those without. PROs are not significantly different between groups. MS is not a risk factor for improvement in peak METs. Improvement in peak METs post CR is independently associated with the number of sessions attended and with increased daily activity (DASI). Clearly, program adherence is essential for improved exercise performance.

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Enablers, Barriers, And Intervention Strategies For Maintaining Exercise Following Cardiac Rehabilitation

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(No relevant relationships reported)

PURPOSE: A significant proportion of cardiac rehabilitation (CR) patients decline or cease regular exercise following the structured CR program. The purpose of this qualitative study was to identify barriers, enablers, and intervention strategies to maintain exercise post CR.
METHODS: We conducted five focus groups (3 to 5 participants in each group) in three North Carolina locations in 2017 with 22 current CR participants. Participants also completed a brief survey. Focus groups were transcribed verbatim and double coded, analyzed, and reconstructed to identify overarching themes using ATLAS.ti software.
RESULTS: Focus group participants were referred to CR after experiencing a myocardial infarction (36%), coronary artery bypass grafting surgery (36%), stents (9%), angina (5%), and heart failure (5%). Over half of participants were male (55%), the mean age was 72 years (standard deviation=7 years), and 82% were retired. Potential barriers to continuing exercise post CR included lack of motivation to exercise, lack of financial resources to stay active, health conditions, loss of group social support, and not enjoying exercise. Potential enablers to continuing exercise post CR included continued contact with CR staff after finishing the CR program, extending the number of weeks of CR, returning for a check-in CR session after discharge, having an exercise plan after finishing CR, and receiving social support from family and friends. The focus group discussion asked participants about their interest in using an activity tracker during and following CR. Most participants were positive about using activity trackers; however, some expressed concern about the complexity of using the tracker. In questions about specific activity tracker features, most participants expressed favorable views about tracking step counts, but had mixed views about sharing their tracking information with peers. Participants were asked about introducing peer support from CR alumni and this feature received positive feedback. **CONCLUSION**: These findings can be used to design interventions that help CR participants maintain exercise following CR.

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Functional Capacity And Cardiac Self-efficacy Measures Are Associated With Health Literacy In Cardiac Rehabilitation

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(No relevant relationships reported)

PURPOSE: Health literacy (HL) defines the degree to which individuals can obtain, process, and understand basic health information and services needed to make proper health decisions. Low HL (LHL) is associated with reduced adherence to exercise, medications, healthy nutrition, and low utilization of preventive health services. Cardiac Rehabilitation (CR) is a secondary prevention program that improves functional capacity and risk factor profile, leading to improved health status. The purpose of the present study is to assess the how the effectiveness of CR, as measured by functional capacity and cardiac self-efficacy (CSE), may differ between patients with LHL and high HL (HHL) who attend CR.
METHODS: In a quality improvement project, we evaluated the impact of LHL versus HHL on change in functional capacity and CSE measures. HL of patients enrolling in CR was evaluated by the REALM-SF. HL was divided into two groups: LHL was less than 9th grade reading level and HHL was greater than 9th grade reading level. We assessed changes in functional capacity by six-minute walk distance (6MWD) in relation to scores from the 13 question CSE scale that measures controlling and maintaining cardiac symptoms.
RESULTS: 134 patients that completed CR were assessed: 42 LHL and 92 HHL. LHL patients had lower baseline 6MWD and CSE scores compared to HHL patients (**Table 1**). There were clinically significant gains in 6MWD (>30 m) and statistically significant improvements for CSE in both groups (**Table 1**). Additionally, LHL and HHL patients both had significant correlations between 6MWD and CSE (**Table 2**).

Table 1	Pre		Post		Change		P-Value (P) (PRE vs POST)		P
	LHL	HHL	LHL	HHL	LHL	HHL	LHL	HHL	(BETWEEN GROUPS)
6MWD (m)	272 ± 92	333 ± 86	326 ± 94	384 ± 93	54 ± 48	47 ±59	<0.001	<0.001	0.47
CSE	32.2 ± 12.9	33.1 ± 11.8	39.9 ± 10.9	40.7 ± 8.6	8.0 ± 14.4	7.6 ± 8.4	0.001	<0.001	0.84
Table 2	Pre			Post					
	Correlation Coefficient (R)		P	R		P			
HHL 6MWD vs. CSE	0.26		<0.0001	0.34108		0.0009			
LHL 6MWD vs. CSE	0.33		0.0001	0.378		0.01			

CONCLUSIONS: This work indicates a positive correlation between improvements in functional capacity and CSE over the course of CR for both LHL and HHL groups, highlighting the utility of CR in overcoming some of the risks of diminished functional capacity and CSE associated with LHL. The study also reflects the importance of HL as a criterion of risk and associated management modification.

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Efficacy of a Newly Developed Phase II Cardiopulmonary Rehabilitation Program in the Rural Southeastern United States

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(No relevant relationships reported)

Healthy People 2020 has identified improving access to comprehensive, quality health care services, like cardiopulmonary rehabilitation (CR), as essential for reducing cardiovascular disease (CVD) burden in the United States (US). Yet, the utilization of CR programs in the US is low, especially among rural communities where patients experience additional challenges. Low levels of physical activity and higher prevalence of CVD risk factors in the southeastern US further exacerbate these issues. **PURPOSE:** To evaluate the efficacy of a newly developed phase II CR program in rural Alabama. **METHODS:** Medical records of 14 cardiac and pulmonary patients enrolled in CR at a small rural hospital between November 2016 and July 2017 were analyzed retrospectively. Patient demographics, cardiometabolic profile, and functional capacity (i.e., 6-minute walk test [6MWT]) were assessed at baseline and upon program completion. **RESULTS:** Nine of the 14 patients successfully completed CR (64%). On average, patients were (*M*±SD) overweight (body mass index: 29.3±10.4 kg/m^{2}), middle-aged and older (range: 31-81 yr) adults (66.7% women; 37.5% Black) with dyslipidemia, who were taking ≥1 antihypertensive medication for their high blood pressure (BP) (systolic/diastolic BP: 135.0±20.9/76.0±7.5 mmHg). Baseline characteristics were similar among Black and White patients, with the exception of age: Black patients participating in CR tended to be younger than White patients (48±15 vs. 68±15 yr, p=0.07). Overall, patients attended the CR facility 1.8±0.2 d/wk and completed the 36-session program in 19.3±2.1 wk. Patients significantly improved their 6MWT distance post-CR compared to baseline (p=0.007), an estimated increase of 1.6±1.4 ml/kg/min (≈12.6%) in peak oxygen uptake. Participation in CR also produced small reductions in body weight (-2.1 kg, p=0.07). **CONCLUSIONS:** These preliminary results demonstrate that a newly developed phase II CR program in rural Alabama elicited favorable changes in body weight and functional capacity (i.e., 6MWT). Additional research is warranted to determine how CR programs can be tailored effectively to address challenges unique to rural communities while targeting the disproportionate burden of CVD in the southeastern US.

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Sedentary Behavior Characteristics in Cardiovascular Patients versus Healthy Controls.

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(No relevant relationships reported)

BACKGROUND: Time spent sitting is strongly and independently associated with an increased risk for adverse health outcomes, such as incident cardiovascular disease (CVD), diabetes, cancer and all-cause mortality. Previous studies mainly assessed sedentary behavior characteristics in the general population, whereas relatively little is known about this type of behavior in individuals with CVD.
PURPOSE: To compare sedentary behavior characteristics between CVD patients and healthy controls.
METHODS: Sedentary behavior patterns of 19 CVD patients and 18 age- and gender-matched controls were measured for seven consecutive days using the activPAL micro monitor. We used sedentary time (hours/day) as primary outcome, and the number of sedentary breaks (n/day) and sedentary bout duration (min/bout) as secondary outcomes.
RESULTS: CVD patients were sedentary for 11.1±1.5 hours/day, which was significantly more compared to healthy controls who reported 9.1±1.3 hours/day of sedentary behavior (mean difference 2.0 hours/day, 95%CI: 1.0 - 2.9). CVD patients broke up their sedentary behavior 32±7 times per day with a mean duration of each sedentary period of 15.5±3.7 minutes. In contrast, healthy controls had 42±8 breaks of sedentary behavior (p=0.016), whilst the average sedentary period only lasted 10.6±2.7 minutes (p<0.001). The mean difference for the number of sedentary breaks was -9.6 (95%CI: -14.5 - -4.7), and for sedentary bout duration 4.9 minutes (95%CI: 2.7 - 7.0). **CONCLUSIONS**: CVD patients spent more time sedentary during wake hours compared with healthy controls. Specifically, CVD patients had sedentary bouts with a longer duration and less frequently broke up their sedentary behavior compared to healthy controls. These findings stress the importance of specific interventions that target sedentary behavior in CVD patients.

B-64   Free Communication/Poster - **Metabolism, Mitochondria and Muscle Physiology**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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Seric Musclin is not Increased in Patients with Metabolic Syndrome and Insulin Resistance

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(No relevant relationships reported)

Skeletal muscle has now been recognized as an endocrine tissue, through the production and secretion of myokines. Musclin is a myokine mainly secreted by

fibers type II (FT-II) that induces insulin resistance (IR) in both cellular and murine models. We hypothesize that musclin could be involved in pathophysiology of metabolic syndrome (MS) in humans. **PURPOSE**: to evaluate the relationships among IR, seric musclin, area occupied by FT-II and muscle mass in adults with and without MS. **METHODS**: analytical study in adults with and without MS. Homeostatic model assessment (HOMA-IR) was used as indicator of IR, musclin was measured by ELISA, area of FT-II in right vastus lateralis muscle by proton magnetic resonance spectroscopy and both fat and lean mass of the body and the right thigh (absolute values in Kg, or indexes in Kg/m^2 and Kg/Kg body mass) by dual X-ray absorptiometry. Data presented as mean±standard deviation. **RESULTS:** 23 subjects with and 10 without MS, comparable in age (51.6±5.7 with MS vs 53.5±6.3 without MS; P>0.05) and gender were included. Subjects with MS had higher values of insulin (18.3±7.4 vs 6.7±2.5 μU/ml; P<0.05) and HOMA-IR (4.6±2.2 vs 1.6±0.6; P<0.05). There were no differences between groups regarding glycaemia (99.1±8.8 vs 93.2±12.7), musclin (609.9±203.4 pg ml^{-1} vs 657.9±240.5 pg ml^{-1}), area of FT-II (51.4±23.2% vs 49±26.7%) or absolute values or indexes of muscle mass. There were positive correlations between HOMA-IR and both body fat mass or thigh fat mass (r>0.46; P<0.05), between musclin and indexes of total lean mass (Kg m^{-2}, r=0.51; P<0.05) and thigh lean mass (Kg m^{-2}, r>0.54; P<0.05), also between area of FT-II and indexes of total lean mass (r>0.49; P<0.05). There was a negative trend between total lean mass and HOMA-IR (r=-0.34; P=0.07). We did not find correlation between HOMA-IR and musclin or area of FT-II. **CONCLUSIONS:** lean mass seems to determine seric musclin, however, this myokine was not associated to IR in our patients. These findings are in controversy with previous ones reported for cellular models. COLCIENCIAS 111562638757. CODI 2605. Interinstitucional 2016-1341. Colciencias doctoral scholarships 727-2015.

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Ketone Bodies Induce Mitochondrial Biogenesis In Skeletal Muscle Cells

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(No relevant relationships reported)

Previous studies have shown that a long-chain fatty acid-rich diet as well as endurance exercise induce increase in muscle mitochondria and enhance endurance capacity in rodents. We previously showed that a medium-chain fatty acid (MCFA)-rich diet increases mitochondrial protein levels in the skeletal muscles of non-obese rodents. However, its mechanism remains unclear. Most MCFAs are converted to ketone bodies, which are thereafter released into the blood. **PURPOSE:** The purpose of this study was to examine whether β-hydroxybutyrate (β-OHB), a ketone body, increases the levels of mitochondrial proteins in muscles (Exp. 1). We also evaluated the binding of β-OHB to peroxisome proliferator-activated receptors (PPARs), which regulate the expression of mitochondrial genes (Exp. 2). **METHODS:** Exp. 1: C2C12 mouse skeletal muscle cells were grown in Dulbecco's modified Eagle's medium (DMEM) with 10% fetal bovine serum and 1% penicillin/streptomycin (PS), and differentiated in DMEM with 2% donor bovine serum and 1% PS. After 5 days, the cells were treated with different concentrations (0.05, 0.1, 0.25, 0.5, or 1 mM) of β-OHB for 24 h. The levels of voltage-dependent anion channel (VDAC) and complex-IV (COX-IV) were then measured by western blotting. Exp. 2: PPARs-ligand-binding domain were incubated with buffer containing either agonists or β-OHB, and then with fluorescein-labeled coactivator peptide and terbium-labeled anti-GST antibodies. The fluorescence intensity was measured using time-resolved fluorescence resonance energy transfer. **RESULTS:** Exp. 1: Treatment of the cells with 0.25 mM, 0.5 mM, and 1 mM β-OHB increased VDAC levels compared with those in the control (3.5-, 2.6-, 3.7-fold, p < 0.05, respectively). Similarly, treatment with 0.25 mM and 0.5 mM β-OHB increased COX-IV expression compared with that in the control (2.0-, 2.5-fold, p < 0.05, respectively). Exp. 2: GW7674, an agonist of PPARα (EC50: 6.2±0.4 nM), and GW501516, an agonist of PPARδ (EC50: 10.3±3.6 nM), increased the fluorescence intensity ratio (520/495 nm). Treatment with β-OHB, however, did not increase the 520/495 nm ratio for either PPARα or PPARδ. **CONCLUSION:** The results indicate that β-OHB induces the expression of mitochondrial proteins in skeletal muscle cells of mice via a pathway different from the one associated with PPARs.

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Cancer-Related Fatigue and Mitochondrial Function in Cancer Survivors

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(No relevant relationships reported)

Cancer-Related Fatigue (CRF) is a commonly reported symptom of cancer survivors during or after treatment and can contribute to decreased quality of life (QOL). The cause of CRF is largely unknown and is likely multifactorial. CRF has long

been hypothesized to result from decreased energy production due to impaired mitochondrial function. **PURPOSE**: To investigate if impaired mitochondrial function contributes to CRF. **METHODS**: Ten cancer survivors (CA, Prostate, Breast, Ovarian), reporting CRF to varying degrees and 5 control subjects with no history of cancer (C), participated in this pilot cross-sectional study. The following measurements were obtained from all subjects: CRF (FACIT-F), depression (CES-D), QOL (PROMIS Global Well-Being (GWB)). Physical function was indicated by handgrip strength (HG), 30 Seconds Sit-to-Stand (STS), timed 6 min walk test (6MWT), and Godin Leisure Time Questionnaire (Godin). Mitochondrial oxidative capacity of the wrist flexor muscles was indicated by the time constant (T$_c$) of muscle mVO$_2$ recovery measured with near-infrared spectroscopy (NIRS). The upper limb was chosen so to be relatively independent from ambulation or activity. Analyses were by unpaired T-tests. Pearson Correlations were obtained for variables that differed between groups. Sig. p ≤ 0.05. Data are mean (SD).**RESULTS**: No significant group differences (all ≥ 0.3) were noted in age (CA = 53.8 (10.3), C = 48.6 (10.5) yr.), height (CA = 168.7(7.2), C= 166.6(9.0) cm), weight (CA=81.7 (13.2), C=73.8(13.6) kg), or body fat (CA=28.7 (4.45), C=33.14(8.6) %, bioelectrical impedance). Significant differences or trends were noted between CA and C groups in FACIT-F (Ca = 36 (11), C = 49 (2), p =0.01), CES-D (Ca = 11 (9), C = 4 (4), p = 0.05), PROMIS-GWB (CA = 37 (7), C =46 (3), p =0.02), HG (Ca = 27 (9), C = 38 (7) kg, p = 0.04), and 30STS (Ca = 15 (4), C = 22 (4), p =0.01)), and Tc (Ca = 46 (9), C = 36 (9) s, p = 0.07). Significant correlations were noted between: FACIT-F and CESD (r = -0.84), PROMIS-GWB (r = 0.90), STS (r = 0.72), and Tc (r = -0.52). PROMIS-GWB was also correlated to HG (r = 0.57), STS (r = 0.74), and CES-D (r = -0.93). **CONCLUSIONS**: Mitochondrial oxidative capacity (i.e. Tc) may be lower in Ca reporting fatigue compared to C and contribute to CRF (i.e. FACIT-F). Further, Tc may mediate QOL through CRF.

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Impaired Mitochondrial Function May Contribute to Disability and Symptoms of Multiple Sclerosis

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(No relevant relationships reported)

Multiple Sclerosis (MS) is a neurological disease of autoimmune origin. Cognitive, physical, and psychosocial symptoms arise which can interfere with activities of daily living and decrease quality of life (QOL) of persons with MS (PwMS). The cause of MS is unknown, but mitochondria have been implicated in the pathogenesis of the disease and may otherwise affect symptoms of MS including muscle endurance and symptomatic fatigue. Mitochondrial function in leg muscles has been studied in PwMS, but not in arm muscles which may indicate systemic effects independent of ambulation or activity.**PURPOSE**: The purpose of this study was to determine if altered mitochondrial function is associated with MS disability or symptoms. **METHODS**: Six PwMS and 5 healthy controls without MS (C) took part in this pilot cross-sectional study. All subjects were ambulatory. Measurements included QOL (PROMIS Global Well-Being), depression (CES-D), fatigue (FIS), Handgrip Maximal Voluntary Contraction (MVC), Symbol Digit Modalities Test (SDMT), Six Minute Walk Test (6MWT). Disability status was indicated by the MS Functional Composite Measure (MSFC) comprising: 25ft walk test, 9-Hole Peg Test, and PASAT. Mitochondrial oxidative capacity was indicated by the time constant (Tc) for the recovery of forearm muscle mVO2 using near infra-red spectroscopy (NIRS). T-tests and correlations were used with significance at p≤0.05. Data are mean(SD). **RESULTS**: MS and control (C) groups were similar in age, height, and weight (p ≥ .25 for all). Significant differences were noted between MS and C groups in QOL (MS=34.0(6.3), C=46.0(2.8)), CES-D (MS=15.3(8.2), C=3.8(4.0)), FIS (MS=60.3(37.8), C=4.2(5.0)), MSFC (MS=0.74(0.58), C=2.00(0.55)), and Tc (MS=54.4(9.8), C=36.0(8.8)s). For all participants, Tc was correlated with MSFC (r=-.751). In turn MSFC was also correlated with GWB (r.774), CES-D (r=-.673), FIS (r=-.698), 6MWT (r=.767), and SDMT (r=.643). Forearm Tc was not correlated to 6MWT (r=-.496, p=.145) suggesting some independence of this measure from ambulatory function. **CONCLUSIONS**: Mitochondrial oxidative function is related to disability status due to MS which in turn is associated with cognitive, physical, and psychosocial symptoms of MS. The results are consistent with a role for mitochondria in the pathogenesis and symptoms of MS.

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Insulin Receptor-WNK1 Signaling Targeting Glut4 Trafficking Are Blunted In Diabetic Skeletal Muscle

In Deok Kong, Ji-Hee Kim, Hanul Kim, Kyu-Hee Hwang, Kyu-Sang Park, Seung-Kuy Cha. *Yonsei Univ. Wonju College of Medicine, Wonju, Korea, Republic of.*
(No relevant relationships reported)

PURPOSE: WNK1 kinase is a downstream effector of insulin receptor-phosphatidylinositol 3-kinase (PI3K) signaling and regulates ion homeostasis. Impaired insulin signaling in skeletal muscle disturbs trafficking of glucose transporter 4 (GLUT4) associated with the onset of type 2 diabetes (T2D). WNK1 is highly

expressed in skeletal muscle and is known to regulate trafficking of transporters including GLUT1. Here, we investigated if and how insulin receptor signaling cascade targeting WNK1 regulates cell surface abundance of GLUT4 in skeletal muscle and whether this regulation is altered in T2D.
METHODS: Insulin receptor-WNK1 signaling cascades targeting GLUT4 trafficking were examined using *in vivo* T2D *db/db* mice and *in vitro* C2C12 cell models.
RESULTS: Compared with control mice, T2D *db/db* mice exhibited significant insulin resistance and decreased WNK1 phosphorylation, TBC1D4 and GLUT4 expression. Insulin increased phosphorylation of the downstream kinase Akt as well as WNK1 in a PI3K-dependent mechanism. A biotinylation assay demonstrated that insulin stimulates GLUT4 surface expression by promoting its exocytosis suggesting that WNK1 is a novel regulator of insulin-stimulated GLUT4 trafficking in the skeletal muscle. **CONCLUSIONS**: These results provide a new perspective on WNK1 function beyond regulation of ion homeostasis and offer new insights for pathogenesis of hyperglycemia in T2D. [Supported by NRF-2015R1D1A1A01060454 & 2017R1D1A3B03031760]

864　　　Board #125　　　　　May 30 2:00 PM - 3:30 PM
ALDH2 Restores Exhaustive Exercise-induced Mitochondrial Dysfunction in Skeletal Muscle

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(No relevant relationships reported)

Mitochondrial aldehyde dehydrogenase 2 (ALDH2) is highly expressed in heart and skeletal muscles, and is the major enzyme that metabolizes acetaldehyde and toxic aldehydes. The cardioprotective effects of ALDH2 during cardiac ischemia/reperfusion injury have been recognized. However, less is known about the function of ALDH2 in skeletal muscle.
PURPOSE: This study was designed to evaluate the effect of ALDH2 on exhaustive exercise-induced skeletal muscle injury.
METHODS: We created transgenic mice expressing ALDH2 in skeletal muscles. Male wild-type C57/BL6 (WT) and ALDH2 transgenic mice (ALDH2-Tg), 8-weeks old, were challenged with exhaustive exercise for 1 week to induce skeletal muscle injury. Animals were sacrificed 24 h post-exercise and muscle tissue was excised.
RESULTS: ALDH2-Tg mice displayed significantly increased treadmill exercise capacity compared to WT mice. Exhaustive exercise caused an increase in mRNA levels of the muscle atrophy markers, Atrogin-1 and MuRF1, and reduced mitochondrial biogenesis and fusion in WT skeletal muscles; these effects were attenuated in ALDH2-Tg mice. Exhaustive exercise also enhanced mitochondrial autophagy pathway activity, including increased conversion of LC3-I to LC3-II and greater expression of Beclin1 and Bnip3; the effects of which were mitigated by ALDH2 overexpression. In addition, ALDH2-Tg reversed the increase of an oxidative stress biomarker (4-hydroxynonenal) and decreased levels of mitochondrial antioxidant proteins, including manganese superoxide dismutase and NAD(P)H:quinone oxidoreductase 1, in skeletal muscle induced by exhaustive exercise.
CONCLUSIONS: ALDH2 may reverse skeletal muscle mitochondrial dysfunction due to exhaustive exercise by regulating mitochondria dynamic remodeling and enhancing the quality of mitochondria.

865　　　Board #126　　　　　May 30 2:00 PM - 3:30 PM
Heavy Load Exercise Causes Mitochondrial Dysfunction and Increases Mitophagy

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(No relevant relationships reported)

Scientific Abstract
PURPOSE: To observe the effect of heavy load exercise on mitochondrial structure and function in skeletal muscle of rats and analyze the change of mitophagy protein of PINK1 and Parkin and related proteins, and to explore the role of PINK1/Parkin pathway in exercise-induced mitochondrial damage in skeletal muscle. **METHODS:** Male Sprague-Dawley rats were divided into quiet control group (C group, n=8) and exercise group (E group, n=40). Rats in the E group performed a running on a treadmill down a 16°incline at 16m/min for 90 min, and those were further divided into 0h,12h,24h,48h and 72h sub-groups (n=8), and at each time point the soleus muscle was collected under anesthesia. Mitochondrial ultrastructural changes in skeletal muscle were observed by a transmission electron microscope. The content of quatitative enzyme citrate synthase (CS) and the activities of mitochondrial respiratory chain Complex II and IV were measured by ELISA. Protein expression of skeletal muscle cytochrome c oxidease subunit I (COX I),PTEN-induced putative kinase 1 (PINK1) and mitochondrial Parkin,microtubule-associated protein 1 light

chain 3 (LC3) were determined by western blot. Mitochondrial co-localization with Parkin,ubiquitin (Ub),p62/Sequestosome 1 (p62) and LC3 was measured by the immunofluorescence double labeling technique. One-way ANOVA was used to evaluate statistical significance. **RESULTS:** After heavy load exercise, the mitochondrial structure appeared to be abnormal and formed a lot of mitophagosomes; the CS content and Complex II activity significantly decreased, whereas the Complex IV activity and COX I protein level remained unchanged; the expression of PINK1 (E12=2.552±0.141),Parkin (E24=2.535±0.100),Ub (E24=2.501±0.191) ,p62(E12=2.662±0.240) ,LC3 (E12=2.757±0.180) significantly increased (C=1.000, $P<0.05$ or $P<0.01$).
CONCLUSION: A heavy load exercise may activate the PINK1/Parkin pathway and promote the combination of Ub,p62,LC3 and mitochondria, and result in mitophagy and mitochondrial damage within skeletal muscle.

866　　　Board #127　　　　　May 30 2:00 PM - 3:30 PM
Hypermetabolic Effects of Dietary Ketones are Independent of Changes in Skeletal Muscle Mitochondrial Respiration

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(No relevant relationships reported)

Dietary ketone-mediated increases in energy expenditure (EE) have been attributed to increased adipose thermogenesis; however, little is known regarding the contribution of skeletal muscle to the hypermetabolic phenotype. **Purpose:** Determine if dietary ketone esters increase mitochondrial respiration in skeletal muscle. **Methods:** Thirty 5-wk old male C57BL/6J mice were placed on an *ad libitum* high fat diet (HFD) for 10 weeks. Mice were then randomized to one of three groups (n = 10 per group) for an additional 12 weeks: 1) Control (CON, remain on HFD); 2) Ketone Ester (KE, 22% kcal from KE); 3) Pair-fed (PF, pair-fed to KE group). Body composition was measured during the final week of the study by Quantitative Magnetic Resonance (QMR) and EE was examined by indirect calorimetry. Skeletal muscle mitochondrial respiration was measured by high-resolution respirometry in permeabilized muscle fiber bundles. **Results:** Body weight in the KE group was 27% lower and total adiposity 54% lower than the PF group (p < 0.05 for both) despite comparable energy intake. Differences in body weight and adiposity were attributed to higher resting (REE) and total (TEE) energy expenditure in the KE group (p<0.05). Markers of mitochondrial biogenesis and thermogenesis were increased in brown adipose and a browning phenotype was observed in inguinal white adipose. However, there were no differences in skeletal muscle mitochondrial respiratory capacity between groups. **Conclusions:** These results provide further support that dietary ketone esters increase brown and white adipose thermogenesis but do not appear to have effects on mitochondrial respiration in skeletal muscle.

867　　　Board #128　　　　　May 30 2:00 PM - 3:30 PM
Mitochondrial Respiratory Capacity and Coupling Control of Skeletal Muscle in Colon-26 Tumor-Induced Cachexia

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(No relevant relationships reported)

Cancer cachexia is a life-threatening, paraneoplastic syndrome featuring unintended weight loss and skeletal muscle atrophy. Mitochondria, the major providers of cellular energy, couple oxygen consumption to ATP synthesis (i.e. oxidative phosphorylation, OXPHOS). Impaired mitochondrial bioenergetics (e.g. respiration) is associated with the pathophysiology of multiple diseases. The control of mitochondrial respiration in skeletal muscle during the induction and progression of cancer cachexia is not well understood. **PURPOSE:** To investigate mitochondrial respiratory capacity and coupling control of skeletal muscle in the colon-26 model of cancer cachexia.
METHODS: Balb/c males (10 wks) were assigned to control or colon-26 (C26). C26 mice were injected with 1×10^6 tumor cells, and tissue collected on days 7, 14, and 21 post-injection. In this model, mice develop palpable tumors at day 7, and cachexia by day 21. Controls were injected with PBS and tissue collected on day 0. Respiration was measured in permeabilized fibers from the medial gastrocnemius via high-resolution respirometry. A substrate-uncoupler-inhibitor titration protocol was used to evaluate Complex I OXPHOS (CI_p), Complex I+II OXPHOS ($CI+II_p$), and electron transfer system capacity (ETS). Efficiency of the OXPHOS system was determined from the ratio $CI+II_p/ETS$ (P/E). **RESULTS:** CI_p was significantly lower (p<0.05) at day 21 (4.8±1.6 pmol/s/mg) in comparison to day 0 (53.4±7.0), day 7 (57.4±6.5), and day 14 (60.0±2.9). $CI+II_p$ was significantly lower (p<0.05) at day 21 (22.3±2.3 pmol/s/mg)

in comparison to day 0 (65.5±7.8), day 7 (69.3±8.5), and day 14 (73.8±4.8). Maximal ETS was significantly lower (p<0.05) at day 21 (24.1 pmol/s/mg) in comparison to day 0 (83.7±13.8), day 7 (84.4±12.3), and day 14 (105.1±7.3). P/E was not significantly different across timepoints (p>0.05). **CONCLUSION:** Phosphorylating respiration with electron input from Complex I and I+II, and maximal electron transfer system capacity (i.e. non-coupled respiration) was significantly reduced at day 21 concomitant with cachexia, but not at earlier timepoints, suggesting that changes in oxidative metabolism occur as a consequence of cachexia rather than having a causative role. Loss of respiratory capacity may compromise muscle function and physical independence.

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Localization Of Myoglobin In Mitochondria: Implication On Regulation Of Mitochondrial Respiration In Muscle

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(No relevant relationships reported)

PURPOSE: Mitochondria play a principal role for metabolism and have a primary role in regulating respiration and energy expenditure. Recently, we showed that the muscle-specific protein myoglobin (Mb) interacted with complex IV to augment mitochondrial respiratory capacity in skeletal muscles. However, the precise mechanism for the Mb-mediated upregulation remains under debate. The present study has focused on localizing Mb within the mitochondria.
METHODS: Muscle specimen from deep portion of m. Gastrocnemius in Wistar rat was homogenized. Crude mitochondria were isolated by differential centrifugations and washed with the mitochondrial isolation buffer. The isolated mitochondria were treated with proteinase K (PK), osmotic shock (OS), and SDS (or TriX) in order to digest proteins on the outer membrane and in the intramembrane. The final samples were subjected to SDS-PAGE and immunoblotting using antibodies to localize the proteins in the mitochondria.
RESULTS: Western blotting analysis revealed that the PK digests Tom20, which localized on the outer membrane of mitochondria. The Tom20 band intensity decreased with the amount of PK used. Other mitochondrial proteins such as cytochrome c (intermembrane space), COX-IV (inner membrane), and PDH (matrix), were not affected by PK treatment. PK treatment did not affect Mb. The results suggested that Mb did not localize on the outer membrane of mitochondria. The combined treatment of PK, OS and SDS (or TrX) allowed immunoblotting detection of the mitochondrial proteins in specific regions of the mitochondria. For example, cytochrome c disappeared with OS treatment. Timm22 disappeared with PK+OS treatment. However, Mb was detected with either PK or OS treatment. But it cannot be detected with a combined PK+OS treatment. The results suggest that Mb associated with the inner membrane (intramembrane side, not matrix side) of the mitochondria.
CONCLUSIONS: We conclude that Mb in muscle cells localizes in the cytosol and in the mitochondrial intermembrane space. Since exercise training increases Mb expressions of skeletal muscle, the increased Mb concentration may play a direct role in modulation skeletal muscle respiration and oxidative phosphorylation capacity.

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Effects of PGC-1α Overexpression on Sirtuins, GCN5, and Mitochondrial Protein Acetylation in Aged Mouse Skeletal Muscle

Li Li Ji, FACSM, Dongwook Yeo. *University of Minnesota at Twin Cities, Minneapolis, MN.*
(No relevant relationships reported)

Mitochondrial dysfunction in skeletal muscle is well-documented in sarcopenia. Protein hyperacetylation in mitochondria is one of the emerging causes of the pathogenesis. The interplay between acetylases and deacetylases such as GCN5 and Sirtuins (SIRTs) plays an important role in maintaining mitochondrial quality, which is also controlled by PGC-1α. Thus, it is important to know how PGC-1α impacts on GCN5 and SIRT protein levels in aged skeletal muscle. **PURPOSE:** To investigate the effect of aging and PGC-1α overexpression (OE) on SIRTs and GCN5 protein expressions, global and mitochondrial protein acetylation in aged mouse muscle. **METHODS:** C57BL/6J mice at the age of 2 mo (young, Y; N=7) and 24 mo (old, O; N=7) were transfected *in vivo* with either PGC-1α DNA or GFP into the tibialis anterior (TA) muscle. For electroporation, mice were anesthetized, and a small incision was made through the skin covering the TA muscle. A 27-gauge needle was used to inject plasmid DNA solution into the proximal and distal ends of the muscle belly. Electric pulses were applied to proximal and distal myotendinous junctions. The incision was closed with surgical glue. **RESULTS:** Aging increased SIRT1 level by 1.9, and 2.4-fold (P<.01) in O and O/OE, respectively; PGC-1α OE enhanced this effect (P<.05). SIRT3 and 6 level were decreased by 70 and 80% with aging (P<.01), whereas this effect was attenuated with PGC-1α OE. GCN5 level was elevated by

~10-fold with aging (P<.01), and PGC-1α OE showed no effect. Total cytoplasmic and mitochondrial protein acetylation level was 1.5- and 1.2-fold higher in O vs. Y (P<.05), whereas no effect of PGC-1α OE was seen. **CONCLUSION:** GCN5 and global and mitochondrial protein acetylation levels were increased with aging in mouse skeletal muscle. PGC-1α OE exerted no effect on this aging phenomenon. However, PGC-1α OE upregulated SIRT1 and ameliorated age-associated reduction of SIRT3 and 6 protein levels.

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Comparison Between The Slow Components Of HR Kinetics And Of V'O$_2$ Kinetics: Functional Significance

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(No relevant relationships reported)

PURPOSE: Aerobic exercise prescription is often based on a linear relationship between pulmonary oxygen consumption (V'O$_2$) and heart rate (HR). The aim of the present study was to test the hypothesis that during constant work rate (CWR) exercises at different intensities the slow component of HR kinetics occurs at lower work rate and is more pronounced that the slow component of V'O$_2$ kinetics, thereby negating the linear relationship mentioned above. **METHODS:** Seventeen male (age 27±4 yr) subjects performed on a cycle ergometer an incremental exercise to voluntary exhaustion (to determine peak O$_2$ uptake [V'O$_2$ peak] and the gas exchange threshold [GET]) and several CWR exercises: 1) moderate CWR exercises (MOD), below GET 2) heavy CWR exercise (HEAVY), at 45% of the difference between GET and V'O$_2$ peak (Δ); 3) severe CWR exercise (SEVERE), at 95% of Δ 4) "HR controlled" exercise in which work rate was continuously adjusted to maintain a constant HR slightly higher than that determined at GET. Breath-by-breath V'O$_2$, heart rate and other variables were determined. **RESULTS:** In MOD, no slow component of V'O$_2$ kinetics was observed, whereas a slow component was observed for HR kinetics. During HEAVY, the amplitude of the HR slow component was more pronounced than that for the V'O$_2$ slow component. During the HR-controlled exercise the decrease in work rate needed in order to maintain a constant HR was associated with a decreased V'O$_2$. **CONCLUSION:** The HR slow component occurred at a lower work rate and was more pronounced than the V'O$_2$ slow component. The absence of a linear relationship between HR and V'O$_2$ during CWR at different exercise intensities has implications on exercise prescription and tolerance.

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Oxidative Stress Impaired Irisin Synthesis and Mitochondrial Homeostasis in C2C12 Myoblast

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(No relevant relationships reported)

PURPOSE: In aging skeletal muscle, disrupted mitochondrial homeostasis and lower levels of Irisin were found to accompany with elevated oxidative stress. Recent research indicates that impaired mitochondrial homeostasis may lead to diminished Irisin biosynthesis during aging. In order to gain some insight into the role of Irisin in mitochondrial homeostasis, we investigated the effect of oxidative stress, induced by exogenous H$_2$O$_2$, on Irisin and its precursor FNDC5, as well as key markers of mitochondrial biogenesis and dynamics in C2C12 myoblasts. **METHODS:** Myoblasts were treated for 24 hours with prepared dilutions of H$_2$O$_2$ in culture medium resulting in a final concentration of 10, 20, 40, and 80 mM. Survival rate of cells was detected by MTT to determine the optimal concentration of H$_2$O$_2$. Flow cytometry was used to assess mitochondrial membrane potential and reactive oxygen species (ROS) generation. Confocal laser scanning microscopy was used to monitor the morphology of the mitochondrial reticulum. Protein content of Mfn1, Mfn2, OPA1, Drp1, FNDC5, PGC-1α, NF-κB and p38 MAPK were measured with Western blot. Content of Irisin in culture medium was determined by Elisa. **RESULTS:** Treatment of cells with 80μM H$_2$O$_2$ caused decrease in mitochondrial membrane potential (-65%, p<0.01), and Mfn1 (-41%, p<0.01), Mfn2 (-49%, p<0.05), OPA1 (-17%, p<0.05), Drp1 (-25%, p<0.05), FNDC5 (-36%, p<0.01), PGC-1α (-80%, p<0.01), and p38 MAPK (-22%, p<0.05). H$_2$O$_2$ exposure elevated MDA content (+107%, p<0.01), ROS generation (+71%, p<0.01), and NF-κB activation (+23%, p<0.01). H$_2$O$_2$ induced visible fragmentation of the mitochondrial reticulum. However, Irisin content showed no significant change. **CONCLUSION:** H$_2$O$_2$ -induced oxidative stress impaird Irisin biosynthesis, which may be caused by disruption of mitochondrial homeostasis in muscle cells. Unchanged Irisin level in the cell might result from a decreased export under oxidative stress. Supported by NSFC (No. 81370454, 31110103919).

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Exercise Training Induced Anti-inflammatory IL-6 in Aged Skeletal Muscle: Role of Mitochondrial Homeostasis

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(No relevant relationships reported)

Deleterious actions for IL-6 have been proposed, such as provoking aging-associated low-grade inflammation accompanied with pro-inflammatory cytokine TNF-α and IL-1β. However, anti-inflammatory effect of exercise may to some extent be associated with muscle-derived IL-6 through inducing anti-inflammatory cytokines such as IL-1a and IL-10. It is increasingly clear that mitochondria are directly involved in the activation of anti-inflammatory response. **PURPOSE:** To determine the relationship between mitochondrial homeostasis and biological effects of muscle-derived IL-6 in aging and exercise intervention. METHODS: Male C57BL/6J mice aged 3 months (young) and 16 months (aged) were randomly divided into four groups: young normal (YN), young exercise training (YT), aged normal (AN) and aged exercise training (AT). Trained animals were exercised on a treadmill for 12 weeks. ROS generation, ATP content, mitochondrial homeostasis protein, anti-inflammatory and pro-inflammatory cytokines were examined in gastrocnemius muscle. **RESULTS:** Aging elevated ROS generation (+175%, p<0.01) and protein content of IL-6 (+104%, p<0.01), TNF-α (+188%, p<0.01), IL-1β (+85%, p<0.01), and NFκB (+77%, p<0.01), when comparing AN vs. YN. Furthermore, AN mice showed decreased ATP content (-26%, p<0.01), protein levels of COX IV (-29%, p<0.05), Beclin1 (-27%, p<0.05), PINK1 (-23%, p<0.05), IL-1α (-26%, p<0.05) and PGC-1α (-43%, p<0.01). Compared with AN, AT increased ATP content (+30%, p<0.05), COX IV (+35%, p<0.05), Beclin1 (+100%, p<0.01), PINK1 (+116%, p<0.01), IL-1α (+90%, p<0.01) and PGC-1α (+41%, p<0.05) levels. Moreover, training decreased ROS generation (-55%, p<0.01), IL-6 (-42%, p<0.01), TNF-α (-49%, p<0.01), IL-1β (-28%, p<0.01), and NFκB (-28%, p<0.05) levels. **CONCLUSION:** Aging increased inflammatory cytokine expression and deteriorated mitochondrial function in mouse muscle. Exercise training promoted mitochondrial biogenesis and mitophagy, suppressed inflammatory cytokine production, and elevated anti-inflammatory cytokines, possibly due to upregulation of PGC-1α and inhibition of NFκB pathway.

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Overexpression of PGC-1α Modulates Mitophagy in Aged Mice Skeletal Muscle

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(No relevant relationships reported)

Mitochondrial dysfunction may contribute to age-related muscle atrophy known as sarcopenia. PGC-1α has been shown to regulate selective mitochondrial autophagy (mitophagy) in skeletal muscles. However, its role in aged skeletal muscle is currently unclear. **PURPOSE:** To investigate the effect of aging and PGC-1α overexpression on autophagy and mitophagy protein markers, as well as mitochondrial ubiquitination (Ub) and content in skeletal muscle. **METHODS:** C57BL/6J mice at the age of 2 mo (young, Y; N=7) and 24 mo (old, O; N=7) were transfected in vivo with either PGC-1α DNA (OE) or GFP into the tibialis anterior (TA) muscle. For electroporation, mice were anesthetized and a small incision was made through the skin covering the TA muscle. A 27-gauge needle was used to inject plasmid DNA solution into the proximal and distal ends of the muscle belly. Electric pulses were applied to proximal and distal myotendinous junctions. The incision was closed with surgical glue. **RESULTS:** LC3II level increased 30% in O (P<.05) compared to Y, whereas PGC-1α OE had no effect on Y or O. P62 level was increased in O (70%, P<.05) vs. Y; however, PGC-1α OE abolished this effect (P<.05). RheB level was ~5.5-fold higher in both O and O/OE (P<.01), and PGC-1α OE reduced it by 22% (p<. 01). Beclin-1 level increased with aging (p<.01) but no effect of PGC-1α OE was seen. Aging decreased Bnip3 level (p<.01), whereas the effect was abolished with PGC-1α OE. PGC-1α OE increased Mfn2 level by 8.2 fold in Y/OE and 3-fold (p<.01) in O/OE, and Drp1 by 73% in O/OE (P<.05). Aging increased Fis-1 level by 20.1, and 14.4-fold (P<.01) in O and O/OE, respectively; however, PGC-1α OE attenuated this effect (p<.05). Mt PINK1 and Parkin level were increased by 3.6, 1.4-fold with aging (P<.01), whereas this elevation was diminished with PGC-1. Mt Ub was increased 1.5-fold in O vs. Y (P<.05), and suppressed by 20% (P<.05) in O/OE vs O. COX4 level was decreased 85% in O vs. Y (p<.01), but PGC-1α OE restore the level by 65% (P<.05). **CONCLUSION:** Aging disrupted mitophagy flux, upregulated fission, and reduced Mt contents, while PGC-1α OE ameliorated Mt homeostasis and dynamics.

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Testosterone and Resistance Exercise Improved Body Composition and Basal Metabolic Rate after Spinal Cord Injury

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(No relevant relationships reported)

Spinal cord injury (SCI) results in a dramatic loss in lean mass and subsequent increase in fat mass (FM) with concomitant decrease in basal metabolic rate (BMR). These changes expose persons with SCI to lifelong chronic health comorbidities. **PURPOSE**: To investigate the effects of testosterone replacement therapy (TRT) with evoked resistance training (RT) using neuromuscular electrical stimulation (NMES) on body composition and BMR in men with motor complete SCI. **METHODS**: Twenty-two participants were randomly assigned to either TRT+RT (n=11) or TRT only (n=11) for 16 weeks. The TRT+RT group participated in a progressive ankle weight lifting program using NMES twice weekly while sitting in their wheelchairs. The TRT was provided via transdermal testosterone patches (4-6 mg/day) placed on their shoulders. Body composition (lean mass and %FM) using dual energy x-ray absorptiometry and BMR using indirect calorimetry were measured prior to-and post-training. **RESULTS**: In the TRT+RT group, ankle weights (*P*< 0.0001) increased over the 16-week period for the right (19.6±6.5 lbs.) and the left (20±6.1 lbs.) legs. Serum testosterone decreased by ~ 34-36% (TRT+RT: 413.5±147 to 265±183 ng/dl and TRT: 435±177 to 288±258 ng/dl; *P*< 0.05) following both interventions. Total body (33±11% to 32±11%; *P* =0.025) and leg (33±11% to 32±9%; *P*= 0.037) %FM decreased by 1% in the TRT+RT group with no changes in the TRT group. Leg lean mass increased by ~1.8 kg (14.5±3.2 to 16.3±2.7 kg; *P*= 0.037) in the TRT+RT group with a concomitant increase in BMR by 218 kcal/day (*P* =0.03), but no changes in the TRT group. **CONCLUSIONS**: TRT combined with RT may help to attenuate the decline in lean mass and BMR years after SCI. At this dose or vehicle of delivery, TRT only is ineffective in restoring lean mass or BMR in men with SCI.

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Key Glycolytic Metabolites In Paralyzed Skeletal Muscle Are Altered 7 Days After Spinal Cord Injury In Mice.

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(No relevant relationships reported)

Spinal cord injury (SCI) leads to rapid losses in muscle mass due to immobilization and loss of communication with the central nervous system. SCI is also associated with an oxidative-to-glycolytic fiber-type transition which likely results in muscle metabolic function. How paralysis affects the levels of major muscle metabolites in is not well-described. **Purpose:** The purpose of this study was to identify changes in metabolite levels in muscle paralyzed at 7 and 28 d following a complete SCI. **Methods:** Female C57BL6 mice aged 20 weeks underwent sham or complete SCI surgeries. The sham group (Sham) was sacrificed at 7 d and SCI animals were sacrificed at 7 d (7d SCI) or 28 d (28d SCI) post-surgery (n=5/group). Gastrocnemius muscles were removed at sacrifice and flash frozen. Primary metabolomics analysis was performed on the muscle samples using GC-TOF mass spectroscopy (West Coast Metabolomics, NIH). Statistical analyses of mass spectroscopy peaks was completed using Metaboanalyst 3.0 and R Software. Protein expression was determined using Western blotting. **Results:** A principle components analysis identified muscle metabolites at 7 d SCI as a distinct cluster when compared to Sham and 28 d SCI. Metabolomic profiling identified 88 known metabolites with 8 being statistically different: lactate, glucose, maltose, oxoproline, sorbitol, tryptophan, maltotriose and pyruvate. Because glucose, lactate and pyruvate are key metabolites of glycolysis, the expression of key glycolytic proteins were probed. GLUT4 levels were upregulated in 7 d SCI animals compared to Sham and 28 d SCI animals. There was a strong trend (p=0.07) for reduced pyruvate kinase expression in 7 d SCI animals compared to Sham and 28 d SCI animals while pyruvate dehydrogenase was greatly reduced in 28 d SCI compared to 7 d SCI. The level of lactate dehydrogenase approached statistical reductions (p=0.09) at 28 d. **Conclusions:** Paralysis following SCI leads to reductions in glucose, lactate and pyruvate at 7 d post-injury with levels recovering by 28 d. Reductions in levels of these are seen despite elevations in the expression of GLUT4 expression at 7 d, suggesting SCI leads to a disruption in glucose handling and glycolytic functioning in paralyzed muscle in the acute timeframe after injury. Funding was provided by a VA RR&D Service Center Award (B9212C) to W.A.B.

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Type I Diabetes Suppresses Intracellular Calcium Ion Influx by Heat Stress in Rat Skeletal Muscle

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(No relevant relationships reported)

Intracellular Ca^{2+} ($[Ca^{2+}]_i$) homeostasis following muscle contractions is profoundly impaired in diabetic skeletal muscle. Because heat stress activates transient receptor potential vanilloid 1 (TRPV1) and promotes Ca^{2+} influx from the extracellular space in skeletal muscle we questioned whether TRPV1 might play a role in this pathological response. **PURPOSE:** To test the hypothesis that impaired muscle Ca^{2+} homeostasis in type I diabetic rats is due to attenuated heat stress tolerance (mediated via TRPV1). **METHODS:** Male Wistar rats were randomly assigned to 1 of 4 groups: 1. diabetes 40 ℃ (DIA40℃), 2. diabetes 30℃ (DIA30℃), 3. control 40℃ (CONT40℃), 4. control 30℃ (CONT30℃). Heat stress of 40℃ was selected because it represents the activation threshold of TRPV1. Spinotrapezius muscles of Wistar rats were exteriorized *in vivo* and loaded with the fluorescent probe Fura-2 AM. $[Ca^{2+}]_i$ was estimated over 20 min using fluorescence microscopy (340/380 nm ratio) in quiescent muscle held at the required temperature by means of a calibrated heat source applied to the ventral muscle surface. Western blotting was performed to determine the protein expression levels of TRPV1 in spinotrapezius muscle. **RESULTS:** After 20 min heat stress, the CONT40℃ condition induced a 20.0 ± 7 % $[Ca^{2+}]_i$ ($P<0.05$) elevation that was markedly absent from the DIA40℃ or other conditions. Thus there was no significant differences found over the 20 min observation period between DIA40℃, DIA30℃ and CONT30℃ ($P>0.05$). The expression of TRPV1 was significantly decreased 40 ± 7 % in DIA compared with CONT ($P<0.05$). **CONCLUSION:** This study revealed that the diabetic condition actually suppresses the expression of TRPV1 and inhibits Ca^{2+} influx evoked by heat stress. These findings do not support the notion that impairments of Ca^{2+} homeostasis during exercise result from increased Ca^{2+} influx due to thermal stress *per se*.

B-65   Free Communication/Poster - **Neuromuscular Physiology**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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877   Board #138   May 30 2:00 PM - 3:30 PM

Muscle Oxygenation Of The Quadriceps Femoris During Voluntary Or Femoral Nerve Stimulation Induced Fatiguing Contractions

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(No relevant relationships reported)

Fatigue of the superficial muscles in quadriceps femoris (QF), notably focusing on vastus lateralis (VL), has been evaluated using near infrared spectroscopy (NIRS). Our previous study (Akima & Ando Clin Physiol Func Imaging, in press) showed that muscle oxygenation of deep vastus intermedius (VI) muscle in QF was significantly higher, i.e. less fatigue, than the other superficial muscles after a fatiguing voluntary contraction. It is unclear that this higher oxygenation in VI at muscle fatigue was whether specific response induced by voluntary contraction or the other physiological characteristics. **PURPOSE**: The purpose of this study was to compare oxygenation level of individual muscles of the QF at fatigue, which was induced by voluntary contraction or femoral nerve electrical stimulation elicited contraction. **METHODS**: Eight healthy men (age, 27 ± 8 years; height, 175 ± 7 cm; weight, 73 ± 12 kg) performed isometric knee extension with knee joint angle of 90° at 50% of maximum voluntary contraction (MVC) for 50 sec induced by voluntary or femoral nerve electrical stimulation (frequency, 20 Hz; pulse duration, 200 μs). The oxygenation level of the VI, VL, vastus medialis (VM) and rectus femoris (RF) were measured using NIRS during the two types of fatiguing contractions. Tissue saturation (StO_2) of each muscle was calculated at -10, 0, 10, 20, 30, 40, 50 sec of the contraction time. A two-way (times x muscle) analysis of variance with repeated measures was used to compare parameters. **RESULTS**: StO_2 of all four QF muscles were significantly decreased after voluntary contraction and nerve stimulation elicited contraction; however, StO_2 in VM during voluntary contraction at 40 and 50 sec was significantly lower than nerve stimulation elicited contraction. When comparison StO_2 among four individual QF muscles at the end of fatiguing contraction, VM was significantly lower than VI during voluntary contraction and RF was significantly lower than VI during nerve stimulation elicited contraction. **CONCLUSIONS**: Muscle oxygenation in VI could be less fatigued during nerve stimulation elicited contraction as well as voluntary contraction, suggesting slower muscle fatigue in VI was the intrinsic characteristics of physiological response.

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mRNA Expressionin the Rat Spinal Cord Including Motoneurons Innervating Damaged Muscle

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(No relevant relationships reported)

PURPOSE: There are several methods to examine the morphological properties of spinal motoneurons, but it is difficult to evaluate their functional properties. In this study, we developed a method to evaluate motoneuron plasticity using real-time RT-PCR for the entire spinal cord in rats.
METHODS: Male Wistar rats (9 weeks old) were anesthetized and subjected to 100 repeated eccentric contractions (ECC) of their left plantar flexion muscles. The ECC were induced by direct electrical stimuli (45 V, 50 Hz) to the surface of the gastrocnemius muscle and simultaneous dorsal flexion of the ankle joint (150 degree/s, 0-40 degree). The lumbar spinal cord and medial gastrocnemius muscles on both sides were removed at 2 and 4 days after the ECC, and real time RT-PCR analysis was then performed using the muscle and spinal cord. The right gastrocnemius muscle and right half of spinal cord were used as the non-damaged control. Glyceraldehyde-3-phosphate dehydrogenase and Beta actin in the muscle and spinal cord, respectively, were used as housekeeping genes.
RESULTS: The mRNA expression of IL-6 was 50-times higher in the left muscles compared with in the right muscles, indicating marked muscle damage due to the ECC. The mRNA expression of the motoneuron-related factors Choline acetyltransferase, Osteopontin and Estrogen-related receptor gamma was significantly higher in the damaged left half than in the right control of the spinal cord. Furthermore, the mRNA expression of neurotrophic factors and their receptors, Calcitonin gene-related peptide and Brain-derived neurotrophic factor, was higher in the left half of the spinal cord. However, the mRNA expression of Nerve growth factor was significantly lower in the left half of the spinal cord. The mRNA expression of oxidative metabolism related factors, PPAR gamma coactivator 1 and Vascular Endothelial Growth Factor, was not significantly different between the left and right spinal cord.
CONCLUSIONS: These results indicate that reconstruction of some neuro-muscular systems is facilitated in the muscle and motoneurons by muscle damage induced by ECC. We concluded that this standard method for the spinal cord may be a useful tool to clarify the role of each neurotrophic and myotrophic factor in the muscle regeneration process.

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Effects Of Post-activation Potentiation On Neuromuscular Parameters

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(No relevant relationships reported)

PURPOSE: The aim of this study was to the effects of post-activation potentiation protocol (PAP) on neuromuscular parameters post-performance of an advanced resistance training method.
METHODS: Seventeen (n = 17) men who were experienced in resistance training (4.6 ± 1.4 years) completed PAP isometric protocol on the horizontal bench press, in the consisted in 3 sets of 3 seconds of maximum voluntary isometric contraction (MIVC). After interval 4 minutes was performed at the intervention with the resistance training where the Tri-set methodology of resistance training directed to upper limbs. Average power strength (POWs) and MVIC were assessed pre-potentiation and post-training. *Statistical:* for data analysis, the descriptive statistics was used with the determination of average and standard deviation. The Kolmogorov-Smirnov test with Lilliefors correction was performed to verify the data distribution. For the comparison analysis among the PAP mechanisms, the t test of paired samples was used. In all the analyses, the significance level was $p<0.05$.
RESULTS: in the POWs, there was a significant decrease ($p < 0.05$) among the pre ($712,96 \pm 124,70$ watts) and post assessments in both PAP stimuli (isometric: $559,13 \pm 118,98$ watts), in MVIC there was also a decrease without differences among PAP stimuli (control: 74.54 ± 19.48 kgf; isometric 62.72 ± 13.51 kgf).

CONCLUSIONS: We concluded that the PAP mechanism is ineffective after a tri-set method session, not showing plausible benefits that justify the daily routine in a gymnasium.

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The Effect of Caffeine on Peak Torque, Muscle Fatigue and Prefrontal Cortex Blood Flow

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(No relevant relationships reported)

Purpose: The purpose of this study was to assess the effect of caffeine consumption on prefrontal cortex (PFC) hemodynamics and muscular fatigue during maximal isokinetic exercise testing. **Methods:** Six active (exercise $\geq$3x/week, >1 hour per bout for >3 months) individuals (age 20.6$\pm$2.3yrs, body weight 72.1 $\pm$7.3kg, height 172.6 $\pm$ 14.5cm) participated in a double-blind placebo controlled study. Participants attended three separate exercise sessions on the Humac Norm Isokinetic Dynamometer. Each exercise session included three sets of 30 maximal knee extensions at 180° per second using their dominant leg. Exercise sessions were separated by one week and participants were instructed to refrain from consumption of caffeine 36 hours prior to testing. One hour prior to testing, participants were administered a placebo (NC), low caffeine (LC) (3mg/kg body weight) or high caffeine (HC) (6mg/ kg body weight) dose. Time-resolved near-infrared spectroscopy monitoring (TRS0-21, Hamamatsu) was utilized throughout testing to measure hemodynamics in the PFC. Peak torque and fatigue index were analyzed. **Results:** The fatigue index for HC (42.78%) and LC (42.82%) was lower when compared to the NC condition (47.39%; p<0.05). Peak torque per exercise session was found to increase during LC (124.17 N*m) compared to both NC (120.00 N*m) and HC (116.75 N*m). Additionally, LC showed a significant increase in total hemoglobin levels (141.21uM) compared to NC (101.05uM) and HC (97.618uM) in the PFC. **Conclusion:** The results of the study indicate that both high and low doses of caffeine were found to reduce fatigue across the bout of fatiguing exercise, but only LC resulted in increased peak torque and total hemoglobin to the PFC. Further examination of both PFC and local muscle hemodynamics should be explored to further understand the differential response between LC and HC.

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Relationships between Motor Unit Behavior during Maximal Effort Contractions and Skeletal Muscle Phenotype

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(No relevant relationships reported)

It has long been hypothesized that the physical properties of the muscle are related to motor unit behavior. Indeed, recent investigations have reported a relationship between skeletal muscle phenotype of the *vastus lateralis* and motor unit (MU) firing parameters during submaximal contractions. However, the nature of this relationship during maximal contractions in unknown and warrants further investigation. **PURPOSE:** The purpose of the current investigation, therefore, was to examine the relationships between motor unit firing behavior during a maximal voluntary contraction and Myosin Heavy Chain (MHC) isoform content of the *vastus lateralis* muscle in resistance-trained men. **METHODS:** Ten resistance-trained males (mean $\pm$ SD, age = 22 $\pm$ 2) completed a trapezoidal ramp contraction up to 100% of their maximal voluntary isometric strength (MVIC). During the contraction, surface electromyography was recorded from the VL using a multi-channel electrode array and decomposed to examine the firing characteristics of individual MUs. A skeletal muscle biopsy of the VL was also collected and the mean fiber area for type I and II muscle fibers was calculated for each individual subject. Regression analyses were performed to identify relationships between type II fiber area and the slopes or intercepts of the mean firing rate (FR_{MEAN}) vs. recruitment threshold (RT), max firing rate (FR_{MAX}) vs. RT, and RT vs. MU action potential amplitude ($MUAP_{PP}$) relationships. **RESULTS:** The mean type II fiber area was 65.8% ($\pm$ 13.5%). Each subject displayed a significant (p < 0.05) relationship for the FR_{MEAN} vs. RT (r = -0.95 to -0.82), FR_{MAX} vs. RT (r = -0.96 to -0.81), and RT vs. $MUAP_{PP}$ (r = 0.64 to 0.91) relationships. There were significant inverse relationships between type II fiber area and the y-intercept of the FR vs. RT relationship (p < 0.05). Additionally, strong relationships (r > 0.50) were found between type II fiber area and FR_{MEAN} vs. RT slope and RT vs. $MUAP_{PP}$ slope and intercept. **CONCLUSION:** These data further support the hypothesis that skeletal muscle phenotype is strongly related to MU behavior during isometric contractions. However, our data, in concert with previous investigations, may suggest that these relationships are influenced by the intensity of the contraction.

B-66　　Free Communication/Poster - **Intervention Strategies**

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882　　Board #143　　　　　　　　May 30 3:30 PM - 5:00 PM

Music And Regular Physical Exercise:perception Of Practiitioners Regarding Duration And Performance.

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(No relevant relationships reported)

Regular PE practice with music can improve subjective effort perception, motivation, extend the activity time and increase performance. Music is used by practitioners of different modalities and it is considered important by the practitioner, and this can influence the way music can be used in the training plan in order to improve performance, duration, engagement and quality of practice. The objective of this study was (1) to evaluate the use of music during different PE practices and (2) to evaluate how important music is to the practitioner. We used a questionnaire of musical taste and PE practice. The questionnaire assessed the relationship of the regular PE practitioner with music. We asked if the practitioner used music during the exercise and what was his preferred and current practice. The sample consisted of 50 participants, 28 men and 22 women, with a mean age of 36 years ($\pm$ 12.5). We used Google Forms to submit an electronic questionnaire, which was strictly forwarded to regular PE practitioners. Among the reported modalities we identified 28.6% resistance training, 18.4% running, 14.3% cycling and 10.2% walking. The level of physical activity of the participants was considered high, since most PE practices occurred either 2-3 times per week (46,9%) or 4 or more times per week (44,9%). The results show that 70% of the participants considered music necessary to perform the preferred PE, this result agrees with 71% of the participants that reported that listened music during their preferred PE. Also, 40% believed that music can change the PE session duration and 72.7% reported that music helps to improve performance during PE practice. Based on these results, we believe that music can stimulate greater engagement in PE practice, since most of the practitioners reported to listen to music during their PE practice. Also, according to the subjective perception reports of the participants, music became necessary for PE practice extension or it worked as a stimulant for PE performance improvement. These results suggest that music is an important factor for PE practice, especially in some modalities, and it should be included in the training program development (in a more elaborated way with the choice of musical style and rhythm) to improve the proposed training and not only as entertainment to be randomly chosen during PE.

883　　Board #144　　　　　　　　May 30 3:30 PM - 5:00 PM

Providing Estimates Of Fitness May Influence Subjects' Exercise

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(No relevant relationships reported)

PURPOSE: We investigated if providing measurements of cardiorespiratory and muscular fitness would influence subsequent self-reported physical activity. **METHODS**: The Exercise Vital Sign and current types of physical activity were obtained from 1315 individuals attending the 2014 and 2015 Minnesota State Fairs. The baseline mean Exercise Vital Sign was 213 min/week. Subjects were randomized in 1:1 fashion to control and intervention groups. The 656 intervention subjects were provided with personal measurements and age appropriate norms of cardiorespiratory fitness using a validated non-maximal step test to estimate VO2max and muscular strength using a hand grip dynamometer. All subjects were provided exercise recommendations based on current standards and follow up surveys conducted to determine subsequent physical activity. Follow up Exercise Vital Sign and physical activity type was obtained from 823 subjects (62.5%) over the following year. **RESULTS**: No significant changes in the Exercise Vital Sign were noted in the control group or intervention group at 3 months, 6 months or 1 year of follow-up. At 3 months resistance training activity was reported to increase in the intervention group from 29.1% to 42.8% while unchanged in the control group (26.3% to 31.4%) (p<0.05). The increase in resistance training was driven by a significant increase in those with grip strengths below normative values. Lifestyle physical activity was also reported increased in the intervention group at both 3 months (27.7% to 29.1%) and 6 months (25%) whereas it declined in the control group from 24.4% to 20.1% at 3 months and 18.7% at 6 months(p<0.05). Among the subjects who were less active at baseline (Exercise Vital Sign<150) we observed a significant increase in their Exercise Vital Sign from a baseline of 86 to 146 at 6 months (p<0.05). **CONCLUSIONS**: Recording the Exercise Vital Sign and providing exercise recommendations appears effective in increasing physical activity in less active

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Abstracts were prepared by the authors and printed as submitted.

individuals. In an already very active population measuring grip strength and estimating VO2max using a step test may have short term positive effects on lifestyle activity and resistance training. Wider adoption of these measures could be effective in promoting physical activity and resistance training.

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Associations Between The Physical Activity Vital Sign And Cardiometabolic Disease In High-risk Pediatric Patients

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(No relevant relationships reported)

Purpose: To determine the utility of the physical activity vital sign (PAVS), and its association with the cardiometabolic disease biomarkers of body mass index (BMI) and blood pressure (BP).
Methods: All patients in a high-risk family medicine clinic (>99% Medicare/Medicaid/Uninsured, n = 2710) were assessed via the PAVS (minutes/week), a product of the reported days/week and minutes/day of physical activity. For pediatric patients (5-18 years, n = 255), individuals were categorized into 3 PAVS groups: inactive (PAVS = 0), under-active (1 - 299), and sufficiently active ($\geq$ 300). Pediatric patients were further classified into youth (5-11 years, n = 118) and adolescents (12-18 years, n = 137). Associations were tested between PAVS, BP and BMI utilizing ANOVA. Chi-square-tests were used to compare results to 2015-2016 National Health and Nutritional Examination Survey (NHANES) reported accelerometer data.
Results: Among pediatric patients, PAVS decreased with increasing age (p = 1×10^{-6}). The average level of physical activity reported for youth patients was 384.9 $\pm$ 218.1 with 72.9% reporting sufficient PA, 24.6% under-activity and 2.5% inactive. Adolescents reported a mean PAVS of 278.3 $\pm$ 199.6 with 51.8% reporting sufficient PA, 33.6% under-activity and 15.6% inactivity. Using the PAVS, only 24.3% of adults reported sufficient PA of $\geq$ 150 minutes per week (mean 97.9 $\pm$ 149.4). Similar to adults, pediatric males reported a higher PAVS than females (355.1 vs 298.6; p < 0.05). BMI (p < 3.4×10^{-7}) and systolic BP (p < 0.001) were inversely associated with PAVS in pediatric patients. Similar to adults, patients meeting PA guidelines demonstrated reductions in obesity (p < 0.05) and hypertension (p < 0.05).
In comparison to NHANES data, a greater number of children report meeting PA guidelines through the PAVS (73% vs. 42% for youth, p < 0.00001; 51.8% vs 8% for adolescents, p < 0.00001). PAVS values decline with age and by adulthood the inactivity burden leads to a smaller portion of patients meeting PA guidelines (24% vs 60% in NHANES).
Conclusion: The PAVS may under-estimate the burden of physical inactivity in pediatric patients. However, correlations with BP and BMI may suggest a role for the PAVS in identifying youth at risk for obesity and hypertension, which may allow earlier intervention.

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Acute Effect of Three Different Exercise Training Modalities on Executive Function in Overweight Inactive Men: The BrainFit Study

Andrea del Pilar Quintero[1], María A. Domínguez-Sanchéz[2], Kely Bonilla-Vargas[1], Jorge E. Correa-Bautista[1], Gina Paola Velasco-Orjuela[1], Antonio García-Hermoso[3], Alejandra Tordecilla-Sanders[1], Robinson Ramírez-Vélez[1]. *[1]Universidad del Rosario, Bogotá D.C, Colombia. [2]Universidad de la Sabana, Chía, Colombia. [3]Universidad de Santiago de Chile, USACH, Bogotá D.C, Colombia.*

(No relevant relationships reported)

PURPOSE: There is currently a consensus about the positive effects of physical exercise on cognition. However, the exercise intensity-dependent effect on executive function remains unclear. Thus, the aim of this study was to compare the acute effects of high-intensity aerobic interval training (HIIT), resistance training (RT), or combined training (RT+ HIIT) on the cognitive inhibition and attention capacity in overweight inactive men adults (age 18-30 years old).
METHODS: Randomized, parallel-group clinical trial among 36 (23.6±3.5 years; 83.5±7.8 kg; 28.0±1.9 kg/m²), inactive men (i.e. <150 min of moderate-intensity exercise per week for greater than 6 months), with abdominal obesity (waist circumference $\geq$ 90 cm) or body mass index $\geq$ 25 and $\leq$ 30 kg/m² were randomly assigned to a HIIT (n=12), RT (n=7), RT+HIIT (n=7), and a control group (n=10) until the energy expenditure of 400-500 kcal. Cognitive inhibition and attention capacity were examined using Stroop Test and d2 Test of Attention respectively, before (pre) and 1-min post-exercise for each exercise training modalities.
RESULTS: For cognitive inhibition, significant differences were observed in HIIT and RT+HIIT protocols for congruent and neutral conditions, and in HIIT, RT and RT+HIIT for incongruent condition. The largest effect size was identified in RT+HIIT for congruent condition (*d*=1.70). Regarding attention capacity, there were significant

in RT+HIIT for concentration performance domain, and in RT and RT+HIIT with total performance. The largest effect size was found in RT+HIIT for concentration performance domain (*d*=1.23).
CONCLUSIONS: Acute RT+HIIT session reported larger effect sizes than RT and HIIT alone for congruent condition. Combined exercise seems to favor acute benefit on executive function and could be particularly recommended in inactive overweight men. Overall, combined RT+HIIT seems to favor acute benefit on executive function in inactive overweight men. **TRIAL REGISTRATION:** ClinicalTrials.gov NCT02915913 (Date: September 22, 2016).

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An Evaluation of an Unstructured and Structured Approach to Increasing Recess Physical Activity

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate the effectiveness of structured and unstructured programs implemented to increase physical activity (PA) for students during the recess period of the school day. **METHODS**: Two suburban school districts in Colorado (USA) implemented different techniques to increase recess PA during the 2015-16 school year. The structured program implemented in one school district included planned activities and games for students, led by a recess paraprofessional. The unstructured program implemented in the second school district provided equipment to students during recess by instructing teachers to roll out equipment carts at the beginning of the recess period. Students were able to use equipment, although it was not required. The amount of available equipment was recorded by the school district implementing the unstructured program. PA was observed using the System for Observing Play and Leisure Activity in Youth (SOPLAY). Evaluators recorded baseline and follow-up observations for sedentary activity, moderate activity (MPA), and vigorous activity (VPA). Observations from individual schools were aggregated so data analyses could be performed at the district level, and the distribution pattern for each variable was examined and noted to be either normally distributed or not normally distributed. Descriptive statistics were calculated for each variable of interest at the district level, and parametric and nonparametric tests were used to determine if the differences were statistically significant after adjusting for compounded error with a Bonferroni correction ($p < 0.004$). **RESULTS**: For the unstructured program (i.e., increased equipment): MPA increased and VPA significantly ($p < 0.004$) increased, while sedentary behavior decreased. For the structured program: MPA and VPA did not increase, whereas sedentary behaviors were higher following the program, though changes were not significant. **CONCLUSIONS**: This study indicates that the degree of effectiveness may vary between structured and unstructured recess PA programs. However, additional variables outside of the scope of this study such as teachers' interaction with students or the fidelity of the program may influence student PA during recess, and should be evaluated in future research.

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Associations Between Self-Efficacy and Acculturation on Leisure-Time Physical Activity in Hispanic Men Enrolled in a Weight Loss Intervention

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(No relevant relationships reported)

Background: Hispanic men have the highest prevalence of obesity-related chronic diseases when compared to men in other racial/ethnic groups. Benefits of regular leisure-time physical activity (LTPA) to improve health outcomes are demonstrable. There is limited information on how acculturation status and self-efficacy for exercise influence LTPA for Hispanic men. **Purpose:** To examine associations between acculturation, changes in self-efficacy for exercise behaviors, and changes in LTPA in response to a gender-and culturally-sensitive weight loss intervention (GCSLWI). **Methods:** Thirty-five Hispanic men (mean age: 41.5 (SD 11.2) yrs.; mean BMI: 34.8 (5.5) kg/m²) enrolled in a 12-week GCSWLI. Participants attended weekly in-person individual sessions guided by a trained bilingual Hispanic male lifestyle coach, were prescribed a daily reduced calorie goal, and 225 minutes of moderate-intensity physical activity per week. A free gym membership was provided to facilitate engagement in LTPA. The Acculturation Rating Scale for Mexican Americans (ARSMA-II) measured acculturation related to language, ethnic identity, and ethnic interaction at baseline. Self-efficacy for exercise and LTPA, assessed by the Global Physical Assessment Questionnaire (GPAQ), were measured at baseline and week 12. **Results:** On the ARSMA-II, 22 (63%) scored Very Mexican or Mexican Oriented, 9 (26%) scored

Slightly Anglo, and 4 (11%) scored Strongly Anglo. None scored Very Assimilated. At baseline, self-efficacy for exercise was 3.82 (SD 0.86) on a 5-point scale with 1 low and 5 high self-efficacy. Over 12-weeks, mean self-efficacy changed slightly by -0.18, (95% CI (-0.46,0.09)), mean LTPA increased by 200.1 (4.01, 396.3) minutes/week, with moderate and vigorous LTPA increasing by 90.1 (-23.2, 203.7) and 109.9 (16.1, 203.6) minutes/week, respectively. Change in vigorous LTPA was weakly positively correlated with change in self-efficacy score (Spearman's rho=0.30, p=0.08). We found no significant associations between ARSMA-II scores and LTPA. **Conclusions:** Significant improvements in LTPA were observed for Hispanic men participating in a GCSWLI. Acculturation and self-efficacy were not associated with this change. Studies examining additional factors that influence LTPA in this health disparate group are needed.

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Low-Frequency High-Intensity Interval Training (HIIT) Improves Cardiorespiratory Fitness and Body Composition in Overweight Adults

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(No relevant relationships reported)

PURPOSE: This study examined the effects of 8 weeks of low-frequency high-intensity interval training (HIIT) on cardiorespiratory fitness and body composition. **METHODS:** Twenty-three overweight/obese young men (mean age 22.7 ± 2.8 years, BMI 25.5 ± 1.8, percent body fat $22.3 \pm 2.2\%$) were randomly assigned to HIIT and no-intervention control (CON) groups. Participants assigned to HIIT group performed 12 bouts of 1-min 30-meter shuttle runs at 90% of heart rate reserve (HRR), interspersed by 1-min of active recovery at 70% of HRR once weekly. Participants in control group were instructed to maintain their daily lifestyle habit for 8 weeks. VO_{2max} was measured by beep test and body composition was assessed by bio-impedance segmental body composition analyzer before and after the study period. **RESULTS:** VO_{2max} was significantly increased after 8 weeks of HIIT intervention (HIIT +17.5% vs. CON -0.3%). Total body fat mass, percent body fat and waist circumference were significantly reduced after 8 weeks of HIIT intervention (fat mass: HIIT -7.9% vs. CON +4.7%, percent body fat: HIIT -7.6% vs. CON +2.9%, waist circumference: HIIT -4.5% vs. CON +0.8%). **CONCLUSION:** Our results demonstrate that low-frequency HIIT (i.e., performed once weekly) improves cardiorespiratory fitness and body composition in overweight/obese men.
Supported by HKU Seed Fund for Basic Research

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The Influence of Nutritional Intervention Program onthe Dietary Habits of High School Students

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(No relevant relationships reported)

The increase in obesity and sedentary lifestyle has caused many educational bodies to develop intervention programs in an attempt to implement healthier life style. **PURPOSE:** To assess the efficiency of an educational program embedded in a high-school curriculum on dietary habits of the students. **METHODS:** Fifty eight 10th grade students (15-16 yrs) participated in this study. 29 students were chosen randomly to attend four lectures on healthy nutrition habits. The lectures were given once a month for 4-month period by their physical education teacher, who had an appropriate background in nutrition. The other 29 students served as a control group and did not attend the lectures. All students were asked to fill-out a questionnaire before the intervention and three month after the last lecture. **RESULTS**: After the intervention program, the study group was found to adopt healthier dietary habits, expressed by higher consumption of grains (p<0.019), and vegetables (p<0.0039) in comparison to the control group. Interestingly, no differences were found between the two groups in the level of the students' knowledge on nutrition habits at the end of the intervention program. **CONCLUSIONS**: A nutrition intervention program for high school students as part of their curriculum has an effect on their nutritional habits and can lead to a positive change in their eating habits. Including lessons on nutrition and wellness in school should be encouraged, in order to increase students' awareness and implementation of healthy life style behaviors.

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Effect of A Neuromotor Intervention on Balance and Strength

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(No relevant relationships reported)

Falls are the most common mechanism of injury and a leading cause of accidental death in the elderly. Therefore, functional independence for the elderly is clearly contingent upon fall prevention. **PURPOSE** : The purpose of this study was to determine the effectiveness of a neuromotor-based exercise intervention on balance, balance confidence, and strength in older adults. **METHODS** : Nine individuals (eight female) with a mean age of 78.3 ± 9.3 years were assessed before and after a 16-session exercise intervention implemented over eight weeks. Balance was assessed using the Berg Balance Scale (BBS); lower-body strength and endurance was assessed using a 30-second sit-to-stand test (30 SSTS); balance confidence was assessed using the Activities Specific Balance Confidence Scale (ABC); finally, a handgrip dynamometer was used to assess grip strength. Participants were instructed in an exercise session two times per week consisting of the following exercises: squats, chair dips, lunges, band rows, hip flexion and extension, bicep curls, plantarflexion and dorsiflexion with band resistance, and a balance progression series. Two sets of 10 repetitions were completed for each exercise. **RESULTS** : There was a significant difference in balance, as indicated by an improvement in BBS from 44.5 ± 14.5 to 47.6 ± 14.6, ($p < 0.05$) after the intervention. Although not statistically significant, there was an 18 percent increase in 30 SSTS performance, from 11.0 ± 4.7 to 13.1 ± 3.9 repetitions. Similarly, ABC scores improved practically but not significantly, from $73.6\% \pm 14.8$ to $79.2\% \pm 15.7$. Pre- and post-test scores for grip strength performances were not statistically different. **CONCLUSION** : The findings of this study indicate that a 16-session neuromotor-based exercise intervention has a positive influence on balance in older adults. Moreover, there was a clinically significant improvement in 30 SSTS and ABC measures. It is strongly recommended that the elderly be encouraged to participate in similar neuromotor-based training, as this type of intervention may reduce falls and enhance independent living.

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Health And Wellness Coaching Improves Body Composition and Quality Of Life With No Diet Prescription

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(No relevant relationships reported)

Global obesity rates have reached epidemic proportions. However, it is estimated that 95% of the dieters find difficulty in maintaining weight loss and return to gain it for up to 2 years. The desire for long lasting behavioral and weight changes motivated health professionals to seek for new approaches to stop the obesity growing rates. Health and wellness coaching (HWC) comes up as a behavioral change approach, based on a client-centered process, without a diet prescription, and seems to be more likely to promote long lasting changes. The subject of this study had previously tried different diets, all of which failed to achieve lasting weight loss.
PURPOSE:the aim of this case report is to present and evaluate HWC in promoting sustainable lifestyle changes especially in body composition, eating pattern and self-assessment of quality of life.
METHODS: body composition, quality of life (WHOQOL-bref) and nutritional intake were assessed at baseline (P1), after 12 weeks of HWC (P2) and 14 weeks after the end of the intervention (P3). 12 HWC sessions were completed, which were held weekly (1 hour each), and 36 physical activity sessions, which were held 3 times a week (1 hour each). No diet was prescribed during the whole process.
RESULTS: In P3, HWC and physical activity sessions were associated with reductions in body weight (-5.1 kg), fat mass (-5.2 kg), BMI [from 29.6 (P1) to 27.8 kg/m^2 (P3)], and waist circumference (-7.1cm). From P1 to P3, we also observed maintenance of the fat free mass (54,1 kg), a decrease in total energy intake (-300 kcal/day) and fat intake (-44%). Great improvement in all aspects of self-rated quality of life was also shown. This outcomes emphasize the effectiveness of HWC in promoting behavioral changes with high impact in health parameters and quality of life.
CONCLUSIONS: HWC was effective once the new eating pattern and weight loss achieved during the process were maintained in the medium term after the end of the sessions.

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Epidemiology Of Self-reported Physical Activity In Eight Latin American Countries: Findings From Elans Study

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(No relevant relationships reported)

BACKGROUND: The prevalence of physical inactivity in Latin America was one of the highest reported worldwide. The purpose of this study was a comparative international study of population PA prevalence across eight countries from Latin American. **METHODS:** Data from the Latin American Study of Nutrition and Health (ELANS) were included in the analysis. The sample included 9,218 adolescents and adults aged 15-65 years. PA was assessed using the International Physical Activity Questionnaire. PA was compared among countries, gender, age group, socioeconomic, educational level and different PA domains. In addition to using the MET-minutes/week rank, we also used the rating in active or insufficiently active based in minutes/week. Individuals were categorized as active (mean $\geq$150 min/week) or insufficiently active (mean $\leq$150 min/week). **RESULTS:** The prevalence of physically active individuals was 52.5%. Men were more active than women in all countries. Only 13.4% of the population had high PA level and 27.4% showed moderate PA level. More than half (59.3%) of subjects exhibited low levels of PA. The prevalence of physically active individuals slightly, increased from low to high socioeconomic level. Regarding the educational level, the prevalence of physically active individuals was similar among those who have a lower educational levels, high school studies, and university degrees (52.4, 52.0, and 52.3%). The largest fraction of transportation time was explained by walking time (87%). Vigorous-intensity PA was the one that contributes the most for the total leisure time (52%). Recreation/sport time contributes with 25% to total leisure time. The total of minutes of PA is explained in 55% by leisure time and in 45% by transportation time. Most of the countries more than 80% of total MET-minutes/week were explained by walking (44%) and vigorous-intensity PA (39%). The only exceptions were Ecuador and Chile, the two countries with the highest levels of PA. **CONCLUSIONS:** The high percentage of Latin American subjects insufficiently active people and with low levels of PA should be of concern. Measures are needed to promote the practice of PA. If assessment methods are used consistently over time within this world region, trend data will inform countries about the success of their efforts to promote PA.

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Efficacy Of A Workplace Wellness Program On The Staff Of A Hemodialysis Clinic

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(No relevant relationships reported)

Current evidence indicates that health and wellness programs in the workplace provide numerous benefits with respect to altering indices of health. **PURPOSE**: The purpose of this pilot study was to assess the feasibility of a workplace wellness program (WOW) as a means of improving participation in habitual physical activity and improving dietary choices amongst the staff at a hemodialysis clinic and to assess the indirect impact of a workplace wellness program (WOW) on the hemodialysis patients. **METHODS**: 16-staff members (age: 45±8 y; BMI: 32±9 kg/m^2) from a hemodialysis clinic (nurses, technicians, and administrative staff) participated in a 12-week workplace wellness program (WOW) consisting of weekly counseling sessions, the provision of educational resources, physical activity incentive challenges, and healthy dietary choices challenges. Body weight (kg), height (cm), blood pressure, BMI (kg/m^2), waist circumference (cm), and hip circumference (cm) were collected 1-week prior to the intervention, at 6-weeks, and within 1-week following the conclusion of the intervention. **RESULTS**: On average participants lost 2.7±3 kg. (P<0.0002). There was a systolic blood pressure change of -16.86±19.81 mm Hg. BMI changed by an average -1±1.7 (P<0.0002). Waist Circumference changed by -2.6±3 cm (P<0.0016)

and Hip Circumference changed by -3.29±4 cm (P<0.0001). **CONCLUSION:** Our data demonstrated that the staff of a hemodialysis clinic improved BMI values in response to WOW. The pilot study suggests that a workplace wellness program has the potential to improve health indices of the staff of a hemodialysis clinic and may positively impact the health behaviors in the hemodialysis patients under their care.

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Changes in Physical Activity Using Motivational Interviewing in Law Enforcement Officers

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to investigate the effects on physical activity with the utilization of motivational interviewing (MI) on sedentary law enforcement officers (LEOs). In addition, this study considered the reasons why LEOs choose to be participate in physical activity or to stay sedentary. The incidence of cardiovascular disease and early mortality are prevalent in LEO, additional behavior change technique research may have a positive impact in their long term health and wellness. **METHODS**: The LEOs in this study represent veteran officers from the Midwest region of the United States, over the age of 35 years, who were not getting greater than 150 minutes a week of exercise. of the five officers involved in the study received four MI sessions in 6 weeks. Data collection procedures for this included transcripts from MI sessions, pre/post results from the Self-Efficacy for Exercise (SEE) scale (Bandura, 2006), the Stages of Exercise Behavior Change scale (SEBC) (Marcus, 1992), and 6 weeks of accelerometer data. A descriptive case study of five law enforcement officers was presented with examples drawn from data, followed by a cross-case comparison of the five officers. **RESULTS**: Overall, the number of steps for the participants increased a total of 20.6% from the pre-MI (420,044 steps/week) to the post-MI (506,780 steps/week. The SEE score increased by 18%. Positive movement in the SEBC was seen from pre-MI to post-MI in three out of five of the case study participants. The findings from this study also indicated four major themes regarding why officers make the physical activity choices that they make: (1) their life depends on it, (2) competition is key, (3) I'm too tired, who has energy to exercise, and (4) they choose to fail. **CONCLUSIONS**: Based on this study, sedentary LEOs can increase physical activity, increase SEE and help individuals to move closer to making behavior changes. Motivational interviewing can used an effective behavior change technique in LEOs. It can also be noted that officers have distinct barriers that keep them from participating in physical activity. Allied health care professionals and worksite wellness could benefit from information gained from this study.

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Health Professionals Trained As Diabetes Educators Are Influential In Their DM2 Patients´ Lifestyle

Sergio Márquez-Gamiño, Alejandro Castro-Rosales, Karla S. Vera-Delgado, Cipriana Caudillo-Cisneros, Fernando Sotelo-Barroso, Montserrat G. Vera-Delgado, Carolina Cabrera-de la Cruz. *Universidad de Guanajuato, León, Mexico.*
(No relevant relationships reported)

Diabetes mellitus (DM) is a pandemic disease. In 2015, 422 million people around the world were living with DM, 80% in developing countries. 642 million are expected to have DM by 2040; North America and the Caribbean will contribute with 60.5 million. Since long time ago it has been claimed that DM's treatment for control, as well for secondary and tertiary prevention should be based on education. **PURPOSE**: to compare life style in type 2 DM (DM2) patients being attended by health professionals trained or not as diabetes educators (HP-DE and HP-nonDE, respectively). **METHODS**: 160 DM2 patients, receiving health service in public health centers in Central Mexico, signed an informed consent, and answered a validated questionnaire to assess lifestyle in persons living with DM2 (IMEVID). The survey contains 25 items, distributed in seven domains, i.e. Nutrition, Physical Activity, Information on Diabetes, Adherence to Treatment, Alcohol Consumption, Emotion Management and Tobacco Consumption. Descriptive and inferential analysis was done using SPSSv21. **RESULTS**: 160 DM2 patients (70.6% women and 29.4% men) of 57.7±9.2 years (□±s.d.; n=152) were assigned to two groups: 1) 84 (55.0%) participants being attended by HP-DE; 2) 72 (45.0%) patients being served by HP-nonDE. The IMEVID total scores and the separated dimensions' scores were analyzed with Kolmogorov-Smirnov Tests. Total scores mean, HP-DE = 78.6±10.0/HP-nonDE = 61.3±12.7 were compared using a *Student's t* test for independent samples, resulting statistically different (*p<0.001)*. Six out of the seven dimensions were as well different (U-Mann Whitney): Nutrition, Physical Activity, Diabetes Information, Adherence to Treatment (p=0.001 for the previous four), Alcohol Consumption (p=0.02) and Emotion Management (p=0.04). **CONCLUSION**: training health professionals as diabetes educators have a positive impact on the lifestyle of their DM2 patients.

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Enhancing Goal Achievement: Do Implementation Intentions Influence Goal Achievement in a Worksite Pedometer Program?

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(No relevant relationships reported)

For behavioral change, having strong goal intentions does not guarantee goal achievement. Implementation intentions (II) are specific plans of action concerning when, how, and where an intended behavior will be enacted. This self-regulatory skill combined with self-monitoring from daily pedometer use may influence goal achievement. **PURPOSE:** To examine physical activity (PA) goal achievement between participants that used both II and a pedometer and those that just used a pedometer. **METHODS:** Sedentary employees (<150 minutes of moderate to vigorous PA/week) (N = 54) at a mid-sized public university were recruited to participate in an 8-week intervention. A 2-arm randomized trial was used to compare the effectiveness of: 1) only pedometers (PED) (n = 26) and 2) pedometers and II (PED + II) (n = 28) on goal achievement. All participants were asked to track steps daily. Participants in the PED + II group were asked to write three II for each perceived barrier to meeting their step goals in Weeks 1 and 4. Daily step goals for Weeks 1-3 were based on baseline data, increasing daily goals each week 10% (Time 1). At Week 4, participants were able to individually revise or keep their daily step goals for the remainder of the study to promote autonomy (Time 2: Weeks 4-8). Goal achievement was evaluated as whether the participant met their daily step goal each day that week (YES) or not (NO). **RESULTS:** For Time 1, at least one day/week goal achievement was higher in the PED group (97.4%; 25 ± 1) compared to the PED+II group (83.3%; 23.3 ± 3), as well as for Time 2 the PED was higher (84.6%; 22 ±2.8) than the PED+II group (70.0%; 20 ± 5.9). For ≥3 day/week goal achievement, the PED group again had higher goal achievement Time 1 (75.6%; 20 ± 2) and for Time 2 (57.1%; 16 ± 4) compared to the PED+II group (42.3%; 11 ± 5.3) and (35.5%; 10 ± 5.4); respectively. **CONCLUSIONS:** The PED group had higher goal achievement at both time points compared to the participants in the PED+II. Implementation Intentions have been promoted as a behavioral strategy to bridge the gap between intention and behavior, with specific emphasis on improving goal achievement (Gollwitzer & Sheeran, 2006). These results question the utility of II to enhance goal achievement. Further research is needed to examine if this contradictory finding is unique to worksite pedometer-based II.

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Do Bike Fix-It Stations Influence Active Transportation Awareness and Behaviors in a School Setting?

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate the influence of the installation of bike fix-it stations on active transportation (AT) awareness and behaviors among middle school students. Self-reported barriers to active transportation (AT) were also recorded. **METHODS**: Three suburban middle schools in Colorado (USA) installed bike fix-it stations on school property that were available for students to use to perform minor repairs to their bikes. A questionnaire was developed by the school district that inquired about AT behaviors (e.g., day·wk[-1] biking to school) and awareness and use of the fix-it station. The questionnaire was administered before installation of fix-it stations (pre-survey) at the various schools between October 2015 and October 2016. Approximately one semester after installation of the fix-it station at each school, post-surveys were collected. Survey results from individual schools were aggregated at the district-level. Descriptive statistics were calculated for variables of interest and nonparametric tests were used to determine if the differences existed, pre- to post. **RESULTS**: The vast majority (80%) of respondents had not used their school's fix-it station at the time of the post-survey. There was no significant difference in the number of days respondents biked to school each week, pre-to post-survey. Both those who were aware of the station and those who said they did not need training on its use were more likely to ride their bikes to school, though these relationships were not statistically significant. The most commonly selected barriers to active transportation were time (43%), distance (42%), weather (36%), and having things to carry (38%). Between genders, boys were more likely commute via AT than girls (p < 0.05). **CONCLUSIONS**: The installation of bike fix-it stations alone does not appear to increase AT, although the students in this survey were often not aware of or trained to use the station which may have affected these results. Other barriers should be addressed to make AT a more feasible choice for students.

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Comparing Home- And Group-based Physical Activity Interventions For People Living With HIV

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(No relevant relationships reported)

The transition of HIV infection from a terminal illness to a chronic disease requires a focus on lifestyle interventions to address health challenges in this vulnerable population. Social, mental and physical barriers to recruitment/retention of participants can create challenges to acquiring accurate measurements during studies. **PURPOSE**: The purpose of this investigation is to compare the methodologies and results of two approaches to community-based health interventions for people living with HIV (PLWH). **METHODS**: Data from an ongoing support group-based (SGB) intervention designed to improve health-related quality of life (HRQOL) through classes that teach and reinforce healthy lifestyle habits, like increasing physical activity (PA), for disease and symptom management was compared to that of a previously published home-based (HB) intervention by the investigators. The same accelerometer brand and psychometric questionnaires were used in each study. The SGB approach included the addition of Fitbits to help set goals and track progress. The approaches of each investigation were compared using the average changes from baseline in an independent t-test. **RESULTS**: The SGB study participants significantly increased daily steps from 4,326 ± 389.83 to 8,400 ± 487.58 (p=0.01), as well as mental health (p=0.03) and physical function (p=0.04) as measured by the SF-36. A decreasing trend in weight and perceived stress was also observed. The HB approach resulted in no significant change in daily step counts (p= 0.49). In comparison the HB intervention was more successful in retention rates and gathering reliable follow-up data with 57 participants. Although only 5 participants (out of 15) were retained at follow-up, the SGB study, however, did have more success increasing daily PA by 94% compared to a -5% change in the HB. **CONCLUSIONS**: Our results indicate that compared to an individualized HB program a SGB approach could be more effective in changing healthy behavior, like increased PA and stress reduction, to improve HRQOL in vulnerable populations. With minimal funding and no incentives offered, the SGB study encountered survival bias so it would be prudent for future investigations to find creative ways to keep participants involved in the program to determine their feasibility and effectiveness more reliably.

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College Students' Situational Motivation and Physiological Outcomes during Single and Double Player Exergaming Conditions

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(No relevant relationships reported)

PURPOSE: College students' psychological and physiological outcomes during single and double player exergaming conditions remain largely unexplored. The purpose of this study was to examine differences in college students' situational motivation, physiological responses and PA levels during single player and double player exergaming conditions.
METHODS: Twenty Chinese elite athletes (18 females; X_{age} = 27.3 ± 4.3 years; $X_{wt.}$ = 63.5 ± 9.9 kg) completed two separate exergaming conditions: 1) Xbox 360 Reflex Ridge-single player; and 2) Xbox 360 Reflex Ridge-double player. Participants' situational motivation (intrinsic motivation [IM], identified regulation [IR], extrinsic motivation [ER], amotivation [AM]) was examined following each exergaming condition using an established questionnaire. Blood Pressure (BP) response to each exergaming condition was measured using an Omron HEM-705CP digital BP cuff, with light PA (LPA), moderate-to-vigorous PA (MVPA), and energy expenditure (EE) assessed using ActiGraph GT3X+ accelerometers.
RESULTS: One-way ANOVAs suggested that no significant differences were observed for any outcome between the two exergaming conditions, F (1, 38) = 0.002-1.9, p = 0.2-1.0; n^2 = 0.0-0.05. However, it is noteworthy that participants demonstrated higher levels of IM and IR (5.5; 4.7, respectively) compared to ER and AM (3.4; 2.2, respectively) during both exergaming conditions. Further, participants engaged in slightly greater MVPA during the single player condition (8.8 minutes) compared to the double player condition (7.8 minutes)—resulting in greater EE being observed during the single player condition (63.7 kcalories) compared to the double-player condition (52.8 kcalories).
DISCUSSION: Findings suggest both single player and double player exergaming conditions may promote motivational states which are more predictive of long-term PA participation (i.e., IM and IR) and that a single player exergaming condition might be more physically demanding than a double player condition. The non-significance between conditions may due to small sample size, and thus future research with larger samples is warranted.

WEDNESDAY, MAY 30, 2018

900   Board #161   May 30 3:30 PM - 5:00 PM

Comparison of Caloric Expenditure in a Smart Watch and Portable Metabolic Cart

Andrew Rioveros, Evan Glasheen, Antoinette Domingo, Taylor Penaflor, Brian Panaligan, Jochen Kressler. *San Diego State University, San Diego, CA.*
(No relevant relationships reported)

Purpose: To validate a Smart Watch (SW) for wheelchair users by comparing caloric energy expenditure (EE) against expired gas analysis. Valid activity tracking will be helpful for clinicians, patients and consumers and may help increase physical activity levels among wheelchair users.
Methods: Five wheelchair users (age=50.0(5.6)) and three able-bodied (age=25.3(3.2)) participants completed a series of exercises including wheelchair treadmill propulsion at 30, 45, and 60 strokes per minute (spm) and arm cycle ergometry at 45, 60, and 80rpm. They were equipped with a SW on their dominant hand, heart rate monitor, and a portable metabolic tracking cart. The bundled workout app was used for each task. Caloric expenditure data was extracted from both devices and compared by Bland-Altman analysis. **Results:** For treadmill tasks, the SW reported the average EE at 30, 45, and 60spm frequencies were 7(2.0), 8(2.3) and 9(2.0) kcals, respectively. At the same frequencies, the metabolic cart expenditures read 10(3.9), 12(5.3), and 15(6.7). Bland-Altman analysis showed relatively poor agreement between the cart and watch at 30spm (mean difference 3 with limits of agreement (LoA) -4–9). Mean absolute percent error (MAPE) was 21.56%. Agreement worsened at higher stroke frequencies, 45spm (4(-4–12)) and 60spm (6(-4–10)). MAPE was 29.11% and 35.88%, respectively. For arm ergometry, the average EE reported by the watch at 45, 60, and 80rpm were 7(1.0), 9(1.5), and 11(1.4). Metabolic cart expenditures were 6(3.0), 7(2.4), and 8(2.8) at the same frequencies. Bland-Altman analysis showed good agreement at 45rpm (-0.4(-6–5)) with a MAPE of 32.69%. Agreement worsened at higher frequencies, 60rpm (-3(-6–1)) and 80rpm (-2(-7–2)). MAPE was 58.57% and 48.54%, respectively. **Conclusion:** While performing a treadmill task, the SW underestimated caloric expenditure, but overestimated for arm ergometry. The activity tracker records EE with good validity only at lower frequency tasks.

B-67   Free Communication/Poster - **Older Adults and Aging**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

901   Board #162   May 30 3:30 PM - 5:00 PM

Weight Loss Involving Exercise Increases Older Women's Perceived Ability To Accomplish Their Physical Roles

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(No relevant relationships reported)

PURPOSE: Older women are known to be at higher risk for both obesity and physical disability compared to their male counterparts. Reductions in perceived physical function (P-PFx) contribute to a decreased health-related quality of life (HRQoL). Weight loss can improve HRQoL in the domain of P-PFx, but the weight loss method that elicits the greatest improvements in both P-PFx and physical role limitations (PRL), such as difficulties or limitations in habitual daily physical activities, is less well characterized in older women. Thus, this study aimed to evaluate the relative efficacy of a weight loss program, with or without exercise, on changes in P-PFx and PRL in inactive overweight and obese older women.
METHODS: Women (n=53; 64-77 & 69.3±3.6 yo; 31.0±4.8 kg/m²) were randomized to either diet only (D; n=19) or diet+exercise (D+EX; n=34) treatment groups for 6 months. The diet component involved reductions of ~500 kcal/day and was designed to elicit ~10% weight loss. The EX program was comprised of 3 x 75-minute sessions/week with cardiorespiratory, resistance, flexibility, and balance modes. Outcomes of interest were related to physical domains and were assessed using SF-36 subscales that measure P-PFx and PRL.
RESULTS: Mean weight loss was similar in D and D+EX groups (9.9% vs. 9.1%, p>0.05). Within groups, both D and D+EX improved in P-PFx and PRL (all p<0.05). ANCOVA, controlling for baseline measures, revealed no group difference for change in P-PFx (p>0.05), but a group effect for PRL was evident with D+EX having a 16.5% greater change compared to D (p<0.01). Comparing groups, Cohen's d effect sizes were 0.18 and 0.86 for change in P-PFx and PRL, respectively. In the total sample, change in weight was not associated with change in P-PFx and PRL (r=-0.09 and 0.04, respectively, both p>0.05).

CONCLUSIONS: P-PFx is improved in older overweight and obese women after a weight loss intervention irrespective of whether it included exercise. Perceived ability to accomplish physical roles improved to a greater extent with exercise inclusion in the weight loss intervention in this older adult cohort.

902   Board #163   May 30 3:30 PM - 5:00 PM

A Comparison of Changes in Strength And Dynamic Balance Following 8 Weeks of Eccentric Training in Older Adults

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(No relevant relationships reported)

PURPOSE: To compare changes in leg strength and dynamic balance following training on an eccentric step trainer. **METHODS:** Participants ($N = 14$; 63.5 ± 2 years) completed 2 training sessions per week across 8 weeks, with session duration ≤ 10 minutes. Pre- and post-assessments included a 30-second repeated chair stand (RCS), the timed-up-and-go (TUG), and maximal eccentric strength (MES). Pre-test values for the sample were compared to population averages for the RCS and the TUG, to characterize the sample. Percent change was calculated using: [(Pre-test - Post-test)/Pre-test] x 100 and paired sample t-tests were conducted to compare changes on RCS, TUG, and MES. **RESULTS:** All participants met or exceeded the population average on the TUG and, overall, the sample began at a higher level on the TUG relative to this average ($p = .031$). In contrast, the sample for RCS began training below the population average ($p = .041$) and only 4 of 14 initiated training at or exceeding the population average. There was a significantly smaller percent improvement for TUG than MES ($p < .001$) and RCS ($p = .001$). There was no significant difference in percent improvement between RCS and MES. **CONCLUSIONS:** The positive changes in RCS and MES indicate similar improvements in eccentric and functional strength following the 8 week eccentric training program. The smaller percent change on the TUG may be attributable to the higher baseline performance. Further investigation using other assessments of general function and dynamic balance should be considered for samples with above average TUG performance.

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Changes In Cortical Gray Matter Following A 12-mohth Physical Activity Intervention In Older Adults

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(No relevant relationships reported)

Changes in cortical gray matter following a 12-mohth physical activity intervention in older adults
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PURPOSE: Aging is characterized by reductions in gray matter volume. Cardiorespiratory fitness is associated with higher cortical and subcortical gray matter volume in older adults, and several interventions have indicated that some brain areas might increase in volume after the intervention. However, volumetric changes in *cortical* regions have been under-examined in the context of controlled interventions. In the present study, we examined whether a 12-month randomized, controlled aerobic exercise intervention in older adults would change cortical gray matter volume.
METHODS: 116 participants were assigned to either an aerobic **walking** or **control** (stretching and toning) group. All participants completed MRI sessions before and after the intervention, which included high resolution structural scans. Our initial analyses focused on participants who maintained at least 75% adherence (N = 79 total; mean age = 66.94; 31 males). Thus, our primary analyses include 43 participants from the walking and 36 from the control groups. Gray matter volume was assessed via voxel-based morphometry (VBM) in FSL. Longitudinal VBM analyses were conducted on the images to test for differences between groups.
RESULTS: Following the intervention, gray matter volume increased in the bilateral frontal poles and middle/inferior temporal gyrus, as well as in the left anterior parahippocampus and posterior cingulate in the walking group compared to the control group. Unexpectedly, several regions increased in volume in the control group relative to the walking group, including the cerebellum and precentral gyrus.
CONCLUSIONS: Aerobic exercise is associated with plasticity in cortical gray matter in older adults. Among the most modified regions were those especially vulnerable to aging, including the prefrontal and medial temporal lobes. The reduction in volume in several motor and balance-related regions in the walking versus the control group may suggest that the effects of aerobic exercise on brain plasticity are regionally specific.

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Impact Of BAILAMOS© Dance Program On Self-reported Physical Activity In Older Latinos

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(No relevant relationships reported)

By 2050, 20% of the older population in the US will be comprised of Latinos. However, Latino health is often poorer than that of non-Latinos whites, with a higher prevalence of chronic diseases and Alzheimer's disease. In addition, Latinos engage in low leisure-time physical activity (LTPA) levels. **PURPOSE:** Test the impact of the BAILAMOS© dance program on lifestyle PA at 4 months and BAILAMOS© maintenance activities on lifestyle PA at 8 months. **METHODS:** Older Latino adults (N= 333; M_{age} = 64.89±7.08) were randomized into the dance (n=167) or health education (HE) (n=166) groups. Inclusion criteria were: (1) aged ≥55 years old; (2) self-identification as Latino/Hispanic; (3) Spanish speaker; (4) participation in ≤2 days/week of aerobic exercise; (5) at risk for disability; (6) Mini-Mental State Examination >14; (7) Danced <2 times/month over past year. The dance group participated in 4 months of Latin dancing, two times per week, plus a 4-month maintenance program. The HE group participated in health education classes once per week for 4 months. The Community Healthy Activities Model Program for Seniors (CHAMPS) Physical Activity Questionnaire was administered. A random-intercept mixed model with data imputation was performed, adjusting for baseline covariates of age, sex, education, income, and health status. **RESULTS:** Total PA significantly increased at 4-months in both dance (M=899.3 ± 538.6) and HE groups (M=870.4 ± 555.8) compared to baseline (Dance, M=718.2 ± 529.4; HE, M=702.3± 437.9; Estimate=137.08, SE=57.52, p=0.017). It was also observed that total LTPA increased in the dance (M=578 ± 433.2) and HE group (M=464.2 ± 394.6) at 4 months compared to baseline (Dance, M=385.3 ± 416.9; HE, M=364.8 ± 332.7; Estimate=89.9, SE=43.81, p=0.04); and from baseline to 8 months (Dance, M=536.1 ± 470.6; HE, M=436.3 ± 336.5; Estimate=104.09, SE=47.36, p=0.028). The mean change in LTPA between dance and HE at 4-months was statistically significant (M=114.24, SE=48.84, p=0.019). However, there was no group*time interaction (p > 0.05). **CONCLUSION:** The results demonstrated that both study groups increased their self-reported total and leisure-time PA after 4 and 8 months, suggesting a positive impact of both dance and the HE program on PA levels in older Latinos. Supported by NIH Grant 1R01NR013151-01.

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Effects Of Lower-leg Training With CLX Bands On Balance, Strength, And Mobility In Older Women

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(No relevant relationships reported)

Weakness in the lower-leg, particularly the tibialis anterior, can negatively impact balance and mobility, and thus exacerbate the risk for falls. Although a variety of interventions have been shown to improve strength and balance, such programs often require extensive time and trained professionals. Furthermore, targeting the muscles of the lower-leg is difficult using traditional resistance exercises. The advent of CLX elastic bands with their continuous-loop design has made it easier to perform such exercises. However, the efficacy of such training is unknown. **PURPOSE**: The purpose of this study was to determine if performing two lower-leg exercises using CLX bands for short periods of time (10 min) each day in a home-based setting improves strength, balance, and mobility in older women. **METHODS**: Eleven women (age=78.8±4.8yr) participated in exercise training and 10 women (age=77.7±4.5yr) served as controls. All participants were sedentary retirement community residents. Training consisted of chair-based dorsiflexion and plantar flexion exercises using CLX bands performed in the residents' apartments for 3 sets of 10 repetitions on 5 d/wk for 8 wk. Performance was assessed before and after the intervention. Isometric dorsiflexion and plantar flexion strength was assessed using a hand-held dynamometer. The Limits of Stability (LoS) test, performed on a force platform, was used to assess dynamic balance. Mobility was assessed by the Timed Up-and-Go (TUG) test. **RESULTS**: Compared to controls, CLX band training improved (p<0.05) both dorsiflexion and plantar flexion by approximately 20%. LoS improved in the forward and backward (but not other) directions by 7% and 9%, respectively. TUG performance did not change in either group. **CONCLUSIONS**: Lower-leg training with CLX bands appears to improve dorsiflexion and plantar flexion strength as well as LoS in the forward and backward directions, but not mobility, in older women. These improvements may reduce the risk of falls.

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Combined Aerobic And Resistance Training In The Elderly: Effects Of Exercise Order On Arterial Stiffness

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(No relevant relationships reported)

PURPOSE: Prescribing aerobic and resistance training in conjunction is proposed as an optimum strategy to target cardiovascular as well as musculoskeletal functions in the elderly. However, few studies have examined the effects of intra-session exercise order on arterial stiffness in the elderly. This study investigated the effects of aerobic exercise before and after resistance training on arterial stiffness, body composition, and muscle strength in older men. **METHODS:** Forty-five older men (70.5±3.5 years) were randomly assigned to one of three groups that performed aerobic exercise first (AR: 16), performed resistance training first (RA: 16), and did not perform any training (CON: 13). The AR and RT groups performed aerobic exercise consisted of cycling at 60% heart rate reserve (HRR) and resistance training consisted of 5 types of exercises (leg curl, leg press, chest press, seated row, shoulder press) at 70-80% one repetition maximum (1RM) twice a week for 10-week. Body composition was evaluated by height, weight, body fat percentage, lean body mass and waist circumference. Muscle strength was measured by 1RM and arterial stiffness was evaluated by carotid-femoral pulse wave velocity (cfPWV). Pre- and post-intervention group comparisons were analyzed using a two-way ANOVA with repeated measures. **RESULTS:** A significant group difference was observed in cfPWV (F=3.464, P=0.042). cfPWV significantly reduced in the RA group (9.3±2.1 m/s to 8.2±1.9 m/s,P<0.05), while did not change in the AR group (8.4±2.1 m/s to 8.7±1.5 m/s, P=0.413). Significant group differences were observed in all exercise types (leg press: F=9.814, P=0.001; leg curl: F=26.667, P=0.001; chest press: F=17.223, P=0.001; seated row: F=15.648, P=0.001; shoulder press: F=13.244, P=0.001), and waist circumference (F=10.516, P=0.001). However, there were no significant differences between AR and RA. **CONCLUSION:** Based on our results, aerobic exercise after resistance training reduced arterial stiffness and a difference of intra-session exercise order was observed.

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The Relationships Of Physical Exercise To Executive Function And Mental Health In Elderly Individuals

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(No relevant relationships reported)

PURPOSE: In exchange for a life of greater convenience, the pandemic of physical inactivity has become a worldwide public health concern. This study aimed at evaluating the relationships of the intensity and types of daily physical activity and weight status to cognitive function and mental health among elderly individuals. These examinations may provide a useful evidence of how intense and what types of exercise improve cognitive function and mental health. **METHODS**: The total number of 307 healthy individuals (110 males, 197 females; 42 to 84 years old) was studied. The amount, frequency, intensity, and type of daily exercise were assessed by the questionnaire. The performance of inhibitory control as an index for executive function was evaluated by the Stroop Test. The status of mental health was evaluated by the General Health Questionnaire 28.
RESULTS: As the results, moderate intensity exercise habits were positively related to performance on Stroop Test after controlling for age, sex, and BMI (β = .10, p = .01). The interaction effect between sex and BMI on Stroop Test performance was observed after controlling for age, sex, and exercise habits (β = .10, p = .01). The over-weight was associated with poorer Stroop Test performance in females (β = .12, p = .02) but not in males (β = -.09, p = .16). No significant relationships of exercise type and performance on Stroop Test was detected. No significant relationships of age, sex, weight-status, and exercise habits to mental health status was observed, whereas resistance training was positively associated with mental health status (β = .12, p = .03).
CONCLUSIONS: This study suggests that daily physical activities with moderate intensities, but not with vigorous intensities, are associated with better executive function in elderly individuals. Furthermore, the relationships of weight-status and executive function may be moderated by sex. Resistance training appears to be useful exercise for enhancing mental health status in elderly individuals. Current results provide the evidence to help forming efficient strategies to personalize their active approaches.

WEDNESDAY, MAY 30, 2018

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Effects Of 24 Months Resistance And Endurance Training On Muscle Quality, Quantity And Physical Functions In Elderly With Long-term Care

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(No relevant relationships reported)

Muscle quality has been determined the fat tissue content within a skeletal muscle (i.e. intramuscular fat content). Muscle quality become worse with aging and disuse as a result of increasing of intramuscular fat and/or decreasing of muscle tissue. Intramuscular fat content is known as a negative contributor to force production and physical functions. We have reported the unique change of muscle quality by the 12 months resistance and endurance training in elderly; however, it is not well understood how the muscle quality, quantity and physical functions change by further 12 months (totally 24 months) trainings. **PURPOSE**: The purpose of this study was to assesse the effects of 24 months training on muscle quality, quantity and physical functions in elderly who need long term-care. **METHODS**: Ten elderly men and women (6 women and 4 men, age, 77 ± 6 years; height, 154 ± 7 cm; weight, 54 ± 9 kg) participated in this study, and they needed long-term care while they could do almost all activities of daily living. They performed physical training consisting of resistive exercises, stretching, and aerobic exercises as a part of rehabilitation program once or twice a week for 24 months. B-mode transverse ultrasonographic images were taken from rectus femoris (RF) and biceps femoris (BF). Echo intensity (EI) as an index of muscle quality and muscle thickness as an index of muscle quantity was calculated from these muscles. We measured their physical performance tests, i.e. isometric knee extension peak torque (PT), one-leg stand, chair stand, handgrip strength, 5-m normal/maximal walk, and timed up and go, before and after the training. **RESULTS**: EI in RF and BF did not change through the intervention, but BF thickness was significantly increased after the training. PT, 5-m normal/maximal walk, and timed up and go were improved after the 24 months training. Percent change of PT was the only independent variable to explain the percent change of EI in RF (regression coefficient = 1.24, R = 0.91, adjusted R^2 = 0.82, $P < 0.001$), implying that improvement of PT could be induced increasing EI in RF. **CONCLUSIONS**: Twenty-four months concurrent training induced muscle hypertrophy with the improvement of physical functions. Furthermore, in this type of long-term training, the increase of EI RF could be a key to improve PT.

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Physical Function, Cardiorespiratory Fitness, and Body Composition in Older Individuals

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(No relevant relationships reported)

Advanced age is often accompanied by deterioration of body composition and physical function. These alterations can lead to reduced performance of activities of daily living and autonomy. It has been purported that regular aerobic exercise may enhance physical function in older adults.
PURPOSE: To determine the effects of habitual physical activity on physical function (5m gait time, 5m gait speed, and total gait time), cardiorespiratory fitness (VO_{2max}), and body composition (body fat percentage, total lean mass, and bone mineral density) outcomes in older adults.
METHODS: 27 active and 35 inactive older adults (70 ± 5yrs, 73.4 ± 15.0 kgs, 170 ± 8.0 cm, 30.7 ± 7.5% body fat) were recruited for this study. The perceptually-regulated treadmill exercise test was used to estimate VO_{2max}. Body composition was determined by a whole body DXA scan. Gait variables were assessed via the 400m walking test. The Yale Physical Activity Survey (YPAS) was used to determine self-reported activity.
RESULTS: Active individuals had better 5m gait time (2.78 ± 0.24 vs 3.02 ± 0.48 seconds, p <0.05), gait speed (1.81 ± 0.15 vs 1.68 ± 0.24 m/s, p <0.05), total gait time (273.3 ± 21.6 vs 297.4 ± 43.0 seconds, p <0.05), VO_{2max} (41.3 ± 9.1 vs 26.0 ± 4.1 ml/kg/min, p <0.01), and reduced body fat (25.8 ± 6.6 vs 34.1 ± 6.24 %, p < 0.01) compared to sedentary individuals. Age was positively correlated with 5m gait time (r= 0.39 P <0.01) and negatively correlated with gait speed (r= -0.40, p <0.01), but was not a determining variable for any other physical function or body composition outcome. Exercise time (7.9 ± 5.8 hrs/week) was positively correlated with gait speed (r= 0.27, p <0.05) and negatively correlated with 5m gait time (r= -0.30, p <0.05), total gait time (r= -0.30, p <0.05), and body fat percentage (r= -0.33, p <0.01). VO_{2max} was negatively correlated with gait total time (r= -0.258, p <0.05) and body fat percentage (r= -0.580, p <0.01).

CONCLUSION: While aging is considered a main determinant for decrements in physical function, these data suggest that habitual exercise, low body fat percentage, and increased cardiorespiratory fitness are better determinants of improved physical performance in active older men and women.

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Impacts of Multidimensional Exercise Program for Older Adults on Mild Cognitive Impairment

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(No relevant relationships reported)

Substantial evidence suggest that the prevention and improvement were a crucial factor of the early stage of dementia. Although the exercise programs were found to improve positive effects of cognitive function, there is a lack of research on the impacts of their use in multidimensional exercise program design on functional fitness on mild cognitive impairment for older adults. **PURPOSE:** To examine the impacts of multidimensional functional fitness program design on mild cognitive impairment for older adults. **METHODS:** A pre -post one group experimental design for this study. The pool of available participants in this study were 25 volunteer with mild cognitive impairment elder (on age 65 or above) enrolled in a multi-exercise prescription program. For random reasons were not available for 10 subjects. The final analysis were performed on a sample of 15 volunteer participants.(age: 78.76±7.06,height: 150.9±9.2,weight: 56.4±7.24. The material as measurement on cognitive function for participants was a Mini Mental State Examination, MMSE. The study was implemented during ten- weeks period. Each week was performed 90 min. on a multi-exercise prescription program. A multidimensional functional physical and mental fitness platform designed were performed on the program. Data analysis were applied to each of the dependent variables. A t-test was use for pre -post one group experimental design. After participants completed 10 weeks of training program, a post-test was delivered. Calculations were made using the Statistical Package for the Social Sciences(SPSS). All tests of significance adopted an alpha level of .05. **RESULTS:** The participants demonstrated positive increased cognitive function on three dimensions: total score of MMSE (17.07±3.127 vs 21.93±3.845), reaching a significant difference (p=.001, p < .05). The average score increased from 17.07 before the intervention to 21.93 after the intervention. The results also revealed that two variables among MMSE score were significantly different for cognitive function performance including short-term memory (p=.000, p < .05) and understanding (p=.002, p < .05). **CONCLUSIONS:** The multidimensional functional fitness program intervention on mild cognitive impairment may result in older adults processing cognitive function more effective.

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Association Between Light Intensity Physical Activity And Sedentary Behavior Among Active Older Women

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(No relevant relationships reported)

Objective: to examine the association between light intensity physical activity (LIPA) and sedentary behavior (SB) among active older women. **Methods:**Physical activity intensity was based on the accelerometer scale sedentary, light, moderate, total moderate vigorous physical activity (MVPA), vigorous and very vigorous. Sample consisted of 75 women, with mean age 69.2 ±8.6 years old, BMI 20.2 ±14.4 kg/m². They were involved in a exercise program of 2 times sessions per week, 50 min duration each in a Municipal Elderly Center. All off them taken part in the Longitudinal **Project on Aging and Physical Fitness** from São Caetano do Sul. An accelerometer (*Actigraph GT3X+)* was used in the waist by the participants 24 hours per day, during 10 days in a row. Seven days data, including one weekenday, were considered for calculation, and accelerometer data from 6 am to 9 pm were taken for analysis. **Statistical Analysis:** The regression linear model was used with 95% Confidence interval for β to predict LIPA using SPSS 20.0, and a level of p<.05 was taken as significant. **Results:** 43% of participants reached the international recommendation for physical activity and health (at least 150 min per week). They spent 9.2 ±1.7 hour per day on sedentary behavior, 5.6 ±1.4 hours per day sitting time and 5.4 ±1.5 hours per day light-intensity physical activity. The prediction between light intensity physical activity (minutes per week) and sedentary behavior (minutes per week) time (β=-.986; 95% -.95 to -.88), and sitting time (β=.278;95% .001 to .009) and other intensities of physical activity are in the table below. **Conclusion:** Objectively measured of light-intensity physical activity time was significantly associated with sitting time,sedentary behavior time, modarate activity time, MVPA time and vigorous time among active older women.

Light Intensity Physical Activity (LIPA) Time (*N= 75*)	Adjusted R Square	95% Confidence Interval	p
Sitting Time	.065	(.001 - .009)	.001
Sedentary Behavior Time	.973	(-.947 - -.876)	.000
Moderate Physical Activity Time	.111	(.702 - 3.024)	.002
Moderate/Vigorous Physical activity Time	.112	(.702 - 2.999)	.002
Vigorous Physical Activity Time	.071	(24.368 - 191.241)	.012

p <.05

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Effects Of A 12-week Self-managed Exercise Program On Fatigability In Older Adults

Mutasim D. Alharbi, Baian A. Baattaiah, Lisa MK Chin, Clinton J. Wutzke, Jeffrey E. Herrick. *George Mason University, fairfax, VA.* (Sponsor: Randall Keyser, FACSM)
(No relevant relationships reported)

Aging is associated with greater fatigability and reduced participation in physical activity. Exercise training in older adults has been associated with a number of health benefits; however, less is known about the effects of self-managed exercise on perceived and performance fatigability. **PURPOSE:** Compare the effects of a 12-week self-managed exercise program on perceived (PercF) and performance (PerfF) fatigability in a group of unimpaired older adults. **METHODS**: 28 older adults participated in a self-managed exercise program (15 men and 13 women; age 71.3 ± 4.2 years). The program consisted of educational lectures on aerobic (AT), resistance (RT), and balance (BT) training methods as described by the National Institute of Aging. 17 adults completed the 12-week program in three exercise groups: AT only (n=8), AT/RT (n=5), and AT/RT/BT (n=4). Fatigability was assessed following a standardized 10-minute walk test at a self-selected speed at baseline (PRE) and at the conclusion of the 12-week exercise program (POST). PercF was calculated at the completion of walking by dividing participant-perceived changes in fatigue by the total distance walked in meters. PerfF was calculated as the change in walking velocity (at 2.5 and 10 minutes), divided by the total distance walked. Within-group data were analyzed with a paired *t*-test and between-group effects using one-way ANOVA. **RESULTS**: Within the AT and AT/RT groups, significantly lower PerfF was observed at POST ($p = .011$ and $p = .035$, respectively) with no differences found in the AT/RT/BT group ($p = .437$). PercF was unchanged in all groups (AT, $p = .50$, AT/RT, $p = .65$, AT/RT/BT, $p = .70$). No difference was observed between groups for PercF ($F(2,14) = 0.443$, $p = .651$) or PerfF ($F(2,14) =. 528$, $p = .601$). Further, Cohen's effect size for changes in PerfF was moderate for AT ($d = .48$), AT/RT ($d = .38$), and AT/RT/BT ($d = 38$). **CONCLUSIONS**: Participation in a 12-week self-managed exercise program reduced performance fatigability in unimpaired older adults. However, our results did not reveal specific exercise recommendations for older adults to improve both performance and perceived fatigability. Future studies are needed to investigate the influence of exercise training on measures of fatigability to optimize exercise interventions.

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Physical Activity And Technology: Older Latinos' Perceptions

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(No relevant relationships reported)

The Latino community in the U.S. experiences a high prevalence of chronic diseases that can be prevented or improved by physical activity (PA), yet Latinos engage less frequently in leisure-time PA (LTPA) than non-Latino whites. Technology can impact PA levels both negatively and positively. **PURPOSE:** To examine older Latinos' motivators and barriers for LTPA engagement and their perceptions on how technology can influence LTPA participation. **METHODS:** Six focus groups were conducted with 27 middle-aged and older Latinos, 55+ years old, who speak Spanish, and own a cell phone. Participants were recruited from a primarily Latino neighborhood in Chicago. Participants were asked about their overall perceptions and experiences with PA and technology. Participants' perceptions of the impact of technology on PA and sedentary behavior (SB) were specifically asked if these themes did not emerge from the discussion. Discussions were recorded, transcribed verbatim in Spanish, and translated to English. Directed content analysis was conducted. **RESULTS:** Participants reported improvements in health as the main motivator for PA engagement. Participants reported walking and dancing as the most common types of PA they participated in. Common barriers to engaging in LTPA were distance to facilities, and the need of companionship and extrinsic motivators. Participants mentioned that technology can both decrease and increase their PA levels. It was stated that the convenience of driving everywhere, using remote controls and paying bills online leads to more SB. On the contrary, participants mentioned that PA levels can be increased using technology with the example of the use of wearables. Perceptions about wearables varied from a great interest in using wearables as a motivating tool to the idea that

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wearables are unnecessary. **CONCLUSION:** Older Latinos reported being aware of the health benefits of participating in LTPA, and the majority of those who engage in PA participate in culturally-appropriate types of PA. Participants were aware of the negative changes in lifestyle PA with the advances of technologies on a daily bases; however, most of them were interested in using wearables as motivators for PA. Using wearables in PA interventions targeting older Latinos might be feasible.

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Changes in Global Health Status in Older Adults Following a Self-Managed Exercise Program

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(No relevant relationships reported)

Regular exercise has been shown to improve the health status of older adults, however less is known regarding the effects of a short-term, self-managed exercise program **PURPOSE**:To examine the effect of self-directed exercise on global health status in unimpaired older adults. **METHODS**: Older adults attended a series of educational seminars based on the National Institute of Aging guidelines for aerobic (AT), resistance (RT) and balance training (BT). Following exercise clearance by their physician, participants chose a combination of AT, RT and BT to perform over 12 weeks. 17 adults completed the self-managed exercise program and were grouped according to their reported activity: AT only (G1) n=8, 73±2 years; AT&RT (G2) n=5, 68±3 years; AT,RT,BT (G3) n=4, 70±1 years. Before and after the 12-week program, participants completed the PROMIS-43 Adult Profile Instrument to assess global health status, and the International Physical Activity Questionnaire for evaluation of weekly physical activity (expressed as energy expenditure, EE). A one-way ANOVA evaluated within group differences, while Cohen's effect sizes were calculated for combined groups in each domain. A regression analysis assessed the relationship between changes in each domain and EE at each timepoint. **RESULTS**: Depression was improved within G2 (P=0.038), however no difference was observed across other PROMIS-43 domains (P≥0.30) among the 3 groups. A trend toward significance was found for anxiety and sleep disturbance for G2. Collectively, all 3 groups showed large effect sizes for lower depression (d=1), and medium effect sizes for lower anxiety (d=.54) following the 12-week program. Small effect sizes were found for fatigue, social role, physical function and pain interference (d≥.4). EE predicted anxiety scores (β=.2, R^2=.3, P=.01), while G2 showed an association between depression and EE (β=.43, R^2 =.8, P=.026). **CONCLUSIONS**:Improvements in mental health were observed in older adults participating in a self-managed exercise program consisting of AT and RT. However, regardless of the training mode, anxiety and depression were reduced for participants that reported higher EE. This suggests a greater role for physical activity participation over type of exercise in older adults for improving mental health with a self-managed exercise program.

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Reducing Sedentary Behavior and Improving Physical Function in Older Adults

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(No relevant relationships reported)

Older adults spend 60-70% of their waking hours sedentary, increasing their risk for negative health outcomes. Thus, interventions that reduce sedentary behavior (SB) are needed. **PURPOSE:** Three pilot studies were conducted. The first two studies tested a small group intervention to reduce SB and improve physical function in older adults. The third study used a focus group to assess how to engage African American (AA) older adults in similar trials. **METHODS:** The interventions were based on self-regulation theory and consisted of 4 wkly sessions involving group discussions, goal setting, action plans, self-monitoring, and problem solving. SB and physical function were measured via self-report (SB questionnaire & SF-36) and objective measures (accelerometry & the Short Physical Performance Battery). Study 1 participants (N = 12; mean age=69 ± 5 yrs) completed assessments pre- and post-intervention; study 2 participants (N = 9; mean age=68 ± 2 yrs) completed assessments pre- to post-intervention and at a 4 wk follow up. Due to the pilot nature of this research, data were analyzed with effect sizes (Cohen's *d*). A 90-min focus group was then conducted with 10 AA women (mean age=71 ± 6 yrs). The session was recorded, transcribed, and summarized. **RESULTS:** *Study 1:* There were moderate to large reductions in SB (self-report *d* = 0.95; accelerometers *d* = 0.53) and a moderate improvement in physical function (self-report *d* = 0.41) post-intervention. *Study 2:* Post-intervention, there were small to moderate improvements in SB (self-report *d* = 0.49; accelerometers *d* = 0.15) and gait speed (*d* = 0.22) with further improvements at follow up (SB self-report *d* = 0.85; accelerometers *d* = 0.57; gait speed *d* = 1.16). Results from the focus group revealed positive attitudes towards the intervention, potential barriers for participation

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Abstracts were prepared by the authors and printed as submitted.

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(e.g., scheduling, location), and specific marketing strategies (e.g., pictures of AA adults on brochures, partner with a community sponsor). **CONCLUSION:** A group-based intervention targeting sedentary time showed promise for changing SB and improving function in older adults. With attention to scheduling, location and marketing, this intervention may be translatable to AA communities.
Supported by the Greater Wisconsin Agency on Aging Resources & the UW Virginia Horne Henry Fund.

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Physical Activity Policy for Older Adults in China:A Textual Analysis

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(No relevant relationships reported)

PURPOSE: As a country under increasing financial pressure and with the largest aging population, China has launched a series of policies to promote the health of older adults through physical activities (PA). The purpose of this study was to analyze those policies. **METHOD:** An effort was made first to collect all related policies enacted between 1960 and 2017. The taxonomy of innovation policy proposed by Rothwell and Zegveld (1981) was then used to build the analysis framework for this study. Accordingly, 3 policy groups and 5 influencing factors classifications were derived to textually analyze policies collected. **RESULT:** A total of 44 related policies were identified. It was found that the Chinese government took an active role in environmental related polices (58%), followed by demand (14%) and supply (28%) related policies as figure 1. Specifically, the government focused more on launching strategies, developing infrastructure, and setting objectives for implementation. While the government still plays a key role in facilitating PA promotion for older adults, it also started to increase efforts to promote organizational participation. However, PA policies to support older adults' individual needs and PA in more scientific way in different settings, such as communities, workplace, and senior centers, were overlooked as figure 2. **CONCLUSION:** Presently, the policy for promoting PA among older adults by the Chinese government has been focused on environmental aspects. Future policy should recognize the diversity of older adults by taking into consideration of their health conditions so as to promote PA at a variety of ability levels. Finally, more scientific evidence-based health promotion programs should be developed and promoted through multi-sector and collaborative partnerships along with all related governmental offices.

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Efficacy Of Bingocize®: A Game-centered Mobile Application To Improve Physical And Cognitive Performance In Older Adults

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Reported Relationships: K. Crandall: *Intellectual Property; Western Kentucky University.*

PURPOSE: Adherence to health-promoting programs is a significant barrier to improving the health and well-being of older adults. The present study examined whether Bingocize®, a game-centered mobile app that combines exercise, health education, and bingo, could improve community-dwelling older adults' physical and cognitive performance. METHODS: Participants (N=85) used the app for approximately one hour, twice per week, for 10 weeks. Each using a tablet, they played the game in small social groups, and were randomly assigned to either an Experimental (Bingo + Health Education + Exercise; n=47) or Control (Bingo + Health Education; n = 38) group. Pre and Post-intervention assessments of (a) functional performance, (b) fluid cognition, and (c) knowledge of two health topics (osteoarthritis and fall risks) were administered. RESULTS: Two (Experimental/Control) x Two (Pre/Post) interactions were found for Arm Curls (F (1,81)=4.78, p=.03, ES=.06) and Chair Stands (F (1,81)=4.44, p=.04, ES=.05) and one domain of cognition (updating, a component of executive functioning) (F (1,79)=5.75, p=.02, ES=.07), such that the Experimental group improved more relative to the Control group. Both groups improved their knowledge of the two health topics (F (1,83)=275.56, p<.001, ES=.77). Alpha was set at .05. CONCLUSION: Our findings suggest the fun and interactive nature of Bingocize® may serve as an effective way to potentially improve multiple aspects of quality of life for community-dwelling older adults.

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The Effects of Pedometers on Body Weight and Metabolic Factors in Patients with Prediabetes

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(No relevant relationships reported)

Sedentary behavior, increased total body weight, elevated blood glucose levels and hyperlipidemia increase the risk of prediabetes. Individuals diagnosed with prediabetes (fasting blood glucose (FBG) between 100-125mg/dL) are recommended to perform a minimum of 150 minutes of physical activity (PA) per week and decrease total body weight by 7% to reduce the likelihood of developing type 2 diabetes. However, there is little known about the role of pedometers with regards to a Diabetes Prevention Program (DPP) **PURPOSE:** To determine if pedometer use could aid in the reduction of total body weight, cholesterol, and blood glucose levels as a part of the Centers for Disease Control National DPP. **METHODS:** Body weight, FBG and lipids (total cholesterol, high-density lipoproteins (HDL) and low-density lipoproteins (LDL)) were measured prior to the start of the DPP and 16 weeks following the intervention. All participants were either diagnosed as prediabetic or at risk for prediabetes based on the CDC screening tool. The pedometer group (PG) (n=9) received pedometers and the control group (CG) (n=8) did not. All participants received the same educational sessions that explained dietary changes and strategies to increase PA. The PG was asked to wear a pedometer on their belt for all waking hours of the day, seven days a week, for sixteen weeks. At each weekly DPP meeting, step counts from pedometers were recorded and pedometers were reset and returned to the participants. A 2x2 ANOVA was performed to examine differences. **RESULTS:** The PG experienced significant (p<0.05) weight loss from pre to post-test (186.2lbs $\pm$ 9.7 to 180.7 $\pm$ 8.9) while the control group did not (191.3lbs $\pm$ 16.8l to 190.1 $\pm$ 17.0). Interestingly, HDL significantly decreased from pre to post-test (p>0.05) in the PD group (58.1mg/dL $\pm$ 4.0 to 54.1mg/dL $\pm$ 3.6) while the CG remained unchanged (50.9mg/dL $\pm$ 5.1 to 50.5mg/dL $\pm$ 4.8). There were no differences between any other variables. **CONCLUSION:** It appears that the addition of pedometers into the DPP can contribute positively to weight loss. It is possible participants experienced a sense of greater accountability due to the added tracking tool. Further research and a larger participation population is needed to elucidate the mechanisms that contribute to the changes in body weight and lipid profile.

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MVPA And DXA-derived Adiposity In Adolescents With And Without Down Syndrome

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(No relevant relationships reported)

PURPOSE: Obesity is a highly prevalent secondary health condition among adolescents with Down syndrome (DS). It is thought that low levels of physical activity may promote excess adiposity in this population. However, reported associations between body mass index (BMI) and moderate-to-vigorous physical activity (MVPA) have been small and non-significant. The purpose of this study was to compare group differences in adiposity derived from dual-energy x-ray absorptiometry (DXA) and accelerometer-measured physical activity between adolescents with and without DS and then examine associations within each group.
METHODS: Thirty-nine adolescents (22 with DS and 17 typically developing (TD) controls), aged 12-18 years participated in the study. Groups had similar distributions of age, sex, and Tanner pubertal stage. Body composition was assessed by DXA, BMI, and BMI percentile. MVPA was measured with Actigraph GT3X+ accelerometers over 7 days. Group differences were analyzed with multivariate analysis of covariance (MANCOVA) while controlling for age, sex, Tanner pubertal stage, and accelerometer wear-time. Pearson product-moment correlation coefficients and linear regression were used to examine the associations between MVPA and adiposity among adolescents with DS and TD.
RESULTS: Adolescents with DS had significantly higher BMI, BMI percentile, and DXA-derived percent body fat (BF%), as well as lower minutes of MVPA compared to TD controls (p < .05). Associations between MVPA and BF% in adolescents with DS were moderate (r = -.39, p = .07), but substantially stronger than BMI (r = -.19, p = .40). However, linear regression analyses identified Tanner stage (β = -.77, p <

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.001) and MVPA (β = -.34, p = .047) as statistically significant predictors of BF%. No relevant associations between body composition and MVPA were observed in adolescents with typical development (p > .05).
CONCLUSION: Our findings suggest that MVPA is associated with adiposity among adolescents with DS when properly measured with DXA. This study also provides further evidence of significantly higher levels of adiposity and significantly lower levels of physical activity among adolescents with DS compared to their TD peers, clearly reflecting a source of health disparity and need for targeted intervention.
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Cancer Cachexia: Metabolic Changes In Carbohydrate Metabolism Of The Liver

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(No relevant relationships reported)

One negative side effect of cancer that dramatically affects cancer prognosis is the development of cancer cachexia. Cancer cachexia is defined as cancer-associated muscle wasting. This is thought to be at least partially mediated by increased energy expenditure and is responsible for the death of 20-40% of all cancer patients. Although the liver is known to be the predominant regulator of whole body metabolism, there is little known about its relationship to the development of cancer cachexia. **PURPOSE:** The purpose of this exploratory study was to investigate alterations in liver metabolism by examining measures of glycogen storage throughout the progression of Lewis Lung Carcinoma (LLC) induced cancer cachexia. **METHODS:** C57BL/6J mice were injected with 1X10⁶ LLC Cells in the left posterior leg, and the control group with phosphate buffered saline (PBS). The experimental groups included PBS, 1wk, 2wk, 3wk, and 4wk of cancer progression with 10-16 in each group. Sections of liver (n=~8/group) were cut and periodic acid-Schiff (PAS) stain for glycogen was completed. Images were analyzed for total area of stain as well as intensity of stain using NIS-Elements imaging software. A Welch's one-way analysis of variance was used to determine differences between groups, a Tukey post hoc was used to determine differences between means. Significance was denoted at p<0.05. **RESULTS:** 4wk animals had ~30% larger livers compared to all other groups with no other differences detected (~1000mg compared to ~1300mg, p<0.05). However, there were no statistical differences detected between groups on either PAS area stained (~50% across groups, p>0.05) or intensity of stain (Arbitrary Intensity Unit ~30 across groups, p>0.05). Furthermore, neither glycogen area nor intensity correlated with liver size (r = 0.12 and r = 0.16 respectively). **CONCLUSION:** Differences in liver sizes are not attributable to glycogen storage. Though there were no differences in glycogen content, the increase in liver size suggests disruption of other processes in the liver. For future projects, we will further investigate mechanisms for liver hypertrophy in order to determine the relationship between the liver and cancer cachexia progression.
This study was supported by The Arkansas Bioscience Institute and National Institutes of Health R15AR069913.

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Time-Dependent Alterations in Liver and Adipose Mitochondrial Respiration During Colon-26 Cancer Cachexia

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(No relevant relationships reported)

Nearly half of all cancer patients undergo cachexia, a life-threatening condition characterized by weight loss and skeletal muscle atrophy. Recent frameworks describe cachexia a systemic condition in which several non-muscle organs are reprogrammed or remodeled. Mitochondria are organelles with a major role in cellular energy metabolism, and impairment of mitochondrial function is linked with a number of diseases. Adipose and liver are energy-regulating tissues implicated in cachexia. The control of mitochondrial respiration in these tissues during the induction and progression of cancer cachexia is not well-defined. **PURPOSE:** To investigate oxidative phosphorylation (OXPHOS) and electron transfer system (ETS) capacity in white adipose and liver during colon-26 tumor-induced cachexia. **METHODS:** Balb/c males (10 wks) were assigned to control or colon-26 (C26). C26 mice were injected with 10⁶ tumor cells and euthanized for tissue at 7, 14, and 21 days post-injection. By day 21, C26 mice exhibit significant muscle atrophy. Controls were injected with PBS and euthanized for day 0 tissue. Epididymal white adipose tissue (eWAT) was immediately analyzed by high-resolution respirometry. The liver was permeabilized via mechanical separation prior to respiration. Saturating levels of substrates were used to evaluate Complex I OXPHOS (CI_p), Complex I+II OXPHOS ($CI+II_p$), and ETS.

RESULTS: In comparison to day 0 liver (78±15 pmol/s/mg), CI_p was lower at day 14 (26±6, p=0.08) and day 21 (8±4, p<0.05). CI_p was also lower in day 21 liver vs. day 7 (p<0.05) and day 14 (p=0.06). In comparison to day 0 liver (157±26 pmol/s/mg), $CI+II_p$ was lower at day 14 (49±5 pmol/s/mg, p=0.05) and day 21 (34±11, p<0.05). $CI+II_p$ was also lower (p<0.05) in day 14 and day 21 livers when compared to day 7 (112±9). In comparison to day 0 liver (221±38 pmol/s/mg), maximal ETS was lower at day 14 (70±13, p=0.06) and day 21 (40±14, p<0.05). ETS was also lower (p<0.05) in day 14 and day 21 livers when compared to day 7 (176±14). Respiration of eWAT was not different across time points (p>0.05). **CONCLUSION:** Coupled respiration with electron supply from Complex I and I+II, and non-coupled respiration (i.e. ETS) decreased during the progression of cachexia, suggesting that changes in liver oxidative capacity are associated with the development of this comorbidity.

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Dietary Fat Intake Predicts Aortic Stiffness Independent of Physical Activity

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(No relevant relationships reported)

PURPOSE: To determine if increased dietary fat consumption predicts aortic stiffness independent of physical activity.
METHODS: Men and women 18-60 years of age were recruited for this cross-sectional study. Body mass, height, body fat percentage (bioelectrical impedance analysis), aortic stiffness (carotid-femoral Pulse Wave Velocity; cfPWV), habitual dietary intake (NIH's validated Dietary History Questionnaire-II; DHQ-II), and physical activity (International Physical Activity Questionnaire; IPAQ) were assessed for all subjects. Univariate linear regression analyses were implemented to determine dietary correlations with cfPWV, and partial correlations were employed to adjust for traditional risk factors using SAS 9.4.
RESULTS: The study population consisted of predominately young men and women (23.5 ± 7.9 years, 70.0% female) with a normal body mass index (BMI = 23.6 ± 4.3 kg/m²) and mean cfPWV of 5.8 ± 0.9 meters/second. Weekly physical activity was estimated at 5,547.6 ± 5,478.2 MET-minutes per week. Habitual daily caloric intake was 1,921.0 ± 798.9 calories, consisting of 46.0 ± 0.1% carbohydrate, 36.8 ± 0.1% fat, and 16.3 ± 0.0% protein. Greater consumption of total discretionary solid fat was associated with increased cfPWV ($R^2 = 0.155$, P = 0.031). However, total calories from dietary fat (R2 = 0.093, P = 0.101), total grams of fat ($R^2 = 0.047$, P = 0.248), and total discretionary oil fat ($R^2 = 0.008$, P = 0.650) were not associated with cfPWV. The correlation between discretionary solid fat and cfPWV remained after adjustment for age, body fat percentage, BMI, and physical activity ($R^2 = 0.160$, P = 0.043). Among food choices contributing to the increased discretionary calories from solid fat, cheese intake was positively correlated with cfPWV ($R^2 = 0.134$, P = 0.047). Additionally, specific fatty acids that predicted cfPWV included trans fatty acid, trans-hexadecenoic acid ($R^2 = 0.179$, P = 0.020), and monounsaturated fatty acids, hexadecenoic acid ($R^2 = 0.148$, P = 0.036) and myristoleic acid ($R^2 = 0.206$, P = 0.012).
CONCLUSIONS: Increased dietary discretionary fat consumption within the habitual diet predicts aortic stiffness independent of physical activity. Cheese consumption and specific fatty acids may be novel contributors to increased aortic stiffness independent of regular physical activity.

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High Intensity Circuit Training Versus Moderate Strength Training On Body Composition In Obese Adults

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(No relevant relationships reported)

Weight loss has been shown to adversely affect body composition due to the loss of fat free mass that accompanies fat mass loss during negative energy balance. Exercise has been recommended as a therapy to ameliorate fat free mass loss during weight loss interventions. **PURPOSE:** The primary purpose of this study was to compare the effectiveness of high-intensity circuit training (HICT) versus moderate strength straining (ST) on body composition in obese adults. **METHODS:** Obese adults (10 women and 1 man) completing a medically supervised weight loss program were randomized into one of two 12-week exercise training groups: HICT (n=5) or ST (n=6). Baseline (BL) testing included height, weight, and DEXA scans to assess total and regional body composition. Each group underwent a supervised exercise training program of upper and lower body exercises (30 minute sessions; 3 times per week for 12 weeks); follow-up (FU) testing was performed after 12 weeks. The HICT consisted of 8-12 exercises of 2-3 sets, with rest periods of approximately 30 seconds. Exercise intensity corresponded to 80-95% of their VO_2peak. The ST group completed progressive resistance training which included 2-3 sets of 10-12 repetitions

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Abstracts were prepared by the authors and printed as submitted.

of each exercise. **RESULTS:** When examining changes in body mass index (BMI), total fat mass (FFM), total fat free mass (FFM), trunk fat mass (TFM) , and estimated visceral fat mass (VFM), mixed model ANOVA revealed no significant group x time interaction (p>0.05) nor a main group effect (p>0.05) for the variables. However, there was significant time (BL vs FU) main effect for BMI (38.7 ± 1.5 vs. 33.1 ± 1.7, respectively, p<0.001); FM (48.4 ± 4.0 vs 38.7 ± 3.8 kg, respectively, p<0.001); TFM (26.1 ± 2.1 vs. 19.6 ± 1.8 kg, respectively, p=.001); and VFM (1.5 ± .19 vs. 1.0 ± .13 kg, respectively, p=.001). **CONCLUSION:** Both the 12-week HICT and ST program in conjunction with the medical weight loss program produced successful weight loss and FM changes. Furthermore, FFM was retained in both groups, suggesting both programs are viable options to improve or maintain body composition through substantial weight loss.

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Continuous Exercise Training Reduces Arterial Stiffness In An Exercise Dose Dependent Manner in Adults With Prediabetes

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(No relevant relationships reported)

PURPOSE: Although prior work highlights an exercise dose-response relationship for glucose regulation, no study has assessed if exercise energy expenditure is related to reductions in arterial stiffness in an intensity based manner. We tested the hypothesis that increased exercise dose would correlate with reduced arterial stiffness in obese adults with prediabetes. **METHODS**: In this randomized trial, 26 adults (Age: 61.4±2.5 y, BMI: 32.1±1.0 kg/m^2) were screened for prediabetes using American Diabetes Association criteria (75g OGTT and/or HbA$_{1c}$). Aerobic fitness (VO$_2$peak) was measured on a cycle ergometer by indirect calorimetry. Subjects performed either supervised continuous exercise (CONT; n=13) at 70% of HR$_{peak}$ or underwent interval training (INT; n=13) for 3 min at 50% HR$_{peak}$ and 3 min at 90% HR$_{peak}$ for 60min/d over 2-weeks. Arterial stiffness (augmentation index; AI) and glucose tolerance were determined during a 75g OGTT and analyzed by total area under the curve (tAUC) before and after training. Exercise dose was assessed using VO$_2$-heart rate derived linear regression equations. **RESULTS**: Mean energy expenditure during CONT and INT training was 312.5±12.0 and 399.9±19.6 kcal/session, respectively (P=0.001). Exercise training had no effect on body weight, but it did significantly improve VO$_2$peak (P=0.001), independent of intensity. Both CONT and INT intervention also reduced glucose tAUC$_{180min}$ (P=0.01) and AI tAUC$_{180min}$ (P=0.03). However, this reduced arterial stiffness tended to correlate with increased exercise energy expenditure from CONT (r=-0.53, P=0.06) but not INT (r=-0.005, P=0.98) training. Improved VO$_2$peak was also related to reduced AI tAUC$_{180min}$ (r=-0.63, P=0.02) only after CONT exercise. **CONCLUSIONS**: Short-term exercise training reduces arterial stiffness independent of intensity. However, only CONT training improves arterial stiffness in an energy dose-dependent manner. These findings suggest that intensity of exercise may exert different mechanisms for enhancing vascular function in adults with prediabetes to lower diabetes and cardiovascular risk.

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Influence Of Sex On The Relationship Between Two Estimates Of Visceral Adipose Tissue

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(No relevant relationships reported)

Magnetic resonance imaging (MRI) is the gold standard for estimating visceral adipose tissue (VAT) area. However, MRI machines are not available to all laboratories, and other methods of estimating VAT, including dual-energy X-ray absorptiometry (DXA) and B-mode ultrasound (US), are often more readily available, cost effective, and feasible. DXA and US have been reported to be valid methods of VAT determination, but their relationship has yet to be evaluated. PURPOSE: To determine the relationship between estimates of VAT derived from DXA and US in college-aged females and males with a normal body mass index (BMI). METHODS: Sixty-three female (Mean ± SD; Age= 19.6 ± 1.4 yrs; Height= 1.64 ± 0.07m; Weight= 58.7 ± 6.3kg; BMI= 21.7 ± 1.6) and 29 male (Age= 19.3 ± 1.6 yrs; Height= 1.79 ± 0.09m; Weight= 71.6 ± 9.9kg; BMI= 22.3 ± 2.0) subjects were enrolled in this study. Exclusion criteria included age <18 or >25 years old and BMI <18.5kg/m^2 or >24.9kg/m^2. The participants reported to the laboratory 8 hours fasted, and were required to have abstained from alcohol consumption and vigorous physical activity for at least 24 hours prior to testing. DXA scans were completed, and estimates of VAT mass (kg) were reported using the core scan feature of a total body scan (Lunar iDXA). US scans of the abdomen were completed 2 cm above the umbilicus, and VAT depth (cm) was estimated by measuring the distance between the posterior surfaces of the linea alba and the descending aorta.

RESULTS: There was no significant correlation between VAT estimates derived from DXA and US (R=0.07, p>0.05) in females. However, there was a significant correlation in males (R=0.77, p<0.001). Furthermore, there was a significant relationship when combining males and females (R=0.45, p<0.001). CONCLUSIONS: There was no relationship between the two estimates of VAT quantity in females in this population, but there was a significant relationship in males and in the combined sample. This highlights the importance of considering sex as an important moderating variable when selecting an instrument to assess body composition.

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The Effect Of Single Stair-Climbing/Descending Bouts Of Varying Lengths On Postprandial Glycemic Responses

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(No relevant relationships reported)

Impaired glucose tolerance is strongly associated with cardiometabolic disease risk. Single bouts of exercise can improve insulin sensitivity and attenuate the rise in postprandial glucose. **PURPOSE**: To investigate the effects of moderate intensity stair climbing of various durations on postprandial glycemic responses in healthy men and women. **METHODS**: Eight males (27.1±5.9y) and seven females (25.7±5.4y) completed a 75g oral glucose tolerance test (OGTT). On three subsequent visits, participants completed an OGTT combined with either 1min, 3min, or 10min of stair-climbing, all ending 28 min after completion of glucose consumption in randomized order. Blood measurements were taken at baseline and thirty minutes post-glucose consumption and analyzed for glucose and insulin as well as insulin resistance and sensitivity. **RESULTS:** All stair-climbing trials reduced peak (30 min) postprandial glucose levels compared to control, however the 10 min bout yielded a significant difference (30.5±5.9mg/dL, p<.001), whereas neither the 1 min bout (8.6±5.6mg/dL, p=.147) nor the 3 min bout (6.3±4.9mg/dL, p=.221) were significant. Insulin concentration was also significantly reduced following the 10 min trial (5.18±1.68μIU/mL, p<.010), however there were no significant differences for the 1 min trial (0.62±0.94μiu/mL, p=.524) or the 3 min trial (1.41±0.83μIu/mL, p=.113) compared to control. There was a significant decrease in HOMA-IR following the 10 min bout (3.96±0.79, p<.001) compared to control. No significant differences in HOMA-IR were seen for the 1 min (0.82±0.64, p=.222) or 3 min (0.89±0.46, p=.077) trials. Insulin sensitivity index values increased significantly following the 10 min trial (2.24±0.71, p<.007), while no significant differences were seen for 1 min (0.35±0.62, p=.584) or 3 min (0.02±0.79, p=.980) trials compared to control. **CONCLUSIONS**: Ten minutes of moderate intensity stair-climbing/descending exercise is effective at improving postprandial glycemic responses in healthy adults while shorter bouts of 1 and 3 min were not.

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Self-Regulation in Early Childhood Predicts Adolescent Metabolic Syndrome Profile Membership

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(No relevant relationships reported)

The prevalence of full-blown clinical metabolic syndrome (MetS) in adolescence ranges between 5-9%. Many adolescents fail to meet the rigid criterion thresholds for MetS but may still have an increased risk for chronic disease. Thus, a continuous MetS score has been used to circumvent these issues. Recent research suggests, however, that other factors, such as self-regulation, may influence chronic disease through a variety of processes and may be critical for identifying cardiometabolic risk in younger populations. **PURPOSE**: To determine if self-regulation in early childhood predicts MetS profile membership in adolescence. **METHODS**: As part of a large longitudinal study, adolescents visited a lab (N=117, 59% female) and completed anthropometric measures, resting blood pressure and a fasted blood draw at age 16. All biomarkers were assessed using colorimetric assay techniques using commercially available items or a multiplex system. All dimensions of self-regulation were assessed at age 5 using age-appropriate, laboratory-based tasks and parent-report measures. Latent profile analysis (LPA) and one-way analysis of variance (ANOVA) were employed to address the study aims. **RESULTS**: The best-fitting LPA model identified 3 groups (BIC=6597.12, Entropy=.92, Adj. p LMR-LRT=81.65, p=ns); a low risk group (LRG; n=48) had low leptin (L), glucose (G), and non-HDL, but high HDL, a moderate risk or dyslipidemic group (DLG; n=58) had high G and non-HDL, but low HDL, L, waist circumference (WC), mean arterial pressure (MAP), and C-reactive protein (CRP), and a high-risk group (HRG; n=11) had high L, G, WC, MAP, CRP, and moderate non-HDL. Adolescents in the HRG showed lower emotion regulation (F = 5.19, p < .01), attentional focusing (F = 6.39, p < .01), and inhibitory control (F = 2.66, p < .05), at age 5 compared to adolescents in LRG. Physiological self-regulation (assessed by vagal withdrawal or RSA) at age 5 was higher (greater self-regulation) in LRG

compared to the DLG ($F = 3.23$, $p < .05$). **CONCLUSIONS**: These data suggest that self-regulation in early childhood is a significant *modifiable* construct influencing risk for cardiometabolic disease in adolescence and should be investigated as a potential target for future behavioral interventions. Funded by NICHD R01HD078346

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Changes In Liver And Skeletal Muscle Sensitivity In Response To Acute And Chronic Calorie Restriction On A Low Carbohydrate Diet

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(No relevant relationships reported)

PURPOSE: We determined the effects of acute and chronic calorie restriction with a low-carbohydrate diet on hepatic and skeletal muscle insulin sensitivity. **METHODS**: Twelve obese subjects (body-mass index, 36.1 ± 1.0kg/m^2) followed a low-carbohydrate (<60g/d) energy-deficit diet (1,200kcals/day). Magnetic resonance spectroscopy, muscle biopsies, and a euglycemic-hyperinsulinemic clamp were used to determine insulin action, cellular insulin signaling and intrahepatic triglyceride content before, after 48 h, and after ~12 wks (7% weight loss) of diet therapy. **RESULTS**: Intrahepatic triglyceride content significantly decreased at both 48-h ($28.6\pm3.8\%$) and 7% weight loss ($-38.0 \pm 4.5\%$; $p<0.05$) compared to baseline. Basal glucose production rate significantly decreased at 48 h ($21.8\pm3.2\%$, $p<0.001$) and after 7% weight loss ($20.8\pm3.4\%$, $p<0.001$). Insulin-mediated glucose uptake did not significantly increase at 48 h ($4.4\pm12.7\%$, $p>0.05$) but did significantly increase at 7% weight loss ($35.2 \pm 8.4\%$, $p<0.05$). Insulin-stimulated phosphorylation of Jun N-terminal kinase decreased by ($-15.4 \pm 18.1\%$, $p>0.05$) and -41.3 ± 19.5, $p<0.05$) and phosphorylation of Akt increased by $19.2 \pm 26.9\%$ ($p>0.05$) and $36.1 \pm 12.4\%$,($p<0.05$), after 48-h and 7% weight loss respectively. **CONCLUSIONS**: A low carbohydrate calorie diet acutely reduced intrahepatic triglyceride content and improved hepatic insulin sensitivity whereas moderate weight loss is necessary to improve insulin sensitivity in the skeletal muscle.

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Exercise Training Attenuates Non-Alcoholic Fatty Liver Disease in rats with Diabetes via Endoplasmic Reticulum Stress

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(No relevant relationships reported)

Non-alcoholic fatty liver disease (NAFLD) is highly prevalent in type 2 diabetes (T2D). Recent evidence supports that endoplasmic reticulum (ER) stress plays a critical role in the development of NAFLD. Although exercise training has been commonly prescribed for the treatment of NAFLD, the effects of different types of exercise on ER stress in NAFLD under type 2 diabetic condition are largely unknown. **PURPOSE**: The purpose of this study was to determine the effects of aerobic and resistance exercises on hepatic ER stress response and NAFLD in rats with T2D. **METHODS**: Male Sprague-Dawley rats were randomly assigned to four groups (n=10/group): Control (CON), T2D, T2D with aerobic exercise (T2D+AE; treadmill walking at 30 m/min, 0° incline, 60 mins/day, 5 day/week, for 8 weeks) and T2D with resistance exercise (T2D+RE; climbing a 80° incline vertical ladder with weights progressively increased from 50% to 100% of maximal carrying capacity on the tail, 3 times/day, 5 days/ week, for 8 weeks). Liver tissue samples were collected for histopathological analysis of the density of lipid droplets, and immunoblot analysis of expression levels of ER stress proteins, including glucose-regulated protein (GRP78), C/EBP homologous protein (CHOP), caspase 12, and c-Jun N-terminal kinase (JNK). One-way ANOVAs and Tukey's -test were used for data analysis. **RESULTS:** The density of lipid droplets in the liver was significantly higher in the T2D group than in the CON group ($p<0.01$), but was significantly lower in the T2D+AE and T2D+RE groups when compared to the T2D group (both $p<0.01$). In addition, the T2D group had significantly higher levels of protein expression of GRP78, CHOP, caspase 12 and JNK when compared to the CON group (all $p<0.01$). Both exercise groups had significantly lower levels of protein expression of GRP 78, CHOP, Caspase 12 and JNK when compared to the T2D group ($p<0.05$ to $p<0.01$). **CONCLUSION**: Our findings suggest that both aerobic and resistance exercises are protective against NAFLD in rats with T2D by potentially regulating proteins involved in ER stress response.

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Effect of Exercise and/or Spirulina maxima On Body Composition In Overweight/Obese Humans

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(No relevant relationships reported)

Overweight and obesity are the main risk factors for cardiovascular diseases, which are the leading causes of death worldwide. As a consequence of this, it is indispensable to apply a nutritional intervention involving both a healthy diet adjustment and to promote an active lifestyle, since they are effective in preventing and reducing weight gain and excessive accumulation of body fat.
PURPOSE: To determine the independent and synergistic effect of a systematic physical exercise program and/or *Spirulina maxima* supplementation on body composition in overweight and obese subjects.
METHODS: Through a randomized, double-blind, placebo-controlled, counterbalanced crossover study design, overweight and obese adults (N= 52, 25.12 ± 4.88 y, 1.71 ± 0.11 m, 88.14 ± 16.99 kg) were evaluated during a 12 wk of 4.5 g a day of supplementation (6 wk *Spirulina maxima* and 6 wk placebo) and/or a systematic physical exercise program (three days a week 20 to 30 min of aerobic exercise with intensities between 50% and 80% of maximum heart rate (HR max) and two days 20 to 30 min between 80% and 90% of HR max using high-intensity interval training (HIIT) intervention); the participants were divided in four groups: exercise and *Spirulina maxima* supplementation (ES), exercise and placebo supplementation (E*), Spirulina maxima* supplementation without exercise (S), and the control one, placebo without exercise (C). Body weight, body mass index (BMI) and body fat percentage (BFP) were assessed. Differences between treatments comparisons in all response variables were made using and ANOVA test. The present study was approved by bioethics committee of Universidad Autónoma de Ciudad Juárez.
RESULTS: The differences between individuals usually are of wide range, for that reason the results are shown like differences between final and initial evaluations. All the treatments showed statistical differences compared with the control in body weight (kg) (ES= -2.36 ± 0.84, E= -0.89 ± 0.68, S= -0.91 ± 0.73, C= 0.04 ± 1.28), BMI (kg.m^{-2}) (ES= -0.72 ± 0.41, E= -0.26 ± 0.29, S= -0.31 ± 0.48, C= 0.01 ± 0.44), and BFP (%) (ES= -1.15 ± 0.20, E= -0.49 ± 0.21 S= -1.46 ± 0.45, C= -0.04 ± 0.13).
CONCLUSION: *Spirulina maxima* intake joint a HIIT have an individual and a synergistic effect on body composition (decrease of body weight, BMI and BFP) in overweight and obese adults.

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Restricted Carbohydrate Diet and Exercise Increase BDNF, Cognitive Function, and Metabolic Profiles

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(No relevant relationships reported)

Metabolic syndrome (MetS) has been recognized as one of the most important clinical challenges and global health issues of today. Growing evidence suggests that mechanisms of energy metabolism may play a key role in mediating aspects of cognitive function. Brain-derived neurotrophic factor (BDNF) is one such factor well known for its critical role in neuronal plasticity, including memory and learning, and more recently metabolic processes, including body weight control, food intake and energy homeostasis. **PURPOSE**: The purpose of this study was to investigate the effect of diet and exercise on cognitive and metabolic function in individuals characterized with MetS. **METHODS**: Eleven subjects with MetS followed a crossover design with two 4-wk interventions, including a restricted carbohydrate paleolithic-based diet (RCPD) with high intensity interval training (RCPD-Ex) and a RCPD with sedentary activity (RCPD-Sed), separated by a 4-wk washout period. A two-way analysis of variance with repeated measures was performed with post-hoc analysis using simple effects analysis with a Bonferroni adjustment. The level of statistical significance was established a priori as $P < 0.05$. Values are reported as means ± SD. **RESULTS**: Compared to baseline, RCPD-Sed and RCPD-Ex improves cognitive function, including improving serum BDNF by 20% and 38% (15.4 ± 5.2 verse 18.5 ± 4.6 and 21.2 ± 6.4 ng/mL), psychomotor speed and cognitive flexibility (-14%, -14%), and self-perceived cognitive symptoms and functioning (+8%, +16%), respectively. Compared to baseline, RCPD-Sed and RCPD-Ex also improves metabolic markers, reducing waist adiposity (15%, 18%), weight loss (-3%, -5%), body fat % (BF%; -7%, -12%), fasting plasma glucose (GLU; -20%, -27%), triglycerides (TG; -47%, -52%), mean arterial pressure (MAP; -28%, -34%), and increases HDL-C (+22%, +36%), respectively. RCPD-Sed and RCPD-Ex reduces fasting insulin by -34% and -39% (12.8 ± 9.1, 11.3 ± 9.4 µUI/ml), HOMA-IR by -37% and -41% (1.7

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± 1.4, 1.4 ± 1.7), and increases adiponectin by +33.7% and +38% (6.18 ± 2.8, 6.89 ± 3.9 ng/ml), respectively, when compared to baseline. **CONCLUSION**: RCPD-Sed and RCPD-Ex were able to improve cognitive and metabolic factors, while RCPD-Ex outperformed RCPD-Sed in all measured factors. These effects may be dependent on BDNF as a metabotrophin mediator.

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Normalized Grip Strength Thresholds for the Detection of Metabolic Syndrome in Colombian Collegiate Students

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(No relevant relationships reported)

PURPOSE: Evidence shows an association between grip strength and health; however, grip strength cut-offs for the detection of metabolic syndrome (MetS) risk in Latin-American populations are scarce. The purpose of this study was to determine cut-offs of normalized grip strength (NGS) in a large collegiate student population from Colombia (2014-2017). **METHODS**: A total of 1,795 volunteers (61.4% female, mean age = 20.68 (2.9) years old), ranging between the ages of 18 and 30 years participated in the study. Strength was estimated using a hand-held dynamometer and normalized to body mass (handgrip strength [kg]/body mass [kg]). Anthropometrics, serum lipids indices, blood pressure, and fasting plasma glucose were measured. Body composition was measured by bioelectrical impedance analysis (BIA). MetS was defined as including ≥3 of the metabolic abnormalities according to the International Diabetes Federation definition. A metabolic risk score was computed from the following components: waist circumference, triglycerides, high-density lipoprotein cholesterol, glucose, and systolic and diastolic blood pressure. Receiver operating curve (ROC) analysis showed a significant discriminatory accuracy of NGS in identifying the thresholds and risk categories. **RESULTS**: Lower strength was associated with increased prevalence of MetS. In males, weak, intermediate, and strong NGS values at these points were <0.47, ≥0.47 to 0.62, and >0.62, respectively. In females, these cut-off points were <0.33, ≥0.33 to 0.44, and >0.444, respectively. **CONCLUSIONS**: In summary, our sex-specific cut-off points of NGS could be incorporated into a clinical setting for identifying college students at cardiometabolic disease risk.

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Effect Of 12-weeks Of Moderate Versus High-intensity Interval Exercise Training On Postprandial Lipemia, Vascular Function And Arterial Stiffness After High-fat Meal Ingestion In Inactive Adults

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(No relevant relationships reported)

PURPOSE: The aim of this study was to determine the effect of 12-weeks of moderate continuous training (MCT) and high-intensity training (HIT) on postprandial lipemia, vascular function and arterial stiffness after high-fat meal (HFM) ingestion in inactive adults. **METHODS**: A randomized clinical trial was conducted in 20 healthy, inactive aged adults (31.6 ±7.1 years). Participants completed two exercise protocols, namely, HIT and MCT, for 12 weeks. To induce a state of postprandial lipemia (PPL), all subjects received an HFM containing 1049 kcal, 31 g of protein, 79 g of fat (31 g of saturated fat), 666 mg of cholesterol and 69 g of carbohydrates. Endothelial function was measured using flow-mediated vasodilation (FMD), normalized brachial artery FMD (nFMD), aortic pulse wave velocity (PWV) and augmentation index (AIx). Plasma total cholesterol, High-density lipoprotein cholesterol (HDL-c), triglycerides and glucose were also measured. The effects of the HFM were measured in a fasted state and 60, 120, 180, and 240 minutes postprandially. **RESULTS**: The area under the curve from 0 to 240 minutes [AUC$_{(0-240)}$] for glucose was lower after HIT than after MCT (10%, P=0.008). FMD and nFMD AUC$_{(0-240)}$ were increased in HIT compared with MCT (46.9%, P=0.021 and 67.3%, P=0.009, respectively). Regarding between-group differences, the results showed for glucose, and nFMD. In addition, the average delta of nFMD value was significantly higher in HIT than MCT (P = 0.03) **CONCLUSIONS**: Supervised exercise-training mitigate endothelial dysfunction and glucose response induced by PPL. Exercise intensity plays an important role in these protective effects, suggesting that HIT might be more effective than MCT in reducing postprandial glucose levels and attenuating vascular impairments.

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The Acute Effect of Moderate Intensity Stair-Climbing on Postprandial Blood Glucose

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(No relevant relationships reported)

PURPOSE: To investigate the effects of moderate intensity stair-climbing of various durations on postprandial glucose response in healthy men and women. The postprandial glucose response is strongly associated with cardiometabolic disease risk. **METHODS**: Twenty males (26.8±6.0y) and fourteen females (24.8±4.5y) completed a 75g oral glucose tolerance test (OGTT). On three subsequent visits, participants completed an OGTT combined with either 1min, 3min, or 10min of stair-climbing, all ending 28 min after subjects finished the drink. Fingerstick blood glucose measurements were taken at baseline and every fifteen minutes thereafter for one hour. **RESULTS**: All stair-climbing trials reduced peak (30 min) postprandial blood glucose levels compared to the control (12±31 to 35±30mg/dL, p≤.001-.038). At the 45min time point, there were significant reductions compared to the control for the 3 and 10min trials (11±29 and 23±30mg/dL, p=.037 and p≤.001), but not between 1min and control (2±33mg/dL, p=.701). No significant differences exist in BG between any trials at baseline, 15, or 60min time point (Δ=-0.3- 5.1mg/dL, p=.391-.882). There were significant differences in AUC compared to the control for the 3min and 10min trials (436±1126and 896±1108mg/dL*min, p=.036 and p≤.001) but not for the 1min (272±1112mg/dL*min, p=.177). For iAUC, there were significant differences compared to the control for the 3 min and 10 min trials (424±1124 and 901±903mg/dL*min, p=.038 and ≤.001) but not for the 1 min (107±918mg/dL*min, p=.509). **CONCLUSIONS**: Moderate intensity stair-climbing bouts as short as one minute in duration are effective at attenuating peak postprandial blood glucose with longer bouts producing more substantial benefits.

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Increase In Beta-hydroxybutyrate After High-fat Meal In Metabolically Healthy Overweight/obese Adults

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(No relevant relationships reported)

Ketone synthesis is of interest for several clinical purposes including obesity, weight loss and diabetes. Beta-hydroxybutyrate (BHB) is the predominant ketone found in the blood and an indicator of ketone synthesis, which is elevated when carbohydrate availability is low. However, little is known about ketone synthesis in metabolically healthy overweight/obese (MHO) adults with mixed diets.
PURPOSE: To investigate BHB concentrations and responses to a high-fat meal in MHO adults.
METHODS: Adults (n=23), 23-54 y of age with BMI 27-35 kg·m^{-2} were assessed for body composition, self-reported physical activity level, and VO$_2$max. After Fasting blood collection, a high-fat meal (50g fat, 54g carbohydrate, and 12g protein) was consumed and blood was collected hourly for 4 hours for measurement of glucose, insulin, triglycerides, and BHB.
RESULTS:

Metabolic Responses to High-Fat Meal					
Time (h)	0	1	2	3	4
BHB (mmol/L)	.23 (.01)	.23 (.01)	.22 (.01)*	.25 (.01)	.31 (.02)*
GLU (mg/dl)	96.9 (1.5)	108.4 (3.6)*	95.6 (2.7)	93.0 (1.6)*	91.9 (1.5)*
TG (mg/dl)	139.4 (16.8)	158.1(17.2)*	193.7 (19.8)*	216.1 (24.0)*	225.0 (32.2)*
INS (µU/ml)	8.1 (1.3)	35.3 (4.7)*	18.1 (2.9)*	10.4 (1.5)	8.2 (1.4)
Values = mean (SEM); *p <0.05 compared to time 0					

Glucose and insulin both increased 1 hour after a high-fat meal. At 2 hours post meal, insulin was still elevated and BHB decreased. At 3 and 4 hours post-meal, glucose decreased below fasting levels and BHB elevated above fasting levels. These data indicate that there was an inverse relationship between BHB with blood glucose and insulin levels, and that a potential rebound increase in BHB occurred when blood glucose dropped below fasting levels and insulin returned to baseline. Blood TG increased at each measurement over the course of 4 hours.
CONCLUSION: These findings support a pattern in the sequence of metabolic responses to a high-fat meal of increased then decreased blood glucose and insulin levels followed by increased BHB. An unexpected increase in blood BHB 4 hours after a single high-fat meal containing a significant amount of carbohydrate warrants additional research.

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Postprandial Serum Concentrations of Trimethylamine N-oxide in Metabolically Healthy Adults with Low and High Inflammation

Stephanie Wilson, Jesse Peach, Brian Bothner, Adam Maes, Carl Yeoman, Seth Walk, Sarah Bronsky, Mary P. Miles, FACSM. *Montana State University, Bozeman, MT.*

(No relevant relationships reported)

Trimethylamine (TMA) is a bioactive amine made by gut microbes that is converted to trimethylamine-N-oxide (TMAO) in the liver. The conversion of TMA to TMAO is downregulated by insulin. TMAO is pro-inflammatory and has been linked with the development of atherosclerosis. It is hypothesized that TMAO may be an underlying factor differentiating metabolically healthy overweight or obese (MHO) individuals with low (LO) versus high (HI) systemic inflammation. **PURPOSE**: To compare serum TMAO concentrations and metabolic responses to a high fat meal challenge between LO and HI MHO individuals. **METHODS**: Adults (n=25), 28-54 years old with BMI 27-35 kg·m^{-2} were measured for interleukin (IL)-1β, IL-6, IL-17, IL-23, tumor necrosis factor-α (TNF-α), and granulocyte-macrophage colony-stimulating factor (GM-CSF) measured after an overnight fast. A subsample of individuals was grouped to LO (n=5; above median in ≤ 1 of 6 cytokines) and HI (n=4; above the median in ≥ 5 of 6 cytokines). Blood samples were collected immediately before ingestion of a high-fat meal (50g FAT, 54g CHO, 12g PRO) and hourly for 4 hours postprandial for measurement of TMAO, glucose (GLU), insulin (INS), and triglycerides (TG). TMAO concentrations were determined through ultra-high performance liquid chromatography-tandem mass spectrometry. **RESULTS**: Fasting TMAO concentrations were similar in HI compared to LO (11.0 ± 5.5 vs 5.9 ± 2.8 μmol·l^{-1}). After correction for fasting insulin concentrations and removal of one outlier participant, TMAO decreased from fasting (9.6 ± 2.2 μmol·l^{-1}) to 1 h (p=0.061; 6.2 ± 1.1 μmol·l^{-1}) and 3 h (p=0.04; 3.7 ± 0.9 μmol·l^{-1}). Postprandial increases (p<0.05) were measured for glucose at 1 h, insulin and 1-2 h, and TG at 1-4 h. **CONCLUSION**: Our preliminary analysis indicates that TMAO concentrations were not higher in MHO individuals with higher inflammation. However, TMAO decreased in the postprandial period after insulin was elevated. Thus, TMAO concentrations fluctuate postprandially and its influence on inflammation warrants further investigation, particularly to determine if TMAO synthesis increases with insulin resistance.

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Obese Hispanic Females Improved Plasma Glucose and Lipid Profiles Following Aerobic Exercise Training

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(No relevant relationships reported)

Obesity is strongly associated with elevated morbidity and mortality, especially, within the population of Hispanic women. Although exercise can improve obesity, the role of different intensities of exercise in plasma glucose and lipid profiles has not been explored in the obese Hispanic population. **PURPOSE:** To examine the effects of 12-week aerobic exercise training at low- and high- intensity on plasma glucose and lipid profiles in obese Hispanic females. **METHODS:** Thirty sedentary, obese females (age = 26.07±4.4 years, height = 161.4±4.1cm, body weight = 89.8±8.1kg, and % body fat = 40.9±4.9%) were randomly assigned to three groups: control (n=10, no exercise), low-intensity (LI, n=10, 50% VO$_2$max), and high-intensity exercise (HI, n=10, 70% VO$_2$max). Participants in low- and high-intensity exercise groups performed a supervised treadmill exercise training for 12 weeks according to the following progressive exercise protocol: weeks 1 - 4 (3 days per week to expend 13.5 METs·hr/w), weeks 5 - 8 (4 days per week to expend 18.0 METs·hr/w), and weeks 9 - 12 (5 days per week to expend 22.5 METs·hr/w). Overnight fasting blood samples were collected at pre- and post-exercise training (POST). Changes in plasma glucose and lipid parameters, including total cholesterol (TC), lipoprotein (a) [Lp(a)], low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C) were analyzed using a 2 x 3 analysis of variance with repeated measures along with a Tukey post-hoc test (*p* < 0.05). **RESULTS:** Both LI and HI groups decreased body weight up to 2.1 and 3.4kg, respectively. TC at POST in the LI group (116.53±5.32 mg/dL) was significantly lower (*p*=0.012) than in the control (139.12 mg/dL). The LI group also had significantly lower LDL-C at POST (50.25±5.24 mg/dL) than the control (67.17±5.24 mg/dL, *p*=0.006) and the HI group (62.83±5.24 mg/dL, *p*=0.036), respectively. Plasma glucose at POST in both LI (75.32±2.71 mg/dL, *p*= .024) and control groups (80.1±2.71 mg/dL, *p*=0.001) was lower than in the

HI group (90.77±2.78 mg/dL). **CONCLUSION:** Although the 12-week aerobic exercise training at either low- or high-intensity can improve body weight and body composition, it seems that low-intensity exercise training can provide more favorable effects on plasma glucose and lipid profiles in obese Hispanic women.

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Downregulation Of Angptl6 Expression By Exercise In Mice And Human

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(No relevant relationships reported)

Angiopoietin-like protein 6 (ANGPTL6) has been introduced as an anti-obesity and insulin-sensitizing hepatokine in mice models. But in human studies, paradoxical upregulations of ANGPTL6 were reported in type 2 DM and metabolic syndrome. Although these phenomena have been understood as compensatory ones, regulatory mechanisms still remain unclear. **PURPOSE**: The objective of this study is to investigate the changes of ANGPTL6 levels by exercise in mice and human. **METHODS**: 1) Animal study: Male C57BL/6 mice were grouped into standard chow diet-fed, high fat diet-fed, and high fat diet-fed with swimming exercise. After 12 weeks of intervention, serum and liver tissues were harvested for analysis. 2) Human study: 20 healthy female subjects (47.75±2.09 years) performed one hour of supervised aerobic exercise four to five times per week for 12 weeks. Pre and post-training measurements were made. **RESULTS**: 1) Animal study: Swimming exercise significantly inhibited weight gain (final body weight 36.61±0.61 vs. 29.46±0.56g, p<0.001) and visceral fat accumulation on high fat diet in mice. Increased serum leptin levels on high fat diet were diminished on exercise intervention (41.5±6.3 vs. 28.1±4.5ng/mL, p<0.001). Hepatic *Angptl6* expressional profile showed same trend of leptin (relative expression 1.00±0.06 vs. 0.72±0.04, p<0.01). 2) Human study: After training program, there was a significant increase in maximal exercise capacity (VO$_2$max 31.25±1.18 vs. 35.51±1.17ml/min/kg, p<0.001) with decreased body mass index (24.80±0.66 vs. 24.05±0.64kg/m^2, p<0.001). Serum leptin (7.49±1.24 vs. 5.22±0.69ng/ml, p=0.022) and ANGPTL6 (414.02±24.93 vs. 348.25±18.45ng/ml, p=0.015) concentrations were significantly decreased by exercise intervention. **CONCLUSIONS**: Our study shows that habitual exercise significantly decreases ANGPTL6 expression in mice and human. As alterations of leptin were accompanied with ANGPTL6 changes, regulation of ANGPTL6 might be related to leptin signaling.

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Coagulation Activation Pathway May Be Altered in Individuals Comorbid with HIV and Type 2 Diabetes

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(No relevant relationships reported)

The expected lifespan of persons living with human immunodeficiency virus (PLWH) has increased significantly due to improved treatment options. However, an unintended consequence has been an increased prevalence of chronic diseases such as type 2 diabetes mellitus (T2D). It is therefore important to explore underlying biological mechanisms for this increased risk of T2D among PLWH as it is not yet well understood. Investigation of specific biomarkers may help define the pathogenesis of T2D in PLWH and yield positive outcomes including the detection of at risk individuals as targets of early interventional strategies along with identification of new diagnostic criteria. **PURPOSE:** The aim of this research was to identify specific biomarkers which differentiate PLWH and those comorbid with HIV and T2D (PLWH+T2D). **METHODS:** 16 PLWH (47.9±2.7 y/o; 10 male) and 16 clinically diagnosed PLWH+T2D (53.6±1.4 y/o; 10 male) were recruited for the study. Blood was drawn via venipuncture for assessment of HbA1c and biomarkers associated with inflammation (IL-1β, IL-6, hsCRP, insulin, adiponectin, leptin, and TNF-α, along with soluble receptor counterparts sIL-1RI, sIL-1RII, sIL-6RI, sTNF-RI, and sTNF-RII), vascular function (ADAMTS13, slCAM-1, sVCAM-1, SAA, and, SAP), and coagulation activation (fibrinogen, D-dimer, and, vWF). **RESULTS:** As expected, HbA1c was lower in PLWH (5.8±0.1 vs 7.0±0.4%, p<0.05). As further confirmation of T2D diagnosis, all individuals in the PLWH+T2D group were taking prescribed oral diabetes medication. Predictably, hsCRP levels were elevated; however, not significantly different between groups (7.8±1.4 vs 11.0±2.8 mg/L, p>0.05). Differences were found between PLWH and PLWH+T2D in indicators of coagulation activation, specifically vWF (2.39±0.42 vs 3.88±0.55 mg/dL, p<0.05) and fibrinogen (1425±103.1 vs 1914±184.2 ng/mL, p<0.05). No significant differences between PLWH and PLWH+T2D were seen in any biomarkers associated with vascular function or inflammation. **CONCLUSIONS:** We believe this is the first time biomarkers of vascular function and coagulation activation have been assessed in this comorbid

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population. The significant increase in vWF and fibrinogen in PLWH+T2D suggests that pathways involving coagulation may be the first altered in the transition to this comorbid state.

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Antibiotics Reduce While Forced-Exercise Increases Inflammation in the Small Intestine

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(No relevant relationships reported)

Risk of metabolic and intestinal inflammatory disorder development increases significantly with age. In contrast, exercise has shown to reduce disease risk and promote longevity. Interestingly, adenylyl cyclase 5 knock out (AC5KO) mice demonstrate an enhanced exercise capacity and improved longevity. **PURPOSE:** We aimed to examine the inflammatory status along the gastrointestinal tract of AC5KO mice compared to Wild type (WT) mice. **METHODS:** 21 C57BL WT and AC5KO male mice were randomly assigned to one of 2 groups: (1) sedentary and (2) exercise for 12 weeks. Mice had *ad libitum* access to food and water. Exercised mice were trained for 4 weeks at 60-70% max speed for 1 hr each session, 5 d/wk. WT sedentary and exercised groups were given antibiotics via oral gavage during the last 7 days of the exercise protocol. At the end of 4 weeks, mice were sacrificed and intestinal tissues were fixed for histological analysis and immunohistochemistry for cyclooxygenase-2 (COX-2), a marker of inflammation. Group means of staining score were analyzed using a one-way ANOVA and LSD post hoc tests. A difference of mean with a p value of ≤ 0.05 was considered statistically significant. **RESULTS:** In the duodenum, COX-2 expression was isolated in the lamina propria and staining occurred predominately within macrophages. COX-2 expression in the duodenum was less in sedentary animals given antibiotics ($p \leq 0.015$). In the ileum, COX-2 expression was localized to both the crypts and lamina propria. Expression in ileal crypts was less in sedentary animals given antibiotics compared to WT exercised animals ($p = 0.02$) while expression in the ileal lamina propria was increased in WT exercised animals ($0.001 \leq p \leq 0.009$). **CONCLUSIONS:** Antibiotics reduce small intestinal inflammation. COX-2 expression localizes differently in the mucosa along the small intestine. Forced-exercise increases inflammation to a greater degree in the lamina propria of the distal small intestine.

942   Board #203   May 30 2:00 PM - 3:30 PM

Effects of Early Life Undernutrition on Maximum Treadmill Running Capacity in Mice

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(No relevant relationships reported)

Undernourishment in early life has been shown to impair cardiovascular function, which could potentially influence maximum exercise capacity in adulthood. **PURPOSE:** To determine the effects of early life undernutrition on maximal exercise capacity in adulthood. **METHODS:** Using a cross fostering model, pups were undernourished either during gestation (GUN) or lactation (PUN; PN1-21) by feeding the dam a low-protein diet (8% protein) to decrease milk production. Control pups were born and suckled to dams fed an isocaloric diet with 20% protein content. At postnatal day 21 (PN21), all mice were weaned and switched to a control diet. To assess exercise capacity, mice began a 5-day treadmill acclimation protocol at PN61. At PN67, mice underwent a maximum work test, which began at 10 meters/minute with a 10% grade. Speed was increased every two minutes until exhaustion. The amount of work completed by each mouse was calculated as: Maximum Work(J)= 9.8 x Maximum Speed (m/min) x grade(radians) x Time (min) x Weight (kg). A two-way ANOVA was used to determine differences in maximal work and cardiac parameters between groups with the effects of gender and diet. **RESULTS:** GUN (0.3312±0.037 J) mice performed higher than PUN (0.2527±0.050 J) and CON (0.2674±0.030 J) mice on a maximum work test (p<0.05). There was no gender effect. **CONCLUSION:** Undernourishment during lactation leads to lower work capacity, indicating that developmental programing during the first 21 days of life impairs work capacity during adulthood.

943   Board #204   May 30 2:00 PM - 3:30 PM

Metabolic and Microbial Responses to Exercise in C57 Wild-type and Adenylyl Cyclase 5 KO Mice

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(No relevant relationships reported)

Healthy aging has been observed in our adenylyl cyclase type 5 knock out (AC5KO) model. Aging is also associated with alterations in composition and diversity of the gut microbiota. The extent to which the microbiota contributes to the healthy aging phenotype is unknown. **PURPOSE**: To examine the role of the microbiota in diabetes and exercise tolerance in AC5KO mice compared to wild type (WT). **METHODS**: 17 (n=6/group) 6-week old C57BL/6J male WT and AC5KO mice were randomly assigned to one of the following four groups: (1) wild type-exercise (WT-EX), (2) wild type-sedentary (WT-CON), (3) AC5-exercise (AC5-EX) and (4) AC5-sedentary (AC5-CON). Mice underwent a treadmill test to determine maximal oxygen uptake (VO$_2$max) and max exercise performance (i.e. running distance). Mice were exercised via forced treadmill running at 60-70% VO$_2$max for 60-minutes 5 days/week, for 5 weeks. Following exercise training, mice were given oral antibiotics for five days to eliminate gut microbiota. Measurements were taken: 1- prior to exercise, 2- post training/pre-antibiotic and 3- post antibiotic. Fecal samples underwent phenol-chloroform extraction and ribosomal operons were amplified with 10 ng of genomic DNA using the universal 16S rRNA-27Forward primer, 23S rRNA-2241Reverse primer and a High Fidelity/Proofreading Taq polymerase. The MinION was used for library preparation and we used Poretools and Geneious sequence analysis software for sequencing. Finally, fasted glucose tolerance (i.p; 2 ul/kg [BW]) and insulin tolerance (i.p;1 ul/kg [BW]) were measured. **RESULTS**: AC5KO mice have a unique microbiota with *Helicobacter typhlonius & Bacteroides sartorii spp.* being dominant in AC5KO and not in WT mice. Furthermore, AC5-EX mice showed altered glucose tolerance (33325 vs. 23025 AUC, p<0.05) and reduced exercise performance (517m vs. 258m, p<0.05) following antibiotic treatment. Post antibiotic AC5-EX mice showed insulin sensitivity following antibiotic treatment. **CONCLUSION**: AC5KO mice have a unique microbiota compared to WT mice and their insulin/glucose control phenotype may be dependent on the microbiota.

944   Board #205   May 30 2:00 PM - 3:30 PM

Anti-apoptosis Effects Of Diosgenin In D-galactose-induced Aging Brains

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate the effects of diosgenin on the D-galactose-induced cerebral cortical widely dispersed apoptosis.
METHODS: Male Wistar rats at 12-week-old were divided into four groups: Control (1 mg/kg/day of saline, i.p.), DD0 (150 mg/kg/day of D-galactose, i.p.), DD10 and DD50 (D-galactose+10 or 50 mg/kg/day of diosgenin orally). After eight weeks, histopathological analysis, positive TUNEL and Western blotting assays were performed on the excised cerebral cortex from all four groups.
RESULTS: TUNEL-positive apoptotic cells, the components of Fas pathway (Fas, FADD, active caspase-8 and active caspase-3) and mitochondria pathway (t-Bid, Bax, cytochrome *c*, active caspase-9 and active caspase-3) were increased in the DD0 group compared with the Control group whereas they were decreased in the DD50 group (p<0.05). The components of survival pathway (p-Bad, Bcl-2, Bcl-xL, IGF-1, p-PI3K and p-AKT) were increased in the DD50 group compared to the Control group, whereas the levels of Bcl-xL, p-PI3K and p-AKT were also compensatorily increased in the DD0 group compared to the Control group (p<0.05).
CONCLUSIONS:Taken together, diosgenin suppressed neuronal Fas-dependent and mitochondria-dependent apoptotic pathways and enhanced the Bcl-2 family associated pro-survival and IGF-1-PI3K-AKT survival pathways, which might provide neuroprotective effects of diosgenin for prevention of D-galactose-induced aging brain.

945   Board #206   May 30 2:00 PM - 3:30 PM

The Characterization of Normal Weight Obesity in College Students

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(No relevant relationships reported)

While normal weight obesity (NWO) has become an important health topic, to date no data exist describing physiological characteristics among this group. **PURPOSE:** The primary aim was to characterize NWO in college-age males and females through body composition and cardiometabolic measures. The secondary aim was to observe the relationship between waist to hip ratio (WHR) and body mass index (BMI) with body fat percentage (BF%). **METHODS:** Ninety-two college students (Mean ± SD; Age: 19.5 ± 1.4 yrs.; Height: 171.9 ± 9.4 cm; Weight: 67.9 ± 8.2 kg, BF%: 26.0 ± 6.2 %; males n=29; females n=63) participated in this study. NWO was defined being above NHANES body fat 25th percentile based on age and sex. Body composition variables including BF%, lean mass (LM), and visceral adipose tissue (VAT) were assessed by dual energy x-ray absorptiometry. The same technician measured waist and hip circumferences. Mean arterial pressure (MAP) and metabolic biomarkers [total cholesterol (TC), high density lipoproteins (HDL), non-high density lipoproteins (NHDL), and glucose (GLU)] were evaluated for cardiometabolic health. Blood pressure was measured in a seated position with an automated cuff; biomarkers were assessed by a fasted blood draw. **RESULTS:** Forty percent of the sample (n=37) was identified as NWO, with 31% of the females (n=19) being NWO, whereas 62% of males (n=18) were. NWO individuals had significantly higher BF% (28.4 ± 6.7% vs. 24.4 ± 5.2%, p<0.001), VAT (0.20 ± 0.15 kg vs. 0.07 ± 0.10 kg, p=0.002), and larger WHR (0.76 ± 0.40 cm 0.72 ± 0.41 cm, p=0.003) compared to normal weight lean (NWL). Although not significant, NWO had higher LM (46.2 ± 8.5 kg; NWL: 41.7± 10.3 kg, p>0.05) and MAP (NWO: 84.4 ± 6.8 mmHg; NWL: 82.5 ± 7.0 mmHg, p>0.05) compared to NWL. NWO also had higher levels of GLU, and lower levels of TC, HDL, and NHDL; however, biomarkers were not significantly different between groups (p>0.05). While WHR was significantly correlated with BF% (R= -0.293, p=0.005), BMI was not (p>0.05). **CONCLUSION:** The occurrence of NWO among otherwise healthy college students is high. Identification of these individuals may be an effective approach to obesity prevention and treatment. Determining effective methods to measure both body fat and abdominal obesity in this population is essential, as BMI may mask obesity in a young adult population.

946   Board #207   May 30 2:00 PM - 3:30 PM

Effects of Acute Exercise and Green Tea Supplementation on Glucose Homeostasis in Overweight/Obese Postmenopausal Women

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(No relevant relationships reported)

Menopause is associated with decreased estrogen levels, increased adiposity, negative changes in adiponectin and TNF-α, and increased insulin resistance. Decreased adiponectin and increased TNF-α are associated with impaired glucose uptake. Exercise enhances glucose uptake several hours post-exercise. Polyphenols in green tea extract (GTE) increase insulin sensitivity and adiponectin while decreasing TNF-α. Orzechowski (2003) proposed using antioxidants as a "preconditioning" method to prevent development of Type 2 Diabetes (T2D). **PURPOSE:** To investigate independent and combined effects of acute exercise or GTE on glucose homeostasis and adipokines in overweight to obese postmenopausal sedentary women. **METHODS:** Eight women (52 ± 7 yrs, BMI 32.04 ± 4.95 kg/m²) were randomly assigned to complete four trials (Control [C], green tea [GT], exercise [EX], green tea + exercise [GTEX]). For each trial the participant consumed 400 mg of placebo (rice flour, C and EX) or green tea extract (GT and GTEX) with lunch and dinner the day prior and the morning of (1 hr prior) an oral glucose tolerance test (OGTT). Exercise trials (EX and GTEX) consisted of walking exercise at 65% heart rate reserve (400 Kcal) and were completed 12-14 hours prior to the OGTT. **RESULTS**: Fasting glucose (C 5.7 ±.8, GT 6.1 ± 1.7, EX 5.6 ± .8, GTEX 5.4 ± .8 mmol) and insulin (C 11.93 ± 4.75, GT 11.66 ± 6.17, EX 11.31 ± 4.12, GTEX 12.23 ±6.05μU/ml) were not different between trials as well as no differences in area under the curve for both glucose and insulin. There were also no differences between trials for TNF-α (C 5.45 ± 3.68, GT 4.73 ± 1.38, EX 3.55 ± 1.46, GTEX 3.87 ± 1.81 pg/ml) or total adiponectin (C 7443 ± 2941, GT 4497 ± 3070, EX 10060 ± 7393, GTEX 5335 ± 3193 ng/ml). **Discussion:** An acute bout of exercise or green tea supplementation may not be sufficient to see a favorable impact in glucose homeostasis or adipokines within this population. Elevated TNF-α (> 1.36 pg/ml) and low adiponectin levels observed in all trials may reflect an inflammatory state that could be associated with menopause. Inflammation is known to alter glucose metabolism. Postmenopausal woman present a unique challenge with prevention of T2D, as increased adiposity and decreased estrogen levels negatively effects adipokines, which negatively impacts glucose homeostasis.

947   Board #208   May 30 2:00 PM - 3:30 PM

Family History of Diabetes Does Not Affect Exercise-Induced Improvements in Insulin Sensitivity and Metabolic Flexibility

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(No relevant relationships reported)

A Family History of Diabetes Does Not Affect Exercise Induced Improvement in Insulin Sensitivity and Metabolic Flexibility
Manuel Amador, Cesar Meza, Mario A Garcia, Christopher Figueroa, George King, Andrew McAinch, Sudip Bajpeyi
A family history of diabetes (FH+) is considered a risk factor to develop insulin resistance and type 2 diabetes. However, it is not known whether exercise induced improvement in insulin sensitivity (IS) and metabolic flexibility (MF) are impacted by a FH+, compared to those without (FH-).
PURPOSE: To determine if a FH+ limits exercise induced improvements in IS, MF, body composition, and strength following an 8-week combined aerobic and resistance training intervention.
METHODS: 19 sedentary, normoglycemic, Mexican-American males underwent 8 weeks of combined exercise training 3 times/week (35-min aerobic & 45-min resistance training/session). A controlled diet was provided 5 days before pre/post intervention tests. IS was assessed by hyperinsulinemic euglycemic clamp. MF was assessed by change in respiratory quotient (ΔRQ) at the insulin stimulated state of the clamp compared to the fasted state. Body composition was measured using DXA. Upper/lower body strength were measured by 1 repetition maximum bench press and leg strength dynamometer.
RESULTS: IS is significantly improved in both groups (FH- 2.95±31 to 3.84±0.31ml/ kg estimated mean body size (EMBS), p=0.03; FH+ 3.6±0.5 to 4.8±0.5ml/kg EMBS; p=0.002). MF significantly improved in both groups (FH- 0.72±0.009 to 0.78±0.008, p=0.001; FH+ 0.70±0.01 to 0.80±0.02, p=0.0001). Fat free mass significantly improved in both groups (FH- 56.6±2.1 to 58.5±2.1kg, p=0.01; FH+ 51.8±1.95 to 53.4±1.79kg, p=0.01). Upper body strength (FH- 172.78±20.95 to 200.56±20.74lb, p=0.0001; FH+ 136.5±14.06 to 168.33±15.29lb, p=0.0001) and lower body strength (FH- 368.89±31.02 to 431.11±22.58lb, p=0.007; FH+ 341.0±22.03 to 412.78±16.22lb, p=0.0001) significantly increased in both groups. Degrees of improvement in IS was not different between groups (FH- 28.3±13.6% vs. FH+ 41.66±11.9%; p>0.05).
CONCLUSION: FH+ is not a limiting factor for exercise induced improvements in IS, MF, body composition, and strength in normoglycemic Mexican Americans.

948   Board #209   May 30 2:00 PM - 3:30 PM

Physical Activity and Glycemic Control in Low Versus High Inflammation Phenotypes in Metabolically Healthy Adults

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(No relevant relationships reported)

Metabolically healthy overweight or obese (MHO) individuals may be studied to better understand the relationship of low-level inflammation to physical activity (PA) and fitness, metabolic syndrome, glycemic control, and postprandial responses. It was hypothesized that individuals with lower inflammation would have greater volume of PA, cardiorespiratory fitness (VO₂max), and metabolic health.
PURPOSE: To compare PA, VO₂max, glycosylated hemoglobin (HbA1c), metabolic syndrome criteria, and metabolic responses to a high-fat meal between low (LO) and high (HI) inflammation phenotypes within a group of MHO adults.
METHODS: Adults (n=25), 23-54 y of age with BMI from 27-35 kg·m⁻² were assessed for body composition, self-reported PA, VO₂max, and fasting/resting concentrations of interleukin (IL)-1β, IL-6, IL17-, IL-23, tumor necrosis factor-α (TNF-α), and granulocyte-macrophage colony stimulating factor (GM-CSF). LO (n=11) were below the group median for ≥ 4 of the cytokines; HI (n=12) above for ≥ 4. Two participants were between phenotypes. After fasting blood collection, a high fat meal (50 g fat, 54 g carbohydrate, and 12 g protein) was consumed and 4 hourly, postprandial blood samples were collected for measurement of glucose, insulin, and triglycerides (TG).
RESULTS: Mean cytokine concentrations were 1.8 to 4.3-fold higher (p<0.05) in HI compared to LO for IL-1β, IL-6, IL17-, IL-23, TNF-α, but not (p=0.12) GM-CSF. The frequency of aerobic activity was higher (p<0.05; mean ± SEM; 5.2 ± 0.5 vs 3.1 ± 0.4

d·wk⁻¹) while VO₂max was similar (p=0.21; 42.9 ± 2.7 vs 38.3 ± 2.2 ml·kg·min⁻¹) for LO vs HI. Contrary to our hypothesis, LO were higher (p<0.05) in HbA1c (5.38 ± 0.08 vs 5.10 ± 0.07%) and 1-h postprandial glucose (116.6 ± 5.7 vs 102.1 ± 3.5 mg·dl⁻¹). TG and insulin responses, BMI, body fat (%), visceral adipose (l), and metabolic syndrome criterion scoring for waist circumference, blood pressure, and fasting TG, glucose and HDL were similar between groups.
CONCLUSION: The current data support the beneficial influence of physical activity on inflammation; however, the unexpected finding of healthier glycemic control in individuals with higher inflammation warrants additional research.

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949   **Board #210**   May 30 2:00 PM - 3:30 PM
Reduced Insulin Sensitivity in Young, Normoglycemic Subjects, Alters Tissue Oxygenation During Post Occlusive Reactive Hyperemia

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(No relevant relationships reported)

INTRODUCTION: Near-infrared spectroscopy (NIRS) measures of the tissue oxygen saturation ([StO₂]) reperfusion rate during post occlusive reactive hyperemia (PORH) has recently been correlated with flow mediated dilation (%FMD) of the popliteal artery (McLay et.al. 2016). Cardiovascular disease is associated with impairments in %FMD. Reduced insulin sensitivity may negatively affect the vascular system for many years prior to a pre-diabetic/diabetic diagnosis. **PURPOSE:** To determine if static and dynamic, [StO₂] parameters during PORH are correlated with metabolic markers in healthy, young, normoglycemic subjects. **METHODS:** Glucose (G) and insulin (I), both in fasting (F) conditions and during an oral glucose tolerance test (OGTT), were measured in twenty-three, young (18-26y), healthy subjects (12M/11F). Each subject underwent upper limb, PORH with oxy- ([O₂Hb]) and deoxy- [hemoglobin + myoglobin], ([HHb]) measured in the skeletal muscle of the antebrachium by NIRS. [StO₂] was calculated [O₂Hb]/ Total hemoglobin ([O₂Hb] + [HHb]) at rest, during the cuff, and during PORH. Parameters describing the amplitude and time course of the response were measured. Hepatic insulin sensitivity (ISI_HOMA), whole body insulin sensitivity (Matsuda Index), area under the curve for I and GLU, FI and FG and 2-HR GLU were measured. **RESULTS:** FI (range 2.43 - 12.51 µIU/ml) was significantly negatively correlated (r=0.43, P=0.02) with the amount of change of [StO₂] during reperfusion (Δ [StO₂]) (range 13.94 - 38.66%) and significantly positively correlated (r=0.52, P=0.005) with the minimum [StO₂], a measure of extraction, during the cuff (Min [StO₂]) (range 35.97 - 61.87%). ISI_HOMA (range 0.37-2.07) was significantly positively correlated (r=0.57, P=0.002) with Δ [StO₂] and significantly negatively correlated (r=0.56, P=0.006) with Min [StO₂]. There was no significant correlation between any metabolic parameter and [StO₂] upslope (initial slope of [StO₂] following cuff release). **CONCLUSIONS:** Δ [StO₂], a measure of the amount of reperfusion, and Min [StO₂], a measure of extraction during the cuff, were correlated with FI and ISI_HOMA, two of the longest used markers of metabolic function. NIRS-derived [StO₂] may be a useful tool for assessing levels of reduced insulin sensitivity in normoglycemic, young adults.

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950   **Board #211**   May 30 2:00 PM - 3:30 PM
Lower Glucose Tolerance in Normoglycemic, Healthy Hispanics with a Family History of Type 2 Diabetes

Cesar Meza[1], Manuel Amador[1], Mario Garcia[1], Christopher Figueroa[1], Andrew McAinch[2], Sudip Bajpeyi[1]. [1]University of Texas at El Paso, El Paso, TX. [2]Victoria University, St Albans, Australia.

(No relevant relationships reported)

Obesity and type 2 diabetes are associated with impaired glucose homeostasis and blood lipid profiles. Further, a family history of diabetes (FH) increases the risk for development of insulin resistance. However, it is unclear whether differences in glucose tolerance, blood glucose and lipid profiles exist between individuals with/ without a FH.
PURPOSE: To investigate whether a FH impairs glucose tolerance and blood lipid profile in healthy, sedentary Hispanic males.
METHODS: 22 sedentary, normoglycemic, Mexican American males (mean±SEM: age:23±0.56 yrs; BMI: 26.9±0.98 kg/m²) with/without FH participated in the study. Glucose tolerance was assessed by calculating glucose area under the curve (AUC) following an oral glucose tolerance test. Participants were fed a 5-day standardized diet (55/15/30% Carbohydrate/Protein/Fat) before testing. Serum was collected for analysis of blood glucose and lipid panels by a diagnostic center (Lab Corp, Burlington, NC).
RESULTS: AUC was significantly greater in individuals with a FH compared to controls without FH (FH- vs FH+: 311.91±7.30 vs 355.35±11.91 AU; p=0.008). Fasting glucose (75.9±2.07 vs 79.1±2.85 mg/dL; p=0.40) and HOMA-IR (2.64±0.48

vs 1.81±0.19 AU; p=0.26) were not different between groups. There was no difference in fasting insulin between groups. Lastly, no differences in total cholesterol (p=0.18), triglycerides (p=0.28) or LDL cholesterol (p=0.24) were detected regardless of FH.
CONCLUSION: Fasting glucose, insulin, insulin resistance measure by HOMA-IR, and lipid profiles were not different between individuals with and without a FH. However, glucose AUC may be an early indicator of risk for developing insulin resistance in young adults with a family history of type 2 diabetes, despite an otherwise normal clinical health status.

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951   **Board #212**   May 30 2:00 PM - 3:30 PM
Restricted Carbohydrate Diet and Exercise Improves Metabolic and Inflammatory Profiles in Metabolic Syndrome

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(No relevant relationships reported)

One approach to slow the pandemic of obesity and chronic disease is to look to our evolutionary past for clues of the changing behaviors contributing to the emergence of 'diseases of civilization'. Diet and exercise that resemble our ancestral behaviors independently reduce risk factors for the development of chronic disease. To date, little research has examined the effects of combining a Paleolithic diet with high intensity exercise. **PURPOSE**: The purpose of this study was to investigate the effects of diet and exercise patterns that more closely resemble those of our evolutionary past on inflammatory and metabolic profiles in individuals characterized as having Metabolic Syndrome (MetS). **METHODS**: Eleven subjects with MetS followed a crossover design with two 4-wk interventions, including a restricted carbohydrate Paleolithic-based diet (RCPD; ≤50gCHO) with high intensity interval training (RCPD-Ex) and a RCPD diet with sedentary activity (RCPD-Sed), separated by a 4-wk washout period. A two-way analysis of variance with repeated measures was performed with post-hoc analysis using simple effects analysis with a Bonferroni adjustment. The level of statistical significance was established a priori as $P < 0.05$. Values are reported as means ± SD. **RESULTS**: Compared to baseline, RCPD-Sed and RCPD-Ex improves VO²_max by 22% and 29% (28 ± 5.5, 31 ± 6.1 mL·kg-1·min-1), respectively and improves metabolic markers including waist adiposity (-15%, -18%), weight loss (-3%, -5%), body fat % (BF%; -7%, -12%), fasting plasma glucose (GLU; -20%, -27%), triglycerides (TG; -47%, -52%), HDL-C (+22%, +36%), mean arterial pressure (MAP; -28%, -34%), fasting insulin (-34%, -39%), HOMA-IR (-37%, -41%), adiponectin (+33.7%, +38%), and leptin (+33.7%, +38%), levels, respectively when compared to baseline. RCPD-Sed and RCPD-Ex also improves inflammatory markers reducing hsCRP by -32% and-36% (2.8 ± 1.4, 2.5 ± 1.4 pg/mL), TNF-alpha by -35% and -41% (2.3 ± 0.6, 1.9 ± 0.4 pg/ml), and IL-6 by -29% and -40% (2.7 ± 0.8, 2.1 ± 0.6 pg/ml), respectively, when compared to baseline. **CONCLUSION**: Adopting behaviors from our evolutionary past, including diet and exercise, shows favorable metabolic and inflammatory profiles in those that characterize with MetS.

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952   **Board #213**   May 30 2:00 PM - 3:30 PM
Metabolic Inflexibility Among Obese Pregnant Women May Lead to Unfavorable Downstream Metabolic Outcomes

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(No relevant relationships reported)

PURPOSE: The inability to upregulate fat oxidation in response to a high-fat meal during pregnancy (i.e. metabolic inflexibility) may result in a positive lipid balance and excessive gestational weight gain (GWG); both of which may lead to long-term obesity. Metabolic inflexibility may also lead to lipid accumulation and subsequent impaired insulin signaling; playing a role in exaggerated insulin resistance during pregnancy. With obesity, excessive GWG, and insulin resistance being some of the most common and concerning obstetric issues, understanding mechanisms that contribute to these conditions is vital. The purpose of this study was to determine the role of obesity on metabolic inflexibility during pregnancy, and how metabolic inflexibility may contribute to subsequent maternal and neonatal outcomes.
METHODS: After an overnight fast, baseline lipid oxidation (via indirect calorimetry) and insulin resistance (HOMA-IR) were assessed in pregnant women (32-39 weeks gestation). A high-fat shake was consumed (62% fat) and the same metabolic parameters were assessed 4 hours post-shake consumption. Metabolic inflexibility was calculated as fold change in lipid oxidation from baseline to 4-hours post high-fat shake. **RESULTS**: Participants included 56 pregnant women: 31 lean (pre-pregnancy BMI= 22.3±1.6 kg/m², age= 30.1± 4.6 y), 11 overweight (pre-pregnancy BMI=

26.9±1.2 kg/m², age: 29.9 ±1.0 y), and 14 obese women (pre-pregnancy BMI= 35.9± 5.3 kg/m², age= 29.0 ± 3.6 y). Fasted lipid oxidation values were higher among obese women (0.09±0.03g/min) compared to lean women (0.07±0.04g/min) (p=0.05), and were positively correlated to GWG among all participants (r=0.38, p<0.01). Obese pregnant women were less able to upregulate fat metabolism in response to the high-fat meal (i.e. metabolically inflexible) compared to lean women (fold change in lipid oxidation- lean: 59.6 ± 50.6% vs. obese: 36.5 ± 49.9%, p=0.06). There was a trending relationship between metabolic inflexibility and insulin resistance (r=0.33, p=0.07). Data collection and analysis are ongoing. **CONCLUSIONS**: Obese pregnant women failed to upregulate lipid metabolism to the same extent as lean pregnant women in response to a high-fat meal. This "metabolic inflexibility" may contribute to unfavorable maternal and neonatal outcomes.

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Exercise And Diet In Circadian Control Of Postprandial Glycemia

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(No relevant relationships reported)

PURPOSE: On the recommended 45 to 65% high-carbohydrate, low-fat diets, evening meals, but not morning meals, produce glucose intolerance (GLU-INT). We have recently tested the hypothesis that the high carbohydrate (CHO) content of the diet contributed to evening postprandial GLU-INT and found a 30% reduction in evening postprandial insulin and in HOMA-IR measure of insulin resistance after one day of low (30%), relative to 60% CHO diet (Lin & Borer, PLoS ONE 2016). Two hours of exercise before the two daily meals did not alter this dietary effect but increased GLU-INT after both diets. The purpose of the present study was to test the hypothesis that (1) one day of low-CHO diet will reduce postprandial insulin and glucose at both extremes of the circadian period, and (2) that exercise after the meals will lower or eliminate evening GLU-INT.
METHODS: Subjects were 8 postmenopausal women who for 24 h ate a 25%-CHO diet with the final meal at 7 am or 7 pm . Meal was followed by 10-minute blood collection over 4.5 hours for measurement of glucose and insulin. Two trials were sedentary and in two others 1 h of moderate-intensity exercise started 40 minutes after the test meals. Glucose oxidase was used to measure glucose and radioimmunoassay for insulin.
RESULTS: Circadian time had no effect on postprandial insulin in either sedentary or exercise trials. However, postprandial GLU-INT was observed after evening compared to morning meals. Post-meal exercise attenuated by about 50%, but did not abolish, evening GLU-INT.
CONCLUSIONS: Evening postprandial GLU-INT persists even on 25%-CHO diet. Higher postprandial insulin resistance after evening relative to morning meal reflects higher plasma glucose but unchanged insulin response in the evening compared to morning. One h of exercise after the meals attenuated, but did not eliminate, evening postprandial GLU-INT. Therefore, a combination of low-CHO diet and post-meal, but not pre-meal, exercise reduces evening GLU-INT.

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The Postprandial Glycemic Response to Acute Bout of Exercise in Healthy Adults

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(No relevant relationships reported)

Short bouts of exercise can better fit into a busy schedule and have been shown health benefits for glycemic control. However, postprandial glycemic response to a short bout of exercise during mid-day remains to be explored. **Purpose**: This study was to examine glucose responses to short bouts of exercise following different meals at lunch time among healthy adults. **Methods:** Ten healthy young adults (28.2±7.7 yrs) participated in the study with a 2×2 factorial design. Each participant completed four different trials on nonconsecutive days with a different meal and exercise combination. The meal offered was either a standard burger, approximately 740 calories or a prepacked Mediterranean Sandwich, approximately 560 calories. Thirty minutes after the meal, the participants performed either a 10-min treadmill walking at 3 mph with no incline or a 10-min stair stepping on a 7-inch step at a cadence of 92 steps per minute. The combination of meal and exercise was randomized for each trial. Blood glucose was monitored at baseline, 5 minutes post meal, 30 minutes post meal, 5 minutes during exercise, immediately post exercise and 15 minutes post exercise. Blood pressure, heart rate, RER, and VO_2 were also monitored at the corresponding time points. **Results:** Statistical analysis was performed to determine the effect of diet and exercise on glycemic response. Blood glucose level (mg/dL) was measured as 95.13 ± 20.46 at baseline with a significant increase at 30 min post meal (112.73 ± 20.54, P = 0.00). Blood glucose was significantly reduced at 5 min during exercise (105.43 ± 20.06, P=0.024), immediately post exercise (94.51 ± 23.6, P = 0.00) and 15 min post exercise (102.97 ± 17.34, P = 0.005) compared with 30-min post-prandial blood glucose. Multivariate analysis shows a significant main effect for exercise (P =

0.037). No significant effect was found for diet (P = 0.305) or interaction of diet by exercise (P = 0.386). Post hoc analysis further revealed that the only exercise effect was found at 5 min post meal, which was disregarded due to no true exercise effect. **Conclusion:** The finding suggests that a 10-min short bout of exercise significantly lowered post-prandial blood glucose among healthy individuals during midday. The types of the meal consumed and exercise performed made no difference on glycemic responses.

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Low-Calorie Diet Plus Interval Exercise Training Improves Metabolic Flexibility and Insulin Sensitivity in Obese Women

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(No relevant relationships reported)

PURPOSE: Metabolic flexibility has been implicated in the regulation of insulin sensitivity and glucose homeostasis. Although low-calorie diets (LCD) and interval exercise (INT) have been independently shown to improve metabolic flexibility and insulin sensitivity, the combined effect of these therapies is unknown in obese adults. We tested the hypothesis that LCD+INT would enhance fuel selection to a greater extent than a LCD alone, and this change would correlate with insulin sensitivity. **METHODS**: Twenty-four women (Age: 48.2±2.4y, BMI: 37.8±1.3kg/m²) were randomized to a LCD (n=12; mixed meals of ~1200kcal/d) or LCD+INT (n=12; 60min/d of supervised INT at 90% and 50% HR_{peak} for 3 min each, respectively). LCD+INT subjects received an additional 350kcal post-exercise to equate energy availability between groups. Fitness (VO_2peak), percent body fat (BodPod), and insulin sensitivity (Matsuda Index; 180min 75g OGTT) were assessed pre- and post-intervention. Respiratory exchange ratio (RER; indirect calorimetry) was measured at 0, 60, 120, and 180 min of the OGTT to determine metabolic flexibility, which was defined as the slope of fasting to post-prandial (PP; average of 60-180 min) RER. **RESULTS**: LCD and LCD+INT had similar reductions in caloric intake (*P*<0.001), percent body fat (*P*<0.001), fasting plasma glucose (*P*=0.04), fasting RER (*P*<0.001) and improvement in insulin sensitivity (*P*=0.02). However, LCD+INT improved VO_2peak (*P*=0.04), insulin iAUC$_{180min}$ (*P*=0.08), and metabolic flexibility (*P*=0.007) as well as maintained PP RER (*P*<0.001) compared with LCD. Maintenance of PP RER (r=-0.50, *P*=0.01) and reductions in percent body fat (r=-0.45, *P*=0.02) were significantly associated with improved insulin sensitivity. Further, increased metabolic flexibility was directly associated with improved VO_2peak (r=0.48, *P*=0.01). **CONCLUSIONS**: Adding INT to a LCD accentuates metabolic flexibility in relation to insulin sensitivity in obese women. These findings highlight that INT-induced adaptations may be additive for glucose regulation during a weight-loss intervention.

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The Effects Of Age And Sex On Obesity And Insulin Action In C57bl/6j Mice

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the effects of age and sex on body composition, energy expenditure, physical activity, and glucose tolerance in C57BL/6J mice. **METHODS:** Young (YG, 20-25 weeks old) and aged (AG, 72-76 weeks old) mice were housed in metabolic cages to measure energy expenditure (EE) and physical activity (PA), underwent body composition analysis by magnetic resonance imaging, and were subjected to an intraperitoneal glucose tolerance test (GTT) to assess insulin action. **RESULTS:** Body composition analysis revealed that AG male mice had a significantly greater body mass (42.2±1.9 vs 30.0±0.4 g, P<0.0001), fat mass (18.7±2.0 vs 3.3±0.4 g, P<0.0001), and percent body fat (43.0±3.0 vs 11 vs 11.0±1.5%, P <0.0001) than YG male mice. In AG female male mice, body mass was significantly higher (32.8±1.6 vs 26.3±0.9 g, P<0.02), but fat mass (13.3±2.0 vs 9.5±1.3 g, P<0.24) and percent body fat (37.8±4.8 vs 35.5±3.8%, P=0.67) were similar when compared to YG female mice. Interestingly, lean body mass was higher in AG female mice (16.9±0.6 vs 14.7±0.6, P<0.008) but lower in AG male mice (18.4±0.4 vs 22.6±0.5, P<0.0001) when compared to their young counterparts. AG male mice had significantly higher body mass (42.2±1.9 vs 32.8±1.6 g, P=0.001) and fat mass (18.7±2.0 vs 13.3±2.0 g, P=0.04) compared to AG females, however, percent body fat (43.0±3.0 vs 37.8±4.8%, P=0.28) was similar between AG male and female mice. Surprisingly, EE was higher in both AG male (24.0±0.8 vs 19.0±0.4 kcal/hr, P=0.004) and female mice (26.4±2.0 vs 20.7±0.4 kcal/hr, P=0.001) compared to respective YG mice; however, EE does not appear to explain the sex-dependent differences in body composition. Physical activity tended to be higher in AG female mice compared to AG male mice, but this effect was not significant (P=0.12).

Abstracts were prepared by the authors and printed as submitted.

Regarding the effect of aging on insulin action, the area under the GTT curve was significantly higher in AG males (95,102±6,818 vs 64,005±2031, P=0.002) but not AG female mice (50,168±2345 vs 47,369±4,089, P=0.55). **SUMMARY:** Our findings indicate that C57BL/6J female mice, unlike male mice, are protected from age-related obesity and insulin resistance. The mechanism responsible for this protection is yet to be identified.

B-69   Free Communication/Poster - **Nutrition and Immunology**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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957   Board #218   May 30 3:30 PM - 5:00 PM

Bovine Colostrum Has No Effect on Mucosal Immunity Before or After Exercise in a Hot and Humid Environment

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(No relevant relationships reported)

Intro: It is known that strenuous or prolonged exercise can lead to exercise-induced immune impairments in mucosal immunity. Further, exercise in the heat reduces salivary lysozyme (Lys). Bovine Colostrum (BC) can enhance mucosal immunity associated with strenuous exercise. However, the effects of BC remain unclear during exercise in hot and humid conditions. **Purpose:** The purpose of this study was to quantify the effects of BC supplementation on salivary lactoferrin (Lac) and Lys following exercise in a hot and humid environment. **Methods**: 10 males (20±2 years, VO_{2max} 55.8±3.7 mL kg^{-1} min^{-1}, 11.8±2.7% body fat) ran for 46±7.7 min at 95% of V_T in 40° C and 50% RH following a 14-day double-blinded supplementation with either BC or isocaloric placebo (Pla). There was a 3 week washout period before the groups were switched and the procedures repeated. Core temperature, skin temperature, heart rate, and rating of perceived exertion were recorded every 5 min during exercise. Unstimulated salvia was collected pre, post, 1 h, and 4 h post exercise. Lac and Lys concentrations were quantified via ELISA. **Results**: Exercise resulted in an immediate increase in concentration and secretion rate for Lac and Lys (p<0.05), but BC had no effect. Mean body temperature was similar between groups (beginning: 36.11 ± 0.30°C, ending: 39.52 ± 0.28°C (BC); beginning: 35.96 ± 0.43°C, ending: 39.42 ± 0.38°C (Pla)). Saliva flow rate was not different between groups (pre: 0.54 ± 0.3, post: 0.44 ± 0.3, +1: 0.67 ± 0.3, +4: 1.0 ± 0.4 mL/min (BC); pre: 0.58 ± 0.2, post: 0.37 ± 0.1, +1: 0.63 ± 0.2, +4: 0.83 ± 0.4 mL/min (Pla)). **Conclusion**: Contrary to previous work, exercise in the heat did not reduce mucosal immunity. Further, despite similar supplementation protocols that showed enhanced mucosal immunity, BC provided no benefit, either at baseline or in response to exercise. Thus, 45 min of running near V_T, in a hot and humid environment, did not impair mucosal immune parameters.

	Lac. Conc. (µg/ml)		Lys Conc. (µg/ml)		Lac Sec. Rate (µg/min)		Lys Sec. Rate (µg/min)	
	BC	PLA	BC	PLA	BC	PLA	BC	PLA
Pre	22.9 ± 19.3	12.2 ± 5.3	8.2 ± 10.0	3.3 ± 2.15	11.9 ± 10.0	7.2 ± 4.7	4.9 ± 7.1	2.1 ± 1.9
Post	67.2 ± 55.6*	75.1 ± 61.1*	25.6 ± 13.7*	23.6 ± 12.6*	25.2 ± 20.6*	26.1 ± 18.5*	12.7 ± 1337*	8.2 ± 4.8*
1-Hr Post	21.2 ± 17.1	17.3 ± 9.1	13.8 ± 12.8*	11.1 ± 10.9*	12.5 ± 8.4	10.8 ± 7.2	10.6 ± 11.9*	6.9 ± 7.6*
4-Hr Post	17.4 ± 11.0	17.2 ± 8.6	13.3 ± 11.0*	9.6 ± 7.7*	18.4 ± 14.2	12.11± 5.3	14.0 ± 11.4*	6.8 ± 5.2*
*p<0.05 from pre, *n* = 10.								

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Phd2/hif-1α Axis Regulates Intestinal Barrier Function After Strenuous Swimming

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(No relevant relationships reported)

PURPOSE: Exercise decreases tissue blood flow in the gastrointestinal (GI) system. The hypoxia inducible factor-1α (HIF-1α) and its regulator, prolyl hydroxylases 2 (PHD2), are pivotal in the transcriptional responses to the oxygen flux. Strenuous exercise induces immunosuppression and may lead to intestinal barrier dysfunction. Therefore, we hypothesized that PHD2/HIF-1α axis is involved in the intestinal barrier function after strenuous swimming. **METHODS:** Four mouse models were used in this study (male, 8-week, n=6/group). (1) ROSA26 ODD-Luc/+ mice were applied to monitor HIF-1α expression in the intestine. (2) C57BL/6 mice were randomized into 4 groups (n=8/group): control (C), strenuous swimming (S), intraperitoneal injected PHDs inhibitor DMOG (D); injected HIF-1α inhibitor PX-478 before swimming (PS). Intestinal segments were stained with HE and AB-PAS. Intestinal permeability was quantified with FITC-dextran. Bacterial translocation was determined by quantification of colony forming units (CFUs) in cultured mesenteric lymph nodes, livers, kidneys and spleens. (3) Villin-Cre mediated, intestine-specific deletions of HIF-1α (Vil-Hif1a$^{-/-}$) or (4) PHD2 (Vil-PHD2$^{-/-}$) mouse models were developed to verify the function of PHD2/HIF-1α axis in regulating the intestinal antimicrobial responses related genes expression. **RESULTS:** (1) One session of strenuous swimming markedly increased *in vivo* HIF-1α in the intestine (C: Radiance$_{max}$ = 0.31, S: Radiance$_{max}$ = 2.17, 10^{7}p/sec/cm^2/sr, P<0.01). (2) One session of strenuous swimming increased bacteria translocation (C: 0.61±0.15, S: 6.25±2.49, 10^5CFU/g, P<0.01) and intestinal permeability (C: 1, S: 1.87±0.21, folds, P<0.01). (3) The antimicrobial responses related genes expression was significantly decreased in Vil-Hif1a$^{-/-}$ (P<0.01, compared to the controls), including Il12a, Irak3, Irf5, Lbp, Lyz2, Nlrp1a, Ticam2, Tlr4, Tlr9 and Tnfa. **CONCLUSION:** Strenuous swimming induces intestinal barrier dysfunction. PHD2/HIF-1α axis plays an important role in the regulation of intestinal barrier dysfunction related genes expression after strenuous swimming in mice.

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Effects Of Diet Before Endurance Exercise On Hepcidin Response In Young Females

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(No relevant relationships reported)

PURPOSE: The purpose of the present study was to examine the effects of diet before prolonged exercise on hepcidin response in young female subjects. **METHODS**: Ten young, untrained-female subjects [age 20.6 ± 0.8 years; height 157.5 ± 1.0 cm; weight 54.4 ± 1.5 kg; peak oxygen uptake (VO2max) 35.9 ± 1.1 ml/kg/min] participated in the present study. Subjects completed a 60-min bout of cycling at 65% of VO2max after with consuming (FED) or not consuming (CON) a meal before the exercise. The two experimental sessions were conducted with a crossover design, and these sessions were separated by about a month (each trial was performed during the follicular phase). Blood samples were collected before exercise, immediately after exercise and 3-h after exercise. **RESULTS** : Blood glucose levels were significantly elevated immediately after exercise in the FED (from 91 ± 2 mg/dL to 114 ± 5 mg/dL, P < 0.05). Serum iron level was significantly elevated after exercise in both FED (from 82 ± 14 µg/dL to 99 ± 16 µg/dL, P < 0.05) and CON (from 70 ± 14 µg/dL to 83 ± 15 µg/dL, P < 0.05). However, plasma interleukin-6 and hepcidin levels were not altered significantly during 3-h of post-exercise period in either condition (interaction, main effects for trials and time, P > 0.05). **CONCLUSIONS** : Diet before endurance exercise did not affect exercise-induced hepcidin elevation in young females.

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Aerobic Training Status Enhances the Pentraxin 3-Mediated Innate Immune Response Following Maximal Exercise

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(No relevant relationships reported)

PURPOSE: Pentraxin 3 (PTX3) is a vital regulator of innate immune function. Although plasma PTX3 concentrations are enhanced by aerobic exercise, the capacity of aerobic exercise to alter PTX3 functioning at the cellular level in aerobically trained (Tr) and untrained (UTr) subjects remains unknown.

METHODS: Fifteen Tr and 15 UTr participated in an acute bout of maximal exercise to examine *ex vivo* PTX3 production from whole blood (WB) and isolated peripheral blood mononuclear cells (PBMCs) exposed to LPS or palmitate. The capacity of PTX3 to regulate the *ex vivo* production of inflammatory cytokines was also examined in isolated PBMCs.

RESULTS: Elevated plasma PTX3 concentrations prior to exercise were positively associated with the percent change (pre to post exercise) in plasma PTX3 concentrations following acute exercise (r = 0.428, *p* = 0.018), independent of training status and cardiorespiratory fitness (VO_{2max}). In response to acute exercise, while *ex vivo* PTX3 production from LPS stimulated WB was unaltered following acute exercise in all subjects, the production of PTX3 from LPS stimulated PBMCs tended to be lower in Tr compared to UTr subjects (*p* = 0.098). Likewise, PTX3 production from palmitate stimulated PBMCs was reduced in Tr compared to UTr subjects (*p* = 0.017). In addition, plasma PTX3 concentrations in Tr, but not UTr, subjects were positively associated with the LPS- and palmitate-mediated production of PTX3 from PBMCs at rest and in response to acute exercise (*p* ≤ 0.050). Next, isolated PBMCs were stimulated with PTX3. As a result, PTX3-mediated production of the anti-inflammatory cytokines IL-10 and TGF-B1 decreased following acute exercise in both Tr and UTr subjects (*p* = 0.004, *p* ≤ 0.001, respectively). To the contrary, although PTX3-mediated IL-6 production was unaltered following acute exercise, the percent change in IL-6 production was positively associated with elevated plasma PTX3 concentrations at rest and in response to acute exercise in Tr subjects only (*p* ≤ 0.050). **CONCLUSIONS**: Aerobic exercise training may enhance the utility of plasma PTX3 concentrations to serve as a biomarker of the PTX3-mediated innate immune response to acute exercise.

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The Effect Of Exercise On CD4+ T-cell Activation And Their Susceptibility To HIV-1

Alexander K. Holbrook, Michael A. Belshan, Eric C. Bredahl, Jacob A. Siedlik. *Creighton University, Omaha, NE.* (Sponsor: Joan Eckerson, FACSM)
(No relevant relationships reported)

HIV-1 can efficiently infect and replicate in activated CD4+ cells, including T cells and macrophages. Quiescent CD4+ T cells are susceptible to virus binding and entry, but infect poorly due to a lack of transcriptional and metabolic factors. We previously showed that circulating T cell populations undergo significant functional changes after short episodes of intense exercise. We hypothesize these changes can prime T cells for HIV-1 infection, and possibly facilitate the development of latent infection. **PURPOSE**: To identify if exercise-induced changes in CD4+ T cell physiology alter susceptibility to HIV-1 infection. **METHODS:** Subjects participated in both a control (no exercise) and exercise session. Venous blood samples were obtained at baseline (Pre) and immediately after each session (Post) in sodium heparin vacutainers. Blood samples were immediately processed and CD4+ T cells isolated with a human CD4+ T cell enrichment kit. A subset of cells was activated by stimulation with anti-CD3 and -CD28 antibodies. Unstimulated cells were immediately inoculated with NLX HIV-1 at a multiplicity of infection (MOI) of ~0.1 for 4 h, washed, and cultured in XF T Cell media supplemented with 50 U/mL IL-2. After 3 d of stimulation, the activated cells were similarly infected and cultured. Cultures were incubated for 17 d and supernatants collected, clarified by centrifugation, and stored at -20°C every 3-4 d for measurement of virus replication. At 14 d post infection, the resting cells were activated for 3 days with human CD3/CD28/CD2 T cell activator beads to test for latent infection (activated cell group was not restimulated). Virus replication was quantified by HIV reverse transcription assay. **RESULTS:** Preliminary data from the initial subjects suggests there is not a statistically significant change in viral replication levels between baseline and post exercise cells. In one subject however, a 1702% increase was observed in viral replication after reactivation of control resting cells compared to a 55% increase in reactivated exercise cells. **CONCLUSIONS:** While evidence suggests acute exercise alters the phenotypic state of T cells, it may not alter overall T cells susceptibility to infection with HIV-1.

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High-fat Diet Attenuated Plasma sCD130 and sCD163 In Trained Men

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(No relevant relationships reported)

High-fat (HF) diets have been shown to favorably influence weight management and exercise performance. Inflammation is closely related to cardiovascular and other metabolic diseases. Yet, the responses of inflammatory markers to HF diets have not been extensively studied. **PURPOSE:** To examine the effects of a short-term high-fat (HF) diet and an acute bout of exercise on inflammatory markers in trained men. **METHODS:** Aerobically trained men (N = 8, VO_2max = 48.5±4.5 mL/kg/min, age

= 39.5±9.9 years) that had been on a typical high-carbohydrate (HC) diet (60-70% of carbohydrate) maintained their HC diet during the first phase of the study and switched to the HF diet (~70% of total calories from fat with carbohydrate < 50 g) for 3 weeks during the second phase. At the end of each phase, the participants performed a treadmill exercise for 50 minutes at varying race paces followed by an outdoor 5-km time trial. Overnight fasting serum samples were collected at pre- and 24-hours post-exercise at the end of each phase to analyze the inflammatory markers, including sCD30, sCD163, chitinase-3-like protein 1, glycoprotein 130, TNF-α, sTNF-R1, IL-1, IL-6, and CRP by a multiplex flow immunoassay. Data were analyzed using a factorial analysis of variance with the Sidak's multiple comparisons when necessary (p < 0.05). **RESULTS:** The inflammatory markers were not altered following an acute bout of exercise. However, the 3-week HF diet significantly lowered the following markers: sCD30 (421.61±27.71 to 290.25±23.80 pg/mL, p=0.09), sCD163 (87570.01±8081.49 to 61708.73±6754.50 pg/mL, p=0.020), chitinase-3-like protein 1 (8127.80±775.56 to 5481.72±606.47 pg/mL, p=0.020), and gp130 (41472.71±1761.09 to 33603.12±2048.81 pg/mL, p=0.029), whereas other inflammatory markers were not different between the HC and HF diets. **CONCLUSION:** High-fat diets have been typically thought to negatively influence cardiometabolic health. However, a short-term high-fat diet demonstrated its positive role in inflammation in trained middle-aged men. It is highly recommended that the future studies focus on examining the effects of a long-term high-fat diet on inflammatory markers in a variety of subject populations.

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Adding Short-Term Interval Exercise to a Low-Calorie Diet Favorably Influences Appetite in Obese Adults

Emily M. Heiston, Nicole M. Gilbertson, Natalie Z.M. Eichner, Julian M. Gaitan, Monique E. Francois, James H. Mehaffey, Taryn E. Hassinger, Peter T. Hallowell, Arthur Weltman, FACSM, Steven K. Malin, FACSM. *University of Virginia, Charlottesville, VA.* (Sponsor: Steven Malin, FACSM)
(No relevant relationships reported)

Purpose: Appetite is influenced by gut-derived hormones and behavioral factors. Caloric restriction is suggested to reduce satiation and increase hunger, thereby contributing to challenges in long-term weight loss. Although intense exercise is suggested to attenuate appetite, no data exist testing the effects of interval exercise (INT) during a low-calorie diet (LCD) on appetite regulation. We hypothesized that LCD+INT would favorably influence satiety when compared with LCD in obese adults. **Methods:** Seventeen obese adults (50.5 ± 3.0 yrs; 35.9 ± 1.4 kg/m²) were randomized to either LCD (n=8; mixed meals of ~1200 kcal/d) or LCD+INT (n=9; 60 min/d of supervised interval exercise at 90% HR_{peak} for 3 min and 50% HR_{peak} for 3 min). An additional 350kcal (shake) was provided to LCD+INT individuals post-exercise to equate energy availability between groups. Total PYY, acyl ghrelin (AG) and des-acyl ghrelin (dAG) were measured at 0, 30 and 60 min of a 75g OGTT before and after the intervention. Visual analog scales were also administered at 0 and 120 min of the OGTT to assess subjective appetite. Food logs were recorded prior to and during the intervention to evaluate caloric intake. **Results:** Both interventions decreased food intake (*P*=0.001) and body fat (*P*<0.01). LCD+INT decreased fasting PYY (*P*<0.01) and increased post-prandial PYY stimulation (27.0 ± 7.0 vs. 37.0 ± 11.0%) when compared with LCD (20.1 ± 11.6 vs. 15.8 ± 3.4%, *P*=0.11). LCD+INT increased fasting AG (*P*=0.07) and increased suppression (6.8 ± 5.1%) compared to LCD (-8.3 ± 5.9%, *P*=0.08). Both interventions increased circulating dAG following the OGTT (*P* = 0.06). Interestingly, LCD+INT attenuated the rise in fasting hunger seen with LCD (*P*=0.05). **Conclusion:** Interval exercise favorably influences PYY, AG and perceived hunger during a LCD in obese adults. Further research is warranted to determine how adding interval exercise to long-term caloric restriction may mitigate obesity and related cardiometabolic disease.

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964   Board #225   May 30 3:30 PM - 5:00 PM
Effects Of Obesity And Exercise On Bone Marrow And Leukemia Cells Following Radiation

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(No relevant relationships reported)

Radiation-induced leukemia is a serious late effect of radiation therapy partially due to long-term alterations in the bone marrow (BM) environment. Obesity and sedentary lifestyles, two host factors that remodel the bone marrow, are common amongst cancer survivors and linked to increase leukemia risk. Whether alterations to the bone marrow environment induced by obesity and physical activity alter leukemia risk following ionizing radiation (IR) exposure remains unknown. **PURPOSE:** Determine how exercise training and obesity modulate the BM environment and leukemia blast viability following sub-lethal IR exposure. **METHODS:** 4 week old CBA mice were fed a control (CON; n=20) or 45% high fat diet (HF; n=20). At 9 weeks old, CON and HF mice were divided into sedentary (SED, n=10) or exercise groups (EX,

n=10). At 13 weeks, mice were administered a uniform radiation dose of 3 Gy and continued their specific diet and exercise regimen for 4 weeks. BM stromal cells were quantified by flow cytometry and marrow adipose tissue (MAT) was determined by μCT. Conditioned media (CM) from isolated BM stromal cells was analyzed by cytokine array and applied to the KG-1 leukemia cell line to assess cell viability by MTT assay. **RESULTS:** The number of mesenchymal stromal cells in CON+EX increased compared to CON+SED (p<0.05). EX increased the quantity of osteoblasts and endothelial progenitor cells compared to SED mice (both p<0.05). EX reduced MAT compared to SED, even in the presence of HF diet following sub-lethal IR (p<0.05). Inflammatory cytokines were also increased in the CM of HF-SED compared to CON-SED, and this effect was reduced with EX. CM from HF mice increased KG-1 viability, but not CM from EX (p<0.05). **CONCLUSION:** Overall, exercise increased BM stromal cell content and reduced BM inflammation while obesity increased BM adiposity and leukemia cell viability. These data suggest that exercise may be a therapeutic intervention to reduce secondary leukemias following radiation therapy, particularly in obese cancer survivors.

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965   Board #226   May 30 3:30 PM - 5:00 PM

Exercise-induced Th17 Lymphocyte Response And Their Relationship To CVD Risk Factors In Obese, Post-menopausal Women

Maria A. Cardenas[1], Michael M. Levitt[1], Bryan Richie[1], Shaohan Lu[1], Elise E. Erickson[1], Carmen Cook[1], Jay Haynes[2], Andreas Kreutzer[1], Joel B. Mitchell, FACSM[1], Melody D. Phillips, FACSM[1]. *[1]Texas Christian University, Fort Worth, TX. [2]John Peter Smith Hospital, Fort Worth, TX.* (Sponsor: Melody Phillips, FACSM)

(No relevant relationships reported)

Obesity-induced inflammation promotes type 2 diabetes and cardiovascular disease (CVD). A causative link between adaptive immunity and pathogenesis of obesity-associated diseases has been established.
PURPOSE: To examine the effects of exercise on circulating T-helper (Th) 17 lymphocytes in overweight/obese post-menopausal women.
METHODS: Twenty-seven overweight/obese women (BMI 32.7 ± 5.1 kg×m^{-2}, 55-75 yr) were randomly assigned to the exercise (EX, n=14) or education (ED, n=13) groups. EX performed a 25-min walk (75-80% HRR) and 2 sets of 8 resistance exercises (70-80% 1RM) with blood samples obtained at: pre-exercise, post-exercise, one-hour and two-hour post-exercise. Blood samples were obtained at the same time points in resting ED. Whole blood was stained using the extracellular markers CD4, CD196, CD194, CD26, and CD161 to identify Th17 lymphocytes via flow cytometry. **RESULTS**: Acute exercise increased lymphocyte number (p = 0.0001), but decreased percent of CD4$^+$ cells (p = 0.019) at PO. We observed a diurnal response (main effect) where CD26 expression was significantly lower by 2H compared to PRE (PR: 10631 ± 208; 2H: 9961 ± 271 MFI). There was a main effect (p=0.024) of group for CD26 expression (EX: 10745 ± 251; ED 9880 ± 260 MFI). The difference may have been driven by the apparent exercise-induced plateau of CD26 expression at 2H, which minimized the diurnal reduction observed in ED (p > 0.05). There was a tendency (p = 0.09) for a group x time interaction in Th17 cell number at 1HR (EX = 25.3 ± 4.8; ED =37.2 ± 5.2 x 10^3 cells x ml^{-1}). BMI was significantly correlated with Th17% (r = 0.5, p = 0.008). HbA1c was positively correlated with Th17 number and percentage (r = 0.598, p = 0.003; r = 0.614, p = 0.001, respectively), as well as CCR4$^+$ Th17 cells (r = 0.421, p = 0.036). Multiple regression analysis revealed that BMI and HbA1c were significant predictors (50%, r^2 = 0.497) of Th17 cell %.
CONCLUSION: Exercise reduced CD26 expression, the receptor responsible for Th17 cell migration, but did not significantly alter Th17 concentration (p = 0.09). CD26 upregulation may indicate that Th17 cells, via chemokine release, promote the stress-dependent migratory response of T-helper cells (CD4$^+$). Obese individuals may experience a preferential differentiation of Th17 cells, based on their association with adiposity (BMI) and HbA1c.

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966   Board #227   May 30 3:30 PM - 5:00 PM

Acute Exercise-Induced Response of Platelet-Monocyte Complexes in Obese Postmenopausal Women

Michael M. Levitt[1], Maria A. Cardenas[1], Bryan Richie[1], Carmen A. Cook[1], Kara Steck[1], Shaohan Lu[1], Jay Haynes[2], Andreas Kreutzer[1], Joel B. Mitchell, FACSM[1], Melody D. Phillips, FACSM[1]. *[1]Texas Christian University, Fort Worth, TX. [2]John Peter Smith Health Network, Fort Worth, TX.* (Sponsor: Melody D. Phillips, FACSM)

(No relevant relationships reported)

Inactivity-related diseases such as cardiovascular disease (CVD) are linked to chronic low-grade, systemic inflammation. Platelet-monocyte complexes (PMCs) are markers of *in vivo* platelet activation and atherosclerosis, and may be early indicators of subclinical inflammation.
PURPOSE: To examine the effects of a single exercise bout on PMCs in those at risk for CVD.
METHODS: Twenty-five overweight-obese (BMI 32.7 ± 5.2 kg·m^{-2}, 55-75 yr) women were randomly assigned to either the exercise (EX, n=13) or non-exercise control (CON, n=12) group. EX performed 2 sets of 8 resistance exercises and a 25-min treadmill walk at 70-80% HRR. Blood was obtained pre-exercise (PR), post- (PO), 1-hour and 2 hours post-exercise (1HR and 2HR). Blood was obtained at the same time points in CON. PMCs were identified via flow cytometry and analyzed in each monocyte phenotype. Monocyte phenotypes were defined as: Mon1 (CD14$^+$CD16$^-$CCR2$^+$), Mon2 (CD14$^+$CD16$^+$CCR2$^+$), and Mon3 (CD14$^+$CD16$^+$CCR2$^-$). All events positive for both CD14 and CD42a (marker for platelets) were considered PMCs. **RESULTS**: A main effect for time revealed an increase in total PMC number at PO (p=0.036). This increase appears to have been driven by EX (EX = 61.5%; CON = 33.8% increase). Mon1 and Mon2 PMC responses were similar. A significant time x group interaction for Mon3 PMCs (p=0.002) indicated an increase from PR to PO (PR = 5218±1170 cells·ml^{-1}, PO = 8195±1152 cells·ml^{-1}), and a decrease from PO to 1HR and 2HR (1HR = 3767±820 cells·ml^{-1} 2HR = 3818±814 cells·ml^{-1}). PMC number remained constant for CON at all timepoints. Estimated VO2max was negatively correlated with CD42a MFI (a marker of platelet density per monocyte) (r = -0.583, p = 0.003). Systolic blood pressure (SBP) positively correlated with percent PMC (% CD42a positive monocytes; r = 0.458, p = 0.042).
CONCLUSIONS: Aerobic fitness appears to reduce platelet activation indicated by the negative relationship between VO2max and CD42a MFI. Chronic elevations in resting SBP are linked to PMC percentage, possibly due to sheer stress-induced platelet activation. It is possible that PMC elevation at PO is at least partially driven by exercise-induced increases in BP. These results support previous literature, indicating that PMCs are a marker CVD risk and may elucidate one mechanism by which physical fitness reduces risk for CVD.

B-70   Free Communication/Poster - **Concussion I**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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967   Board #228   May 30 3:30 PM - 5:00 PM

Effects Of A Musculoskeletal Injury On Rebaseline Concussion Assessment Performance

Kelsey Bryk[1], Ryan DeWolf[2], Jessie Oldham[1], Melissa DiFabio[1], Katherine Breedlove[3], Thomas Kaminski[1], Thomas Buckley[1]. *[1]University of Delaware, Newark, DE. [2]Massachusetts General Hospital, Boston, MA. [3]University of Wisconsin - Eau Claire, Eau Claire, WI.*

(No relevant relationships reported)

A multifaceted baseline concussion assessment is a crucial component of properly assessing and managing concussions with post-injury values compared to baseline performance. While concussion adversely affects performance on these tests, musculoskeletal injury (MSI) also adversely affects test performance acutely post-injury; however, the prolonged effect of a MSI on concussion test performance is unknown. If MSI has a prolonged adverse effect on concussions testing, this could reduce the efficacy of the concussion test battery in the event of a suspected concussion.
PURPOSE: To determine the effects of lower-body MSI on pre-season baseline concussion tests.
METHODS: Division I collegiate student-athletes completed annual baseline concussion assessments in successive years. Athletes who sustained a lower-body MSI prior to their rebaseline tests (n=33) were compared to uninjured matched controls (n=33) based on sex, height, weight and sport. Baseline assessment included the Standard Assessment of Concussion (SAC), Balance Error Scoring System (BESS),

King-Device (KD) Test, Clinical Reaction Time (CRT), a computerized neurocognitive assessment (CNT), and tandem gait (TG). A 2 (group) x 2 (time) repeated measures ANOVA was performed for each dependent variable.

RESULTS: There were no statistically significant interactions for any of the dependent variables. There were significant main effects of time with improved performance during the second year for SAC (Baseline 1: 26.5 ± 1.9 and Baseline 2: 27.3 ± 1.8, p = .001), KD Test (Baseline 1: 38.4 ± 6.4 sec and Baseline 2: 37.1 ± 6.3 sec, p = .025), and CRT (Baseline 1: 204.3 ± 24.3 msec and Baseline 2: 195.4 ± 24.6 msec, p = .013), but no differences in BESS, CNT, and TG. There were no significant group effects for all tests.

CONCLUSION: Sustaining a MSI did not adversely affect performance on the concussion baseline tests. This suggests that a student-athlete's initial concussion baseline assessment performance is valid to compare with post-injury performance, even if a lower body MSI was sustained after the initial assessment. As expected, improvements on certain tests were observed with repeat administration. These results suggest that a rebaseline concussion assessment for collegiate student-athletes is unnecessary.

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968   Board #229   May 30 3:30 PM - 5:00 PM

Fighting In The Nhl 5 Year Review: Fists Of Fury But Few Concussions, Believe It!

Neustadtl Aidaan[1], Dave milzman[1], zach tannebaum[1], Andrew Lincoln[2], JEREMY ALTMAN[1]. *[1]georgetown u school of medicine, Washington, DC. [2]MEDSTAR SPORTS MED AND GEORGETOWN MED SCHOOL, Washington, DC.*

(No relevant relationships reported)

In recent years, there has been a unified call to end fighting in the NHL to reduce concussive injury. However, no published data to prove fighting leads to more concussions has been produced, only anecdotal cases. Purpose:To analyze a consecutive NHL Fights from 2010-11 to 2014-15 seasons, recording all resulting injuries and number of games that the player missed. Methods: Public domain 'Hockeyfight' web sites were used to identify and view all fights and injuries were confirmed through two independent sources, the NHL and/or the team or independent press sources. The study received IRB waiver for use of public data. Stat Analysis was performed using available software. Results: The NHL had 992 fights in 1,950 games over 2 seasons with a fight/game rate of: 50.9% (range 38.-65% annually in NHL over past decade). 30 injuries resulted to the 1,984 combatants (n=992 fights) for an injury rate of 1.5/100 per fighters. Specifically looking at concussions, 6 mTBI resulted (20% of injuries) for a rate: 0.2/100 mTBI/fight rate which is ten-fold less than the reported concussion rates in standard NHL play (3.0 mTBI per 100 player games). The 10 players with most fights in NHL annually, for the past 5 seasons, tallied 1,012 fights from 50 players (fights/season range 17-33) with: all injury rate of 3/100 fights and mTBI rate of .15/100 fights. Discussion: Although fighting may appear a direct causative factor to concussions the data does not prove it. The difference of punching on ice compared to land appears to actually offer some protection over significant forces being generated and may explain the greater 'safety' of fighting in the NHL without injury. Currently, we are compiling similar data from the 2015-16 and 2016-2017 to compare changes in injury rates following NHL rule changes intended to better protect players. We expect to have this data completed and ready for presentation at the time of ACSM18. <!--EndFragment-->

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969   Board #230   May 30 3:30 PM - 5:00 PM

Determining the Appropriate Timing of Administration of Computerized Neurocognitive Testing Following Maximal Exertion- Preliminary Analysis

Samantha A. Mohler, Cory L. Butts, Zachary J. Sebghati, Katie L. Stephenson-Brown, Brendon P. McDermott, FACSM, Matthew S. Ganio, FACSM, R.J. Elbin. *University of Arkansas, Fayetteville, AR.* (Sponsor: Matthew Ganio, FACSM)

(No relevant relationships reported)

Computerized neurocognitive testing (CNT) is part of a multi-faceted approach to sport-related concussion assessment. Accurate baseline (pre-injury) CNT scores aid post-concussion management which allows the athlete to serve as their own control. Prior research suggests maximal exertion negatively affects CNT scores immediately following exercise. However, the appropriate wait time for administering CNT following maximal exertion is unknown. **PURPOSE:** To compare differences in neurocognitive performance and symptoms following maximal exertion with varied recovery intervals in healthy college-aged students. **METHODS:** A prospective, randomized cross-over, repeated measures design was used for this study. Twenty-six participants (22 ± 2y) completed four experimental visits. Three visits consisted of a maximal effort graded exercise treadmill test (VO$_2$ max), with a prescribed post-exertion rest period, and CNT administration. Prescribed post-exertion recovery intervals were defined as: <2 min (immediate), 10-min, or 20-min. The fourth visit served as a control (baseline); participants performed a CNT without a preceding VO$_2$ max test. All four experimental visits occurred at least one week apart and

were randomly counterbalanced. A series of one-way repeated measures analysis of variance (ANOVAs) were performed on CNT composite outcome and symptom scores. Statistical significance was set at a Bonferroni-corrected $p \leq .01$. **RESULTS:** There was a significant within-subjects effect for prescribed post-exertion recovery intervals on total symptom scores (Wilks $\lambda = .62$, $F[3, 23] = 4.64$, $p = .01$, $\eta^2 = .38$). Total symptom scores were significantly higher at the immediate ($p < .001$), 10-min ($p = .02$), and 20-min ($p = .05$) post-exertion recovery intervals compared to baseline. There were no significant differences for processing speed ($p = .05$), visual memory ($p = .07$), verbal memory ($p = .06$), or reaction time ($p = .40$). **CONCLUSION:** Baseline symptom scores were negatively influenced by maximal exertion, and continued to be elevated 20 minutes post-exertion. However, cognitive performance was unaffected. Sports medicine professionals should wait at least 20 minutes following maximal exertion to obtain a more accurate representation of symptoms.

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970   Board #231   May 30 3:30 PM - 5:00 PM

Does Greater Susceptibility to Neck Injury Put Females at Higher Risk of Prolonged Sport-Related Concussion Recovery?

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(No relevant relationships reported)

PURPOSE: An increase in female participation in contact sports has resulted in an increase in female athletes presenting with sport-related concussion (SRC). It has been theorized that females have longer SRC recovery time related to lower neck strength compared to males, which may also relate to concomitant neck injury. We proposed that female athletes with SRC have a higher incidence of acute cervical strain, resulting in a longer duration of SRC symptoms. Additionally, we investigated if athletes with acute cervical injury were more likely referred to a neuropsychologist in the post-SRC period compared to those without neck injury.

METHODS: This retrospective study assessed male and female youth, high school, and collegiate athletes (n=431; ages=12-21 years old) for post-SRC symptoms. We analyzed whether females who suffer a SRC are more prone to having an accompanying neck injury in comparison to males. Additionally, we assessed whether athletes who suffer an SRC with a neck injury display longer post-SRC recovery times, leading to increased referrals to a neuropsychologist; Statistical analyses were conducted using chi-square tests.

RESULTS: Of the 431 SRC cases, 92 reported concomitant acute neck strain. When comparing recovery time between male and female athletes, a significant difference was seen with females requiring more time to recover (p<0.001). However, when comparing recovery time in males and females with SRC and acute cervical strain, no significant differences were found (p=0.416). Additionally, when comparing the initial symptom burden using the post-concussion symptom scale in athletes with acute neck injury, females have a non-significant increased number of symptoms compared to males (p=0.157). Athletes with an SRC and neck injury are more likely to need a neuropsychology referral compared to those without a neck injury (p=0.027).

CONCLUSIONS: Evidence has been established that females have an extended recovery time following SRC when compared to males. A sex-based difference in regards to neck injury altering the recovery time were not found in our study. However, a concomitant neck injury with SRC increases the likelihood of neuropsychology referral. Further research is warranted to determine etiologic factors contributing to more prolonged SRC recovery in females versus males.

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971   Board #232   May 30 3:30 PM - 5:00 PM

The Interrelationship and Diagnostic Utility of Memory and Reaction Time in Concussed Students

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(No relevant relationships reported)

More than 40 million American youth participate in interscholastic, community-based, and collegiate sports. A risk of participation is traumatic brain injury (TBI). In up to 40% of TBI cases, athletes experience persistent functional and cognitive deficits. It is important to understand the variables that lead to these deficits to improve diagnosis and prognostic management. **PURPOSE:** To evaluate memory and reaction time as markers of TBI severity among patients experiencing prolonged recovery. **METHODS:** We retrospectively analyzed student-athletes admitted to a Midwestern outpatient clinic for neuropsychological evaluation; 78 patients had relatively comprehensive profiles and were included in the analysis. We conducted a health history, a 22-item post-concussion symptom inventory, and the ImPACT computerized test, which evaluated memory and reaction time. Pearson's and point-biserial correlation coefficients tested the direction and strength of association between memory, reaction time, and markers of injury severity. Logistic, negative binomial, and linear regressions tested memory and reaction time as predictors of whether symptoms

were reported, the number of reported symptoms, and the severity of symptoms. **RESULTS:** Patients were 16.0 ± 2.6 years of age, 56.3% were male, and they had experienced 1.2 ± 1.5 previous concussions. Reaction time was 0.64 ± 0.13 seconds; visual motor speed score was 44.7 ± 34.6; visual memory score was 92.0 ± 69.3; verbal memory score was 98.0 ± 80.9; cognitive efficiency score was 0.34 ± 0.12. Reaction time was a significant predictor ($p<0.05$) of balance problems, dizziness, mental fogginess, and sensitivity to light and noise; it was a trending predictor ($p=0.061$) of the summed severity of symptoms. Verbal memory was a significant predictor ($p<0.05$) of balance problems, sleeping problems, and fatigue. Visual memory, visual motor speed, and cognitive efficiency index were poor predictors of injury severity. **CONCLUSIONS:** Reaction time and memory are common components of testing batteries for concussed athletes. In our sample, reaction time and verbal memory emerged as useful predictors of severity among patients suffering long-term symptoms of TBI. It may be of value for coaches and athletic trainers to establish baseline values at the onset of a competitive season.

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972   Board #233   May 30 3:30 PM - 5:00 PM

No Increased Lower Extremity Injury Risk Following Concussion in Youth Tackle Football Players

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A growing body of literature suggests athletes are at increased risk for acute musculoskeletal injury following return to play after concussion. The association between concussion and musculoskeletal injury has yet to be explored in youth athletes. **PURPOSE:** Compare the proportions of acute lower extremity injuries between youth football players following concussion and upper extremity injury. **METHODS:** Injury surveillance was conducted on 19 youth tackle football leagues (336 teams; 5,177 unique athletes; 6,799 athlete-seasons) from 2012-2015. Athletic trainers entered injury information into an electronic medical record, from which data were de-identified and aggregated for analysis. Musculoskeletal injuries to the lower (at and distal to the hip joint) and upper (at and distal to the shoulder joint) extremities and concussions were identified. The proportion of subsequent acute lower extremity injuries was compared between athletes suffering one of two initial injuries: 1) Concussion, or 2) Time-loss (sport participation loss > 24 hours) upper extremity injury. Only musculoskeletal injuries in the same season as the index injury were analyzed. **RESULTS:** Of the 209 unique athletes who suffered a concussion, 14 had a subsequent same-season acute lower extremity injury (6.7%; 95% CI: 3.2%, 10.2%). Of the 141 unique athletes sustaining a time-loss upper extremity, 10 sustained a subsequent same-season acute lower extremity injury (7.1%; 95% CI: 2.7%, 11.5%). There was no difference in the proportion of youth athletes who sustained an acute lower extremity injury after concussion or time-loss upper extremity injury ($p=0.89$; mean diff.=0.4%; 95% CI: -4.9%, 6.5%). **CONCLUSIONS:** This is the first study to examine musculoskeletal injury risk in youth football athletes following concussion. Although evidence suggests that high school, college, and professional athletes are at increased risk for musculoskeletal injury following concussion, no increased risk was observed in this sample of youth football players. Our findings may be limited by the short time span of the youth football season, providing limited opportunity for re-injury. Despite these null findings, further research is needed to clarify the relationship between concussion and subsequent musculoskeletal injury in youth football athletes.

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973   Board #234   May 30 3:30 PM - 5:00 PM

Head Impact Exposure of Youth Football Players During Their 7th and 8th Grade Seasons

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(No relevant relationships reported)

Nearly 70% of US football players are younger than high school age, yet little is known about the potentially damaging effects of repetitive head impacts in this population. Cross-sectional studies indicate that head impact exposure increases with older levels of play, though little is known about changes in the same group of players from year to year. **PURPOSE:** To evaluate changes in head impact exposure among youth football players between their 7th and 8th grade seasons. **METHODS:** During a five-year span (2012-2016), head impact exposure of thirty middle school football players (12.6 ± 0.4 yr) was assessed during their 7th and 8th grade seasons while

participating in a community tackle football program. Subjects played on the same team during their 7th and 8th grade seasons. Head impact frequency, severity (linear acceleration [LA]; rotational acceleration [RA]) and location during each practice and game were measured using the Head Impact Telemetry (HIT) system, consisting of a helmet-mounted accelerometry array. **RESULTS:** Mean head impacts per player were significantly higher in practices (7.4 vs. 5.8 impacts / player; $P = 0.035$) but not significantly different in games (10.1 vs. 12.4 impacts / player; $P = 0.134$) comparing the 7th to 8th grade seasons, respectively. Furthermore, from the 7th to 8th grade season, mean LA (25.30 g vs. 25.95 g; $P = 0.345$), median LA (20.77 g vs. 21.39 g; $P = 0.225$), mean RA (1741 rad $\cdot$ sec^{-2} vs. 1744 rad $\cdot$ sec^{-2}; $P = 0.950$) and median RA (1481 rad $\cdot$ sec^{-2} vs. 1503 rad $\cdot$ sec^{-2}; $P = 0.538$) did not differ significantly. Finally, no differences in distribution of head impacts by location (Front: 46% vs. 48%; $P = 0.461$; Top: 10% vs. 11%; $P = 0.607$; Back: 26% vs. 23%; $P = 0.159$; Right: 9% vs. 10%; $P = 0.382$; Left: 8% vs. 8%; $P = 0.717$) were found between the 7th and 8th grade seasons, respectively. **CONCLUSIONS:** Individual head impact exposure was similar during two consecutive seasons of youth football, despite increased age and playing experience during the second season. Thus, extrinsic factors such as game rules, practice structure and coaching style may have a greater influence on head impact exposure from year to year in youth football, making those aspects of play key targets for strategies aimed at reducing repetitive head impacts in this population.

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974   Board #235   May 30 3:30 PM - 5:00 PM

Concussion Baseline Performance on Rapid Number and Picture Naming Tests

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(No relevant relationships reported)

Concussion may inflict widespread disturbance throughout the brain, including visual network impairments. The King-Devick (KD) test is a rapid number naming test of oculomotor functioning, however, it is limited to evaluating networks involved with saccadic eye movements and vergence. Recently, the Mobile Universal Lexicon Evaluating system (MULES), which requires object identification and color perception, was developed to encompass additional networks which may be a beneficial addition to concussion assessment. However, no published data describes MULES scores in an athlete-specific cohort. **Purpose:** To compare the relationship between KD and MULES scores in an athletic population. **Methods:** Twenty-nine ice hockey players (17.1 ± 3.3 years old, 27M/2F) completed both tests at baseline. The MULES consists of two cards, totaling 54 color pictures of foods, animals and objects; KD consists of 3 cards totaling 120 numbers in random order. Both tests were administered twice and the fastest time without errors was recorded as the "best" time. Descriptive statistics were used to describe test scores and a Pearson correlation examined the relationship between the tests. **Results:** Mean scores of "best" KD and MULES trials were 47.8 ± 9.4 seconds (Range: 31.77-68.0) and 37.7 ± 6.7 (Range: 27.73-50.47), respectively. Every MULES trial 2 improved from trial 1 with a mean improvement of 6.8 ± 3.7 seconds; KD mean change between trials was 2.4 ± 7.3 seconds, where 8/29 subjects performed slower on the second trial. Pearson correlation revealed a significant ($p=0.003$) moderate relationship between KD and MULES best times ($r=0.543$). **Conclusion:** These data are the first to report on MULES test scores in an athletic-specific cohort. While the significant correlation denotes a relationship exists between the two tests, the moderate strength suggests that the two may be providing somewhat different information. This may be due to the MULES utilizing additional neurological resources as it requires additional object and color recognition. These findings support the use of MULES in a clinical concussion testing battery, as it is also easy to administer and takes a short time to complete. Future studies should focus on MULES scores through concussion recovery.

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Concussion recovery trajectories among United States Service Academy Members

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(No relevant relationships reported)

Purpose: Describe concussion/mild traumatic brain injury (mTBI) recovery durations by sex and injury-related activities in US Service Academy cadets.
Methods: Injury data (2014-2017) from three US Military Service Academies were examined to describe concussion/mTBI characteristics (n=800 injuries, 301 female). Of the documented injuries, there were 738 injured individuals, of which, 679 had one injury, 56 individuals had two injuries and three individuals had three injuries. The recovery trajectories for all injuries were examined across sex and injury activity. Three durations were examined: days until asymptomatic, duration of return to activity (RTA) protocol, and days of total time lost. Duration was examined using Kaplan-Meier and log-rank tests. Due to the right skewed distribution, medians and interquartile range (IQR) are reported.
Results: Across all cadets, the median days until asymptomatic was 9 (IQR: 5-16). The median duration of RTA protocol was 5 days (IQR: 5-7). The total time lost due to concussion/mTBI was 20.68 days (IQR: 12.78-33.12). There was a significant effect of sex for days until asymptomatic and total time lost (p's < 0.01). Across all recovery metrics, females were more likely to have more days until asymptomatic (11 vs. 8.0 median days) and total time lost (24.6 vs 18.8 days). A significant effect of injury activity was observed for days until asymptomatic and total time lost (p's < 0.05). Injuries occurring during free-time activities had the greatest median number of days until asymptomatic (13 days IQR: 10-15) while injuries occurring during varsity athletics or academy specific training had the fewest median days until asymptomatic (both 6 days). Injuries occurring during varsity athletics had the shortest median total time loss of 12.9 days (IQR: 11.95-15.73). All other injury mechanisms were associated with median time loss of more than 20 days.
Conclusions: These analyses show significant effects of sex and injury activity on recovery duration. Differences may also reflect varying approaches to injury management by the medical provider. Further investigation is needed to determine an individualized approach to clinical care.

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Discordance of Autonomic Discharge to the Cardiovascular System following Concussion

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(No relevant relationships reported)

Previous evidence indicates that a transient cardiovascular autonomic dysfunction emerges after concussion. The baroreflex buffers perturbations to systolic blood pressure (SBP) through changes in efferent autonomic discharge to the sino-atrial node inducing a reciprocal change in heart rate (HR) and to the vascular smooth muscle to modulate peripheral resistance. Mayer waves (MW) represent the baroreflex adjustments to the target tissue and appear in the low frequency (LF) band of the HR and SBP power spectrum at a frequency of 0.1Hz. **PURPOSE**: To evaluate changes in MW amplitudes in recently concussed athletes and non-injured controls during the first week following injury. **METHODS**: A prospective, parallel-group, and repeated-measures study was performed in 19 athletes with concussion (age: 20±2 years; height: 1.76±0.14 meters; weight: 75.3±15.1 kilograms) and 19 non-injured athletes (age: 20±1 years; height: 1.71±0.11 meters; weight: 70.2±14.4 kilograms). Cardiovascular autonomic function (i.e., digital electrocardiogram and continuous beat-to-beat BP) was assessed at rest within 48 hours (48H) of concussion and 1 week (Wk1) later. Fast-Fourier transform was performed and power calculated from HR and SBP components for LF spectra and MW activity. The variables (e.g., LF-BP, LF-HR, MWBP, MWHR) were $\log_{10}$ transformed and a difference score was computed between the MWBP and MWHR (CMW) for each subject. **RESULTS**: Data are presented as group mean (95% CI) and there were no group differences for demographics, HR, SBP, LF-BP, LF-HR or MWHR at 48H or Wk1. At 48H, the concussion group had a significantly lower MWBP [p<0.05; 1.38 (1.11, 1.68) vs. 1.92(1.64, 2.21) mmHg2/Hz] and CMW [p<0.01; -3.06 (-3.35, -2.77) vs. -2.49 (-2.78, -2.20)] compared to the control group.

These group differences were gone by Wk1. **CONCLUSIONS**: These findings demonstrate that efferent autonomic discharge to the peripheral vasculature was reduced as evidenced by the MW, but not the LF-BP, LF-HR. The CMW demonstrated a dramatically greater discordance in autonomic discharge after concussion such that the majority of the concussion group distribution fell below the lower limit of the 95% CI of controls. Thus, the central autonomic mechanism(s) regulating MW discharge were discordant after concussion with apparent resolution by 1 week.

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Effects of 3D Multiple Object Tracking on Head Impacts and Cognition in Ice Hockey

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(No relevant relationships reported)

Ice hockey is a high intensity contact sport with elevated risk of injuries including concussion. Three dimensional multiple object tracking (3D MOT) has been proposed as an intervention to reduce the incidence of concussion, and potentially improve cognitive function. **PURPOSE:** The purpose of this study was to examine the effect of using 3D MOT on the frequency and force of head impacts and cognitive function (CTMT and Stroop) in men's ice hockey. **METHODS:** Eight male collegiate ice hockey players (NCAA Division III) (mean age = 22.87 ± 1.46 yrs; mean ht = 177.48 ± 16.82 cm; mean wt = 90.31 ±1.46 kg), had head impacts and cognitive function assessed throughout the regular season without 3D MOT versus with 3D MOT. Paired samples t-tests were performed to test for differences between first half (without 3D MOT) and second half (with 3D MOT) for all measures. **RESULTS:** Utilizing 3D MOT did not reduce the number of head impacts. With 3D MOT there was an increase in rotational force versus without 3D MOT (rotational acceleration (p = 0.010) 3.49 ± 2.31 vs. 3.88 ± 2.29 krads sec^{-2} respectively); (rotational velocity (p = 0.001) (16.21 ± 8.71 vs. 14.35 ± 8.38 krads sec^{-1} respectively); as well as force applied to the right side (p = 0.001) (13.10 ± 7.34 vs 16.67 ± 9.73 krads sec^{-1}), and base of the head (p = 0.019) (13.26 ± 8.40 vs 17.25 ± 9.43 krads sec^{-1}). CTMT improved with 3D MOT (p = 0.004) (49.57 ± 35.97 vs 65.15 ± 36.36%), while Stroop had no significant differences. **CONCLUSION:** The use of 3D MOT during the second half of the competitive ice hockey season did not reduce the number of head impacts. The increase in rotational forces when using the 3D MOT may be attributed to the different time in the season that 3D MOT was utilized, where more aggressive play leading to higher forces was possible. CTMT improvement was not surprising as the CTMT measures all qualities the 3D MOT intervention improves, while the Stroop only measures working memory and opposition to distraction.

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Baseline Visual Measures in High School Football Players With and Without Previous Concussion

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(No relevant relationships reported)

Visual impairments are common following sport-related concussion and may negatively affect athlete performance and safety if unresolved. **PURPOSE:** To examine differences in baseline visual assessment measures in high school football players with and without previous concussion. A secondary purpose was to examine the correlations between these asessments. **METHODS:** High school varsity football players (n=64, n=24 with concussion history) from a single high school (mean age=15.6±1.3 years) were enrolled in the study. Participants completed the following assessments prior to the start of the competitive football season: 1) three near-point of convergence (NPC) trials, 2) vision and sensory performance testing via the Senaptec Sensory Station, and 3) a demographic questionnaire. The independent variable was previous concussion history (with vs. without). Primary outcomes were average NPC across three trials (measured in centimeters) and the Senaptec Sensory Station scores for: visual clarity, contrast sensitivity, depth perception, near-far quickness, perception span, multiple object tracking, and hand-reaction time. Independent samples t-tests were used to examine differences in visual assessments between those with and without previous concussion. Pearson correlations examined relationships between all Senaptec Sensory Station and mean NPC measures. Alpha level was set to $P < 0.05$ *a priori*. **RESULTS:** Over half (62.5%) of those who reported a concussion history indicated that their most recent concussion was within the last year. There was no significant effect of concussion history on any of the visual assessment measures. There was a significant, but clinically insignificant correlation between mean NPC and binocular visual clarity (r=0.26; P=0.03). No other significant correlations among the visual assessment measures were identified ($P < 0.05$). **CONCLUSION:** High school football athletes, regardless of concussion history, exhibit similar baseline clinical and

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performance visual measures. Our data suggest that NPC and binocular visual clarity, while statistically correlated are clinically independent of one another and both worthy of evaluation in assessing concussion.

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The Affect of ADD on Baseline King-Devick and Clinical Reaction Time Performance In The Pediatric Population

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(No relevant relationships reported)

PURPOSE: It is estimated that 1.5-3.5 million concussions occur annually in the US related to sports participation. Recent studies of the King-Devick (KD) and Clinical Reaction Time Test (CRT) have shown promise in the diagnosis and management of concussive injuries in older teens and young adults. The purpose of this study is to evaluate if a history of ADD may affect the baseline performance and hence interpretation of these novel tests in the pediatric and adolescent population.
METHODS: Non-concussed, 6-18 year-olds were recruited from sports medicine clinics during evaluation of other conditions or during participation in their schools' baseline concussion surveillance program. Participants whom were felt to be limited in their ability to perform these tests due to comorbid conditions or injuries were excluded from the study. History of ADD or related medication use was assessed through review of the patient's intake questionnaire or through examination of their past medical history and medication list as previously documented in the EMR on the day of assessment. Subjects completed the KD and CRT tests as previously described in the literature.
RESULTS: 563 participants (333 M, 230 F) were included in the study. Participants (44) were categorized as having a diagnosis of ADD (20 M, 24 F). The average age in the normative group was 12.55($\pm$2.71) versus 14.25($\pm$2.38) years in the ADD group. Baseline KD performance was 50.17($\pm$12.42)s in the normative group versus 48.54($\pm$11.89)s in the ADD group (p=0.43). CRT-RH was measured at 232.32($\pm$23.27) ms versus CRT-RH=223.89($\pm$22.71)ms (p=0.02) and CRT-LH=231.81($\pm$23.38)ms versus CRT-LH=224.75($\pm$22.75)ms (p=0.07) in the normative and ADD groups, respectively. Stratification by age group (6-13 vs. 14-18) did not reveal a difference in performance between groups on either test.
CONCLUSIONS: Baseline performance on the KD and CRT tests did not differ in this population of subjects with or without a history of ADD. Although limited by sample size, this study provides evidence that children with ADD perform similar to their peers on these baseline measures. Clinicians may therefore interpret these scores without adjustment. Additional factors which influence test performance need to be evaluated.

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Treating Pediatric Acute Sport-Related Traumatic Brain Injuries with Hyperbaric Oxygen Therapy: A Case Series

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(No relevant relationships reported)

Athletes often experience symptoms and neurologic deficits following sport-related concussion. Higher initial symptom burden is associated with longer recovery times. The current standard of care for concussed athletes includes cognitive rest and non-specific subthreshold physical activity until self-reported symptom resolve and objective concussion measures demonstrate clinical recovery. There is a paucity of treatment options beyond this wait-and-see approach. Hyperbaric oxygen (HBO_2) therapy has benefited severe and moderate traumatic brain injury patients. It is unknown how HBO_2 therapy affects acute post-injury symptom burden and recovery time following concussion. **Purpose:** To explore the effect of HBO_2 therapy on reducing initial symptom burden in acutely concussed high school student-athletes compared to two different placebo treatments. **Methods:** Eight high school student-athletes suffering from sport-related concussion were randomly assigned into one of three blinded clinical intervention groups: 1) HBO_2 therapy (n=3); 2) hyperbaric therapy with compressed medical-grade air (HBA) (n=2); or 3) normobaric 100% O_2 therapy (n=3). All groups completed five one-hour treatments within the first 10 days following their injury. Main outcome measures included change from initial post-concussion symptom burden and days until the physician (blinded to study group) permitted the student-athlete to return to activity. **Results:** The HBO_2 treatment group experienced a considerably larger mean symptom reduction (Δ symptom score = -54.5) than the HBA (Δ symptom score = -27.8) or O_2 placebo treatment groups (Δ symptom score = -22) over the 5 treatment sessions. Despite the considerably higher symptom

burden of those randomly assigned to the HBO_2 therapy arm, all treatment and placebo groups returned to activity in a similar timeframe (HBO_2 = 13.7$\pm$5.1 days; HBA=13.0$\pm$5.7 days; O_2 =19.0$\pm$16.5 days). **Conclusion:** HBO_2 therapy may be an effective option to acutely treat post-concussion symptoms, particularly in young athletes presenting with high symptom burdens. Future research is needed to determine appropriate and standardized treatment protocols for HBO_2 therapy in this population following concussion.

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Emerging Practice of Speech-Language Pathologists in Sport Related Concussion Care: A Systematic Review

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(No relevant relationships reported)

Speech-Language Pathologists (SLP) prevent, assess, and treat cognitive-communication and swallowing disorders. Due to their experience in caring for people with cognitive-linguistic disorders following traumatic brain injury, SLPs have the potential to play an important role in the management of sport-related concussion (SRC) using strategies that promote increased focus, attention, memory and mental agility.**PURPOSE**: The goal of this systematic review was to summarize the emerging practice roles of SLPs in SRC concussion management.**METHODS**: The following databases were accessed: MEDLINE, CINAHL, PsycInfo, Cochrane Library, and SPORTDiscus. Key words included in the searches were: concussion, mild traumatic brain injury, speech-language pathologist, speech-language pathology, speech therapy and cognitive communication. All articles included were published in peer-reviewed journals prior to October 2017. Studies on traumatic brain injury or papers that investigated concussion and military personnel were excluded. **RESULTS**: A total of 360 articles were identified for formal review. Forty-two articles met our inclusion criteria. The earliest published article was in 2002, but 41 articles (97.6%) were published 2009 or later. Only three studies (7.14%) were level III evidence and one (2.38%) level IV case series was identified. Thirty-seven papers (88.1%) were either literature reviews or perspectives on the role of SLPs in concussion management. Our search revealed no high-quality, randomized controlled trials or systematic reviews related to the role of SLPs in concussion management.**CONCLUSIONS:** A common theme of the studies we reviewed suggest a recent interest in highlighting the value of SLPs in a comprehensive team approach to concussion care. Concussion management continues to evolve, including the identification of clinical subtypes and rehabilitation trajectories. SLPs may assist in neurocognitive testing administration and the assessment of verbal memory, language processing, attention deficits and behavioral aspects of communication. Finally, SLPs may contribute to the planning and implementation of academic accommodations and returning to learning strategies.

B-71   Free Communication/Poster - **Exercise-Diabetes**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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Maintenance of Health-Related Fitness Gains Following Underwater Treadmill Training in Adults with Type 2 Diabetes

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(No relevant relationships reported)

PURPOSE: To document short- and long-term effects of a 12-week aquatic exercise walking program on components of health-related fitness in middle-aged adults with type 2 diabetes.
METHODS:Thirteen adults with type 2 diabetes (age = 59.5 $\pm$ 4.5 yrs; 7 females, 6 males) completed 12 weeks of underwater treadmill training (UTT) (3d·wk^{-1}), followed by a 12-week follow-up period that involved no UTT. Exercise intensity and duration, which were initially set to 40-50% of heart rate reserve (HRR) and 30 minutes (three 10-min bouts) were systematically and progressively increased to 50-70% HRR and 60 minutes (three 20-min bouts) by week 12. During the follow-up period, study participants maintained their current diet and were given permission to perform any type or amount of physical activity except a formalized exercise program.

Primary outcome variables included cardiovascular function [resting heart rate (RHR) and 6-min walk for distance (6MWFD)]; body composition [body mass (BM), body fat percentage (BF%), waist circumference (WC)]; and leg strength [hamstring and quadriceps isokinetic peak torque at $30°·sec^{-1}$ and $60°·sec^{-1}$)]. Baseline, post-UTT, and post-follow-up scores were analyzed using 1-way repeated measures analysis of variance.

RESULTS: Compared to baseline scores, significant ($p < .05$) improvements in cardiovascular function (decreased RHR, increased 6MWD), body composition (decreased BM, BF%, and WC), and leg strength (greater peak hamstrings torque at $60°·sec^{-1}$, and peak quadriceps torque at $30°·sec^{-1}$), were observed after UTT. Three months following completion of UTT, positive changes in nearly all HRF variables (6MWD, BM, BF%, WC, peak hamstrings torque at $60°·sec^{-1}$, peak quadriceps torque at $30°·sec^{-1}$) were maintained ($p < .05$) relative to baseline values.

CONCLUSIONS: Our findings indicate that improvements in HRF resulting from 12 weeks of UTT persist three months after cessation of UTT in middle-aged adults with type 2 diabetes.

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A Bout of High-Intensity Interval Training Increases Seric Musclin in Adults with Metabolic Syndrome

Jaime A. Gallo-Villegas[1], Leonardo A. Castro-Valencia[1], Miguel Alzate[2], Luis Valbuena[3], Yeliana L. Sánchez[1], Juan C. Aristizábal[1], Raúl Narváez-Sánchez[1], Juan C. Calderón[1]. [1]University of Antioquia, Medellín, Colombia. [2]Politécnico Jaime Isaza Cadavid, Medellín, Colombia. [3]Indeportes Antioquia, Medellín, Colombia.
(No relevant relationships reported)

Musclin is a myokine which induces insulin resistance (IR) in vitro, also proposed to favor aerobic capacity in murine models, which seems contradictory. Because of that, and since exercise contributes to improve IR in metabolic syndrome (MS) probably by regulating myokines, it is necessary to understand exercise´s role in regulating musclin in humans. **PURPOSE**: to study the effect of a bout of high-intensity interval training (HIIT) on seric musclin in adults with MS and IR. **METHODS**: 11 men and 4 women with MS and IR were evaluated in an experimental, pilot study. Musclin was measured by ELISA, and both glycemia and insulin by standard methods, at: 1) fasting conditions, 2) 60 minutes after a breakfast of 408 Kcal (55.1 g carbohydrates, 17.4 g fat, 9.2 g proteins), and 3) immediately after a session of HIIT (100 min after breakfast). Homeostatic model assessment (HOMA-IR) was used as indicator of IR. The HIIT session lasted 19 minutes and consisted of 5 cycles, each of them with one minute of high intensity (85% of VO2max) and two minutes of moderate intensity (50% of VO2max). Three minutes of warming up and cooling down at 3 MET intensity was always done. Data are presented as median (interquartile range). Comparisons were done with Friedman test. **RESULTS**: patients had an age of 52 years (45-59), a body mass index (BMI) of $26.8 kg·m^{-2}$ (24.9-30.1), oxygen consumption (VO2max) of $34.6 ml·kg^{-1}·min^{-1}$ (30.2-38.2) and HOMA-IR of 3.3 (2.6-4.3). Musclin values post-HIIT ($709.6 pg·ml^{-1}$ (585.2-833.9)) showed a trend to be higher than fasting (599.1 $pg·ml^{-1}$ (506.2-724.5), P=0.088) and refeeding (593.0 $pg·ml^{-1}$ (466.4-918.2), P=0.061) conditions. Fasting musclin correlated with diastolic blood pressure during the HIIT bout (r=0.62, P<0.05). Insulin of 13.9 $μU mL^{-1}$ (10.4-16.6), 59.4 $μU mL^{-1}$ (23.1-159.8) and 30.8 $μU mL^{-1}$ (22.4-41.5) and glycemia of 102.4 $mg dl^{-1}$ (89.9-108), 111 $mg dl^{-1}$ (84.4-127.4) and 97.1 $mg dl^{-1}$ (87.3-110.3), were measured at conditions 1 to 3, respectively. **CONCLUSIONS**: a bout of HIIT trend to increase circulating musclin in humans with MS and IR, which does not support the idea of a myokine that induces IR. Future experiments will test if the increase in musclin could be explained by an increase in insulin. Colciencias 111562638757. CODI 2605. Interinstitucional 2016-1341. Colciencias Doctoral scholarships 727-2015.

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Time-efficient Sprint Interval Exercise Improves 24-h Glycaemic Control In Men With Type 2 Diabetes

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(No relevant relationships reported)

PURPOSE: Reduced-exertion high-intensity interval training (REHIT) is a genuinely time-efficient exercise intervention that has been shown to improve aerobic capacity and blood pressure in men with type 2 diabetes. However, the acute effects of REHIT on 24 h glycaemic control in type 2 diabetes have not been determined. **METHODS**: Eleven men with type 2 diabetes (mean ± SD: age, 52±6 years; BMI, 29.7±3.1 kg/ m^2; HbA1c, 7.0±0.8 %) participated in a randomised four-trial crossover study, with continual interstitial glucose measurements captured during a 24 h period including either: (1) no exercise (CON); (2) 30 min of continuous exercise (CE); (3) 10 x 1 min at ~90 HR$_{max}$ (HIIT; time commitment, ~25 min); and (4) 2 x 20 s 'all-out' sprints

(REHIT; time commitment, 10 min). Nutritional intake and timings of consumption were standardised within participants. The 24 h monitoring period started prior to breakfast and the exercise was performed 30 min after breakfast. Comparisons for 24 glycaemic variables were made using one-way repeated measures ANOVA and Holm-Sidak corrected t-tests for pre-planned contrasts (exercise conditions *versus* control). Cohens d was used as a measure of effect size with the following thresholds: small ($d = 0.2$), medium ($d = 0.5$) and large ($d = 0.8$) effect. **RESULTS**:Compared with CON (8.1±1.1 mmol/l), both REHIT (7.5±0.9 mmol/l, $p<0.05$, $d=0.55$) and CE (7.7±1.1 mmol/l, $p=0.06$, $d=0.35$) lowered mean 24 h glucose, and this was largely driven by a markedly lower glycaemic response (AUC) to dinner in both instances (-11%, $p<0.05$ and $d>0.8$ for both). The prevalence of hyperglycaemia was reduced with all three exercise bouts compared with CON (REHIT: -112 min; CE: -115 min; HIIT -125 min, all $p<0.05$, all $d>0.5$), whilst measures of glycaemic variability were not significantly altered. **CONCLUSIONS**: These data suggest that REHIT may offer a genuinely time-efficient alternative exercise option for improving 24 h glycaemic control in men with type 2 diabetes.

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The Acute Effects of Exercise Intensity on Blood Glucose Levels in Type 1 Diabetics

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(No relevant relationships reported)

For individuals with Type 1 diabetes mellitus (T1DM), regular physical activity is a fundamental strategy in the management of glycemic control. Previous studies have shown that continuous, moderate-intensity exercise in individuals with T1DM decreases blood glucose concentrations, often resulting in hypoglycemia, whereas vigorous-intensity exercise can increase blood glucose, impacting the risk of hyperglycemia. Sprint interval training (SIT), characterized by brief, all-out bursts of supramaximal exercise, has been shown to improve indices of cardiometabolic health, despite a minimal time commitment. However, the effects of low volume SIT on individuals with T1DM is largely unknown. **PURPOSE**: to contrast the acute effects of exercise intensity on blood glucose levels in Type 1 diabetics. **METHODS**: Four recreationally active college-age students with T1DM, completed a treadmill test to determine maximal aerobic speed (MAS), and performed each of the following 20-min treadmill-based protocols: 1) Moderate-intensity continuous training (MICT): 5-min warm-up (WU), 10 minutes at 70% MAS, 5-min cool-down (CD); 2) high-intensity interval training (HIIT): 5-min WU, 1-min at 90% MAS, 1-min at 30% MAS repeated 5 times, 5-min CD; 3) SIT: 5-min WU, 30-sec at 120% MAS, 2-min, 50-sec at 30% MAS repeated 3 times, 5-min CD. Blood glucose was monitored via glucometer every 5-min during exercise and for 45-min after. **RESULTS**: A statistically significant decline in blood glucose was observed in both the MICT and HIIT conditions (p <0.001, respectively) but not in the SIT condition (p = 0.696). From baseline to the 45-min mark, blood glucose decreased by 27% in both the MICT (180 ± 27 to 132 ± 39) and HIIT (183 ± 29 to 132 ± 15) protocols, but only 11% in the SIT (193 ± 41 to 165 ± 70) protocol. **CONCLUSIONS**: The results of this study provide initial proof-of-concept that a low volume SIT protocol can maintain target blood glucose levels while exercising in individuals with T1DM.

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Exercise Reduces HbA1c in Type 2 Diabetics, but Improved Strength Associates with Poorer Outcomes

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(No relevant relationships reported)

More than 25 million Americans have type 2 diabetes. Exercise is an effective method to prevent, delay, or manage the disease; however, fewer than 40% of patients report engagement in physical activity and more than 20% of this group overestimate their engagement. Structured exercise is warranted. Both aerobic and resistance training may be more effective than either mode in isolation, but studies reporting this are limited by their combined groups having greater volumes of exercise. **PURPOSE:** To evaluate different volumes of combined aerobic and resistance exercise on HbA1c levels in adults with diabetes. **METHODS:** 67 patients were randomly assigned to one of two groups: Group 1 performed supervised aerobic and resistance exercise twice per week. Group 2 performed the same exercise as Group 1 but also walked for 60 min on two additional days. At baseline, health history, seven tests of physical functioning, and measured cardiometabolic parameters, including HbA1c was performed. Following 10 weeks of exercise, follow-up data were collected. Independent-samples t tests compared baseline data and rates of improvement between the two groups. Multiple linear regression tested predictors of improvement in HbA1c. **RESULTS:** Group differences at baseline were minimal. Patients in Group 2 were 4.7 years older (p=0.063), body mass index was 3.3 points lower (p=0.058), and they walked an additional 72.7 meters in the 6-minute walk (p=0.009). There were no differences in

body fat percent (p=0.507), HbA1c (p=0.512), other cardiometabolic parameters, or the other six assessments of physical functioning. The patients who completed the exercise intervention improved in 13 of 15 assessments (p<0.05), including HbA1c (p=0.045). There were no differences in improvement between exercise groups. Regression analysis found elevated baseline body fat percent (p=0.001) and improvements in strength, assessed by arm curls (p=0.009) and grip strength (p=0.042) to correspond to poorer outcomes in HbA1c; the overall model was significant (R^2=0.733; p<0.001). **CONCLUSIONS:** Ten weeks of combined aerobic and resistance exercise improved cardiometabolic profiles of diabetic patients, including HbA1c. Additional volume of aerobic exercise did not enhance outcomes and improvements in strength associated with poorer outcomes.

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The Effects Of Simulated Hypoxia Bouts On Resting Blood Glucose Levels And Hemodynamics Of A Type 1 Diabetic: A Case Study

Devin J. Rettke, Scott Drum, FACSM. *Northern Michigan University, Marquette, MI.* (Sponsor: Scott Drum, FACSM)
(No relevant relationships reported)

Individuals diagnosed with diabetes may choose adventure travel vacations at higher altitudes, thereby perturbing formerly controlled sea level (SL) blood sugar (BG) levels. **Purpose:** We sought to describe change in resting BG concentration, heart rate (HR), and mean arterial pressure (MAP) during repeat acute exposure to simulated altitude bouts in a type 1 diabetic (T1D) vs a non-diabetic (ND). We hypothesized T1D would encounter less stable readings on all variables. **Methods:** Two male participants (n=2), a T1D and ND, 22 and 23 years old, respectively, completed this case study. Participants, simultaneously, visited a lab on six different days [i.e., three days in a row one week (M, T, W) and the same three days the following week (M, T, W)]. They ingested the same meals the night before and day of (1.5-hrs before chamber use). At each visit, BG (Contour Next Link; Parsippany, NJ), HR (Polar, Lake Success, NY), and MAP (Briggs Healthcare, Waukegan, IL) were assessed at rest at SL and during 2-hr/bouts at 10-min intervals using a hypoxic chamber (Hypoxico Inc., New York, NY) set randomly to varying altitudes: SL; 915 m; 1,829 m; 2,743m; 3,658m; and 4,572m. **Results:** For each variable, magnitude of change (Δ) was averaged over the 6 lab visits and compared at SL and across altitude levels. SL ΔBG (mg/dL), ΔHR (bpm), and ΔMAP (mmHg) for T1D and ND, respectively, were: 19, 16, 18; and 34, 18, 12. T1D maintained a more stable BG at SL over 6 days. When averaging the five altitude levels over 6 days, ΔBG (mg/dL), ΔHR (bpm), and ΔMAP (mmHg) for T1D and ND, respectively, were: 58, 9, 10; and 47, 9, 10. Notably, T1D had a less stable BG during hypoxic exposure. **Conclusion:** Simulated hypoxia perturbed BG to a greater extent in T1D. This could have practical application for when a T1D travels to higher, natural elevations, at which point they should more closely monitor their BG levels with normal food and fluid intake.

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988   Board #249   May 30 2:00 PM - 3:30 PM

Effects of Aerobic Exercise on Plasma Metabolites in Prediabetes Subjects

Bowen Li[1], Mian Jia[1], Ningning Zhang[1], Chaojun Li[1], Yan Wang[1], Xianbo Zhang[2], Juan Wang[1], Zhengzhen Wang, FACSM[1]. *[1]Beijing Sport University, Beijing, China. [2]Beijing Hospital, Beijing, China.* (Sponsor: Zhengzhen Wang, FACSM)
(No relevant relationships reported)

Objective: Regular exercise can improve the insulin sensitivity in Prediabetes(PDM). However, the mechanisms remain unclear. This study aimed to examine the effect of aerobic exercise on PDM subjects·plasma metabolites. **METHODS:** 24 PDM subjects were selected [mean age of (54.41±10.34) yr, body mass index of (25.70±3.80)kg/cm², 8 males]. Each 10 age and sex-matched normal subjects and new-onset T2DM subjects were enrolled. PDM subjects received exercise (n=13) or health education (n=12) for 12 weeks. Exercise training: 3 times/week, 50 min per session at 40%-60% of of VO_2 reserve. The body composition (dual-energy x-ray absorptiometry) and cardiorespiratory fitness (VO_2peak) were detected before and after exercise. Plasma metabolites were analyzed by using liquid chromatography/mass spectrometry (LC/MS). **RESULTS:** After training, the body fat percentage, 2-hour OGTT plasma glucose, and low density lipoprotein cholesterol of PDM patients were significantly reduced (by 4.6%, 16.22% and 9.27%, on average). The metabolic characteristics were significantly different before and after exercise, there were 31 endogenous metabolites (VIP > 1 and P < 0.05), of which 25 were increased and 6 were decreased. Main metabolites that changes with training included phosphatidylcholine, lysophosphatidylcholines, sphingomyelin, betaine, linoleic acid,oleic acid and docosahexaenoic acid. **CONCLUSION:** Aerobic exercise intervention has a marked effect on the plasma metabolites in PDM patients, which can improves the glucose and lipid metabolism by regulating the metabolic pathway of linoleic acid and phospholipid. These findings may lead to a better understanding of the mechanism

of aerobic exercise in preventing T2DM. Supported by Key Projects of State General Sports Administration of China (2014B007),Specialized Research Fund for the Doctoral Program of Higher Education of China (20131112110002).
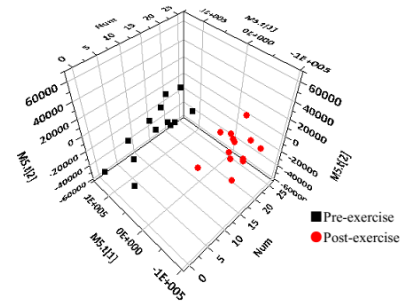
PLS-DA models of LC/MS metabolomics data for pre and post exercise

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989   Board #250   May 30 2:00 PM - 3:30 PM

A Curious Relationship Between Obesity, Diabetes, and Dementia

Megan L. Darling[1], J. Mark VanNess[1], Jonathan M. Saxe[2], Michelle M. Amaral[1], Lewis E. Jacobson[2], Courtney D. Jensen[1]. *[1]University of the Pacific, Stockton, CA. [2]St. Vincent Hospital, Indianapolis, IN.*
(No relevant relationships reported)

Among American adults (age ≥ 18), 36.5% have obesity, 9.3% have diabetes, and more than 4 million have dementia. These pathologies do not develop and progress independently. Compared to adults with a body mass index (BMI) less than 23, overweight adults (BMI>25) have a 10-fold increase in the odds of developing diabetes. In turn, body weight and diabetes appear to exert independent effects on the risk of dementia. More work is necessary to elucidate these relationships. **PURPOSE:** To assess the effects of obesity and diabetes on incidence of dementia. **METHODS:** We analyzed a hospital population that included 2,306 consecutively admitted patients. We conducted a health history, diagnosed cerebral, metabolic, and cardiovascular diseases, and measured anthropometric and cardiometabolic parameters. Chi-square tests analyzed rates of dementia among patients with and without obesity and diabetes. Logistic regression tested the effects of obesity and diabetes on odds of a dementia diagnosis, holding constant potential confounders. **RESULTS:** Across the total sample, 16.3% of patients were obese, 14.3% had diabetes, and 4.6% had dementia. Among obese patients, 26.0% had diabetes; 12.0% of non-obese subjects had diabetes (p<0.001). Among obese patients, 1.6% had dementia; 5.1% of non-obese patients had dementia (p=0.003). Among patients with diabetes, 8.8% had dementia; 3.8% of patients without diabetes had dementia (p<0.001). Logistic regression, holding age and history of stroke constant, found trends for obesity to reduce odds of dementia by 56% (p=0.079) and diabetes to increase odds by 63% (p=0.060). Sex (p=0.418), depression (p=0.608), mean arterial pressure (p=0.837), smoking status (p=0.920), and histories of heart attack (p=0.250), congestive heart failure (p=0.627), and peripheral vascular disease (p=0.943) were not significant. Among patients age ≥ 65 (n=724), 13.8% were obese, 27.2% had diabetes, and 14.0% had a diagnosis of dementia. The same logistic regression preserved its trends for obesity (OR=0.376; p=0.054) and diabetes (OR=1.600; p=0.079). **CONCLUSIONS:** Obesity appears to carry a protective role, lowering risk of dementia, while diabetes elevates risk. Given the absence of a relationship with vascular disease, this is more likely a consequence of glucose, insulin, and amyloid metabolism.

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990   Board #251   May 30 2:00 PM - 3:30 PM

The Dose Effect of Whey Protein on Insulin Responses in Pre-Diabetic and Type 2 Diabetics

Todd J. Castleberry, Christopher Irvine, Michael Oldham, Matthew Brisebois, Sarah E. Deemer, Ryan Gordon, Aubrien Henderson, Vic Ben-Ezra. *Texas Woman's University, Denton, TX.* (Sponsor: David Nichols, FACSM)
(No relevant relationships reported)

BACKGROUND: People with pre-diabetes and type 2 diabetes have shown an increase in insulin secretion after ingesting 55 g of whey protein coupled with a glycemic challenge. However, the effect of lower amounts of whey protein on insulin responses remains unclear. Our hypothesis was that both 20 g and 30 g of whey consumption prior to an oral glucose tolerance test (OGTT) would produce an increase in insulin secretion, with 30 g producing the greatest increase compared to a control.

PURPOSE: The purpose of this study was to examine the effect of two different doses of whey protein ingested 30 min prior to a 50 g OGTT on glucose, insulin, C-peptide, and glucagon responses.
METHODS: Diabetic or pre-diabetic participants (n=9, mean ± SD; age: 64.3 $\pm$ 8.1 yrs; BMI: 29.4 $\pm$ 6.0 kg/m²; body fat percentage: 42.5 $\pm$ 7.8 %; fasting plasma glucose: 6.9 $\pm$ 1.2 mmol/l; HbA1c: 6.4 $\pm$ 0.6 %) completed three trials. The randomly assigned trials consisted of: 250 ml of water (CON), 250 ml of water + 20 g whey (20g), and 250 ml of water + 30 g whey (30g), followed by an OGTT. Blood was collected at -30, 0, 15, 30, 60, 90, 120, and 150 min for the measurement of glucose, insulin, C-peptide, and glucagon. The whey protein mixture was administered immediately following the -30 min blood draw, and the 50 g OGTT began immediately following the 0 min blood draw. Glucose was analyzed using a YSI 2900D glucose analyzer and insulin, C-peptide, and glucagon were measured via multiplex fluorescent detection (MagPix). A one-way repeated measures ANOVA (p<.05) with a Bonferroni post hoc was used for statistical analysis for each dependent variable.
RESULTS: Integrated area under the curve (AUC) for glucose presented no difference between the 3 trials. Insulin AUC was significantly increased from CON to 20g (p=0.004, 36.3%), CON to 30g (p=0.002, 61.7%), and 20g to 30g (p=0.030, 18.6%). C-peptide and glucagon AUC significantly increased from CON to 20g (p=0.018, 20.6%; p=0.046, 33.1%) and CON to 30g (p=0.001, 30.1%; p=0.017, 33.7%).
CONCLUSION: Whey protein elicited a dose response on plasma insulin, increasing concentrations from CON to 20g, and 20g to 30g, however plasma glucose was unaffected. 20g and 30g displayed similar responses for glucagon. Neither 20 g nor 30 g of whey protein may be adequate to provide glycemic improvement in the disease management of type 2 or pre-diabetes.

B-72   Free Communication/Poster - **Hypertension, Exercise Response, and Aging**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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991   Board #252   May 30 2:00 PM - 3:30 PM
A Bout Of Intense Exercise Cannot Substitute Antihypertensive Medication But When Combined, Enhances Medicine Actions.

MIGUEL RAMIREZ-JIMENEZ, FELIX MORALES-PALOMO, JUAN FERNANDO ORTEGA, RICARDO MORA-RODRIGUEZ. *UNIVERSIDAD DE CASTILLA-LA MANCHA, TOLEDO, Spain.*
(No relevant relationships reported)

Purpose: We studied the blood pressure lowering effects of a bout of exercise and/or antihypertensive medicine with the goal of studying if exercise could substitute or enhance pharmacologic hypertension treatment. **Methods:** Twenty-three hypertensive metabolic syndrome patients chronically medicated with angiotensin receptor blockade antihypertensive medicine underwent 24-hr monitoring in four separated days in a randomized order; *a)* after taking their habitual dose of antihypertensive medicine (AHM trial), *b)* substituting their medicine by placebo medicine (PLAC trial), *c)* placebo medicine with a morning bout of intense aerobic exercise (PLAC+EXER trial) and *d)* combining the exercise and antihypertensive medicine (AHM+EXER trial). **Results:** In trials with AHM subjects had lower plasma aldosterone/renin activity ratio evidencing treatment compliance. Before exercise, the trials with AHM displayed lower systolic (130±16 vs 133±15 mmHg; P=0.018) and mean blood pressures (94±11 vs 96±10 mmHg; P=0.036) than trials with placebo medication. Acutely (i.e., 30 min after treatments) combining AHM+EXER lowered systolic blood pressure below the effects of PLAC+EXER (-8.1±1.6 vs -4.9±1.5 mmHg; P=0.015). Twenty-one hours monitoring revealed no differences among trials in body motion. However, PLAC+EXER and AHM lowered systolic blood pressures below PLAC during the first 10 hours, time at which PLAC+EXER effects faded out (i.e., at 19 PM). Adding exercise to medication (i.e., AHM+EXER) resulted in larger reductions in SBP that lasted most of the night (Figure 1). **Conclusion:** One bout of intense aerobic exercise in the morning cannot substitute the long-lasting effects of antihypertensive medicine in lowering blood pressure, but their combination is superior to their separated effects.

Figure 1

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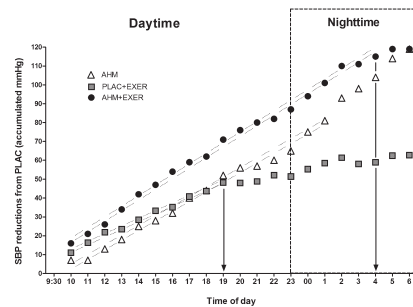
992   Board #253   May 30 2:00 PM - 3:30 PM
The Impact of Peripheral Hemodynamics on Derived Central Pressure Waveforms

Gabriel H. Zieff[1], James Faulkner[2], Simon Fryer[3], Keeron Stone[3], Lee Stoner[4], Claudio Battaglini, FACSM[4]. [1]*University of North Carolina Chapel Hill, Carrboro, NC.* [2]*University of Gloucestershire, Winchester, United Kingdom.* [3]*University of Gloucestershire, Gloucestershire, United Kingdom.* [4]*University of North Carolina Chapel Hill, Chapel Hill, NC.*
(No relevant relationships reported)

THE IMPACT OF PERIPHERAL HEMODYNAMICS ON DERIVED CENTRAL PRESSURE WAVEFORMS. Gabriel Zieff[1], Simon Fryer[2], Keeron Stone[2], James Faulkner[3] Lee Stoner[1].[1]UNC Chapel Hill, NC. [2]University of Gloucestershire. [3]University of Winchester. **Introduction:** Central hemodynamic parameters, such as aortic systolic pressure (cSBP), augmentation index (AIx), and pressure wave forms (Pb) may offer clinicians superior prognostic information to peripheral systolic pressure (SBP). It is unknown whether changes in peripheral hemodynamics affect central hemodynamic measurements. **Purpose:** To investigate whether changes in peripheral hemodynamics, induced using upper limb tilting, affect central hemodynamic parameters. **Methods:** A single visit, repeated measures design, 20 healthy young adults (BMI: 24±2.8; 55% F). Brachial pressure waveforms were simultaneously measured in a supine position using an oscillometric device on an experimental (SphygmoCor XCEL) and control (Oscar, SunTech) arm. The experimental arm was positioned 30⁰ above, 30⁰ below, and at heart level, in a randomized order. The control arm remained at heart level. **Results**: For the experimental arm, there was a large effect change in SBP (eta=0.82, p<0.001) and cSBP (eta=0.81, p<0.001) when the arm was above (cSBP Δ4.9, SBP Δ4.6) and below (cSBP Δ-12.5, SBP Δ-9.8). AIx increased (p=0.023) when the arm was below but not above. No change occurred in Pb. In the control arm, no change occurred in SBP or cSBP, but AIx decreased when the experimental arm was above (p=0.04). **Conclusions:** Changes in peripheral hemodynamics result in large changes in cSBP and AIx, but not in Pb. Findings provide a rationale for standardizing the upper limb position during BP measurement, and may have important clinical implications regarding pharmacological prescription.

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993   Board #254   May 30 2:00 PM - 3:30 PM
Body Composition and Blood Pressure Comparisons of Older Runners and Younger Non-Running African American Women

Doris J. Morris. *Georgia State University, Atlanta, GA.* (Sponsor: L. Jerome Brandon, FACSM)
(No relevant relationships reported)

African American women(AAW) are among the more sedentary and obese segments of the American population. A major question is if body composition and blood pressure responses of active older AAW (OAAW) are different than younger sedentary AAW (YAAW)? **Purpose**: This study was designed to determine if body fat percentage (fat%), bone density and blood pressure (BP) would be different between OAAW and YAAW. **Methods**: A cross-sectional research design with 61 women (18 older runners -age 59.6 5.7 yrs. and 43 younger runners -age 40.6 8.2 yrs.) was evaluated for DXA body composition and blood pressure. The older runners had been runners for a minimum of 12 months and ran a minimum of 10 miles per week. **Results:** The women differed (p<0.05) on fat% (OAAW 38.4 ± 6.0 and YAAW 33.2 ± 9.5%), bone mineral density (BMD) (OAAW 1.133 and YAAW 1.217 g/cm²) and the groups were near different (p=0.054) for systolic BP (OAAW 119 ± 10.8 and YAAW 113.4±10.9). **Discussion:** The anticipated difference between the groups due to age was not

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observed for many of the body composition and diastolic BP variables. The differences observed for BMD and fat% may have been related to the number of years the OAAW had been running. These data suggest that greater physical activity participation by AAW can aid in managing many aspects of body composition. Since BP and fat% are cardio-metabolic risks for cardiovascular disease, an active lifestyle may aid in increasing the quality and perhaps the quantity of their lives.

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994   Board #255   May 30 2:00 PM - 3:30 PM

Effect of Intra-Venous Antioxidant Infusion on the Development of Neuromuscular Fatigue During Whole Body Exercise in Hypertensive Middle-Age Individuals

Taylor S. Thurston[1], Joshua C. Weavil[1], Thomas J. Hureau[2], Jayson R. Gifford[3], Russell S. Richardson[1], Markus Amann[1]. [1]University of Utah, Salt Lake City, UT. [2]University of Strasbourg, Strasbourg, France. [3]Brigham Young University, Provo, UT.
(No relevant relationships reported)

PURPOSE: To investigate the effect of intravenous antioxidant supplementation on the development of neuromuscular fatigue during whole body exercise in middle-age hypertensive patients. **METHODS:** Clinically diagnosed hypertensive males performed fatiguing, constant-load cycling exercise to exhaustion (80% W_{peak}, 150 ± 27 W) following both a 2 g intra-venous infusion of L-ascorbic acid (AOX; dissolved in 20 mL saline) and saline (PLA; 20 mL) randomized and separated by at least 5 days. The trial characterized by shorter exhaustion time was later repeated (i.e., iso-time) under the opposite supplemental condition. Peripheral fatigue was quantified as the pre- to post-exercise change in quadriceps twitch torque (ΔQ_{tw}; supramaximal electrical femoral nerve stimulation), maximal rate of force development ($\Delta mRFD$), and peak relaxation rate (ΔPRR). Central fatigue was quantified as the exercise-induced change in voluntary activation (ΔVA). Femoral arterial blood flow (Doppler ultrasound; Q_L) was quantified during cycling at 25, 50, and 75 W. Cardiopulmonary responses were recorded continuously. Exercise-induced fatigue was quantified during time-matched trials. **RESULTS:** AOX had no effect on blood pressure at rest (MAP: 107 ± 2 mmHg) or during the final minute of exercise (MAP: 137 ± 3 mmHg; P < 0.05). Q_L was similar between conditions at baseline and during exercise (~0.2, ~1.5, ~2.1, ~2.7 L/min, respectively). Furthermore, heart rate (~153 BPM), minute ventilation (~117 L/min), O_2 consumption (~2.2 L/min), and CO_2 production (~2.5 L/min) during the final minute of exercise were similar between trials. While ΔVA (~-6%) and $\Delta mRFD$ (~-45%) were not altered by AOX, ΔQtw and ΔPRR were attenuated in AOX compared to PLA (-40 ± 9% vs -58 ± 9%; -19 ± 12 vs -44 ± 9%, respectively; P < 0.05). Finally, AOX had no effect on cycling time to exhaustion (PLA: 488 ± 22 s vs AOX: 487 ± 65 s). **CONCLUSION:** AOX attenuates the development of fatigue while not altering the cardiopulmonary response and locomotor muscle blood flow during cycling exercise in hypertensive males. This ergogenic effect is likely determined by intracellular mechanisms and independent of muscle O_2 transport. Importantly, the observed AOX-induced reduction in the development of peripheral fatigue does not appear to improve endurance capacity in hypertensive patients.

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Effects of High Intensity Interval Exercise Training on Blood Pressure in Patients with Hypertension

Jung Jun Park[1], Eun-Ah Jo Jo[1], Kyoung-Im Cho[2], Do-sun Im[3]. [1]Pusan National University, Busan, Korea, Republic of. [2]Kosin University, Busan, Korea, Republic of. [3]Korea University, Seoul, Korea, Republic of.
(No relevant relationships reported)

PURPOSE: To compare the effects of HIIT and CAE on changes in blood pressure reduction and endothelial function in hypertensive patients.
METHODS: Seventeen hypertensive patients, aged 52.1±7.6, participated in this study, tapered off their medications, if necessary, and were randomized to either HIIT (n=9) or CAE (n=8) group. HIIT was composed of 5 sets of 3 min exercise at 80% HRR, and each interval was separated by 3 min recovery at 40% HRR. CAE was composed of 35 min exercise at 60% HRR. Both groups were designed to use same energy expenditure, and performed exercise 5 days per week for 4 weeks. Endothelial function was determined by assessing endothelial progenitor cells (EPCs) using flow cytometry and flow mediated dilation (FMD) using ultrasonography. Arterial stiffness was measured by pulse wave velocity (PWV). Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured at rest and during exercise at 60% HRR by using automatic blood pressure monitor.
RESULTS: At rest, SBP was significantly decreased in HIIT ($p<0.01$) and CAE ($p<0.05$), and DBP was significantly decreased in HIIT ($p<0.001$), but not in CAE. During exercise, SBP was significantly decreased in CAE ($p<0.05$), but not in HIIT, and DBP was significantly decreased in HIIT ($p<0.01$), but not in CAE. FMD and EPCs were significantly improved in HIIT ($p<0.01$ and $p<0.05$, respectively), but not in CAE. There were significantly different changes in DBP during exercise and EPCs between groups ($p<0.05$). However, PWV was not changed in both groups.

CONCLUSIONS: The results of this study suggest that HIIT and CAE equally have beneficial effects on blood pressure reduction at rest and during exercise. However, HIIT may improve endothelial function greater than CAE. Therefore, HIIT could be a better exercise program than CAE for hypertensive patients.

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24 Hour Ambulatory Blood Pressure Dipping And Variability Characteristics Following Maximal Treadmill Exercise In Community Dwelling Healthy Older Adults.

Thomas R. Petrella, Narlon C. B. S. Silva, Ashleigh De Cruz, Alan Salmoni, Robert J. Petrella, FACSM. Western University, London, ON, Canada. (Sponsor: Robert Petrella, FACSM)
(No relevant relationships reported)

Abnormal blood pressure (BP) response to maximal exercise may lead to compromised cardiovascular health. **PURPOSE**: To examine the 24-hour ambulatory blood pressure response in older adults following a maximal exercise treadmill test. **METHODS**: Ambulatory BP was recorded every 30 minutes (daytime) and 60 minutes (nighttime) on the day preceding and then 24 hours following a symptom limited maximal exercise treadmill test. Participants were a convenience sample of healthy older adults free of cardiovascular and musculoskeletal limitations who were participants in a community-based exercise program in London, Ontario, Canada. Symptom limited exercise was performed in the AM in a fasted state, during which VO2max was estimated. The study outcomes included mean systolic and diastolic BP (daytime, nighttime and 24-hour), as well as mean change in BP from daytime to nighttime (BP dipping), and BP variability (average real variability [ARV]). Mixed between-within ANOVA was used in the statistical analysis, exploring main effects for time (pretest vs posttest), grouping factors (presence of hypertension [normotensive vs hypertensive], gender [men vs women], and fitness level [low, average and high VO2max]), and interaction effects for time × grouping factors.
RESULTS: 11 men and 9 women, mean age 71.5 (SD=5.4) years were included in the analysis. Mean VO2max was 34.8 (SD=7); 10 subjects had documented hypertension. No difference in the mean pre-exercise systolic ABP was 129.2 (120.3-138.1) vs 124.8 (116.7-132.9) and post-exercise systolic ABP was 126.3 (118.8-133.9) vs 122.8 (116-129.6) in normotensive and hypertensive subjects respectively (p=0.7). Nighttime diastolic BP dipping differed according to VO2max groups, whereby it increased in participants with low VO2max, while it decreased in those with average VO2max and high VO2max (p=0.037). As well, post-exercise systolic BP variability was decreased in men but increased in women (p=0.07). **CONCLUSIONS**: Healthy older normotensive and hypertensive subjects had similar post 24-hour systolic BP dipping. However, nighttime diastolic blood pressure as significantly different according to fitness level and systolic BP variability was reduced in men suggesting low fitness and male gender may alter BP response to maximal exercise in older adults.

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Post-isometric Exercise Hypotension After Moderate intensity Handgrip Exercise In Hypertensive Elderly

MILTON R. MORAES[1], VIVIAN E. MORAES[1], JOYCE B. VICENTE[1], GEIZIANE R. MELO[1], RAFAEL R. OLHER[1], IORRANY C. SOUSA[1], LUIZ H. PERUCHI[2], RODRIGO V. NEVES[1], THIAGO S. ROSA[1], APARECIDO P. FERREIRA[1], LUIZ R. SOUZA[1]. [1]CATHOLIC UNIVERSITY OF BRASILIA, BRASILIA, Brazil. [2]University of Mogi das Cruzes, Mogi das Cruzes, Brazil.
(No relevant relationships reported)

Hypertension is common in people aged 65 or more. The isometric handgrip (IHG) is a model of effective exercise in reducing blood pressure (BP). However, the mechanisms involved in post-isometric exercise hypotension (PIEH) remain unclear. Nitric oxide (NO) is a potent vasodilator and may be involved in PIEH.**PURPOSE**:To determine the response hypotensive and mechanism involving in older with arterial hypertension. **METHODS**:Ten sedentary hypertensive elderly (73.2±2.2 years), underwent two experimental sessions using a portable isometric handgrip dynamometer Jamar; (i) sham session with 3 percent of maximal voluntary isometric contraction (MVIC); and (ii) experimental isometric session with 30 percent of MVIC, total of 8 sets of 1 min contraction and 1 min rest pause. The BP and heart rate (HR) were evaluated at rest and post-exercise (1, 5, 10, 15, 30, 45 and 60 min). Saliva samples were collected at rest, 0, 30 and 60 min post-exercise. **RESULTS**: Systolic BP (SBP) presented a reduction from the 10th min post-exercise to 30 percent MVIC (p < 0.05). At 60 min post-exercise the SBP was lower 30 percent vs. 3 percent MVIC (p = 0.006). There were no differences for diastolic BP, mean arterial pressure, HR and NO metabolites. The results demonstrated that IHG exercise at 30 percent MVIC was tolerated by elderly individuals and induced an PIEH for up to 60 min, but there was no association with NO- salivar metabolite. **CONCLUSIONS**: Yet, this portable equipment of cost-effective, easy performance and short duration can be an excellent adjuvant strategy in the control and prevention of arterial hypertension in elderly.

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Effects Of Isometric Handgrip Versus Aerobic Exercise On Blood Pressure In Elderly Hypertensive Patients

Sae Young Jae, Eun Sun Yoon, Hyun Jeong Kim. *University of Seoul, Seoul, Korea, Republic of.*

(No relevant relationships reported)

PURPOSE: The aim of this study was to compare the antihypertensive effects of isometric handgrip exercise (IHE) versus aerobic exercise (AE) on office, central and 24-h ambulatory blood pressures in elderly hypertensive patients. **METHODS**: We conducted a randomized controlled trial with a three-arm design. Thirty-seven elderly hypertensive patients (mean age 69±6 years) were randomized to IHG training (n=14), AE training (n=11), or non-exercise control group (n=12) for 12 weeks. Bilateral IHG training was performed at 30% of maximal voluntary contraction using a digital handgrip device. AE training was performed brisk walking for 30-min at moderate intensity with 3 times per week. Resting office, central, and 24-h ambulatory blood pressures were obtained at baseline and after intervention. **RESULTS**: No group differences were found at baseline for any variable. Following 12 weeks, resting office blood pressures decreased in both IHG and AE groups (IHG: SBP 135.4±14.1 to 125.8±9.9mmHg (p=0.004), DBP 84.8±8.5 to 79.6±5.8mmHg (p=0.005); AE: SBP 130.3±13.3 to 123.1±8.1mmHg (p=0.022), DBP 80.5±7.0 to 76.8±5.0mmHg (p=0.037)), without any improvement in the control group. Furthermore, central SBP (122.0±13.5 to 117.0±9.8mmHg (p=0.05)) and mean 24h ambulatory DBP (80.3±8.8 to 75.6±7.2mmHg (p=0.021)) decreased only in the IHG group, but not in the AE or control groups. **CONCLUSIONS**: These findings suggest that both IHG and AE trainings reduce resting office blood pressure, but only IHG training is effective in improving central and ambulatory blood pressures. Thus, IHG training may be an alternative antihypertensive therapy for the elderly hypertensive patients.

999   Board #260   May 30 2:00 PM - 3:30 PM

Effects of Whole-body Vibration On Strength, Body Composition, and Function in Skilled Nursing Home Residents

Brandon F. Grubbs[1], Arturo Figueroa, FACSM[2], Jeong-Su Kim, FACSM[3], Karla Schmitt[3], Lynn B. Panton, FACSM[3]. *[1]Middle Tennessee State University, Murfreesboro, TN. [2]Texas Tech University, Lubbock, TX. [3]Florida State University, Tallahassee, FL.* (Sponsor: Lynn B. Panton, FACSM)

(No relevant relationships reported)

PURPOSE: To compare the effects of 12 wks of whole-body vibration training (WBVT: n=10) to standard care, which served as the control (CON: n=10), on strength, body composition, and functional performance in 20 (16 female) pre-frail and frail skilled nursing home residents (82±5 yrs).
METHODS: Participants were screened for frailty syndrome using the FRAIL scale. Isometric knee extension strength (KE) was measured using a mechanical push-pull dynamometer. Bioelectrical impedance analysis was used to measure lean mass (LM) and fat mass (FM). The short physical performance battery (SPPB) was used to assess function. Participants were assigned to 12 wks of WBVT (2x/wk) or CON. WBVT consisted of 3 sets of 10 reps of 4 lower body exercises (partial squat, narrow squat, wide squat, calf raises) during vertical vibration (25-40 Hz). Data were analyzed using two-way ANOVA (group x time) and post-hoc paired t-tests. Significance was set at p≤0.05.
RESULTS: There were no changes in LM or FM. There were significant group-by-time interactions for KE and SPPB. Post-hoc paired t-tests found WBVT improved KE (WBVT: 22.3±4.0 to 29.0±4.5 kg; CON: 23.8±6.3 to 23.6±9.6 kg) and improvement in SPPB performance approached significance (WBVT: 4.5±2.3 to 5.2±2.1 units, p=0.09; CON: 4.1±1.9 to 3.7±2.3 units).
CONCLUSIONS: WBVT was well tolerated and occurred without adverse health complications. WBVT can be used to counteract losses in leg strength. Interventions of greater frequency and duration may help improve functional performance in pre-frail and frail older adults. WBVT was well tolerated and occurred without adverse health complications. WBVT can be used to counteract losses in leg strength. Interventions of greater frequency and duration may help improve functional performance in pre-frail and frail older adults. This study was supported by grants from the College of Human Sciences and FSU.

1000   Board #261   May 30 2:00 PM - 3:30 PM

The Association of Muscular Strength and Treadmill-Based Walking Economy in Older Men and Women.

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(No relevant relationships reported)

Ageing is linearly associated with increased body fat percentage (BF%) and decreased muscular strength, which may lead to lower force production and decreased physical function (PF) in older adults (age 60+ yrs.). The magnitude at which age-related decrements affect energy expenditure associated with walking economy (WE) is not well understood. A better understanding of the relationship between BF%, lower body muscular strength (LBMS), and PF, and the degree to which these variables are related to WE is important for the clinical exercise approach with older adults. **PURPOSE:** To determine the association of BF%, LBMS, and PF on WE in older adults when walking at three separate treadmill speeds. **METHODS:** Twenty-three older adults (12 men, 11 women; age 70 ± 6 yrs.) were recruited to participate. Session 1 included screening, protocol familiarization, and body composition assessment measure (BodPod®). During sessions 2 and 3, participants performed either a treadmill walking (TMW) protocol (three separate 6-minute TMW bouts at set speeds of 0.45, 0.89, and 1.34 m·sec^{-1}) or a LBMS measure (1RM Leg Press) and PF test battery (SPPB). Session, walking speed, and strength/functional testing order was counter-balanced and WE was calculated as an index (kcal·min^{-1}·W^{-1}). Steady state oxygen uptake was used to calculate energy expenditure for all TMW bouts. A linear mixed effects model was used to determine associations between BF%, LBMS, and PF on WE at the three TMW bouts. An *a priori* alpha of $p \leq 0.05$ was set for statistical significance. **RESULTS:** Twenty-one older adults (11 men, 10 women; age 70 ± 6 yrs.) completed the study. There were no significant correlations for BF% ($r^1 = 0.19$, $p^1 = 0.41$), LBMS ($r^1 = -0.07$, $p^1 = 0.78$), and PF ($r^1 = 0.14$, $p^1 = 0.55$) on WE at the 0.45 m·sec^{-1} speed. Correlations were also not significant on WE at the 0.89 m·sec^{-1} speed [BF% ($r^2 = -0.22$, $p^2 = 0.34$), LBMS ($r^2 = 0.01$, $p^2 = 0.96$), and PF ($r^2 = 0.18$, $p^2 = 0.44$)] and the 1.34 m·sec^{-1} speed [BF% ($r^3 = 0.09$, $p^3 = 0.71$), LBMS ($r^3 = 0.14$, $p^3 = 0.54$), and PF ($r^3 = -0.26$, $p^3 = 0.25$)]. **CONCLUSION:** BF%, LBMS, and PF may not be associated with age-related decrements in WE with older adults during treadmill walking. Future research is needed to better determine the interactions of these variables on WE in older adults.

1001   Board #262   May 30 2:00 PM - 3:30 PM

Passive Mobilization-induced Vascular Function: Adaptations In Bedridden Oldest-old.

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(No relevant relationships reported)

PURPOSE: With aging, vascular function (VF) declines. Indeed, a conspicuous number of oldest-old individuals are in chronically bedridden, and literature indicates that chronic immobility exacerbates VF decline. Although studies have suggested that passive mobilization of the limbs (PM) may improve local VF, the effect of PM on nitric oxide (NO)-mediated VF has not been studied yet. Therefore the aims of this study were determine whether PM is effective to counteract VF worsening in bedridden oldest-old. We hypothesized that bedridden patients who underwent a month of PM would have gained significant improvement in NO-mediated VF. **METHODS**: Twenty bedridden individuals (86±7 yrs) were randomly assigned to PM or control (CT) group, treated with standard therapies only. PM groups underwent a program of 30 min of passive knee (flexo-extension) mobilization (4-week, twice a day/5 days a week) in addition to their standard therapies. Pre and post treatment, NO-mediated VF was measured by means of single passive limb movement (sPLM) test.
RESULTS: All PM patients completed all sessions. Concerning sPLM test, PM group improved significantly sPLM$_{peak}$ (+33%), ΔPLM (+55%), as well as Area Under the Curve (AUC, +200%). CT group did not exhibit any change in VF.
CONCLUSIONS: Results suggest that the reduction in VF exhibited in chronically bedridden oldest-old individuals can be reversed by a PM program. PM seems to be an effective strategy to counteract the deleterious effects of bedridden.

1002   Board #263   May 30 2:00 PM - 3:30 PM
Comparing Post-Exertional Symptoms Following Serial Exercise Tests

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(No relevant relationships reported)

Post-exertional malaise (PEM) is an exacerbation of symptoms that leads to a reduction in functional ability. Recognizing the triggers, onset, symptoms and duration of PEM is important for the diagnosis of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). PEM following serial exercise tests has not been examined. **PURPOSE**: To compare descriptions of symptoms by ME/CFS and control subjects after two maximal exercise tests, each separated by 24 hours. **METHODS**: Open-ended questionnaires were provided to 11 control subjects and 49 ME/CFS patients who underwent two maximal exercise tests, 24 hours apart. Each subject evaluated how they felt immediately after the first exercise test, before and immediately after the second exercise test, and in the week following the tests. Responses were analyzed and categorized by two reviewers, blinded to subject diagnosis. Repeated measures ANOVA was used to examine differences between groups. **RESULTS**: Over the two days of testing, ME/CFS subjects reported an average of 15.4±7.7 symptoms compared to 5.5±1.8 in the control group. Following the tests, ME/CFS subjects reported an average of 5.0±2.8 symptoms compared to 0.1±0.3 in the control group. Among the ME/CFS subjects, fatigue, cognitive dysfunction, and sleep problems were reported with the greatest frequency. Out of the eighteen symptom categories, ME/CFS subjects reported seventeen at a higher frequency than control subjects. The largest differences were observed in cognitive dysfunction, headache, light-headedness, muscle/joint pain and weakness. Other symptoms included decreased function, pain, flu-like and gastrointestinal symptoms. Forty-nine percent of ME/CFS subjects recovered within an average of 4.5 days while fifty-one percent had not recovered by day seven. In contrast, all but one control subject recovered within 1 day. **CONCLUSION**: A standardized exertional stimulus produces prolonged and more diverse symptoms in ME/CFS subjects compared with those seen in control subjects. Understanding PEM more comprehensively may provide clues to the underlying pathophysiology of ME/CFS and lead to improved diagnosis and treatment.

1003   Board #264   May 30 2:00 PM - 3:30 PM
Exercise Ventilatory Limitation To Exercise In Dyspneic Iraq And Afghanistan Veterans

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(No relevant relationships reported)

Veterans of Iraq and Afghanistan frequently report dyspnea on exertion following deployment despite the presence of normal pulmonary function testing. Determining underlying causes of exertional dyspnea is difficult due to the variety of potential contributing factors, but a ventilatory limitation to exercise is one factor that may contribute to the perception of dyspnea. **PURPOSE:** The goal of the present study was to determine the frequency of ventilatory limitation to exercise and compare pulmonary function between those individual with (VL+) and without (VL-) ventilatory limitation. **METHODS:** 83 deployed Iraq and Afghanistan Veterans (43.5±9.8 years; 72 men and 11 women) were referred to our dyspnea clinic and completed pulmonary function and cardiopulmonary exercise testing (CPX). VL+ during CPX was defined as a peak exercise ventilation (VE) that was ≥ 80% of the maximal voluntary ventilation (VE/MVV > 0.80). All Veterans completed pulmonary function testing (PFT) including body plethysmography, spirometry, diffusing capacity and forced oscillometry testing (FOT). Veterans with abnormal baseline PFTs and current smokers were excluded from analysis. **RESULTS:** 30.1% of our sample (25 of 83) demonstrated VL+ during exercise. Groups were similar in age (VL+ vs. VL-; 43.9±9.9 vs. 43.2±9.7 years) and body mass index (31.7±5.6 vs. 30.3±3.7 kg/m^2). In comparison to VL-, Veterans with VL+ had a reduced total lung capacity (TLC % pred; 90.5±9.3 vs. 97.4±13.8, p = 0.027); however, all other pulmonary function indices were similar between groups. CPX patterns differed between groups such that Veterans with a VL+ demonstrated greater peak exercise capacity (Peak VO2 % pred: 90.6±18.0 vs. 73.4±13.7%, p < 0.001) and ventilatory anaerobic threshold (% of peak VO2: 57.2±11.5 vs. 48.9±12.1%, p = 0.015). **CONCLUSIONS:** Approximately 30% of our clinical sample referred for evaluation of dyspnea demonstrated a ventilatory limitation to exercise (VL+). However, pulmonary function was similar between groups, and CPX performance was superior in those with VL+. Given the persistence of respiratory symptoms across both groups, these data may suggest that VE/MVV is an insensitive method to evaluate exertional dyspnea in this population.

1004   Board #265   May 30 2:00 PM - 3:30 PM
The Validity of an Energy Cost Prediction Equation for Unloaded Cycling

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(Sponsor: Michael D. Brown, FACSM)
(No relevant relationships reported)

American College of Sports Medicine (ACSM) metabolic equations estimate energy cost from known workloads. These equations may be used in healthy and clinical populations for exercise testing and prescription to determine the metabolic cost and required intensity associated with a desired level of energy expenditure. A constant of 3.5 mL/kg/min is used in the cycle ergometry equation to represent resting VO2 and a constant of 3.5 mL/kg/min represents the energy cost of 'unloaded' cycling; however this does not account for the energy cost variability in RPMs. **Purpose:** The purpose of this study was to evaluate the validity of ACSM's energy cost prediction equation for unloaded cycling at various RPMs in college females. **Methods:** Subjects included 10 females (20-26 y/o) who performed three exercise trials. Prior to the exercise trials, seat height on a Monark cycle ergometer was standardized with a 5-10 degree knee bend in the pedal-down position with the sole of the foot parallel to the floor. The subjects pedaled at 50, 70, and 90 RPM with no belt resistance on the flywheel for 7 minutes each with 10 minutes of rest between trials. Heart Rate (HR) and VO2 were recorded for each minute. Data from the 6th and 7th minutes were averaged and used for statistical analysis. A one-way within subjects ANOVA was conducted to compare the effect of RPM on HR and VO2. Bonferroni correction was applied for post hoc comparisons. **Results:** Mean HR was 98 ± 12 bpm at 50 RPM, 102 ± 13 bpm at 70 RPM, and 115 ± 13 bpm at 90 RPM. Mean VO2 was 6.68 ± 0.78 mL/kg/min at 50 RPM, 8.03 ± 0.88 mL/kg/min at 70 RPM, and 11.23 ± 1.45 mL/kg/min at 90 RPM. There was a statistically significant difference in HR between 50 and 70 RPM (p = 0.030) and between 70 and 90 RPM (p < 0.001). Statistically significant differences were found in VO2 between all of the RPM trials (p < 0.001). When comparing the VO2 data from each RPM trial to a constant of 7 mL/kg/min, statistical significance was found at 70 RPM (p = 0.030) and 90 RPM (p < 0.001) with no significance at 50 RPM (p = 1.000). **Conclusion:** The effect of RPM on energy cost revealed VO2 at 70 and 90 RPM to be significantly greater than the constant of 7 mL/kg/min used in ACSM's metabolic cycling equation. This may have negative health implications when prescribing a constant level of exercise intensity, particularly for low-level exercise in a clinical population.

1005   Board #266   May 30 2:00 PM - 3:30 PM
Metabolic Cost of Walking in Low Functioning Older Adults

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(No relevant relationships reported)

PURPOSE: The metabolic cost of walking increases with age, but the effect of functional status that accompanies aging remains unknown. The purpose of the study was to compare the metabolic cost of walking between low functioning (LF) and high functioning (HF) older adults.
METHODS: Ten HF and ten LF older adults (70+ years), pair matched by age (±3 Yrs) and gender, were categorized using the Short Physical Performance Battery (SPPB) that ranks participants from 0 (worst performance) to 12 (best performance) based on balance, walk speed, and chair stand tests. High functioning participants scored >10 (11.5 ± 0.7) and low functioning participants scored <8 (6.06 ± 1.4). Participants walked over ground at self-selected usual and rapid paces. Participants also walked at a standard pace on the treadmill at 0.76 m/s. Expiratory gases were measured using a portable indirect calorimeter. Gross metabolic rate was defined as W·L/kg/min. Metabolic cost was expressed as gross metabolic rate by walking speed (W·L·s/kg/min/m). Peak energy expenditure was measured during a graded exercise treadmill test to normalize walking metabolic rate (e.g. walking metabolic rate as a percent of peak metabolic rate).
RESULTS: HF participants walked faster than LF participants: usual (1.14 vs. 0.81 m/s, p < .001) and rapid (1.41 vs. 1.13 m/s, p = .006) pace. Gross metabolic rate was 21% higher in HF adults compared to LF adults for usual paced walking (3.3 ±.67 vs. 4.2 ± 0.83, respectively) and 27% higher for rapid-based walking (3.9 ± 0.84 vs. 5.3 ± 0.79, respectively). However, no group differences were noted for walking at usual (-0.46, 95% CI: 0.54, -1.46), rapid (0.31, 95% CI: 0.44, -1.07), or standard pace (0.11, 95%, CI: 0.75, -.51). There was a strong trend for LF participants to walk at a higher percent of VO2 peak on usual (71% vs. 55%, p =.12), rapid (85% vs. 75%, p =.31) and standard pace walk tests (89% vs. 71%, p =.01).
CONCLUSIONS: In comparison to HF older adults, LF older adults had lower gross metabolic rate due to their slower walking speed. Despite their slower pace, LF older adults walk at a higher percentage of their peak energy expenditure. Collectively, these

results support the notion that LF older adults favor a walking speed that optimizes metabolic cost, but are susceptible to higher relative energy expenditure due to their lower peak capacity.

B-73   Exercise is Medicine®/Poster - **EIM: Exercise and the Older Adult**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1006   Board #267   May 30 3:30 PM - 5:00 PM

Comparative Th1 Th2 of Elderly Women Engaged in a Program of Resistance or Aerobic Exercise

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(No relevant relationships reported)

It is well-known the alterations that occur in the immune response with aging that can generate an imbalance of the immune response leading to a low-grade chronic inflammation. Some studies have described the decrease in proliferative capacity of Th1 cells in elderly. The imbalance between Th1 and Th2 cells seems to play a role in the development of autoimmune and inflammatory diseases. **PURPOSE:** Therefore, the aim of this study was to evaluate Th1 and Th2 responses and verify Th1/ Th2 ratio in elderly women engaged in different exercise programs. **METHODS:** Initially, 27 elderly women (65± 3.2 years old) were selected and distributed into four groups accordingly to exercise program that they practiced: 1. sedentary (SED); 2. resistance training practitioners (RE); 3. aerobic exercise practitioners (AE); 4. resistance and aerobic exercise practitioners (REAE). Th1 and Th2 cell populations were assessed by flow cytometry. **RESULTS:** Th1 response was higher in RE groups (RE, 16.7± 5.8% ; REAE 15.7± 4.7%) when compared with AE (12.5± 2.9%), and SED (12.9± 4.4%). Inversely, Th2 had a trend to decrease in exercise programs (SED, 10.4± 5.3; REAE, 9.2± 4.9; AE, 7.6± 3; RE, 4.9± 2.4 %) Finally, the Th1/ Th2 ratio was higher in RE (3.2± 1.4) versus REAE (2.2± 1.4), AE (1.9± 0.9) and SED (1.3± 0.3). **CONCLUSIONS:** Increased Th1/Th2 ratio was due to a higher response of Th1 cells and lower response of Th2 cells. These findings suggest an improvement in Th1 response in elderly women engaged in exercise program, mainly in resistance exercise groups.

1007   Board #268   May 30 3:30 PM - 5:00 PM

The Effects Of Core Muscle Training Combined With Lower Limbs Strengthening On Physical Fitness Of community Elderly

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(No relevant relationships reported)

According to the long-term care service planning proposed by the Ministry of Health and Welfare in Taiwan, 80% of the aging population requiring long-term care service would also require community-based or home-base care. The strength of lower limbs and core muscle plays important role in prevention against fall behavior, especially for the community elderly.**PURPOSE**: To evaluate the physical fitness of the elderly in local community care-concern center in Taiwan, a four-month course of regular core muscle training and lower limbs strengthening was conducted.**METHODS:** Four elderly (Age: 66±1.6 years of age; Body height: 156.7±6.6 cm, Body weight: 62.5±13.7 kg) without any severe illness were included in this study. The training of core muscle training and lower limbs strengthening last for four months with 3 sessions per week, 60 min per session, and an intensity of 5-6 on the Ratings of Perceived Exertion scale. Physical fitness was evaluated one week before and after the intervention. Data of multiple variables were collected by using questionnaire and examination on functional fitness including grip, two-min step test, back scratch test, and 8-foot up-and-go test. The ranges of motion and isometric strength of lumbar spine and knee were measured by the microFET3. Descriptive statistics, independent sample t-test, and paired-samples t test were used to evaluate the effects of the intervention. **RESULTS:** The results showed significant improvement after the 4-month course in back scratch test, 2-min step test, chair sit-and reach test, and isometric strength of lumbar spine and knee (p < 0.05). Among the other tests, no significant differences were observed. **CONCLUSION:** Core muscle training combined with lower limbs strengthening for community elderly can improve physical fitness and isometric strength of low back and knee.

1008   Board #269   May 30 3:30 PM - 5:00 PM

Multicomponent Exercise Program Effects On Functional Capacity And Cognition In Frail Hospitalized Patients

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(No relevant relationships reported)

Frail older adults have reduced functional and physiological reserves, rendering them more vulnerable to the effects of hospitalization, which frequently results in failure to recover from functional decline related to the hospitalization and new disability**.** **PURPOSE**: To analyze the effects of a multicomponent exercise program on functional capacity and cognition in frail hospitalized patients. **METHODS**: Randomized clinical trial conducted in 326 patients admitted in an Acute Care Unit were randomly assigned to the intervention (IG) or control group (CG). The intervention consisted of a multicomponent exercise training program, composed of supervised progressive resistance exercise training at low-moderate intensities 30-60%RM (Repetition Maximum), balance training, and walking for 5-7 consecutive days. Evaluations of functional capacity (Short Physical Performance Battery (SPPB), Gait velocity Test (GVT), GVT under dual task conditions, Barthel index), strength assessments; maximal isometric force of handgrip (HG), knee extension and hip flexion, 1RM test in leg press, chest press and knee extension exercises, and cognitive tasks; Mini Mental State Examination (MMSE), Trail Making Test Part A (TMT-A) and verbal fluency test were conducted at admission and previous to discharge in both groups. **RESULTS**: 326 completed pre/post evaluations (IG n= 126, CG n=141). Drop-out rate was 18%. In the IG, significant improvements were observed at discharge in all the functional capacity outcomes (SPPB 4.4 vs. 7.0 points, GVT 14.1 vs. 10.9s., Verbal GVT 17.6 vs. 13.2s., Arithmetic GVT 17.6 vs. 12.9s., p<0.001 and Barthel score 83.8 vs. 85.9 points p<0.05) strength measurements (HG 17.2 vs. 18.8kg., knee extension 97.8 vs. 112.7N., hip flexion 90.8 vs. 104.4N., 1RM leg press 57.7 vs. 76.3kg., 1RM chest press 24.2 vs. 28.4kg., 1RM knee extension 38.5 vs. 47.0kg, p<0.001) and cognitive tasks (MMSE 22.1 vs. 24.3 points, TMT-A 154.6 vs. 121.3s., verbal fluency 6.0 vs. 8.0 words, p<0.001). In contrast, in the CG, no significant improvements were found in those outcomes. **CONCLUSIONS**: A multicomponent exercise program, with special emphasis in progressive resistance training, is an effective therapy to improve functional capacity and cognitive function in frail patients during hospitalization.

1009   Board #270   May 30 3:30 PM - 5:00 PM

Correlation between One-leg Standing Time and Trail Making Test in Japanese Older Adults

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(No relevant relationships reported)

PURPOSE: For older adults maintaining the ability to control balance is closely associated with the risk of falling, an independent mobility, including walking, and engagement with active life. The aim of this study was to examine the one-leg standing time with eyes open and its association with physical, cognitive, and psychological functions in community-dwelling older adults residing in Japan. **METHODS**: Sixty-five women aged 65 years and over (mean age 73+7 yrs.) participated in the study. They were being involved in habitual physical activity at least once a week for three months prior to the study. At the first assessment session, participants completed a demographic questionnaire and one-leg standing balance test. The participants were then divided into two groups according to time of one-leg standing time with eyes open: 1) longer than 15 seconds (n=46, high group - HG: 75.4+61.7 sec.) and 2) shorter than 15 seconds (n=19, lower group - LG: 7.8+3.0 sec.). All participants performed hand-grip strength (HGS), chair-stand (CS), timed up-and-go (TUG), 10-m maximal gate speed (MGS), mini-mental state examination (MMSE), and trail making test (TMT). Data were analysed using unpaired t-test and ANCOVA. **RESULTS**: For all participants the mean length of one-leg standing time was 60.2+45.2 sec. (2 - 120 sec.). Significant difference (p<0.05) were observed between two groups: age (HG; 70.3+3.4, LG; 72.3+3.6 yrs.), HGS (HG;24.9+3.8, LG;22.2+5.8 kg), CS (HG;8.0+2.1, LG;9.0+2.2 sec.), TUG (HG;5.2+1.0, LG;5.7+0.8 sec.), MGS (HG;1.82+0.24, LG;1.69+0.28 m/sec.), MMSE (HG;28.4+1.8, LG;26.9+2.2 score). After adjusting for age, the only significant difference (p<0.05) observed between the two groups was for TMT (HG;90.5+23.0, LG;119.8+49.3 sec.).

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CONCLUSIONS: Physical, cognitive, and psychological functions were significantly related to one-leg standing time. The results of this study also identified the balance ability and cognition decline. Future studies need to confirm these observations in larger samples to track balance-cognitive decline over time among older adults.

1010   Board #271   May 30 3:30 PM - 5:00 PM

Effects of Personal Training on Body Composition and Physical Fitness in Older Adults with DLSD

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(No relevant relationships reported)

Exercise treatment is recommended for older patients with lumbar spine diseases that result in degeneration of muscles and the skeletal system and a resultant decline in function. However, it is often difficult for patients to exercise by themselves and assistance from an exercise professional can be valuable to maintain health status and improve quality of life. **PURPOSE**: This study was designed to evaluate the effect of personalized exercise instruction on changes in body composition, physical fitness and pain management in older adults with degenerative lumbar spinal disorders (DLSD). **METHODS**: Three individuals (Range$_{age}$=66-78 yrs), who no prior experience with a personal trainer and who reported chronic low back pains for more than 12 weeks, participated in the study. This study was conducted by a researcher and a professional personal trainer who had more than 10 years' experience in the personal training area. The data was collected by employing a single-subject, ABA repeated measure design. In addition, schematic analysis was utilized to visualize the changes of participants' body composition, physical strength and rating of perceived pain. A paired t-test using SPSS WIN 20.0 was employed to examine before-and-after differences for key outcome measures. **RESULTS**: The results showed that muscle mass was increased and body fat mass and central obesity were decreased at the end of phase B, which coincided with the period of supervision by the personal trainer. Additionally, there were statistically significant changes in strength of upper and lower extremity, cardiovascular endurance, upper and lower body flexibility and the rating of perceived pain. **CONCLUSIONS**: This study resulted in better understanding of the role for individualized instruction by exercise professionals for older adults with degenerative lumbar spinal disorders. Furthermore, the results may have some applicability to the design and implementation of future personal training programs for seniors with similar conditions.

1011   Board #272   May 30 3:30 PM - 5:00 PM

Knowledge And Practices Of Primary Health-care Providers To Counsel About Physical Activity And Fall Prevention

Harry Papadopoulos, Lorena Guerrero, Mara Nery-Hurwit. *Pacific Lutheran University, Tacoma, WA.* (Sponsor: Eli Lankford, FACSM)
(No relevant relationships reported)

The benefits of regular physical activity on health, fall prevention, and quality of life are widely recognized. However, only a small percentage of older adults meet the current recommendations for aerobic exercise and strength. Primary care providers are in a unique position to counsel patients about exercise and provide them with exercise locations and prescription. PURPOSE: The aim of this study was to assess the perceptions of health care providers regarding knowledge and confidence to assess and counsel older adult patients about physical activity and fall prevention. METHODS: One hundred and twenty health care providers in Pierce County, Washington received a link to an online survey. The survey consisted of 35 questions including demographic and general practice questions, and questions that assessed knowledge and counseling practices of primary care providers about physical activity and fall prevention. Chi-square was used to determine if categorical variables differ from one another. Significance was set at p < 0.05. RESULTS: Thirty-four (28.3% response rate) individuals responded to the questionnaire. Most of the respondents were physicians (56%). Fifty-six percent of the respondents (χ^2= 0.25, p = 0.17) indicated that they routinely counsel their patients to participate in exercise programs that promote fall prevention. Only 12.5% (χ^2 = 8.38, p < 0.05) of the primary care providers responded that they refer their clients to an exercise specialist. The majority (93.8%) of the health care providers were not aware of the Exercise is Medicine® website (χ^2 = 12.25, p < 0.01). Eighty-seven percent (χ^2 = 9.0, p < 0.01) of the respondents described their knowledge of fall prevention assessment and management as "not very knowledgeable" to "somewhat knowledgeable." Most of the health care providers (68.8%, χ^2 = 2.25, p = 0.13) indicated that they routinely administer fall risk screening. CONCLUSION: These results show that while half of these primary care providers counsel their patients to participate in exercise programs, only a small percentage of them refer their clients to an exercise specialist. Furthermore, the lack of knowledge of the Exercise is Medicine® initiative and website by health care providers indicates the importance of further education of health care providers.

1012   Board #273   May 30 3:30 PM - 5:00 PM

Golf Intervention Improves Fast but Not Self-selected Gait Speed.

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(No relevant relationships reported)

Title: Golf Intervention Improves Fast but Not Self-selected Gait Speed. Gait speed (GS) is an important global indicator of successful aging, and slow gait speeds are associated with poor health outcomes in later life, such as falls, hospitalization and mortality. Slower GS may also limit social interaction, functional capabilities and independence; thus, attenuating the slowing of GS should be a priority for seniors. Using golf as an exercise intervention, we hypothesized that golf may improve GS and walking endurance in older adults. **PURPOSE:** The objective of the preliminary investigation was to examine the influence of a 12-week golf intervention on GS in older adult military veterans. **METHODS:** GS (m/s) was measured pre-and post a 12-week golf intervention in 4 older, male military veterans (65-79 years). The 12-week golf training was conducted at a 9-hole, Par-3 course. The training consisted of warmup exercises, swing practice at the net, and progressive golf play culminating in playing all 9 holes during weeks 11 and 12. Participants completed 3 gait trials (10m) of each condition: self-selected (SSGS) / habitual walking and walking "as fast and as safe as possible" (FGS) in a motion analysis laboratory. A 6-minute walk test (6MWT) was completed outside on an even, concrete walking path. Participants were instructed to "walk as fast and safe as possible, covering as much distance as possible in the 6-minute time limit." **RESULTS:** SSGS did not change. FGS improved by 6.08% (ES 0.76) and GMWT distance increased by 4.1% (ES: 0.78). **CONCLUSION:** Following the 12-week golf intervention, participants improved their FGS and their 6MWT distance; however, SSGS did not change. This demonstrates that fast gait may be an important outcome measure to consider when investigating older adult activity interventions. The ability to walk faster and for longer distances can have salient effects on overall wellbeing and safety. In everyday life, habitual GS may **not** be sufficient when challenges in the environment emerge, such as the need to cross a street quickly or get out of the way of a moving vehicle. Results from this study suggest that a 12-week golf training intervention changed the walking ability in older military veterans. Our study also demonstrates the utility of including other measures of walking performance in addition to SSGS.

1013   Board #274   May 30 3:30 PM - 5:00 PM

Correlations Among Subjective vs. Objective Physical Activity, Diet, and Medication Use in Older Adults

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(No relevant relationships reported)

Due to the increased burden of chronic disease, prescription medication use in older adults is high. This rise in the use of multiple medications (polypharmacy) is concerning due to its relationship with adverse drug related events (ADEs), drug-drug interactions, and increasing healthcare costs. Level of physical activity (PA) and habitual dietary nutrient intake are lifestyle factors that may influence prescription medication use and associated complications. The **PURPOSE:** of this study was to identify correlates among PA level measured subjectively and objectively, habitual nutrient intake, and prescription medication use in older adults. **METHODS**: In 96 older adults (58F, 38M, 77±7.7 years) prescription medication use (Rx), subjective PA level (Community Healthy Activities Model Program for Seniors, CHAMPS), and objective PA level (Accelerometer, Actical, Phillips Respironics) were measured. In a subset of 73 subjects, habitual dietary intake of nutrients was assessed (3-Day Diet Log). Partial correlations were run between variables while controlling for age, sex, and body mass index (BMI). Significance was set to p <0.05. **RESULTS**: Mean values±SE for the variables include: moderate-to-vigorous subjective PA (MVPA-S): 1353±120 kcal·wk^{-1}, moderate-to-vigorous objective PA (MVPA-O): 51.2±5.1 min·day^{-1}; Rx number: 3.4±0.3; total caloric intake: 2107±64 kcal·d^{-1}; and percent polyunsaturated fatty acid (PUFA) intake: 10.4±7.0 g·kcal·d^{-1}. Rx was inversely correlated with MVPA-S (r= -0.24, p< 0.05) and with MVPA-O (r= -0.31, p< 0.05). MVPA-S and MVPA-O were positively correlated (r= 0.64, p< 0.01). Rx number was inversely correlated with percent dietary intake of PUFA (r= -0.31, p< 0.01). There were no significant correlations between Rx and other nutrients. **CONCLUSION**: Preliminary data show that Rx use in older adults is inversely associated with subjectively and objectively measured PA level. These data also show a strong correlation between the subjective and objective measures of PA, which could be important when looking at measurement possibilities in clinical settings and for future studies. Additionally, these data show an inverse correlation with Rx number and PUFA. These preliminary data suggest that lifestyle factors may significantly influence Rx use and associated complications.

1014   Board #275   May 30 3:30 PM - 5:00 PM

Standing Balance,Muscle Strength And Proprioception of Each Lower Limb Joint- Which Are Significant Predictors For Mobility In Community-dwelling Older Adults?

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(No relevant relationships reported)

Lower limb proprioception, muscle strength and standing balance are all proposed as important factors in relation to mobility of the elderly. However, it is not clear what the relative contributions are for hip, knee and ankle proprioception, and strength and postural sway.
PURPOSE: To determine the relative contributions of proprioception at each lower limb joint, muscle strength and standing balance, to mobility in community-dwelling older adults.
strength.
METHODS: A group of 102 community-dwelling adults, with mean age of 68.4 years, volunteered. Hip, ankle and knee joint proprioception were measured in standing using joint-specific versions of the active movement extent discrimination apparatus (AMEDA). Muscle strength was determined by grip strength with a hand dynamometer as a proxy variable, and bipedal postural sway was assessed via the Biodex Balance System, tested in anterior-posterior and medio-lateral directions, with eyes open and with eyes closed. Mobility was measured using the timed-up-and-go test (TUG).
RESULTS: TUG scores for the group were significantly worse with low ankle proprioception ($r = -0.29$, $p<0.01$) and low hand grip strength ($r = -0.25$, $p = 0.01$), and across age in years, TUG scores showed an inverted-U shaped function ($p < 0.001$) with the greatest decline after 75 years of age. From multiple regression, ankle proprioception was shown to be the most important factor in predicting TUG performance (Adj $R^2 = .13$, $p < 0.001$).
CONCLUSIONS: Results here add a specific proprioceptive component, ankle proprioception in standing, to the known association of strength with mobility in the elderly. Further, these results suggest that to effectively improve mobility in the elderly, and reduce falls risk, intervention methods should focus on improving ankle proprioception ability as well as increasing strength.

1015   Board #276   May 30 3:30 PM - 5:00 PM

Exercise Prescription Intervention Plan for Pre-frail and Frail Elderly in New Taipei City

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(No relevant relationships reported)

In response to the aim of active aging promoted by the World Health Organization, a plan for intervention in elderly frailty through exercise is in urgent need. In 2016, New Taipei City's elderly health check-up program introduced frailty assessments and exercise intervention. However, 10-57% of frail elderly showed no immediate improvement after exercise intervention.
PURPOSE: The establishment of "Exercise is Medicine"(EIM) Taiwan personnel training and standardized training modules through EIM Taiwan, in the hope of enhancing exercise intervention effectiveness for individuals assessed as pre-frailty or frailty in New Taipei City's elderly frailty assessments.
METHODS:1. Planning of exercise intervention options and training courses: Training content included assessment before exercise and exercise recommendation principles, and exercise prescriptions and recommendations for various chronic diseases. 2. EIM training for physicians and allied health professionals: The EIM Taiwan training included 16-hour courses for physicians and allied health professionals, respectively. Through the training of EIM Taiwan professional personnel, the provision of individualized exercise plans for pre-frail and frail elderly can be implemented.
RESULTS: On March 14, 2017, Eric Liluan Chu, the mayor of New Taipei City cosigned a Memorandum of Cooperation (MOU) with EIM Global. After signing the MOU, a total of 195 physicians and 344 allied health professionals were trained as the EIM-certified professional personnel in Taiwan. Through these EIM-certified physicians, individualized exercise prescriptions were given to elderly assessed as pre-frailty or frailty, with exercise plans then implemented through the guidance of allied health professionals. In 2017, a total of 24,778 people have taken elderly frailty assessments and 23.8% of above elderly received the implementation of exercise plans.
CONCLUSIONS: In addition to continuing to implement exercise intervention for pre-frail and frail elderly, our program aims to establish an EIM Taiwan training guidance handbook. Through these actions, it is expected to enhance exercise intervention effectiveness and reverse frailty in New Taipei City.

1016   Board #277   May 30 3:30 PM - 5:00 PM

The Effect Of Two Low-dose Strength/Balance Programs On The Physical Function Of Mobility-limited Older Adults

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(No relevant relationships reported)

Background: Strength and balance training are critical to maintaining physical function and delaying the onset of major mobility disability in older adults (OAs). The minimum amount of this training required to yield clinically meaningful improvements in physical function is not clear. **Purpose**: To evaluate the effect of two low dose strength/balance programs on physical function in mobility-limited OAs. **Methods**: Twenty community-dwelling OAs with mobility limitations were randomized to one of two strength/balance doses (n=10/dose), held 3x/week at a local YMCA for 10 wks. Eligible participants were ≥ 65 yrs of age, exhibited mild to moderate mobility impairment (short physical performance battery (SPPB) score of 3-9 out of 12), sedentary (<125 minutes/week of any kind of physical activity, determined by 7-day pre-baseline accelerometry), and had no major medical issues that would preclude exercise. Exercise doses were as follows: Low dose (L): 1 set each of chair stands, hip abduction, step-up and back with head turns, toe raises, and a balance stand). Higher dose (H): 2 sets of the previous mentioned exercises were performed. Each exercise had three variations of difficulty to accommodate different participant abilities and the number of reps were based on an RPE of 7 out of 10. Participants were assessed on SPPB score and 400m walk speed before and after the intervention by individuals blinded to which dose that participant was randomized to. Clinically meaningful improvements were defined as an SPPB improvement of 0.5 points and a 400m walk speed improvement of 0.05 m/sec. Data was analyzed using a t-paired test. Results are expressed as means ($\pm$ std deviation). **Results**: SPPB score improved by 2.5 ($\pm$ 1.1) points among the entire cohort (p<0.001). Improvement was significant for each dose alone (L: 1.5 ($\pm$ 0.6), p<0.05), (H: 3.0 ($\pm$ 0.82), p<0.001). The improvement in SPPB score in the higher dose was significantly different from that observed with the lower dose (p<0.05). There was no significant effect of either dose on 400m walk speed.
Conclusion: A 10 wk strength/balance program performed 3x/week and consisting of a single set each of select strength/balance exercises was sufficient to elicit clinically meaningful improvements in physical function for OAs with mild to moderate mobility limitations.

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Associations Between Grip Strength And Generalized Anxiety Disorder: Results From Tilda

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(No relevant relationships reported)

There is a need to identify risk factors for anxiety in older adults that can be targeted for prevention. Associations between grip strength and Generalized Anxiety Disorder (GAD) in older adults are not established.
Purpose: To investigate associations between grip strength and both concurrent probable GAD and the development of GAD during two-year follow-up**.**
Methods: The Irish Longitudinal Study on Ageing (TILDA) is a large prospective cohort study that assesses the social, economic, and health circumstances of community dwelling adults aged ≥50 years and their partners of any age in Ireland. Participants completed a hand grip strength assessment with a Baseline hydraulic hand dynamometer. A score of ≥23 on an abbreviated version of the Penn State Worry Questionnaire defined caseness of probable GAD at baseline. At follow-up, GAD was assessed with the Composite International Diagnostic Interview – Short Form. Participants were divided into sex-specific tertiles based on strength. Data were analysed with linear and logistic regression in September 2017.
Results: Adjusting for age, sex, waist circumference, social class, smoking status, and physical activity, the middle and high strength tertiles were associated with 27.3% ($p\leq0.002$) and 23.1% ($p\leq0.017$) lower odds of prevalent GAD, respectively. A one-standard-deviation increase in strength was associated with 12.1% ($p\leq0.004$) lower odds. The incidence of GAD was 2.0% (n=84). The middle and high strength tertiles were associated with 31.4% ($p>0.38$) and 66.5% ($p\leq0.05$) reduced odds of incident GAD, and a one-standard-deviation increase in strength associated with 24.2% ($p>0.18$) lower odds. There was no significant interaction between strength tertiles and sex in predicting Wave 1 worry symptoms, and no significant interaction between sex and strength tertiles or continuous strength in cross-sectional or longitudinal logistic regression models (all $p>0.20$)
Conclusion: The current findings provide initial support for the protective effect of grip strength on GAD among older adults. Increased hand grip strength may protect against GAD in older adults, although further research with larger samples is needed. Additionally, experimental research is needed to establish causal and mechanistic relationships between strength and worry in older adults.

Abstracts were prepared by the authors and printed as submitted.

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Thermoregulation, Strokes, And Dementia: A Healthy Heart Begets A Healthy Brain.

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(No relevant relationships reported)

More than 5 million Americans live with dementia; it affects 10% of the population over age 65. There is no cure, but recognition of risk factors could be helpful for prevention. Identifying demographic, genetic, and behavioral risk factors can improve the prescription of lifestyle choices, such as exercise training, to minimize risk. **PURPOSE**: To evaluate predictors of dementia in a patient population. **METHODS**: We obtained the patient registry of a hospital in the Midwestern United States. Demographic data, vital signs, health history, and current diagnoses were recorded. There were 2,244 consecutive patients admitted over a 3-year period who met inclusionary criteria; 105 of these patients had a diagnosis of dementia. Logistic regression tested the effects of age, sex, vital signs, and diagnostic history on incidence of dementia in this sample. **RESULTS**: Significant predictors of dementia were age ($p<0.001$), diastolic blood pressure ($p=0.048$), core temperature ($p=0.040$), presence of a bleeding disorder ($p=0.028$), and diagnosis of a previous stroke ($p<0.001$). For each degree F that core temperature increased, the odds of dementia were elevated by 44% (95% CI: 1.02 to 2.05). A history of stroke was the most pronounced predictor of dementia (95% CI: 1.89 to 7.57). When history of stroke was analyzed as the dependent variable, core temperature continued to be a significant predictor ($p=0.025$); holding all other variables constant, each additional degree F associated with a 48% elevation in the odds of a stroke (95% CI: 1.05 to 2.10). **CONCLUSION**: Age and cardiovascular function are known risk factors for strokes, and strokes are a known risk factor for dementia. In this sample, core temperature emerged as a significant predictor of both stroke and dementia. While poor thermoregulation may be a consequence, rather than a cause, of dementia, a possible consideration is the relationship between heat in the brain, cerebral oxygen demand, and blood brain barrier permeability. The brain's energy demand is several orders of magnitude greater than other body cells, and thus temperature dissipation for the brain is vitally important. Because exercise training improves thermoregulatory capacity, it is possible that this capacity could benefit the brain in previously unidentified ways.

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Changes in Cardiovascular Health Following Exercise in Older Men and Women at Risk for Dementia

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(No relevant relationships reported)

Purpose: To investigate the effects of a 24-week multiple-modality exercise intervention with additional mind-motor training on cardiovascular health and fitness. The secondary objective was to investigate whether the intervention had gender-specific effects on the study outcomes. **Methods:** Community-dwelling older adults (n = 127, age = 67.5 [7.3] yr, 71% women) were randomized to a 45-min multiple-modality exercise intervention with additional 15 minutes of either mind-motor training (M4 group) or an active control intervention (15 minutes of balance, range of motion and breathing exercises, [M2 group]). Assessment occurred at: baseline, 24 weeks (intervention endpoint), and 52 weeks (after a 28-week no-contact follow-up). The study outcomes were: predicted maximal oxygen consumption (pVO2max), automated office blood pressure (BP), carotid atrial compliance (cAC), intima-media thickness (cIMT), as well as body weight. Mixed between-within ANOVA was used to examine: i) main effects of time (baseline vs 24 weeks), intervention group (M4 vs M2) and gender (men vs women); ii) interactions of time x intervention group, and time x gender. **Results:** Results at 24 weeks: both M4 and M2 demonstrated improvements in pVO2max (*p<.001*), with no interaction effects for group or gender (all *p>.05*). For BP measures, both groups showed reduction in systolic (*p<.001*) and diastolic (*p=.001*) BP, with no interaction effect for intervention group; however, women showed greater reduction in diastolic BP compared to men (*p=.02*). No significant changes were observed in cIMT, cAC, or body weight. Results at 52 weeks: improvements in pVO2max were retained (*p<.001*), however, the M4 group showed higher pVO2max when compared to M2 (*p=.005*), with no interaction effects for gender. Significant reduction in systolic BP (*p<.001*) was observed for both M4 and M2, with no interaction effects for group or gender. For diastolic BP, M4 showed significant reduction compared to M2 (*p=.04*); women also demonstrated greater reduction compared to men (*p=.02*). There was no significant change in cIMT, cAC or body weight. **Conclusion:** Our results suggest that women may be more likely to benefit from group-based, multiple-modality exercise programs in measures of cardiovascular health.

B-74   Exercise is Medicine®/Poster - EIM: Exercise Programs

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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The Effect of Two Training Protocols on Post Exercise Lactate Clearance in Heart Failure Patients

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(No relevant relationships reported)

Introduction: Heart failure (HF) patients suffer from functional aerobic impairment due to reduced cardiac output and O_2 delivery. This condition leads to metabolic and physiological changes, such as longer recovery time from physical activity. It was shown that aerobic exercise confers a beneficial effect on quality of life (QOL) and physiological parameters in HF. High intensity interval training (HIT) has been argued by some studies to have a superior rehabilitative effect compared to moderate aerobic training (MAT). We hypothesized that HIT has a superior effect on lactate clearance and, by extension, on recovery from exercise. **Methods:** Twenty-nine HF patients were randomized into two exercise groups: MAT or HIT, and trained twice a week for 12 weeks. Before and after completion of the exercise program patients were assessed for QOL, six-minute walk test (6MWT) and a cardiopulmonary exercise test (CPET). Blood lactate concentration was measured after the CPET and lactate clearance kinetics were fit to each patient by a bi-exponential time function. **Results:** HIT group showed a significant improvement compared to baseline in QOL and aerobic capacity (VO2 max 21.4±7 *vs.* 17.5±3 ml/min/kg, 6MWT 461±71 *vs.* 355±58 m). Both exercise groups improved lactate clearance, as represented by the γ2 constant. While the MAT group showed a trend towards significance (0.061±0.020 units) (p=0.07), the HIT group improved lactate clearance significantly (0.074±0.020 units) (p<0.01). **Conclusions**: HIT improves lactate clearance kinetics; thereby can partly explain the improved QOL attributed to exercise training

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Effects Of 12 Weeks Of Yoga Program in Middle Aged Women With Frozen Shoulder

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(No relevant relationships reported)

PURPOSE: The aim of this study is to identify the effects of yoga exercise program on muscle function and pain of shoulder in middle aged women with frozen shoulder. **METHODS:** Subjects were divided into 2 groups; yoga group (n=8) and control group(n=8).They participated in yoga exercise program 3days per week, 50minutes every day during 12 weeks and were measured Visual Analogue Scale, Shoulder Pain and Disability Index, Range of Motion, Strength, Pressure threshold to develop rehabilitation program for frozen shoulder. Data of the results was analyzed by using the SPSS/PC Window version 21.0 statistics program. To verify interaction between the groups, Two-Way ANOVA was conducted. All the statistical significance level was set at p<05. **RESULTS**: In VAS, there was a significant interaction between the groups and time(p=.002). In SPADI(Shoulder Pain and Disability Index), Yoga group showed significantly decreased score after exercise with interaction in times and groups(p=.020). In shoulder Pressure threshold, Yoga group showed a significant increase at subscapula (p=.024) and teres minor of affected shoulder with interaction in times and groups(p=.012). **CONCLUSION:** As a result, yoga exercise program is considered as helpful for middle aged women with frozen shoulder to relieve pain. However, correlation of shoulder muscle strength and range of motion were not clearly identified in this study. In future study, experiments for change of range of motion and muscle strength during yoga exercise and various groups of subjects might be required to establish theoretical basis.

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VO$_2$ Peak, Energy Cost and Stress Biomarkers Responses to High Intensity Interval Protocol (HIIT)

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(No relevant relationships reported)

High Intensity Interval Training (HIIT) Protocols are well stabilised in the literature as a beneficial health inducing strategy to improve health, fitness levels and metabolic biomarkers. Risks management of participation of HIIT programs is challeging despite benefits. Cardiovascular, Musculoskeletal and Metabolic issues, such as dehydration status may play an important role on pre-participation screening of participants. **Purpose:** The purpose of this study was to evaluate energy cost and metabolic stress biomarkers due a HIIT protocol. **Methods:** 8 males (23±6years) were evaluated during a HIIT protocol (30 minutes of CrossFit based multitask pattern) using a Portable Metabolic Analyzer (K4b^2 - Cosmed®) for VO$_2$, energy expenditure and substrate oxidation. Blood samples were taken before and after protocol for Creatine-Kinase (CK), Creatine-Kinase Myocardial Band (CK-MB), Lactate Dehydrogenase (DHL), and Cortisol levels analysis. **Results:** VO$_2$ peak during HIIT protocol were 53.1mL/kg.min^{-1}±6.2mL/kg.min^{-1}; with peak energy cost of 17.3±4.1kcal.min^{-1}; being the fat oxidation less than 10% during the role protocol. Pre *vs* Post levels for CK, CK-MB, DHL and Cortisol were 1129,6±213.6U/L *vs* 1300,8±341.2U/L; 57,1±3.2U/L *vs* 68.0±3.7U/L; 646,1±27.1mg/dL *vs* 720,8±32.7mg/dL and 12,1±1.1µg/dL *vs* 17,2±1.8µg/dL respectively. **Conclusions:** Energy cost of the HIIT protocol evidences some of the benefits, thus leading to weight-loss strategy. Stress biomarkers CK, CK-MB, DHL and Cortisol responses to HIIt protocol suggests metabolic overload on systemic and local: skeletal muscle and myocardial tissue, despite clinical outcomes (pain or claims). Risk *versus* Benefit analysis of HIIT protocols should be focused on general populations and specific patients, wich may lead to detrimental health outcomes.

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Patterns of Physical Activity and Muscle Strengthening Exercise in U.S. Undergraduates

Adrienne Wald. *The College of New Rochelle, New Rochelle, NY.* (Sponsor: Carol Ewing Garber, FACSM)

(No relevant relationships reported)

BACKGROUND: Universities and colleges are target settings for the *Exercise is Medicine*® (EIM) on Campus initiative, aiming to make physical activity a part of campus culture and to foster collaboration between campus organizations for physical activity assessment and promotion.**PURPOSE**: To describe the prevalence of meeting targets for aerobic (PA) or muscle strengthening (MS) exercise of U.S. undergraduates, by gender, and across various university and college types, sizes, and settings.**METHODS**: Data from undergraduate respondents to the 2011 American College Health Association-National College Health Assessment II (ACHA-NCHA-II) were classified by meeting or not meeting target PA and MS recommendations. Data were analyzed by cross tabulation analysis (X^2) by PA and MS status by gender, and across university designation (public vs. private), region of the country (Northeast, South, West, or Midwest), campus size (by student enrollment) and by 4-year or 2-year community college (type).**RESULTS**: The sample of undergraduates, aged 18-24 years (n=75,511), included 33.5% men 46.3% women and (0.2%) transgender (TG) students. Among these, there were significant differences (p< 0.001) across genders and meeting PA and meeting MS: 55.2% men, 48.4% women, and 35.9% TG students met PA, and 47.7% men, 32.6% women, and 25% TG met MS. Meeting PA was significantly different by campus size (p<0.001) and type (p<0 .05), but not by region (p= 018) or designation (p= 0.775). Significant differences for meeting MS were found across regions (p< 0001), campus size (p< 001), type (p =0.49), and university designation (p<0 .001). **CONCLUSIONS**: PA and MS exercise participation in college students is modest at best, and it varies across geographic locations and differing campus characteristics. These results suggest that targeting college students with *EIM on Campus* is indicated, particularly sub-populations where PA and MS participation is low.

1024   Board #285   May 30 3:30 PM - 5:00 PM

Multiple Strength Assessments to Evaluate Adaptations to High-Load and Low-Load Blood Flow Restricted Exercise

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(No relevant relationships reported)

Differences in muscle strength adaptations between high-load (HL) and low-load blood flow restricted (BFR) resistance training protocols may be due to the type of strength test performed (e.g isotonic, isokinetic and isometric). **PURPOSE:** To assess differences in isotonic, isometric and isokinetic strength adaptations in older adults following HL and BFR resistance training. **METHODS:** Thirty-six males and females (mean: 75.6±7.6 years, 1.67±.09 m, 74.3±13.2 kg) classified as being at risk of mobility limitations were randomly assigned to HL (70% 1-RM) or low-load BFR (30% 1-RM coupled with a vascular restriction) exercise for the knee extensors twice per week for 6 weeks. A control group performed light upper body resistance and flexibility training. Knee extension 10-RM to predict 1-RM strength, isometric maximum voluntary contraction (MVC) and isokinetic strength at 60·s^{-1}, 180·s^{-1}, and 300·s^{-1}were measured before and after 6-weeks of training. **RESULTS:** HL and BFR training increased predicted 1-RM strength 34% (P<.001) and 24% (P<.001) respectively, from baseline to 6-weeks of training. HL training produced a 16% increase in MVC (P=.002) while BFR training did not change (P=.91). No interventions, included the control, resulted in changes in isokinetic strength at the various speeds (P>.20). **CONCLUSION:** Strength improvements from HL resistance training carried over to other strength tests. This favorable adaptation did not occur following BFR exercise which may limit the effectiveness of this training program. Isotonic training does not carry over to isokinetic strength adaptations and therefore may be a drawback when implementing resistance training programs for older adults. Supported by NIH grant 1R15 A6040700-01A1.

1025   Board #286   May 30 3:30 PM - 5:00 PM

Oral Creatine Hydrochloride Supplementation: Acute Effects on Intermittent, Submaximal Bouts of Resistance Exercise

Daniel McDonough, Shawn Simonson, Yong Gao, Scott Conger. *Boise State University, Boise, ID.* (Sponsor: Dr. Zan Gao, FACSM)

(No relevant relationships reported)

PURPOSE: Creatine hydrochloride (CrHCl) supplementation and its effects on muscular performance and body composition remains largely unexplored. The purpose of this study was to examine the acute effects of oral CrHCl supplementation on three intermittent, submaximal bouts of bench press and repeated vertical jump exercises (maximal repetitions) and body composition measures (body weight [BW], fat-free mass, and fat mass).
METHODS: Fifteen resistance trained males ($\bar{X}_{age}$ = 22.8 ± 2.0 years; $\bar{X}_{wt}$ = 81.6 ± 9.9 kg) completed 3 sets of the barbell bench press (70% 1RM) and 3 sets of the repeated counter-movement vertical jump (CMJ; 85% maximal CMJ height), with 2 min rest between sets, before and after a 7 d CrHCl intervention (4 g·d^{-1}). Participants continued their normal resistance training and nutrition routines. A two-factor repeated measures ANOVA was used to determine significant main effects (time and set) and interaction effects (time x set) for bench press and CMJ performances from pre- to post-intervention. A one-factor repeated measures ANOVA was used to assess pre- to post-intervention differences in body composition.
RESULTS: Significant main and interaction effects for time and set were found in the bench press from pre- to post-intervention, $F (2, 28) = 4.2\text{-}268.3$, $p < 0.005$; $n^2 = 0.2\text{-}0.9$, with post-hoc analysis indicating increased performance on later sets (eg, Set 3 > Set 2 > Set 1). Significant main effects for time and set were found in the CMJ test from pre- to post-intervention, $F (2, 28) = 27.5\text{-}55.6$, $p < 0.005$; $n^2 = 0.7\text{-}0.8$, but no interaction effect was found ($p > 0.05$). Post-hoc analysis indicated increased performance on later sets (eg, Set 3 > Set 2 > Set 1). BW was the only body composition measure to reach significance ($p < 0.005$).
DISCUSSION: Findings suggest 7 d of CrHCl supplementation (4 g·d^{-1}) to increase repetitions completed on three sets of the intermittent, submaximal bench press and CMJ exercises and BW. The non-significance in the time x set interaction for CMJ performance may due to small sample size, and thus future research with larger samples is warranted.

WEDNESDAY, MAY 30, 2018

1026 Board #287 May 30 3:30 PM - 5:00 PM

A Comparison of Two Tai Chi Interventions Tailored for Different Health Outcomes

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(No relevant relationships reported)

Tai Chi can be tailored based on five major styles, over 108 forms, and three fundamental elements that include breathing techniques, mental relaxation, and movement principles. However, it is not clear if Tai Chi interventions tailored for specific health outcomes will result in different health benefits. **Purpose**: To compare the health benefits of two different Tai Chi interventions targeted for improvements in blood pressure (BP) (PRESSURE) or balance (BALANCE). **Methods**: We tailored PRESSURE to emphasize breathing techniques and mental relaxation; and BALANCE to emphasize movement principles that challenge balance. Participants were randomized based upon baseline values to PRESSURE (n=12), BALANCE (n=13), or CONTROL (n=10). Tai Chi was practiced 3 sessions/week, 60 minutes/session, for 12 weeks. CONTROL (n=10) performed normal daily activities. We measured a variety of cardiovascular, balance, and functional fitness health outcomes pre-and post-intervention. Differences among groups were tested with analyses of covariance with age, body mass index, heart rate, and baseline BP as covariates. **Results**: Participants were older (78.9±5.7 yr), overweight (25.9±4.3 Kg/m^2) adults, with pre-hypertension (systolic BP[SBP]/diastolic BP, 126.5±14.4/69.3±8.4 mmHg), and mostly women (82.9%) and naive to Tai Chi (97.1%). PRESSURE improved Chair Sit-to-Stand Test (CSTS) by 1.0±1.8 times/30s versus CONTROL (p=0.029); and BALANCE improved Single Leg Stance Test by 5.4±18.0 s (p=0.049) and CSTS by 1.0±1.7 times/30s (p=0.027), and tended to lower SBP by 4.2±16.0 mmHg (p=0.052) versus CONTROL. However, there were no differences between PRESSURE and BALANCE versus CONTROL for any health outcome (p>0.05) **Conclusion:** Contrary to our hypothesis, Tai Chi interventions tailored for specific health outcomes did not result in different health benefits. Yet, our results suggest that older adults who are naive to Tai Chi achieve a variety of health benefits from different types of Tai Chi practice within the first few months of participation.

1027 Board #288 May 30 3:30 PM - 5:00 PM

ICT Use and Physical Activity & Implication for Musculoskeletal Pains among Tertiary Institution Students in Kwara State Nigeria

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(No relevant relationships reported)

PURPOSE: Recent studies show that prolonged ICT use is associated with increased sedentariness and postural imbalances. This has implication for the prevalence of musculoskeletal pains among ICT users. To investigate the implications of ICT use for physical activity level and musculoskeletal pains among tertiary institution students in Kwara state. **METHODS**: The research design was ex-post facto. Multistage sampling comprising stratified, purposive and simple random sampling was used to select 2,442 students with average age of 22.8 years from three tertiary institutions in Kwara state. The institutions consisted of federal, state and private. Validated (Rho = .71) ICT Use, Physical Activity and Musculoskeletal Pain Questionnaire (IUPAMP-Q) was used for data collection. ICT referred to mobile phones, tablets/i-pads, computers and television sets. Percentage and Mean were adopted for demographic descriptions, physical activity level and ICT use while hypotheses were tested with t-test and Multiple Regression at a 0.05 alpha level. **RESULTS**: The study revealed that only 56.4% (1,377) of the students performed the recommended physical activity. Mean physical activity level (PAL) of moderate ICT users was higher than excessive ICT users by 178.9METs/wk, which was statistically significant (N = 2426; t (2424) 6.227; p = .001). Majority reported musculoskeletal pain after continuous ICT use for at least 1hour; neck pain = 75.7% (1,836), shoulder pain = 59.9% (1,137) and back pain = 74.4% (1,805). ICT use positively correlated with musculoskeletal pains; it predicted 27% shoulder pain, 30% neck pain and 16% back pain (F(2,2421), 16.769; 18.475, 9.886; p = .001) respectively. **CONCLUSIONS**: use of ICT is a risk factor for musculoskeletal pain and mobile phone was the highest predicting factor. A collaborative effort within tertiary institution communities to inculcate physically active lifestyle and individualised structured ICT use is recommended.

1028 Board #289 May 30 3:30 PM - 5:00 PM

Bedside Exercise Device for Heart or Liver Transplantation Recipients in Early Postoperative Period

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(No relevant relationships reported)

PURPOSE: The aims of this randomized, assessor-blinded clinical trial are to investigate the effect of exercise 25 min or more per day on the bedside exercise device in heart or liver transplantation recipients who are at-risk for functional deterioration during a long inpatient stay after transplantations. **METHODS**: Adult patients who received a heart or liver transplantation were randomized to either UCFit exercise group or usual care group. UCFit exercise group will exercise on the bedside exercise device which uses foot pedals that record exerted forces against adjustable resistances, measure repetitions of upper and lower extremity cycling movements, and give feedback about performance via a wireless internet connection. Usual care group was only encouraged to increase the amount of physical activities. The outcome measure was level of independence for walking, walking speed, 6-minute walking distance, Short-Form 36 health-related quality of life, heart rate variability, knee strength, and cardiorespiratory fitness. **RESULTS**: Thirty-five patients who received a heart (n=13) or liver (n=22) transplantation participated at a median of 8 days after surgery. No adverse events were reported during the median study period of 15 days. The UCFit exercise group (n=15) showed increased standard deviation of all NN intervals (SDNN) from 16.5±13.0 ms to 26.3±18.7 ms, compared to the usual care group (n=20) from 18.4±18.9 ms to 16.6±17.9 ms (p= 0.01 during interaction analysis); and increased the square root of the mean of the sum of the squares of differences between adjacent NN intervals (RMSSD) from 8.8±7.6 ms to 22.3±24.9 ms, compared to the usual care group from 18.4±32.8 ms to 16.5±30.4 ms (p= 0.03). The UCFit exercise group achieved a trend toward greater 6-minute walking distance and higher knee strength at discharge compared to the usual care group. No significant between-group differences were detected in the other outcomes of interest. **CONCLUSIONS**: In this ongoing trial of bedside exercise with remote monitoring for inpatient organ transplantation rehabilitation, exercise 25 min or more per day showed increased heart rate variability of the study subjects in the early postoperative period. Supported by Grant MOST 104-2314-B-002 -221 -MY3 from Ministry of Science and Technology, Taiwan.

1029 Board #290 May 30 3:30 PM - 5:00 PM

Improving College Students' Health-Related Fitness Through Physical Activity Classes

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(No relevant relationships reported)

PURPOSE: College period is usually associated with weight gain and physical fitness decline among population of college students. This study investigated whether and to what extent physical activity (PA) classes could reverse this tendency.
METHODS: Participants were 124 college students (mean age: 20.76±1.03, 73 males and 51 females) who enrolled in 16-week PA classes in a university in the US. The PA classes met two or three times a week with a total of 150 minutes/weekly, focusing on different activities addressing health-related physical fitness. Body mass index (BMI), 20-meter Progressive Aerobic Cardiovascular Endurance Run (PACER), curl-ups, push-ups, trunk lift (in inches), and sit and reach (in inches) tests were administered to the participants at the beginning (pretest) and the end (posttest) of the semester. Performances of each measure at the two test points were compared with paired-samples t test. All data analyses were conducted by sex, and cases were excluded pairwise. The numbers of students who participated in each paired assessment (i.e., having a measure at both test points) ranged from 59 to 71 for males and 42 to 51 for females.
RESULTS: For males, significant improvement (p < .001) occurred in PACER (Pretest 59.41±21.78 vs. posttest 64.58±22.39), curl-ups (55.40±20.73 vs. 62.10±19.04), push-ups (23.56±6.62 vs. 27.21±7.79), and trunk lift (10.21±2.20 vs. 12.54±2.08). Sit and reach showed a non-significant improvement (17.27±2.99 vs. 17.52±3.01, p < .10). BMI was the only measure remaining unchanged (25.83±4.65 vs. 25.80±4.50, p = .38). As for females, significant improvement (p < .005) was observed in PACER (35.31±11.74 vs. 40.67±12.68), curl-ups (43.59±21.78 vs. 50.39±20.40), push-ups (18.76±6.64 vs. 21.06±8.05), trunk lift (11.82±2.48 vs. 13.04±1.72), and sit and reach (18.56±3.57 vs. 19.31±3.86). The only measure remaining unchanged was BMI (23.62±3.10 vs. 23.60±2.99, p = .73).

CONCLUSIONS: While there is a tendency of weight gain and fitness decline among university students, PA classes addressing health-related physical fitness are effective in maintaining body weight and improving other health-related physical fitness components for college students.

1030   Board #291   May 30 3:30 PM - 5:00 PM

Retrospective Analysis Of A Supervised Exercise Program Offered To Post-hematopoietic Stem Cell Transplant Patients

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(No relevant relationships reported)

A growing number of cancer patients receive hematopoietic stem cell transplants (HSCT), a potentially curative treatment, but engenders adverse symptoms of fatigue, reduced physical function and decreased quality of life. Maintaining physical fitness for functional independence and the ability to perform activities of daily living is a high priority for patients. Exercise programs have been found to be effective in improving physical fitness and quality of life and reducing fatigue level in haematological cancer patients, and recently supervised programs have been offered to patients as part of Wellness treatment. **PURPOSE:** To evaluate adherence, safety and physiological effects of an eight-week supervised exercise program in post HSCT patients. **METHODS:** A retrospective study including 55 patients (N=22 female) referred to the optional exercise program after undergoing HSCT for a haematological malignancy. Safety and adherence information was collected throughout the program. Physiological outcomes were measured at baseline and post program (fatigue, quality of life, strength, 6 minute walk test (6MWT), balance and body composition). **RESULTS:** No adverse events were reported during the program and patients demonstrated a high (86.1%) adherence to supervised sessions. Fatigue decreased (4.6±1.9 to 3.4±2.1, p=.003) and Quality of Life increased (105.9±17.8 to 113±17.8, p=.040) from baseline to post intervention. Physical function increased in all measures (6MWT, 413.8±97.2m to 497.4±82.5m, p<.001; 1RM leg press 56.3±34.7kg to 68.0±36.6kg, p=.011; 1RM seated row, 32.7±15.0kg to 40.0±17.5kg, p=.001; Chair stand, 12.0±3.7 to 15.0±3.0, p<.001). Reported weekly physical activity also increased (114.2±132.7min to 205.7±137.8min, p<.001). Body mass, fat free mass and body fat percentage did not change. **CONCLUSIONS:** In line with prior findings, this supervised exercise program was an effective treatment for comorbidities associated with HSCT. Importantly, these results include participants who self-enrolled in the program, and paid a contribution to the cost. The high adherence and significant improvements confirm the efficacy of an exercise program and support the continued offerings of such Wellness treatment as part of usual care.

1031   Board #292   May 30 3:30 PM - 5:00 PM

Shriners Hospitals For Children® At Galveston Exercise Prescription Guidelines For Children With Severe Burn Injury

Eric Rivas[1], David N. Herndon[2], Janos Cambiaso-Daniel[3], Victoria G. Rontoyanni[2], Shauna Glover[2], Craig Porter[2], Oscar E. Suman, FACSM[2]. *[1]Shriners Hospitals for Children and The University of Texas Medical Branch, Galveston TX, and Texas Tech University, Lubbock, TX. [2]Shriners Hospitals for Children and The University of Texas Medical Branch, Galveston, TX. [3]Medical University of Graz, Austria, Shriners Hospitals for Children and The University of Texas Medical Branch, Galveston, TX.* (Sponsor: Oscar E. Suman, FACSM)
(No relevant relationships reported)

PURPOSE: Burn trauma is associated with metabolic abnormalities coupled with prolonged immobilization and deconditioning, where burned patients have markedly reduced strength and aerobic exercise capacity. Over the last 20 years, Shriners Hospitals for Children®—Galveston has endeavored to improve the rehabilitation of burned children. A key contribution from this work has been identifying the benefits of rehabilitation exercise training (RET) in restoring function in burned children. Currently, there are no clear guidelines for the implementation of RET in burned individuals. Therefore, we quantified the training logs for exercise intensity, frequency, and duration of 6 weeks of this program in order to develop a basic framework for outpatient RET in patients recovering from severe burns. **METHODS**: Thirty-three children (mean±SD, 11 female, 12±3 yrs, 145±18 cm, 40±11 kg) with severe burns (49±15% body surface area burned, with 35±22% third-degree burn) completed a 6-week resistance and aerobic exercise training program. Cardiorespiratory function (peak VO_2), strength and power, and lean body mass (LBM) were measured pre- and post-RET. Outcome measures were analyzed as a relative percentage of the age-sex matched non-burned counterpart (n=33, 11 females, 12±3 yrs, 154±20 cm, 49±22 kg).

RESULTS: At discharge, LBM was attenuated by 77% [of non-burned values], peak torque by 53%, power by 62%, and cardiorespiratory fitness by 56%. After 6 weeks of training, LBM increased from pre-training values by 5% (82% of non-burned values), peak torque by 18% (71%), power by 20% (81%), and cardiorespiratory fitness by 18% (74%; P<0.0001 for all). The quantification of exercise logs found that physical capacity can be improved by aerobic exercise training at 5 metabolic equivalents (74% of peakVO_2) performed at least 3 days per week and 150 min per week and by resistance training performed at volume loads [reps × sets × weight] of 280 (19% of total body mass, TBM) for the upper body and 590 (42% TBM) for the lower body at least 2 days per week. **CONCLUSIONS**: For the first time, we quantify our RET program and provide exercise prescription guidelines specific to burn populations. Future research should build upon this work and individualize exercise prescription to optimize rehabilitation benefits in severely burned children.

1032   Board #293   May 30 3:30 PM - 5:00 PM

Post-menarcheal Trabecular Bone Score as a Function of Organized Physical Activity

Jodi N. Dowthwaite[1], Renaud Winzenrieth[2], Tamara A. Scerpella[3]. *[1]SUNY Upstate Medical University; Binghamton University, Syracuse, NY. [2]Medimaps Group, Merignac, France. [3]University of Wisconsin, Madison, Madison, WI.* (Sponsor: Jill Kanaley, FACSM)
(No relevant relationships reported)

PURPOSE: Trabecular bone score (TBS) grades lumbar spine trabecular texture based on DXA scan gray level variation. In adults, TBS correlates with trabecular density indices and predicts fracture risk, independent of areal bone mineral density (BMD). However, few pediatric studies have evaluated TBS, with none demonstrating significant exercise loading associations. Bone accrual accelerates circum-menarche; thus, we hypothesized that circum-menarcheal organized physical activity (OPA, h/wk) would correlate with post-menarcheal TBS, suggesting potential for improvement of baseline adult trabecular texture via circum-menarcheal exercise.
METHODS: Annual DXA scans and semi-annual OPA records were collected via a prospective, longitudinal study of exercise and bone accrual. Analysis inclusion criteria were: 1) a postero-anterior lumbar spine DXA scan (Hologic, Waltham MA) from 0-1 year post-menarche; 2) prior year OPA records. Raw TBS data were generated using proprietary TBS iN-sight software (v2.2, Medimaps, France), adjusted for pediatric-specific soft-tissue effects. Multiple regression evaluated linear and quadratic associations between prior year OPA and TBS, accounting for gynecological age; β and significance are reported for each predictor. To reduce variance inflation, the quadratic function was mean-centered.
RESULTS: Data were included for 111 girls, with means as follows: age 13.4 yrs (10.0 to 15.6, sd 1.1), age at menarche 12.9 yrs (sd 1.1), gynecological age 0.5 yrs (sd 0.3), OPA 8.0 h/wk (sd 5.8) and TBS 1.38 (1.15 to 1.58, sd 0.08). In a regression model entering OPA, OPA^2 and gynecological age, a significant non-linear association was observed with OPA (respective β= 0.003, -0.001, 0.043, p=0.08, 0.003, 0.12).
CONCLUSIONS: Our data suggest a target circum-menarcheal OPA range of 5 to 15 h/wk. Further research is needed to confirm that TBS is modifiable via pediatric exercise to optimize baseline adult trabecular texture.

TBS as a Function of Organized Physical Activity: Raw Scatter Graph and Modeled Accounting for Gynecological Age
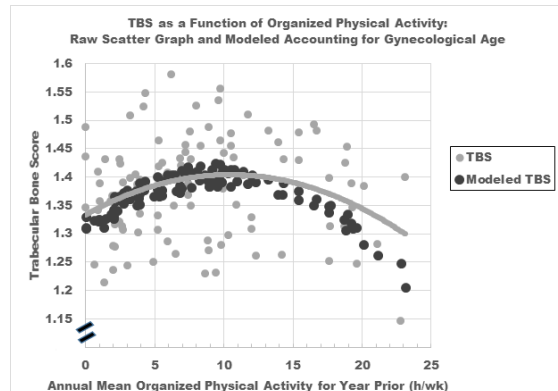
C-07   Thematic Poster - **Carbohydrate and Fat Metabolism**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100C

1068   **Chair:** Sara Campbell, FACSM. *Rutgers University, New Brunswick, NJ.*

(No relevant relationships reported)

1069   Board #1   May 31 8:00 AM - 10:00 AM
Postprandial Lipemic Responses After A High-fat Meal And Low- Or High-intensity Interval Exercise

Racine R. Emmons, Michael A. Figueroa, Toni T. LaSala. *William Paterson University, Wayne, NJ.* (Sponsor: Gordon Schmidt, FACSM)

(No relevant relationships reported)

Evidence suggests that high-intensity interval training can be as beneficial, or superior to traditional low to moderate intensity, long duration exercise in clearing postprandial triglycerides (TG).**PURPOSE**: To compare the effect of exercise intensity on postprandial lipemic responses after a high fat meal. **METHODS**: Maximal oxygen consumption (VO2) was measured in 13 participants (9 male, 4 female). There were no differences between males and females among age (males: 24±2 years; females 23±2 years), height (1.74 ± 0.04 meters vs. 1.69 ± 0.09 meters, respectively), or VO2max (41.42 ± 3.87 mL/kg/min vs. 36.97 ± 1.39 mL/kg/min, respectively.) Males weighed heavier than females (78.9 ± 11.2 kg vs. 65.3 ± 2.1 kg, $p = 0.04$). In a randomized crossover design, participants returned on two separate occasions where they arrived fasting and consumed a high-fat milkshake made from premium chocolate ice cream and heavy whipping cream, delivering 1.3 g/kg bodyweight of fat. Participants performed either low intensity exercise (LE) on a treadmill at a self-selected pace to elicit a heart rate (HR) of 40-60% of heart rate reserve (HRR) for 30 minutes or perform high-intensity interval exercise (HE) of 8 repetitions of 30 second sprints on a treadmill with 90 second active rest. Participants returned on a non-consecutive test day to perform the opposite test. Blood was sampled via fingerstick for TG at baseline (T0), 1 hour (1H), 3 hours (3H), and 5 hours (5H) postprandially. Area under the curve (AUC) determined the postprandial TG response via the trapezoid method. Comparisons among TG at each time point and AUC were determined via paired samples t-tests. Significance was set at $p<0.05$. **RESULTS**: No differences were found among baseline, 1H, or 3H TG values between the exercise conditions (p >0.05). 5H TG and AUC were lower in LE compared to HE (5H: 149.54 ± 113.18 mg/dL vs. 195.85 ± 117.14 mg/dL, respectively, t(13)= -3.384, $p=0.005$, $d=0.402$; AUC: 430.39 ± 269.64 mg/dL vs. 508.12 ± 256.97 mg/dL, respectively, t(13)=-2.212, $p=0.04$,$d=0.295$). Normalized peak TG values were not significantly different across groups. **CONCLUSIONS**: LE resulted in lower postprandial lipemic responses and lower peak compared to HE. The relatively short HE session may have not been sufficient in duration to clear postprandial TG.

1070   Board #2   May 31 8:00 AM - 10:00 AM
Similar Substrate Use During Prolonged Cycling in Men and Women

Beth W. Glace, Ian J. Kremenic, Malachy P. McHugh, FACSM. *Lenox Hill Hospital, New York, NY.* (Sponsor: Malachy McHugh, FACSM)

(No relevant relationships reported)

PURPOSE: It is generally accepted that, compared to men, women rely more upon lipids as a substrate during moderate intensity exercise. However, most studies were conducted in a fasting condition, which is not how prolonged exercise is typically performed. The purpose of this study was to compare substrate use between sexes in well-trained cyclists during prolonged exercise after a standardized breakfast. **METHODS**: Well-trained cyclists [18 women, 16 men] were recruited. Subjects reported to our lab twice. On the first day they performed a VO_{2max} test. At 7:30 a.m. on a subsequent day, they drank a standardized breakfast of a liquid meal replacement which provided 6 kcals/kg. At 9 a.m. they pedaled on their own bikes for 2 hours at their ventilatory threshold [~65% VO_{2max}] with 5,1-min sprints interspersed throughout. Water was provided at a rate of 1% body mass/h. Ventilatory gas exchange was measured every 20 min to calculate RER. Descriptive data were compared using independent t-tests, ventilatory data were compared using repeated measures ANOVA. **RESULTS**: Men and women were of similar age [38 yrs, p=0.92] and VO_{2max} was typical of well-trained, recreational cyclists: 56 ml/kg/min for men, and 47 ml/kg/min for women. Body mass declined by 1% and did not differ between sexes [p=0.98]. RER declined during exercise [p<0.001] but there was no difference between sexes [p=0.38] and no time x sex interaction [p=0.78], indicating that substrate usage was

similar between men and women. Perception of effort and heart rate increased over time, but did not differ between men and women [time x sex p≥0.26, effect of sex, p≥0.62].
CONCLUSIONS: The notion that women rely more upon lipids during exercise was not supported by our data in fed subjects. Men and women who perform prolonged exercise after a light meal, as is typical, are likely to use similar amounts of fats and carbohydrates. This underscores the importance of nutritional status in studies comparing men and women.
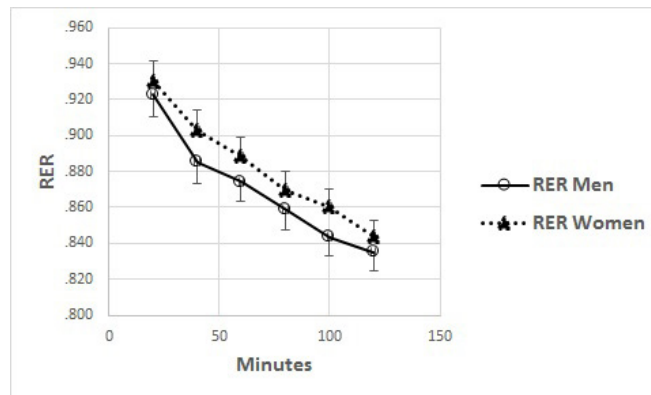
1071   Board #3   May 31 8:00 AM - 10:00 AM
No Lipolytic Suppression With Pre Exercise Carbohydrate Regardless of its Glycemic Index

Daniel A. Baur[1], Brandon D. Willingham[2], Smith M. Kyle[2], Kisiolek N. Jacob[2], Morrissey C. Margaret[2], Ragland J. Tristan[2], Saracino Patrick[2], Ormsbee J. Michael, FACSM[2]. *[1]Elon University, Elon, NC. [2]Florida State University, Tallahassee, FL.* (Sponsor: Michael Ormsbee, FACSM)

(No relevant relationships reported)

INTRODUCTION: It is well-documented that ingesting carbohydrate prior to exercise reduces fat oxidation, and that this effect is attenuated with low glycemic index carbohydrates. However, it is yet to be established whether these metabolic effects are primarily the result of alterations in the mobilization of free fatty acids (FFA) from adipose tissue (i.e. lipolysis) or whether these effects impact exercise performance. PURPOSE: To determine the impact of pre-exercise carbohydrate of different glycemic indices on subcutaneous abdominal adipose tissue (SCAAT) metabolism and running performance. METHODS: Ten trained male runners completed three experimental trials consisting of 30 min at 60% VO_{2max}, 30 min at 75% VO_{2max}, and a 5-km time trial (TT). Thirty min prior to exercise, participants consumed one of three beverages: 1) 75 g low glycemic index modified starch supplement (UCAN), 2) 75 g high glycemic index glucose-based supplement (G), or 3) a non-caloric placebo (PL). SCAAT lipolysis was assessed via microdialysis. RESULTS: Prior to exercise, blood glucose and insulin were elevated with G vs. PL ($+53.0 \pm 21.3$ mg·dL⁻¹ [SD]; $p = 0.000$; $+33.9 \pm 11.0$ μU·mL⁻¹; $p = 0.000$) and G vs. UCAN ($+36.6 \pm 24.9$ mg·dL⁻¹; $p = 0.00007$; $+25.2 \pm 11.0$ μU·mL⁻¹; $p = 0.000$), respectively. Fat oxidation was attenuated, and carbohydrate oxidation increased prior to exercise with G vs. PL (-0.06 ± 0.06 g·min⁻¹; $p = 0.005$; $+0.18 \pm 0.07$ g·min⁻¹; $p < 0.0001$) and G vs. UCAN (-0.06 ± 0.05 g·min⁻¹; $p = 0.004$; $+0.18 \pm 0.14$ g·min⁻¹; $p < 0.0001$). There were no differences in SCAAT lipolysis or running performance. CONCLUSIONS: Pre-exercise carbohydrate results in metabolic effects favoring carbohydrate utilization, and these effects are attenuated with low glycemic index carbohydrate. However, these effects are not the result of alterations in SCAAT lipolysis, nor do they affect exercise performance.

1072   Board #4   May 31 8:00 AM - 10:00 AM
Overload Alters Skeletal Muscle Glucose Utilization but not Glucose Uptake or Hypertrophy in Insulin-Resistant Mice

Luke Weyrauch[1], Shawna McMillin[1], Kristen Turner[2], Carol Witczak[1]. *[1]East Carolina University, Greenville, NC. [2]University of Iowa, Iowa City, IA.*

(No relevant relationships reported)

Resistance exercise training/chronic muscle loading induces skeletal muscle hypertrophy and improves systemic glucose homeostasis in individuals with type 2 diabetes. Surprisingly, it is presently unknown if the improvement in glycemic control is due to an increase in muscle glucose uptake. **PURPOSE:** To determine if chronic muscle loading (overload)-induced muscle glucose uptake is impaired by insulin resistance. **METHODS & RESULTS:** Male C57BL/6J mice (6 wks old) were fed

a low fat diet (LFD) or a 60%kcal high fat diet (HFD) for 12 wks to induce insulin resistance. Plantaris muscle overload was elicited by unilateral ablation of the distal 2/3 of the gastrocnemius and soleus. The contralateral leg was sham-operated. Muscles were weighed 5 days later. Overload increased muscle mass ~40% in both LFD and HFD mice. To assess glucose uptake, muscles were incubated in [^{3}H]-2-deoxyglucose. Overload increased muscle glucose uptake ~80% in both LFD [Sham: 0.52±0.02; Overload: 0.91±0.04 (μmol/g muscle/h)] and HFD mice [Sham: 0.49±0.04; Overload: 0.86±0.09 (μmol/g muscle/h)], showing that overload stimulates glucose uptake independent of insulin resistance. To determine if this effect is due to increased glucose transporter (GLUT) or hexokinase levels, immunoblots were performed. Overload did not alter GLUT4 or hexokinase. In contrast, overload increased GLUT1 ~70%, but only in insulin resistant muscles. Decreased glycogen enhances glucose uptake. To determine if overload lowered glycogen levels, glycogen content was measured using a hexokinase-based reagent. Overload increased muscle glycogen ~26% in LFD (Sham: 29.0±1.6; Overload: 36.1±1.5 nmol/mg muscle), and ~40% in HFD mice (Sham: 31.2 ±2.1; Overload: 42.3±1.7 nmol/mg muscle). To determine if overload-induced glucose uptake is dependent on glucose utilization, muscles were incubated in [5-^{3}H]-glucose to assess glycolytic flux, and immunoblots performed to assess the rate limiting enzyme of the pentose phosphate pathway, glucose-6-phosphate dehydrogenase (G6PD). Overload did not alter muscle glycolytic flux. In contrast overload increased muscle G6PD ~140% in LFD, and ~82% in HFD mice. **CONCLUSION:** Insulin resistance does not impair overload-induced muscle hypertrophy or glucose uptake, but does alter glucose utilization. **SUPPORT:** NIH R01 DK103562

1073   Board #5   May 31 8:00 AM - 10:00 AM

Post-Exercise Fructose-Maltodextrin Ingestion Enhances Subsequent Endurance Capacity

Gareth A. Wallis, Tim Podlogar, Ed Maunder. *University of Birmingham, Birmingham, United Kingdom.* (Sponsor: Professor Janice Thompson, FACSM)

(No relevant relationships reported)

PURPOSE: Restoring muscle and liver glycogen content during short-term (<6 h) recovery from prolonged exercise is pertinent for athletes seeking to maximize performance in repeated exercise bouts. Previous research suggests co-ingestion of fructose-glucose carbohydrate sources augments liver and has equivalent effects on muscle glycogen storage during short-term recovery from prolonged exercise compared to isoenergetic glucose ingestion. The aim of the present investigation was to determine if this has a discernible effect on subsequent exercise capacity.
METHODS: Eight trained endurance runners and triathletes performed two experimental trials in a single-blind, randomised, and counterbalanced cross-over design. Trials involved treadmill running to exhaustion at 70 %VO$_{2max}$, a four-hour recovery with 90 g.h^{-1} of glucose-maltodextrin (GLU) or fructose-maltodextrin (FRU) ingestion (1:1.5 ratio), and a second bout of treadmill running to exhaustion at 70 %VO$_{2max}$. Indirect calorimetry and stable isotope methods were employed to estimate substrate oxidation and ingested carbohydrate oxidation.
RESULTS: Endurance capacity in the second exercise bout was significantly greater with FRU (81.4 ± 22.3 vs. 61.4 ± 9.6 min, P = 0.02), a *large* magnitude effect (ES = 1.84 ± 1.12, 32.4 ± 19.9 %). Total carbohydrate oxidation rates were not significantly different between-trials at given time-points, although the total amount of carbohydrate oxidised in the second exercise bout was significantly greater with FRU (223 ± 66 vs. 157 ± 26 g, P = 0.02). Ingested carbohydrate oxidation rates, representing carbohydrate stored during recovery and/or that derived from ongoing absorption, were greater during bout two with FRU (P = 0.001). Plasma glucose and non-esterified fatty acid concentrations were not significantly different between-trials. Plasma lactate concentrations were significantly greater during recovery with FRU (P = 0.001). Self-reported nausea and stomach fullness during bout two were marginally in favour of FRU.
CONCLUSION: Short-term recovery of endurance capacity was significantly enhanced with fructose-maltodextrin vs. glucose-maltodextrin ingestion during recovery.

1074   Board #6   May 31 8:00 AM - 10:00 AM

Prolonged Low-moderate Intensity Exercise On Physiological Markers Of Metabolic And Oxidative Stress

Dominique Gagnon[1], Sandra Dorman[1], Stephen Ritchie[1], Shivaprakash Jagalur Mutt[2], Ville Stenbäck[2], Jarek Walkowiak[3], Karl-Heinz Herzig[2]. *[1]Laurentian University, Sudbury, ON, Canada. [2]University of Oulu, Oulu, Finland. [3]Poznan University, Poznan, Poland.*

(No relevant relationships reported)

Oxidative stress results in lipid, protein and DNA oxidation as well as metabolic dysfunctions. This may result in chromosomal damage, telomere erosion, and accelerated cellular ageing. Long-term physical activity promotes healthy metabolic and oxidative profiles. The effects of prolonged physical activity however, are unknown.
Purpose
This study investigated the effects of prolonged physical activity on oxidative and metabolic stress in healthy adults participating in a 260-km wilderness canoeing expedition.
Methods
Twenty-seven participants took part in the study. Sixteen went on a 14-day wilderness canoeing expedition (EXP) (24 ± 7 yrs, 72 ± 6 kg, 178 ± 8.0 cm, 18.4 ± 8.4 %BF, 47.5 ± 9.3 mlO$_2$·kg^{-1}·min^{-1}), covering a distance of 260 km, requiring 6-9 hrs of low to moderate exercise daily, and eleven were used as controls (CON) (31 ± 11 yrs, 72 ± 15 kg, 174 ± 10 cm, 22.8 ± 10.0 %BF, 47.1 ± 9.0 mlO$_2$·kg^{-1}·min^{-1}). Blood sample collection was completed before and after the expedition. ANCOVA analyses were performed on metabolic and oxidative variables as well as telomere length from isolated blood mononuclear cells.
Results
For metabolic results, no statistical differences were observed in total cholesterol, high- and low-density lipoprotein, testosterone and insulin concentration. Triglycerides were lower following the expedition (EXP 69 ± 18 *vs.* CON 106 ± 45 mg·dL^{-1}; p = 0.002). Malondialdehyde was unaffected (EXP 4.2 ± 1.3 *vs.* CON 4.1 ± 0.7 μM; p > 0.05) but superoxidase dismutase activity, representative of antioxidant activity, was greater in the expedition group (EXP 3.1 ± 0.4 *vs.* CON 0.8 ± 0.5 U·ml^{-1}; p < 0.001). Finally, telomere length was unchanged (EXP 1.00± 0.48 *vs.* CON 0.89 ± 0.28 TS ratio; p > 0.05).
Conclusion
The present results suggest that there is a stronger cellular protective response from antioxidants to counteract the exercise-associated production of pro-oxidant free radical and reactive oxygen species during prolonged low-moderate physical loading. This shift in cellular oxidative balance, however, did not seem to be sufficient to induce a notable change in telomere length.

1075   Board #7   May 31 8:00 AM - 10:00 AM

In Vivo Knockdown of Hepatocellular eNOS Reduces Cellular Anti-Oxidant Defense and Mitochondria Biogenesis/Function

Grace Meers, Rory Cunningham, Matthew Panasevich, R. Scott Rector, FACSM. *Harry S Truman Memorial VA Hospital and University of Missouri, Columbia, MO.*

(No relevant relationships reported)

PURPOSE: The purpose of this study was to examine the effects of long-term knockdown of endothelial nitric oxide synthase (eNOS) in hepatocytes in vivo to establish a potential regulatory role in liver mitochondrial health. METHODS: C57Bl6 mice (6 months of age) were tail vein injected with either an adeno-associated virus with a hepatocyte specific promoter for the shRNA induced silencing of eNOS (AAV8-Ttr-shRNA-eNOS; 1x10^11 GC; N=8) or a scramble control (AAV8-Ttr-shRNA-Scr, N=8). The mice were maintained on a low fat control diet and terminal studies performed 12 weeks post AAV-shRNA injection. RESULTS: Body mass and percent body fat did not differ between treatment groups. Hepatocellular knockdown of eNOS significantly (p<0.05) lowered hepatic gene expression of anti-oxidant defense, including glutathione peroxidase (GPX-1, ~30%), superoxide dismutase 2 (SOD2, ~30%), and NAD(P)H quinone dehydrogenase 1 (Nqo1, ~40%) compared to Scr control. These are all known targets of the anti-oxidant response element transcription factor, nuclear factor-E2-related factor-2 (Nrf2). In addition to apparent downregulation in anti-oxidant defense mechanisms, AAV-shRNA-eNOS also significantly reduced mitochondrial biogenesis marker peroxisome proliferator-activated receptor gamma coactivator 1α (PGC-1α mRNA) by ~30% (p<0.05) and LC3II protein content in isolated mitochondria (a marker of mitophagy) by ~40% (p=0.16) compared to Scr control. This was coupled with significant reductions in both basal and state 3 hepatic mitochondrial respiration with AAV-shRNA-eNOS compared with Scr control. CONCLUSION: These findings represent the first observations that long-term in vivo knockdown of eNOS specifically in hepatocytes with AAV-shRNA results in suppression of hepatic anti-oxidant defense, impaired hepatic mitochondrial biogenesis and mitophagy, and reduced hepatic mitochondrial function. Funding: This work was supported by VA-Merit Grant I01BX003271-01 (R.S.R.).

1076   Board #8   May 31 8:00 AM - 10:00 AM

Acute Exercise by Insulin Resistant Rats Induces Muscle Fiber Type-selective Improvement in Insulin-stimulated Glucose Uptake

Mark W. Pataky, Carmen S. Yu, Yilin Nie, Edward Arias, Manak Singh, Robert Ploutz-Snyder, Christopher Mendias, Gregory Cartee, FACSM. *University of Michigan, Ann Arbor, MI.* (Sponsor: Gregory Cartee, FACSM)

(No relevant relationships reported)

PURPOSE: To determine if acute exercise induces muscle fiber type-selective changes in glucose uptake (GU), glycogen content or GLUT4 protein abundance in insulin resistant rats.
METHODS: Rats were fed a high-fat diet (HFD; 60% fat) or a low-fat diet (LFD; 13% fat) ad libitum for two weeks. On the experimental day, HFD rats were sedentary (SED) or exercised (2h swim exercise). All LFD rats remained SED, serving as controls. Exercised rats were studied immediately-post exercise (IPEX) or 3.5h post-exercise (3.5hPEX). Isolated epitrochlearis muscles were incubated with [^{3}H]-2-deoxyglucose (2DG). Muscles from IPEX and SED controls were incubated without insulin. Muscles from 3.5hPEX and SED controls were incubated ±100µU/ml insulin. Muscles were incubated with collagenase to isolate single fibers. Fiber type (myosin heavy chain expression: type I, IIA, IIB, IIX, IIAX, or IIBX) was determined by SDS-PAGE. In the same single fibers, GU was measured by [^{3}H]-2DG accumulation. Fiber type-specific glycogen was measured by histochemical periodic-acid Schiff staining. GLUT4 abundance was determined by immunoblotting. Data were analyzed by one-way ANOVA.
RESULTS: In HFD vs LFD rats, GU of insulin-stimulated single fibers was decreased in all fiber types ($P<0.05$) except type I. Insulin-independent GU in single fibers of each fiber type was increased IPEX ($P<0.05$). Glycogen content decreased in all fiber types IPEX ($P<0.01$). In HFD rats insulin-stimulated GU 3.5hPEX was increased in all fiber types ($P<0.05$) except type I. GLUT4 content was unchanged by diet or exercise in each fiber type.
CONCLUSIONS: Greater insulin-independent GU and decreased glycogen IPEX provides compelling evidence that each fiber type, including type I fibers, was recruited. Neither diet nor exercise effects on GU were attributable to altered GLUT4 abundance regardless of fiber type. Earlier research using whole muscles from normal rats demonstrated that exercise causes greater GLUT4 translocation concomitant with greater phosphorylation of AS160 protein, a key regulator of GLUT4 translocation. Our working hypothesis is that fiber type-selective improvement in insulin-stimulated GU at 3hPEX in insulin resistant rats is attributable to fiber type-selective increases of AS160 phosphorylation that facilitates greater GLUT4 translocation.

C-08   Thematic Poster - **Mental Health and Exercise**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100E

1077   Chair: Matthew P. Herring. *University of Limerick, Limerick, Ireland.*

(No relevant relationships reported)

1078   Board #1   May 31 8:00 AM - 10:00 AM

Acute Exercise Effects Among Young Adults with Subclinical Generalized Anxiety Disorder: Replication and Expansion

Matthew P. Herring[1], Derek C. Monroe[2], Brett R. Gordon[1], Mark J. Campbell[1]. *[1]University of Limerick, Limerick, Ireland. [2]University of California Irvine, Irvine, CA.*

(No relevant relationships reported)

Little is known about the effects of acute exercise among individuals with subclinical Generalized Anxiety Disorder (GAD), a disorder marked by persistent worry, elevated anxiety, and low energy and fatigue. Recent findings supported the positive effects of acute exercise on worry, state anxiety, and feelings of energy and fatigue among young women with subclinical GAD. However, exercise effects among young men with subclinical GAD are unstudied. **PURPOSE**: To replicate initial findings, to compare acute responses to aerobic exercise and quiet rest among young men with subclinical GAD, and to explore potential sex-related differences. **METHODS:** Thirty-five young adults (21.4±2.3y; 19M; 16F) with Penn State Worry Questionnaire scores ≥45 (60±8) completed 30-min treadmill running at ~71.2±0.04 percent heart rate reserve and 30-min seated quiet rest in counterbalanced order. Outcomes included worry, worry engagement, absence of worry, state anxiety, and feelings of energy and fatigue. RM-ANOVA examined differences across condition and time. Sex-related differences were

explored with RM-ANOVA and paired samples *t*-tests stratified by sex. Hedges' *d* effect sizes were calculated to quantify and compare magnitude of change in the full sample, men, and women. **RESULTS:** There were no significant baseline differences between sexes. Compared to quiet rest, exercise significantly improved state anxiety ($p<0.04$; $d=0.27$) and feelings of energy ($p<0.001$; $d=1.09$). Small improvements were found for worry ($d=0.22$), worry engagement ($d=0.18$), and feelings of fatigue ($d=0.21$). Although RM-ANOVA did not support significant differences between sexes, exercise effects on worry, worry engagement, absence of worry, and feelings of energy were stronger among females. Moderate-to-large improvements in worry ($d=0.53$), absence of worry ($d=0.38$), and feelings of energy ($d=1.35$) were found among women. Among men, moderate-to-large improvements in state anxiety ($d=0.37$) and feelings of energy ($d=0.92$) and fatigue ($d=0.40$) were found. **CONCLUSION:** Findings support initial reports of positive effects of acute aerobic exercise on worry, state anxiety, and feelings of energy and fatigue among young women with subclinical GAD. Findings also provide initial support for these positive effects among young men with subclinical GAD.

1079   Board #2   May 31 8:00 AM - 10:00 AM

Working It Out: Acute Exercise to Combat Anxiety and Depression in Individuals Living with PTSD

Daniel R. Greene[1], Steven J. Petruzzello, FACSM[2]. *[1]Augusta University, Augusta, GA. [2]University of Illinois at Urbana-Champaign, Urbana, IL.* (Sponsor: Steven J. Petruzzello, FACSM)

(No relevant relationships reported)

Mental health problems are increasingly prevalent in today's society. Exercise interventions have been shown to significantly reduce symptoms of many mental health problems, but often overlooked is the potential for exercise to reduce symptoms of Post-Traumatic Stress Disorder (PTSD) and comorbid psychological conditions (e.g., anxiety & depression). **Purpose:** Examine the acute effects of a bout of moderate intensity continuous aerobic exercise (MICE) and a bout of high-intensity interval exercise (HIIE), relative to a no-exercise inactive control (SED), in participants with subsyndromal PTSD. **Methods:** Participants [N= 24, 9 males; age ($M \pm SD$); 25.9 ± 9.2 yrs; Estimated VO$_{2peak}$ ($M \pm SD$); 34.6 ± 10.2 ml·kg^{-1}·min^{-1}] completed three randomly ordered 35-min conditions (HIIE, MICE, SED) following a within subjects design. All participants met the criteria for subsyndromal PTSD (i.e., having at least one symptom in each of the major DSM-5 clusters), with an average PCL-5 score of 47.64 which exceeded the cut point for probable PTSD of 33. State Anxiety, and Depression were assessed before (Pre), immediate after (Post0), 20-minutes after (Post20), and 40-minutes after (Post40) each condition. **Results:** Anxiety and Depression were significantly reduced following all conditions. Anxiety Post40 was significantly less than Pre for HIIE [Cohen's $d = 1.05$], MICE [Cohen's $d = 0.78$], and SED [Cohen's $d = 0.53$]. Depression Post40 was significantly less than Pre for HIIE [Cohen's $d = 0.76$], MICE [Cohen's $d = 0.84$], and SED [Cohen's $d = 0.32$]. **Conclusion:** Exercise significantly reduced Anxiety and Depression to a greater extent than SED. This study provides evidence for exercise-induced short-term improvements in comorbid psychological conditions associated with PTSD. Future studies need to apply these benefits to a longitudinal program.

1080   Board #3   May 31 8:00 AM - 10:00 AM

The Interrelationship Between Depression and Hemoglobin: Men Are Affected More Than Women

Tina Bhateja[1], Jonathan M. Saxe[2], Lewis E. Jacobson[2], Courtney D. Jensen[1]. *[1]University of the Pacific, Stockton, CA. [2]St. Vincent Hospital, Indianapolis, IN.*

(No relevant relationships reported)

There are 16.1 million Americans with major depressive disorder (MDD) and 3.4 million Americans with anemia. Low hemoglobin (Hb) is known to predict depressive symptoms, but seldom is the inverse examined: how does MDD affect Hb? There may be a cyclic relationship in which depression reduces engagement in physical activity and reduced activity lowers Hb. This presents possible implications for young athletes owing to higher depression scores on average than age-matched controls. **PURPOSE:** To investigate MDD as a predictor of serum Hb levels. **METHODS:** We analyzed 2,206 patients who were treated at a major hospital. All patients had Glascow Coma Scale scores ≥14, received a complete blood count with differential, and were screened for MDD. Differences in Hb between depressed and non-depressed groups were assessed with independent samples t-tests; multiple linear regression measured the effect of MDD on Hb, controlling for confounding variables. **RESULTS:** Among depressed patients, Hb was 12.16 ± 1.86 g/dL; among non-depressed patients, Hb was 13.52 ± 1.93 g/dL ($p<0.001$). This difference was more pronounced among men (14.24 vs. 12.36; $p=0.001$) than women (12.62 vs. 12.02; $p=0.165$). Across the total sample, holding constant age, sex, oximetry, blood pressure, use of dialysis, and diagnoses of diabetes, bleeding disorder, cirrhosis, cancer, and respiratory disease, depression associated with a 5.7% reduction in Hb ($p=0.035$; 95% CI: -1.38 to -0.50 g/dL). The overall model was significant ($r^2=0.299$; $p<0.001$). Among men,

the model retained significance (r^2=0.226; p<0.001) and a diagnosis of depression associated with a reduction in Hb of 1.56 g/dL (p=0.002; 95% CI: -2.56 to -0.56 g/dL). **CONCLUSIONS:** The relationship between Hb and depression may be cyclic. In our population, depression had a greater effect on Hb than diabetes and respiratory diseases, and it had the same effect as bleeding disorders. Depression, via endocrine changes and reductions in physical activity, may lower oxygen-carrying capacity of the blood, and in turn affect endurance performance. Exercise-induced oxidative stress promotes Hb synthesis. For the anemic patient, exercise may enhance mood; for the moody, exercise may enhance oxygen-carrying capacity. For the athlete and the sport psychologist, there may be further implications.

1081   Board #4   May 31 8:00 AM - 10:00 AM

Prevalence of Depression and Low Self-Esteem among Collegiate Female Track and Field Athletes

Samantha Weber, Toni M. Torres-McGehee, Eva Monsma, Allison Smith. *University of South Carolina, Columbia, SC.*
(No relevant relationships reported)

Track and field athletes are under extreme amounts of pressure to be successful as student-athletes. Their academics and demands for their events may predispose them to having low self-esteem (LSE) and mental health disorders like depression (DEP). **PURPOSE:** To examine the prevalence of LSE and DEP in collegiate, NCAA Division I track and field athletes; and to investigate differences between academic status (i.e., freshman, senior, etc.) and event type (e.g., sprinter, distance, lean events etc.). **METHODS:** Collegiate female track and field athletes (n=387) were recruited from 25 NCAA Division I Institutions to participate in an online study. Demographic information, Center for Epidemiologic Studies Depression Scale (CESD) to estimate the risk for DEP and the Rosenburg Self-Esteem Scale for LSE were completed. **RESULTS:** The prevalence of DEP risk was estimated to be 65.1% (n=252). No significant differences were found between academic status; however the highest DEP risk was freshman (19.4%) then sophomores (17.3%). Significant differences were found between event type and DEP within sprinters, middle distance runners, and distance runners (11.4% - 19.6%, $p = \leq 0.01$). Overall, LSE was 10.9% (n=42), with LSE found highest among sophomores (4.1%) then freshman (3.9%). No significant differences were found for event type and LSE; however, distance runners were at the highest risk for LSE with 4.4%. **CONCLUSIONS:** Female track and field athletes demonstrated a high risk of DEP and a lower risk for LSE. Freshman and sophomores demonstrated the highest risk for DEP and LSE, potentially due to the new academic and collegiate sport demands placed upon them. Overall, it is perceived the more acclimated (upper classman) a student-athlete is, the lower risk they have for DEP and LSE. Additionally, distance runners were found to have a higher risk of DEP and LSE; therefore, further examination is needed to draw conclusions to what additional pressures they may have. With a risk of DEP and LSE being most prevalent among younger collegiate athletes, universities need to focus on establishing a support system or mentoring program for incoming student-athletes.

1082   Board #5   May 31 8:00 AM - 10:00 AM

Associations Between Physical Activity and Depression: Results from The Irish Longitudinal Study on Ageing

Cillian P. McDowell[1], Rodney K. Dishman, FACSM[2], Mats Hallgren[3], Ciaran MacDonncha[1], Matthew Herring[1]. *[1]University of Limerick, Limerick, Ireland. [2]University of Georgia, Athens, GA. [3]Karolinska Institutet, Stockholm, Sweden.*
(No relevant relationships reported)

Physical activity (PA) can protect against depression. However, few studies have assessed the influence of dose, including whether meeting PA guidelines is sufficient or if greater benefits can be derived from greater volumes of PA. **PURPOSE**: To examine associations between different volumes of MVPA and walking and prevalence and incidence of depressive symptoms and depression status using data from The Irish Longitudinal Study on Ageing. **METHODS**: Participants (N=4,556; 56.7% female) aged ≥50 years completed the International PA Questionnaire (IPAQ) at baseline, and the Center for Epidemiological Studies Depression Scale at baseline and two years later. Participants were classified as meeting World Health Organisation PA guidelines or not, divided into IPAQ categories, and divided into tertiles based on weekly minutes of walking. Prospective analyses included 4,146 non-depressed respondents. **RESULTS**: After adjustment for age, sex, waist circumference, social class, and smoking, odds of prevalent depression were 45.2% (OR=0.55, 95%CI: 0.44-0.69; p<0.001) lower among those meeting PA guidelines, 40.3% (OR=0.60, 0.47-0.76; p<0.001) and 53.2% (OR=0.47, 0.66-0.61; p<0.001) lower among those in minimally-active and very-active IPAQ categories, respectively, and 24.9% (OR=0.75, 0.59-0.96; p≤0.02) and 44.1% (OR=0.56, 0.43-0.73; p<0.001) lower among those in moderate and high walking tertiles, respectively. Odds of incident depression were 24.4% (OR=0.76, 0.56-1.01; p≤0.06) lower among those meeting PA guidelines, 34.7% (OR=0.65, 0.46-0.93; p≤0.02) and 24.5% (OR=0.75, 0.77-1.07; p>0.10) lower among those in minimally-active and very-active IPAQ categories, respectively, and 22.7%

(OR=0.77, 0.54-1.09; p>0.13) and 25.6% (OR=0.74, 0.52-1.06; p>0.10) lower among those in moderate and high walking tertiles, respectively. **CONCLUSION**: Among a large, nationally representative sample of older adults, moderate and high volumes of MVPA were significantly associated with lower odds of concurrent depression and significantly and non-significantly associated with lower odds of incident depression, respectively. Meeting PA recommendations and walking were associated with significantly lower odds of concurrent depression and non-significantly lower odds of incident depression.

1083   Board #6   May 31 8:00 AM - 10:00 AM

Influence Of Omega-3 Status On Depression And Anxiety In Young Women With Obesity

Helen T. O'Connor[1], Rebecca L. Cook[1], Helen M. Parker[1], Cheyne Donges[2], Janet Franklin[3], Kate S. Steinbeck[4], Hoi Lun Cheng[4], Manohar Garg[5], Nicholas J. O'Dwyer[1]. *[1]The University of Sydney, Sydney, Australia. [2]Charles Sturt University, Bathurst, Australia. [3]Royal Prince Alfred Hospital, Sydney, Australia. [4]The Children's Hospital Westmead, Sydney, Australia. [5]The University of Newcastle, Newcastle, Australia.* (Sponsor: Melinda Manore, FACSM)
(No relevant relationships reported)

PURPOSE: Obesity is associated with an increased risk of depression and anxiety. Higher omega-3 polyunsaturated fatty acid (n-3PUFA) status may help to reduce negative consequences of obesity on mental health outcomes. This cross-sectional study aimed to investigate the relationship of obesity and n-3PUFA with depression and anxiety in young women with a normal (N) or obese (O) body mass index (BMI). **METHODS:** Healthy, young (18-35y) women (N: 18.5-24.9kg/m^2 O: >30.0kg/m^2) with no history of treatment (counselling or medication) for depression or anxiety completed the Depression, Anxiety and Stress Scale (DASS). Status of n-3PUFA was assessed using the red cell Omega-3 Index (low<4%; safe 4-8%; optimal >8%). Data were analysed via repeated measures ANOVA, ANCOVA (controlling for n-3PUFA). DASS components are reported as mean ± SD z-scores (normal <0.5, mild 0.5-1, moderate >1-2, severe >2-3, extremely severe >3). Cohen's d effect size (ES) between BMI, depression and anxiety was also determined. **RESULTS:** 299 women (N: n=157, 24.9±4.6y; O: n=142, 26.9±5.4y) completed the study. Although mean DASS scores were in the normal range, the O group had higher depression (N: -0.33±0.71, O: 0.11±0.98, p<0.001) and anxiety (N: -0.08±0.97, O: 0.29±1.23, p=0.004) scores and lower n-3PUFA status (low; safe, optimal: N: 1%, 83%, 16%, O: 8%, 85%, 8%; p<0.001) than the N group. Medium or small strengths of association were observed between obesity and depression (ES=0.52), anxiety (ES=0.34) and stress (ES=0.21). Adjusting for n-3PUFA attenuated the significance of the depression (p=0.001) and anxiety (p=0.033) scores but they still remained significantly higher for the O group. **CONCLUSIONS:** Young women with obesity had significantly higher scores for depression and anxiety. The status of n-3PUFA had a minimal impact on these scores. This study reinforces the pervasive, negative impact of obesity on mental health in young women.

1084   Board #7   May 31 8:00 AM - 10:00 AM

An Examination of Affective Change in the Absence of Physical Sensation

Kathryn M. Rougeau[1], Stephen R. Koziel[2], Steven J. Petruzzello, FACSM[2]. *[1]Oakland University, Rochester, MI. [2]University of Illinois, Urbana, IL.* (Sponsor: Steven J. Petruzzello, FACSM)
(No relevant relationships reported)

Examination of affective responses to acute exercise has been plagued by the inability to find an appropriate control condition, as a true placebo has been elusive. This has resulted in various "control" conditions (e.g., quiet rest, reading, sitting in a chair on a treadmill, stretching). A potential option involves passive cycling. This would also provide a unique methodology for studying affective responses to activity in spinal cord injured (SCI) individuals. **PURPOSE**: To examine the psychological and physiological effects of Passive (PaC) versus Placebo cycling (PLC), both compared to Rest, in SCI individuals. **METHODS**: Heart rate (HR), Rating of Perceived Exertion (RPE), and affect (Calmness, Tension, Energy, Tiredness, State Anxiety) were recorded in 21 (11 male; 27 ± 6.52 yrs; $M \pm SD$) participants before, during and after each Rest, PaC, and PLC 25-min bout. Each cycling session consisted of identically paced warm-ups (5-min @ 35 r·min⁻¹), movement bout (15-min @ 60 r·min⁻¹), and cool-down (5-min @ 35 r·min⁻¹). **RESULTS:** PaC elicited psychological changes that varied significantly with respect to perceptions of Energy and Calmness, but not valenced (i.e., positive, negative) affect. Energy increased from Pre to Post-0 exercise (P= 0.024), then decreased Post-0 to Post-10 (P= 0.002). Enjoyment was greater following PaC relative to PLC (M_{diff}= 8.29, P= 0.06) and Rest (M_{diff}= 9.33, P=0.001). RPE was significantly higher during the PaC (M= 7.05±0.70) compared to both Rest (M= 6.11±0.08; P< 0.001) and PLC (M= 6.32±0.05; P< 0.001). There were no significant effects on physiological factors such as HR or Temperature across conditions. **CONCLUSION**: These results provide support for this methodological technique as a

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way of examining potential placebo effects of activity on affective outcomes. This also provides insights into how activity may influence affective responses in individuals with a SCI.

1085   Board #8   May 31 8:00 AM - 10:00 AM
Acute Effects of Resistance Exercise in Depressed Black/African American People Living with HIV

Sanaz Nosrat, James W. Whitworth, Nicholas J. SantaBarbara, Mark E. Louie, Joseph T. Ciccolo. *Teachers College, Columbia University, New York, NY.*
(No relevant relationships reported)

In the US, Blacks/African Americans (AA) comprise the largest proportion of People Living with HIV (PLWH). Depressive symptoms and fatigue are highly prevalent among PLWH. Depressive symptoms are linked to progression of HIV disease, and fatigue is linked to severity of depressive symptoms. Resistance exercise (RE) is shown to have psychological benefits in non-HIV depressed populations, and these benefits are hypothesized to be intensity-dependent. To date, no study has examined the use of a single bout of RE for management of affect and fatigue with depressed PLWH. **PURPOSE**: To test the acute effects of RE intensity on affect, arousal, and distress among sedentary AA PLWH who screen positive for depression. **METHODS**: Twenty-five men and 17 women ages 24-66 (47.5±11.2) with a Center for Epidemiologic Studies Depression Scale score of ≥10 completed a battery of questionnaires and 10 repetition maximum (10RM) muscular strength tests. Participants were randomized into: moderate intensity RE (MRE) (i.e., 70% of 10RM), n=21, or vigorous intensity RE (VRE) (i.e., 100% of 10RM), n=21. They had to complete 3 sets of 10 repetitions for 5 exercises. Affect, arousal, and distress were measured with the Feeling Scale, Felt Arousal Scale, and Subjective Units of Distress Scale, respectively. Measures were administered at PRE, MID, POST, at 15-minute DELAY, and at 30-minute DELAY. Changes were analyzed using ANOVAs, with Bonferroni adjustments. **RESULTS**: There were significant group x time interactions for affect (p<.05), and distress (p<.01), and main effect of time for arousal (p<.01). With MRE, affect improved PRE to POST (p<.01), PRE to DELAY15 (p<.01), and PRE to DELAY30 (p<.01), and arousal increased PRE to MID, and PRE to POST (p's<.01). In addition, distress reduced PRE to all time points (p's<.01). With VRE, affect decreased PRE to MID (p<.01), while arousal increased PRE to MID, and PRE to POST (p's<.01). In addition, distress reduced PRE to Delay15 (p<.01), and PRE to DELAY30 (p<.01). **CONCLUSIONS**: Results suggest that an acute bout of MRE is more effective than VRE in improving affect, increasing energy, and reducing distress in depressed AA PLWH. However, VRE also appears to have distress-reducing benefits. These findings should be considered when prescribing exercise for symptom management in this population.

C-09   Thematic Poster - Performance after ACL Reconstruction

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100F

1086   Chair: Brian Noehren, FACSM. *University of Kentucky, Lexington, KY.*
(No relevant relationships reported)

1087   Board #1   May 31 8:00 AM - 10:00 AM
Peak and Rapid Force Deficits during Countermovement Jump Persist Longer than Reduced Jump Height post-ACL Reconstruction

Daniel G. Cobian, Demitra R. Philosophos, Jennifer L. Sanfilippo, Mikel R. Stiffler-Joachim, Bryan C. Heiderscheit. *University of Wisconsin-Madison, Madison, WI.*
(No relevant relationships reported)

Following anterior cruciate ligament reconstruction (ACLR) athletes often demonstrate persistent lower extremity biomechanical abnormalities which may inhibit return to sports and/or contribute to increased risk of re-injury. Countermovement jump (CMJ) height is an indicator of lower extremity explosiveness and athletic ability. Phase-specific CMJ ground reaction force-time curve variables provide detailed information on jump performance, and have not yet been examined in collegiate athletes post-ACLR. **PURPOSE**: To assess eccentric (ECC) and concentric (CONC) phase CMJ maximal and rapid ground reaction force (GRF) variables in collegiate athletes post-ACLR and compare with healthy controls. **METHODS**: 18 Division I athletes (12 males) post-ACLR and 18 controls matched by sport, gender, year, and position performed maximal CMJs on force plates (800

Hz) 5.7 ± 1.8 (EARLY) and 9.8 ± 1.8 months post-surgery (LATE). ECC and CONC phase peak force, rate of force development (RFD), and rate of force unloading (RFU) were computed. Variables were analyzed by 3-way mixed ANOVAs (group x limb x interval). **RESULTS**: Jump height was significantly lower in the ACLR group EARLY (ACLR: 29.7 ± 7.5 cm, CONTROL: 35.7 ± 11.3 cm), but not LATE (33.8 ± 7.6 cm). ACLR group involved (INV) limb peak and rapid force variables were significantly reduced compared to the uninvolved limb at both intervals (Limb symmetry indices: peak ECC force - EARLY: 84.1%, LATE: 96.9%; peak CONC force - EARLY: 83.8%, LATE: 90.1%; ECC RFD - EARLY: 83.3%, LATE: 82.4%, CONC RFU - EARLY: 80.3%, LATE: 90.0%). LATE post-surgery, ACLR group INV limb peak ECC force (deficit: 10.8%), peak CONC force (7.6%), ECC RFD (41.8%), and CONC RFU (22.5%) were significantly lower compared to CONTROL athletes.
CONCLUSIONS: Although CMJ height was not significantly reduced compared to healthy controls 10 months post-surgery, collegiate athletes post-ACLR present with CMJ maximal and rapid force deficits between limbs and when compared to healthy controls. These findings indicate that kinetic abnormalities persist despite minimal limitation in jump height, the most common CMJ performance metric. Deficits in rapid GRF capacity are greater than deficits in maximal GRF capacity and have practical relevance, as sports activities have limited time available for force development.

1088   Board #2   May 31 8:00 AM - 10:00 AM
Neuromuscular Training improves Sagittal Plane Hip and Knee landing Kinematics and Kinetics In Acl-reconstructed athletes

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(No relevant relationships reported)

Deficits in hip and knee biomechanical and neuromuscular control are commonly observed in anterior cruciate ligament (ACL) reconstructed (ACLR) athletes and are associated with an elevated risk of future ACL injury. The efficacy of neuromuscular training (NMT) programs to improve hip and knee biomechanical deficits in ACLR athletes is currently unknown.**PURPOSE:** To quantify the effect of a NMT program in ACL-reconstructed athletes to improve sagittal plane landing biomechanics. The primary hypothesis tested was that sagittal plane hip and knee biomechanics associated with greater risk of ACL injury would be significantly reduced in ACLR athletes after participation in an NMT program. It was further hypothesized that following training hip and knee sagittal plane biomechanics in the ACLR cohort would not differ from a control cohort who also completed the training program.
METHODS: Eighteen ACLR and ten control athletes were recruited and completed a 12 session NMT program. Both groups of athletes participated in three-dimensional motion analysis prior to and after completion of the NMT program to evaluate hip and knee kinematics and kinetics during a drop vertical jump. Repeated measures ANOVA was conducted to determine the effect of training on kinematic and kinetic measures in ACLR athletes. In addition, a two-way ANOVA was conducted to compare post-training differences between the ACLR and control group. **RESULTS**: The ACLR athletes demonstrated significantly greater hip and knee flexion angle at initial contact and lower hip and knee flexion moment at initial contact after participation in the NMT program (p<0.05). Post-training comparison between the ACLR and control group showed no significant differences (p>0.05) in hip and knee flexion moment at initial contact and knee flexion angle at initial contact. The ACLR group landed with significantly greater (p>0.05) hip flexion angle at initial contact than the control group after training.
CONCLUSIONS: Hip and knee sagittal plane biomechanical and neuromuscular measures of ACL injury risk demonstrate significant improvements after completion of a NMT program in ACLR athletes. In addition, comparison of post-training hip and knee biomechanics between ACLR athletes and controls demonstrate recovery of biomechanical control.

1089   Board #3   May 31 8:00 AM - 10:00 AM
Biomechanical Adaptations After Exercise in Healthy and ACL Reconstructed Individuals

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(No relevant relationships reported)

Athletes with history of anterior cruciate ligament (ACL) reconstruction (ACLR) who return to high level of sport are at increased risk of another ACL injury during a game. Neuromuscular fatigue during sport may result in adaptive movement patterns that increase risk of injury. **Purpose:** Compare changes in an ACLR limb and a healthy limb based on fitness level after exercise. **Methods:** Thirty-three individuals with history of ACLR (22F/11M, 22.7±23.3 months post-surgery) and 29 healthy

individuals (18F/11M) were divided into two groups based on VO$_2$max (higher fit and lower fit). Sagittal, frontal, and transverse knee, hip, and trunk kinematics and triplanar knee and hip internal moments were measured on the involved limb before and after exercise. Data were reduced to 101 points for 0-100% of the gait cycle for kinematics and reduced to 41 points for 0-40% of the gait cycle (stance phase) for kinetics. Change scores were calculated for each 1% with 90% confidence intervals. Significant differences between groups were determined when confidence intervals did not overlap for three or more consecutive points. Mean differences were calculated for all significant differences. **Results:** Higher fit ACLR demonstrated decreased knee (-3.13°) and hip flexion (-2.14°) and increased trunk flexion (1.59°) and knee abduction (2.79°) compared to healthy individuals after exercise. Higher fit ACLR also demonstrated increased knee flexion moment (0.18Nm/kg) and hip extension moment (0.21Nm/kg) after exercise. Lower fit ACLR demonstrated increased hip adduction (1.48°), knee external rotation (3.57°), hip external rotation (2.87°), and trunk rotation (3.61°) compared to healthy individuals after exercise. **Conclusions:** Higher fit ACLR demonstrated more sagittal plane changes while lower fit ACLR demonstrated increased transverse plane motion after exercise, suggesting that fitness level should be a consideration when making return to activity decisions after ACLR.

1090   Board #4   May 31 8:00 AM - 10:00 AM

Influence of Lower Extremity Muscle Activation on Altered Landing Biomechanics in ACL Reconstructed Individuals

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(No relevant relationships reported)

While altered landing biomechanics contribute to secondary ACL injury following reconstruction (ACLR), neuromuscular contributions to altered landings are unknown. Understanding this relationship may lead to more effective rehabilitation programs and mitigate re-injury risk. **PURPOSE:** To determine differences in landing biomechanics between ACLR and healthy controls and how muscle activation predicts altered landing biomechanics. **METHODS:** Thirty-six females with ACLR and 14 controls (19.4±1.7yrs, 168.5±6.7cm, 66.9±9.4kg) participated. 3D biomechanics of the reconstructed (ACLR) or dominant (Control) limb were collected during 5 jump landings (JL). The average peak root mean square amplitude (RMS) of 6 muscles [gluteus medius (GMED), gluteus maximus (GMAX), biceps femoris (BF), semitendinosis (ST), vastus lateralis, rectus femoris (RF)] was calculated 50ms prior to initial contact (PRE) and during landing (LAND), normalized to peak RMS. ANOVAs determined differences (P<0.05) in landing biomechanics between groups, and separate step-wise regressions examined whether muscle activation predicted altered landing biomechanics in ACLR individuals. **RESULTS:** ACLR individuals landed (ACLR, control) with greater peak knee external rotation (ER) (-10.4±7.4°, -5.0±5.1°, P=0.016), peak hip flexion (FLX) (-89.4±15.8°, -75.6±21.8°, P=0.017), hip FLX excursion (-51.2±12.5°, -40.2±16.1°, P=0.013), peak knee abduction (ABD) moment (-0.8±1.1, 0.1±0.2, P=0.035), less peak hip adduction (ADD) (-1.3±5.5°, 2.5±6.8°, P=0.046) and less peak knee internal rotation (4.8±7.8°, 9.5±6.1°, P=0.049) compared to controls. In the ACLR: less BF and GMAX LAND predicted greater peak hip FLX (R^2=0.320, P=0.002); less BF LAND, RF PRE, GMAX LAND, and greater ST PRE EMG predicted greater hip FLX excursion (R^2=0.475, P=0.001); greater RF PRE EMG predicted greater peak hip ADD (R^2=0.142, P=0.026); greater BF PRE EMG predicted greater peak knee ER (R^2=0.161, P=0.017); and less GMED PRE predicted greater knee ABD moment (R^2=0.122, P=0.040). **CONCLUSIONS:** ACLR individuals adopt altered landing strategies that increase the risk of re-injury. Muscle activation patterns that mediate altered landings provide valuable information toward developing targeted neuromuscular interventions and decreasing ACL re-injury risk.

1091   Board #5   May 31 8:00 AM - 10:00 AM

Fear of Reinjury is Associated with Knee Biomechanics During Single Limb Landing after ACL Reconstruction

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(No relevant relationships reported)

Biomechanical alterations after anterior cruciate ligament reconstruction (ACLR) are thought to predict reinjury and are common at return to play. These aberrant movement patterns are highlighted by lower sagittal plane knee angles and moments, and greater asymmetry between limbs. Emerging data suggest that fear of reinjury can hinder rehabilitative success. Identifying whether a patient's fear of reinjury is associated with biomechanical alterations is critical to understanding the role of psychological factors after ACLR on movement control. **PURPOSE:** To evaluate the relationship between knee biomechanics during a single limb hop and a patient's fear of reinjury. **METHODS:** Ten participants with a history of unilateral ACLR

(age 22±2y; height 166.4±7.1cm; mass 65.6±12.1kg; years from surgery, 6±2) volunteered. Lower extremity biomechanics were recorded using 3D motion analysis during a single limb forward hop task. For the injured limb, area under the curve (AUC) during the first 50% of stance for knee flexion angle and internal extension moment was used for analysis. Limb symmetry indices (LSIs) were derived by normalizing to the contralateral limb. Fear of reinjury was measured using the Tampa Scale of Kinesiophobia (TSK), which uses a high score to indicate greater fear of reinjury. Initial Spearman correlations and linear regressions were used to determine the association between biomechanical measures and TSK. **RESULTS:** Knee flexion angle (rho=-0.75, p=0.01) and extension moment (rho=0.67, p=0.03) AUC values for the ACLR limb were negatively associated with TSK scores, predicting 56.4% (p=0.01) and 44.5% (p=0.03) of variance in TSK scores, respectively. Knee flexion angle (rho=0.03, p=0.92) and extension moment (rho=0.01, p=0.96) AUC LSIs were not associated with TSK. **CONCLUSIONS:** Greater knee flexion angle and extension moment AUC of the ACLR limb were associated with less fear of reinjury, indicating those who have lower fear completed the hopping task with more optimal biomechanics. LSIs were not associated with fear of reinjury indicating that biomechanical symmetry may not be the best predictor of fear of reinjury after ACLR. Fear of reinjury and optimization of movement control in the ACLR limb during rehabilitation, rather than limb symmetry, may help to improve ACLR outcomes at return to play.

1092   Board #6   May 31 8:00 AM - 10:00 AM

Functional Knee Bracing Improves Loading Symmetry Following ACL Reconstruction

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Reported Relationships: *R. Queen: Contracted Research - Including Principle Investigator; Don Joy Orthopaedics.*

Previous work has revealed significant between limb asymmetry following anterior cruciate ligament reconstruction (ACLR). Current clinical return to sport testing utilizes single-limb hop distance symmetry (limb symmetry index (LSI) > 90%) and time since surgery to determine readiness to return to sport (RTS). Loading metrics could provide new insights on readiness to RTS. Functional knee braces are recommended by clinicians following ACLR. The impact of bracing on hop symmetry is not well understood. **Purpose**: To evaluate the effect of knee bracing and time since surgery on loading symmetry during hop testing (single hop (SH), triple hop (TH) and crossover hop (CH)). **Methods**: 25 ACLR (6 male/19 female, age: 18.7, height: 1.73 m, weight: 709.7 N) completed hop testing after being RTS (29.8 weeks post-op) by the orthopedic surgeon and again 3 months later (RTS +3), while wearing the loadsol (100Hz) (Novel Electronics, St. Paul, MN). Hopping tasks (SH, TH and CH) were collected twice per task. Testing (testing order was randomized) was completed with and without a custom extension constraint knee brace (DonJoy Orthopaedics). Peak vertical ground reaction force (vGRF), loading rate (LR), and impulse (Imp) were calculated using a custom Matlab program. The LSI was calculated as the ratio of the Sx/NSx*100%. The effect of time (RTS, RTS +3) and condition (Braced, Non-Braced) was assessed using a repeated measures ANOVA for all tasks. **Results**: No significant interactions or main effects for time were found. Bracing resulted in improved LSI's for vGRF during TH (p<0.039) and CH (p<0.013) and for Imp during the TH (p<0.039) (Table 1). **Conclusion**: These results reveal that loading symmetry is improved while wearing a functional knee brace and loading symmetry (LSI>90%) was achieved during most hopping tasks. Future work needs to examine additional functional measures (eg. bilateral landings, running) to determine the impact of functional knee bracing and time on loading LSI.

Table 1

	Single Hop			Triple Hop			Cross-over Hop		
	vGRF	LR	Imp	vGRF	LR	Imp	vGRF	LR	Imp
RTS	93.24 (4.177)	89.05 (6.772)	92.897 (2.673)	87.362 (2.792)	89.478 (4.564)	90.992 (2.134)	91.807 (3.770)	92.611 (5.133)	94.835 (2.576)
RTS +3	97.791 (1.984)	107.937 (6.711)	95.264 (1.397)	92.124 (2.615)	93.340 (5.151)	92.908 (1.974)	93.179 (1.508)	95.375 (3.780)	92.820 (1.369)
Braced	97.107 (2.938)	99.122 (6.942)	93.505 (2.493)	**91.921 (2.133)***	92.063 (4.374)	**93.256 (1.887)***	**96.042 (2.406)***	96.319 (3.186)	93.593 (1.647)
Non-braced	93.928 (2.676)	97.865 (6.635)	94.656 (1.762)	**87.565 (2.463)***	90.754 (4.493)	**90.643 (1.762)***	**88.944 (2.124)***	91.666 (3.497)	94.062 (1.815)

Note: values are presented as mean (SE)

1093   Board #7   May 31 8:00 AM - 10:00 AM
Effects of Localized Vibration on Knee Joint Position Sense in Individuals with ACL-Reconstruction

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(No relevant relationships reported)

Anterior cruciate ligament (ACL) injury can disrupt one's proprioception such as joint position sense (JPS) and ultimately motor function. The application of localized vibration has been used to investigate the integrity of the sensorimotor system and the mechanisms of quadriceps weakness after ACL injury and ACLR-reconstruction (ACLR). However, effects of localized vibration on knee JPS in ACLR subjects are largely unknown. **PURPOSE:** To evaluate JPS with and without vibration and compare among ACLR, contralateral, and control limbs. **METHODS:** Fourteen subjects with ACLR (8 males and 6 females) and fourteen control subjects (7 males and 7 females) participated. Subjects sat on an isokinetic dynamometer chair with vibration strapped on the quadriceps tendon while visual and auditory cues were removed. Subjects were asked to remember target position and replicate that position. The absolute difference between the target and replicated trial was used as JPS. There were three trials at three target positions (15, 45, and 75 degrees of knee flexion) with and without vibration. The JPS differences between vibration and no-vibration conditions were calculated by subtraction. The average JPS was used for analyses. The order of testing conditions was randomized. One-way analysis of variance (ANOVA) or nonparametric (Kruskal-Wallis) was used to compare among limbs. Significance was at $p<0.05$ a priori. **RESULTS:** There were no significant JPS differences among ACLR, contralateral, and control limbs ($p=0.207$-0.914) in vibration and no-vibration conditions. Similarly, when the JPS differences between vibration and no-vibration conditions were used to compare the limbs, there were no significant JPS differences among ACLR, contralateral, and control limbs ($p=0.288$-0.755). **CONCLUSION:** The current investigation found minimal effects of localized vibration on JPS in the ACLR, contralateral, and control limbs. There are several potential reasons such as vibration-induced post effect, locations of vibration, types of vibration, and rehabilitation status. Despite the current results and limitations, continued effort to develop and refine a means to examine one's sensorimotor system is warranted.

1094   Board #8   May 31 8:00 AM - 10:00 AM
Quantifying Whole Body Compensations in Ground Reaction Forces During Gait in Individuals Post-ACLr

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(No relevant relationships reported)

Individuals 3 months post-ACL reconstruction (ACLr) decrease vertical (vGRF) and posterior (pGRF) ground reaction forces during loading response (LR) of gait. At this time of double limb support (DLS), decreased loading may result from modifications by the trailing limb. **PURPOSE:** To compare GRFs between limbs during DLS in individuals post-ACLr and controls. **METHODS:** 17 individuals (11F, 24±11yrs) 114±17days post-ACLr and 17 healthy controls (CTRL; 11F, 23±8yrs) walked 1.4 m/s. DLS of stance was divided into initial (iDLS) and terminal (tDLS). Maximum vGRF and pGRF during iDLS and maximum vGRF and anterior GRF (aGRF) during tDLS were identified for ACLr, non-surgical (NS) and CTRL limbs. vGRF and anteroposterior (AP) GRF ratios were calculated: (Reference limb GRF in iDLS)/(Contralateral limb GRF in tDLS). One-way ANOVAs were used to compare variables among limbs; α=0.05, post hoc: paired and independent t-tests. **RESULTS:** Vertical (p=0.007, ACLr:0.92±.02, NS:1.00±0.02; p=.02, CTRL:0.99±0.02) and AP GRF ratios (p<0.001, ACLr:0.83±0.03, NS:0.97±0.03; p=0.001, CTRL:1.00±0.04) were reduced in ACLr compared to NS and CTRL limbs. vGRF (p=0.02, ACLr:1.01±0.01, NS:1.06±0.01; p=0.04, CTRL:1.05±0.01BW) and pGRF (p=0.001, ACLr:0.19±0.01, NS:0.22±0.01; p=.03, CTRL:0.22±0.01BW) during iDLS were reduced in ACLr compared to NS and CTRL limbs. vGRF of the contralateral limb in tDLS was greater when the ACLr limb was in iDLS compared to NS and CTRL (p=0.006, ACLr:1.10±0.01, NS:1.05±0.01; p=0.10, ES:0.56, CTRL:1.07±0.02BW). No differences were observed in aGRF between limbs (p=0.81, ACLr:0.23±0.01, NS:0.23±0.01, CTRL:0.22±0.01BW). **CONCLUSIONS:** Altered GRF ratios suggest differences among limbs in the distribution of forces between the leading and trailing limbs during LR. Reduced vGRF in the surgical limb during iDLS along with greater vGRF in the contralateral limb in tDLS limb may reflect an interlimb compensation that shifts the load to the non-surgical limb. However, no alterations in aGRF were observed suggesting reduced pGRF in the surgical limb during LR is not compensated for by the trailing limb.

1095   Chair: Alpa V. Patel, FACSM. *American Cancer Society, Atlanta, GA.*
(No relevant relationships reported)

1096   Board #1   May 31 8:00 AM - 10:00 AM
Does PhysicalActivity Reduce Cancer Risk? Latest Resultsfrom the WCRF/AICR Third Expert Report.

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(No relevant relationships reported)

Purpose World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) routinely review, synthesize and interpret the scientific literature on the links between physical activity, nutrition, and cancer through the Continuous Update Project (CUP). The WCRF/AICR Third Expert Report, to be published in 2018, will present the latest synthesis of the strength of the evidence linking physical activity to 17 cancer sites and to outcomes in breast cancer survivors. These assessments inform the update of the WCRF/AICR Recommendations for Cancer Prevention and Survival. **Methods** The research team at Imperial College London searched PubMed for relevant prospective studies and extracted literature according to the CUP Systematic Literature Review Protocol for each cancer site. Meta-analyses were conducted comparing the highest versus the lowest categories of physical activity. Where possible, dose-response meta-analyses were conducted and summary relative risks (RR) were calculated using a random effects model. The CUP Expert Panel graded the evidence as: Convincing/probable (strong evidence); Limited-suggestive (limited evidence); 3) Limited-no conclusion (limited evidence); 4) Substantial effect on risk unlikely (strong evidence). **Results** The Panel determined that strong evidence supports that physical activity decreases the risk of postmenopausal breast cancer by 13% (RR: 0.87; 0.79-0.96), premenopausal breast cancer by 17% (RR:0.83; 0.73-0.98, vigorous activity), colon cancer by 20% (RR:0.80; 0.72-0.88) and endometrial cancers by 21-27% (RR:0.79; 0.71-0.88, occupational; RR:0.73: 0.58-0.93, recreational). Studies with compatible measurements were too few to allow dose-response analysis in endometrial and colon cancer; dose-response analyses were statistically non-significant for breast cancer. Limited-suggestive evidence was found for decreased risk of liver and esophageal cancer and all-cause mortality in breast cancer survivors with highest vs. lowest physical activity levels. **Conclusions** There is strong evidence that physical activity reduces the risk of cancer at specific sites. Research is needed to determine the duration, intensity, frequency and timing of physical activity for optimal cancer risk reduction and to improve prognosis in cancer survivors.

1097   Board #2   May 31 8:00 AM - 10:00 AM
Breast Cancer and Physical Activity Level (BC-PAL) Trial: Findings on Cardiorespiratory Fitness and Body Composition

Jessica McNeil[1], Darren R. Brenner[1], Chelsea R. Stone[1], Rachel O'Reilly[1], Jeffrey K. Vallance[2], Kerry S. Courneya[3], Kevin E. Thorpe[4], Douglas J. Klein[3], Christine M. Friedenreich[1]. *[1]Alberta Health Services, Calgary, AB, Canada. [2]Athabasca University, Athabasca, AB, Canada. [3]University of Alberta, Edmonton, AB, Canada. [4]University of Toronto, Toronto, ON, Canada.*
(No relevant relationships reported)

Regular physical activity (PA) participation can improve recovery and survival following a breast cancer diagnosis. Current guidelines focus on moderate-vigorous intensity PA participation (50-85% heart rate reserve; HRR). However, approximately 85% of breast cancer survivors do not meet PA guidelines and may prefer lighter-intensity PA (≈40-60% HRR). **PURPOSE:** We assessed the effects of prescribing different PA intensities, compared to no additional PA, on cardiorespiratory fitness (VO_{2peak}), anthropometry and body composition in breast cancer survivors. **METHODS:** The Breast Cancer and Physical Activity Level (BC-PAL) Trial is a three-arm, 12-week randomized controlled trial. Forty-five inactive (≤60 minutes of moderate-vigorous PA/wk and ≤10,000 steps/day) breast cancer survivors recruited

for pilot data collection were randomized to one of three groups: no additional PA prescribed (CON), 300 min/wk of lighter-intensity PA (LIPA; 40-60% HRR) and 150 min/wk of higher-intensity PA (HIPA; 60-80% HRR). VO_{2peak} (maximal Balke protocol), anthropometric measures (height, weight, waist and hip circumferences) and body composition (DXA) were assessed at baseline and end of study. Participants in both PA groups received written resources on PA, an activity tracker (Polar A360®) to record heart rate and PA time, and a diary to record PA goals, facilitators and barriers throughout the intervention. In-person/telephone meetings occurred every three weeks to review activity tracker data, reinforce adherence and discuss barriers to achieving the prescribed PA goals.

RESULTS: Statistical differences in VO_{2peak} between groups were noted. Specifically, increases in VO_{2peak} were noted in HIPA vs. CON (5.9±6.4 vs. 0.5±3.0 ml/kg/min; $P = 0.01$) and LIPA vs. CON (4.2±4.9 vs. 0.5±3.0 ml/kg/min; $P = 0.03$). No significant changes in BMI (0.3±0.9, -0.1±0.8, -0.0±1.4 kg/m²; $P = 0.6$), waist (1.2±4.2, -1.1±3.3, -1.1±3.8 cm; $P = 0.2$) and hip (0.8±1.7, -0.2±2.7, -0.2±2.1 cm; $P = 0.4$) circumferences, body fat (0.1±1.4, -0.4±1.9, -1.1±2.3 kg; $P = 0.3$) and lean (0.4±0.8, -0.1±1.4, 0.7±1.5 kg; $P = 0.3$) mass were observed between CON, LIPA and HIPA, respectively.

CONCLUSIONS: Pilot results indicate that improvements in cardiorespiratory fitness can be achieved with both higher- and lower-intensity PA in breast cancer survivors.

1098   Board #3   May 31 8:00 AM - 10:00 AM

Self-reported Physical Activity Is Associated With Angiogenesis- And Inflammation-related Biomarkers In Colorectal Cancer Patients: Results From The Colocare Cohort

Caroline Himbert[1], Biljana Gigic[2], Christy A. Warby[1], Tengda Lin[1], Petra Schrotz-King[3], Clare Abbenhardt-Martin[3], Stephanie Skender[3], Nina Habermann[4], Lin Zielske[2], Alexis Ulrich[2], Juergen Boehm[1], Jennifer Ose[1], Cornelia Ulrich, FACSM[1]. [1]Huntsman Cancer Instiute, Salt Lake City, UT. [2]University Clinic of Heidelberg, Heidelberg, Germany. [3]National Center for Tumor Diseases, Heidelberg, Germany. [4]European Molecular Biology Laboratory, Heidelberg, Germany. (Sponsor: Jim Martin, FACSM)

(No relevant relationships reported)

Background: Increased physical activity among cancer patients is associated with decreased cancer-related deaths and improved quality of life. The underlying mechanisms of this association are under investigation. We examined the association between biomarkers of angiogenesis and inflammatory pathways and physical activity in colorectal cancer patients.

Materials/Methods: Pre-surgery (baseline) serum samples were collected from 222 colorectal cancer patients in the ColoCare cohort. Levels of CRP, SAA, IL-6, IL-8, MCP-1, sICAM-1, sVCAM-1, TNFα, VEGFA, and VEGFD were measured with the Meso Scale Discovery platform. Self-reported physical activity levels were assessed at baseline by using the VITAL questionnaire from the VITamins And Lifestyle cohort study and calculated into metabolic equivalent (MET) hours/week (h/wk). Patients were classified into ≤10 METs versus >10 METs hours/week based on the American Cancer Society (ACS) cancer prevention recommendations. Partial correlations, t-test, and multinomial linear regression adjusted for age, gender, and body mass index were used to quantify the associations between biomarker and physical activity levels.

Results: A total of 132 patients (59%) reported weekly physical activity levels below cancer prevention recommendations. Lower METs h/wk were significantly correlated with increased IL-8, sICAM-1, and VEGFD serum levels (r=-0.14, p=0.046, r=-0.15, p=0.047; r=-0.20, p=0.006, respectively). sVCAM-1 and VEGFD also significantly differed by METs h/wk groups, where increased physical activity was associated with decreased biomarker levels (≤10 METs h/wk vs. >10 METs h/wk, sVCAM-1: 0.6 ± 0.2 vs. 0.6 ± 0.2, p=0.03; VEGFD: 926 ± 308 vs. 791 ± 240, p=0.002).

Discussion: For the first time, we report an association between not only inflammation-related, but also angiogenesis-related biomarkers among patients diagnosed with colorectal cancer. This research contributes to our understanding regarding potential mechanisms of physical activity in relation to cancer development, and prognosis.

1099   Board #4   May 31 8:00 AM - 10:00 AM

Pennsylvania Cancer Survivors And Their Adherence To The ACSM Physical Activity Guideline

Joachim Wiskemann, Wayne Foo, Renate M. WInkels, Shirley M. Bluthmann, Scherezade K. Mama, William Calo, Eugene Lengerich, Joel Segel, Kathryn H. Schmitz, FACSM. *The Pennsylvania State University, Hershey, PA.* (Sponsor: Kathryn Schmitz, FACSM)

(No relevant relationships reported)

PURPOSE: To investigate whether Pennsylvania cancer survivors adhere to the ACSM exercise and cancer roundtable guidelines recommending to perform either 75 min of vigorous aerobic exercise per week or, 150 min of moderate aerobic exercise per week, or an equivalent combination, and to performed muscle-strengthening exercises at least two times weekly.**METHODS**: We analyzed data from cancer survivors (n=585), identified using the Pennsylvania Cancer Registry, who were mailed a BRFSS-based questionnaire. We created four guideline-related groups (meeting aerobic guideline, meeting strength guideline, meeting both guideline and not meeting any guideline aspects). We evaluated whether demographic factors (e.g. age, gender, education), health aspects (e.g. smoking, comorbidities, general health status) or disease-related factors (e.g. cancer type, time since diagnosis) were associated with meeting the PA guideline.

RESULTS: Out of 585 respondents 449 (77%) provided sufficient PA data to be included in the analysis. Overall 84 (18.7%) of participants met both, 144 (32.1%) met the aerobic and 28 (6.2%) met the strength guideline. However, 192 (43%) did not meet any aspects of the guideline. Participants with higher education (p=.01) and unemployed/retired participants (p=.04) were more adherent to PA guidelines (main differences for the subcategory meeting both guideline aspects). Having more than two comorbidities (p<.01), being a smoker (p=.04) or being overweight/obese (p<.01) and having a lower general health perception (p<.01) was associated with lower adherence rates for PA guidelines. With regard to disease-related factors no significant differences were found. However, cancer type was borderline non-significant (p=.055) showing lower adherence rates for lung and gynecologic (other than breast) cancer patients.

CONCLUSIONS:More than 50% of Pennsylvania cancer survivors were meeting at least one component of the ACSM PA guideline for cancer patients. Various factors were found to be associated with adherence to the guideline. Identifying predictors for low guideline adherence can help to identify patient groups that may benefit from increased support to achieve a physically active lifestyle.

1100   Board #5   May 31 8:00 AM - 10:00 AM

Differences In Physical Activity Patterns Between Adults With And Without Cancer History

Amal A. Wanigatunga[1], Gillian K. Gresham[2], Pei-Lun Kuo[1], Pablo Martinez-Amezcua[1], Vadim Zipunnikov[1], Sydney M. Dy[1], Eleanor M. Simonsick[3], Jennifer A. Schrack[1]. [1]Johns Hopkins University, Baltimore, MD. [2]Cedars-Sinai Medical Center, Los Angeles, CA. [3]National Institute on Aging, Baltimore, MD. (Sponsor: Todd M. Manini, FACSM)

(No relevant relationships reported)

ABSTRACT

Purpose: Patterns of activity and rest in a typical day may provide insight into functional capacity and reserve in older cancer survivors that may not be apparent in examining total physical activity alone. Using objectively collected PA data from the Baltimore Longitudinal Study of Aging, we assessed differences in the accumulation of daily PA among older adults by cancer history.

Methods: 663 participants (mean age 71 +/- 10 years, 51% women) wore a chest-fitted accelerometer for 7 consecutive days. Participants self-reported cancer history via questionnaire. Accelerometer data were summarized into two continuous metrics: 1) log-transformed total daily PA volume defined as mean counts/day and 2) a fragmentation index defined as the total number of PA bouts (consecutive minutes registering at 10+ counts/min)/total PA minutes. Volume and fragmentation were also each dichotomized into low and high categories using their medians. Participants were categorized into four groups: high PA/low fragmentation, low PA/low fragmentation, high PA/high fragmentation, and low PA/high fragmentation to assess patterns of daily PA accumulation. Multivariable regression models were used to estimate PA pattern differences by cancer history, adjusting for demographics, behavioral factors and number of morbid conditions.

Results: Participants reporting cancer history averaged 0.12 (SE=0.05, p=0.02) fewer log-transformed activity counts per day compared to those reporting no cancer history. Although no significant fragmentation differences were detected between cancer groups (p=0.15) in the continuous model, cancer history was associated with a 78% (odds ratio (OR): 1.78, 95% confidence interval (CI): 1.11-2.82) higher odds of being in a high (versus low) fragmentation group and a 93% (OR: 1.98, 95% CI: 1.13-3.32) higher odds of being in a low PA/high fragmentation group (versus high PA/low fragmentation group) when compared to no cancer history.

Discussion: These results suggest that cancer survivors engage in lower total daily PA and that this activity is performed in a more fragmented manner, compared to those with no cancer history. Collectively, these results may be attributable to lower reserve capacity and greater fatigue burden among older cancer survivors that warrant further investigation.

THURSDAY, MAY 31, 2018

1101   Board #6   May 31 8:00 AM - 10:00 AM

Exercise Is More Effective Than Health Education In Reducing Fatigue In Fatigued Cancer Survivors

Patricia Sheehan, Suzanne Denieffe, Michael Harrison, FACSM. *Waterford Institute of Technology, Waterford, Ireland.*
(No relevant relationships reported)

Cancer-related fatigue is the most debilitating side effect reported by cancer survivors, often lasting years following treatment. **PURPOSE**: To determine the effects of a 10 wk exercise intervention compared to a health education intervention on fatigue, psychological health outcomes and physical fitness in cancer survivors with documented fatigue. **METHODS**: This quasi experimental study allocated 37 post-treatment cancer survivors (33 female, 30 breast cancer, aged 55±2 yr, body mass index 28.5±1.3, time since treatment 2.3±0.3 yr; mean±SEM) to an exercise group (ExG, n=19) or health education comparison group (HEG, n=18). The intervention, with 2 min increments weekly, was tailored to fatigued individuals and emphasized brisk walking, stretching, exercise education and self-efficacy enhancement. Participants were evaluated at 0, 4, 8 and 10 weeks with the ExG evaluated again at 26 weeks. **RESULTS**: The intervention effect on fatigue (FACT-F) in ExG was greater (p<0.05) than in HEG, the difference between groups at 10 weeks being 4 times the recognised clinical important difference. The intervention also increased (p<0.05) cognitive function, global quality of life, 6 min walk test and 30 sec sit to stand scores. It reduced (p<0.05) insomnia and fear of physical activity. There was no intervention effect on C-reactive protein, total leukoytes, lymphocytes, monocytes or granulocytes, or on pulse wave velocity. The intervention effect on fatigue in ExG was largely achieved by wk 4 and maintained to 26 weeks. There was 100% retention rate at 10 weeks in both experimental groups and no adverse events reported. **CONCLUSIONS**: In survivors with documented fatigue, progressive exercise training has beneficial and sustained effects of considerable magnitude on fatigue, physical fitness and other quality of life outcomes beyond those attributable to peer support and investigator attention. These effects do not appear to be mediated by inflammatory factors.

Fatigue and fitness changes following an exercise intervention in fatigued cancer survivors				
.	Exercise		Health Education	
Outcome	Pre-	Post	Pre-	Post
‡ Fatigue (FACT-F)	19.3±2.2	40.3±2.4 *	21.9±2.2	29.6±2.5 *
‡ Quality of Life (EORTC QLQ-C30)	50.0±4.6	69.3±4.7 *	48.1±4.7	50.5±4.9
‡ Cognitive Functioning (EORTC QLQ-C30)	41.2±7.7	71.9±6.5 *	50.9±7.9	51.9±6.7
‡ Insomnia Severity (ISI)	15.2±1.8	8.2±1.6 *	15.5±2.0	13.3±1.8
‡ Fear of physical activity (FAPX-B)	28.9±6.3	13.1±3.7 *	28.3±6.3	27.1±3.7
‡ 6 min walk test (m)	438±16	602±18 *	462±19	496±21
‡ 30 sec Sit to Stand (reps)	13.4±0.8	23.8±1.2 *	11.6±0.8	12.6±1.2
Pulse Wave Velocity (m/s)	5.8±0.8	6.2±0.6	7.9±8.3	7.7±0.6
C reactive protein (mg/L)	1.9±0.6	2.9±0.8	3.1±0.7	2.9±0.9

*Values are mean ± SEM. * p<0.05 compared to pre- value in same group. ‡ significant group x timepoint interaction*

1102   Board #7   May 31 8:00 AM - 10:00 AM

Effects of a Lifestyle Intervention on Change in Body Composition in Prostate Cancer Patients Undergoing Androgen Deprivation Therapy

Zachary L. Chaplow[1], Brian C. Focht, FACSM[1], Alexander R. Lucas[2], Elizabeth Grainger[1], Christina Simpson[1], Ciaran M. Fairman[1], Jennifer M. Thomas-Ahner[1], Victoria R. DeScenza[1], Jessica Bowman[1], Jackie Buell[1], Steven K. Clinton[1]. [1]*The Ohio State University, Columbus, OH.* [2]*Wake Forest University, Winston Salem, NC.* (Sponsor: Brian C. Focht, FACSM)
(No relevant relationships reported)

Androgen deprivation therapy (ADT) is a foundation of treatment for a many prostate cancer (PCa) patients. However, the adverse effect of ADT on body composition place PCa patients at increased risk for sarcopenic obesity, cardiovascular disease, and metabolic syndrome. The synergistic benefits of promoting concomitant change in both exercise and dietary behavior (EX+D) could represent an optimal lifestyle intervention approach for offsetting the adverse effects of ADT on body composition. Nonetheless, knowledge of the effects of lifestyle EX+D interventions on change in body composition remains relatively limited. **PURPOSE**: The purpose of the single-blind, randomized controlled Individualized Diet and Exercise Adherence-

Pilot (IDEA-P) trial is to evaluate the preliminary efficacy of an EX+D intervention, implementing a group-mediated cognitive behavioral (GMCB) approach, relative to standard of care (SC) treatment among PCa patients undergoing ADT. In the current study, we evaluated the effects of the EX+D intervention on select body composition outcomes. **METHODS**: A total of 32 PC patients (*M* age = 65 years) on ADT were randomly assigned to the EX+D (n = 16) or SC (n = 16) interventions. Measures of body composition were obtained via Dual x-ray absorptiometry (DEXA) at baseline and 3-month follow-up assessments. **RESULTS**: Results of intention to treat 2 (Intervention) x 2 (Time) ANOVA analysis yielded significant Intervention x Time interactions for android, gynoid, and total body fat (p<0.05). Post hoc analysis revealed that the EX+D intervention resulted in significant reduction in android, gynoid, and total body fat while no change in any body composition outcomes were observed with the SC intervention across 3 months. **CONCLUSIONS**: Findings from the IDEA-P trial suggest that an EX+D intervention, implementing a GMCB approach designed to promote adoption and adherence to lifestyle behavior change, resulted in superior improvements in key body composition outcomes relative to SC approach. Given the meaningful impact favorable body composition changes may have on chronic disease risk, these results underscore the utility of including EX+D intervention in the adjuvant treatment of PCa patients undergoing ADT.

1103   Board #8   May 31 8:00 AM - 10:00 AM

Breast Cancer Survivors Maintain Exercise after Breast Cancer Survivors Maintain Exercise after Team Triathlon Training

Linda B. Piacentine[1], Judy A. Tjoe[2], Leslie J. Waltke[2], Aidan M. Flanagan[1], Elizabeth M. DePauw[1], Julia A. Hilbert[1], Lauren Opielinski[1], Alexander V. Ng, FACSM[1]. [1]*Marquette University, Milwaukee, WI.* [2]*Aurora Health Care, Milwaukee, WI.*
(No relevant relationships reported)

Breast Cancer Survivors (BCS) often do not exercise at recommended levels. Estimates are that only 21% exercise at recommended levels 10 years after treatment. Interventional exercise programs examining exercise maintenance have found 49% to 58% maintain exercise at 6 months, and less then 50% of BCS can be expected to maintain exercise levels at 1 year or longer. Our previous studies have shown improvement in physical and psychosocial function with a 14-week training program. The 14-week triathlon training was comprised of two supervised group sessions and three home-based sessions per week. The training program culminated with participation in a sprint distance triathlon (0.25-0.5 mi swim, 12-15 mi bike, 3.1 mi run). **PURPOSE**: To determine if BCS who participate in a triathlon training program maintain high exercise levels after training. **METHODS**: Female BCS (n=156) were asked to complete a mailed survey about their leisure time activity 1-6 years after completing a triathlon training program. A Leisure Score Index (LSI) was derived from the Godin Leisure-Time Activity Questionnaire in the survey. Those completing the survey who reported the highest and lowest LSI scores were invited to participate in testing which included weight, BMI, body fat and circumference measurements as well as a 6-minute walk test and the FACIT-fatigue scale. **RESULTS**: Eighty (75%) reported LSI of 24 or greater. A subset of BCS with high (H) scores (n=6) and low (L) scores (n=5) were tested. No significant group differences (p>.05) were noted in age (H=62.3(5.1), L=56.6(5.7)yrs), time since training (H=3.2(1.7), L=3.2(1.3) yrs), and 6MWT (H=593.2(60.6), L=553.4(29.6) min p>0.1). Group differences were found in hip circumferences (H=96.2(6.9) L=116(11.5) cm, p<.01), waist circumferences (H=79.8(11.2) L=97.5(9.1) cm, p<.05), weight (H= 61.0(9.9) L=86.2(12.9)kg, p<.01), BMI (H=23.2(3.2), L=39.2(13.7) p<.05), body fat % (H=36.7(2.4) L=46.8(5.1), p<.01) and fatigue (H=49.3(2.1), L=34.8 (14.8) p≤.05). Data are mean (sd). **CONCLUSIONS**: Structured training for BCS can lead to higher levels of activity maintenance at 1-6 years after training. Thus, triathlon training could lead to continued exercise, less fatigue, and better health in breast cancer survivors.

C-11   Thematic Poster - **Sleep**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Lower level L100H

1104   **Chair:** Edward F. Coyle, FACSM. *University of Texas at Austin, Austin, TX.*

(No relevant relationships reported)

1105   Board #1   May 31 8:00 AM - 10:00 AM

The Influences of Acute and Chronic Sleep Duration on Endurance Performance in Female Youth Athletes

Andrew Watson, Kristin Haraldsdottir, Stacey Brickson. *University of Wisconsin-Madison, Madison, WI.*

(No relevant relationships reported)

Prior research has evaluated the influence of sleep deprivation on endurance performance, but the influence of real-world variation in acute and chronic sleep in youth athletes is unknown. **Purpose:** To determine the relationship between acute, chronic, and acute:chronic sleep on aerobic performance in female youth soccer athletes. **Methods**: 59 female soccer players (13-18 years) underwent cycle ergometer testing to determine maximal aerobic capacity (VO_{2max}), time to exhaustion (T_{max}) and ventilatory threshold (VT). Subjects were asked to report prior night sleep duration and average sleep duration during the previous calendar month. Acute:chronic sleep was calculated as the ratio of prior night and prior month sleep. Variables were grouped by prior night and prior month sleep duration (<8 hours, ≥8 hours) as well as acute:chronic sleep (<1, ≥1). VO_{2max}, T_{max}, and VT were compared between groups using least square means from age-adjusted linear models. Effect size was calculated as Cohen's d. **Results:** No statistically significant differences were identified between those subjects who slept ≥8 the prior night and those who slept <8 hours, with respect to VO_{2max} (50.3 ± 2.4 v 47.6 ± 2.0 ml/kg/min, p=0.10, d=0.45), T_{max} (15.7 ± 0.7 v 14.9 ± 0.9 min, p=0.17, d=0.37), or VT (43.2 ± 1.9 v 40.7 ± 2.2 ml/kg/min, p=0.09, d=0.46). Subjects who averaged ≥8 hours of sleep in the prior month demonstrated significantly greater VO_{2max} (50.4 ± 3.2 v 45.2 ± 1.7 ml/kg/min, p=0.011, d=0.83) and VT (43.0 ± 1.5 v 39.0 ± 2.9 ml/kg/min, p=0.016, d=0.78), but not T_{max} (15.6 ± 0.6 v 14.8 ± 1.2 min, p=0.24, d=0.37). On the other hand, subjects who slept more the previous night than over the previous month (acute: chronic ≥1) demonstrated greater T_{max} (16.4 ± 1.0 v 14.9 ± 0.7 min, p=0.012, d=0.73), but not VO_{2max} (50.1 ± 2.8 v 48.7 ± 1.3 ml/kg/min, p=0.38, d=0.25) or VT (42.7 ± 2.5 v 41.9 ± 1.7 ml/kg/min, p=0.60, d=0.15). **Conclusion:** Among female adolescent athletes, greater sleep duration over the prior month is associated with increased VO_{2max} and VT, while increased prior night sleep relative to the preceding month was associated with increased T_{max}. This suggests that chronic sleep may facilitate physiologic adaptation to increase aerobic capacity, while acute:chronic sleep may exert a greater influence on perceived exertion that impacts overall performance.
1

1106   Board #2   May 31 8:00 AM - 10:00 AM

Effects of 36 h of Sleep Deprivation on Physical Performance

Edward F. Coyle, FACSM, Michael R. Casner, Steve Kornguth. *University of Texas at Austin, Austin, TX.*

(No relevant relationships reported)

Acute sleep deprivation is often experienced in military operations. **PURPOSE:** To determine if 36h of sleep deprivation influences physical and cognitive performance. **METHODS:** Twenty-seven physically fit college age men and women, mostly from the U.S. Military Academy at West Point, were evaluated on Day 1 (baseline) and then again on Day 2 after missing a night's sleep and being awake for 36h. Peak oxygen consumption while cycling (VO_2peak) was measured breath by breath using a mass spectrometer, and time to fatigue was determined. Deoxygenated hemoglobin of the vastus lateralis was measured with near infrared spectroscopy. Maximal neuromuscular power was measured using the inertial load ergometer. Cognitive performance was assessed from the two-back test and reaction time. **RESULTS:** The differences between Day 1 and Day 2 were small or non-existent. Peak HR was reduced slightly from 193.6 ± 8.4 bpm to 191.7 ± 8.6 bpm (p < 0.05). Furthermore, during the first stage of submaximal exercise the oxygen cost of cycling increased from 44.7 ± 8.7% to 48.0 ± 7.4% VO_2peak ; p < 0.01). VO_2peak was 3,619 ± 1,026 mL/min vs. 3,671 ± 1,038 mL/kg, respectively; (p = 0.274). Time to fatigue was not different between the two trials (347 ± 168 seconds vs. 347 ± 186 seconds (p = 0.954) and deoxygenated hemoglobin of the vastus lateralis increased similarly. Maximal neuromuscular power was not different on the two days (1,188±268 watts vs. 1,173±215 watts). Cognitive performance was similar on Days 1 and 2, although it did decline during exercise due to divided attention. **CONCLUSION**: Missing a night's sleep and being awake for 36h has little influence on aerobic performance or maximal neuromuscular power although it does appear to slightly reduce peak heart rate and increase the oxygen cost of low intensity exercise.
Supported by grant: U.S. Army #W911NF

1107   Board #3   May 31 8:00 AM - 10:00 AM

The Effect Of Sleep Duration On Sleep Quality In Elite Soccer Athletes

Ryan M. Curtis[1], William M. Adams[2], Courteney L. Benjamin[1], Yasuki Sekiguchi[1], Douglas J. Casa, FACSM[1]. *[1]University of Connecticut, Storrs, CT. [2]University of North Carolina at Greensboro, Greensboro, NC.* (Sponsor: Douglas Casa, FACSM)

(No relevant relationships reported)

PURPOSE: To examine the effect of sleep duration on sleep quality in elite soccer athletes. **METHODS**: Twenty-two male collegiate soccer players (mean±SD; age, 20±1y; height, 181.2±6.5cm; body mass, 79.4±6.9kg; VO_{2max}, 50.9±4.4 ml•kg⁻¹•min⁻¹) participated in this study. Participant sleep observations were recorded via wrist-worn actigraphy throughout the complete 2016 competitive season from August to November (1450 files). Sleep was categorized according to sleep duration: <6 hours (580 files), 6-8 hours (643 files), and >8 hours of sleep (227 files). Percentage of time in bed spent in wake time (WT%), light sleep time (LS%), slow wave sleep time (SWS%), and rapid eye movement time (REM%) were used to assess sleep quality. Significant differences between sleep groupings and effect of sleep duration ($Sleep_{Hours}$) on sleep quality was assessed via linear mixed effects models and subsequent tukey post hoc testing (p<0.05). Results are presented as Mean±SE, mean difference (MD) and 95% confidence intervals (95%CI). **RESULTS**: Athletes who slept <6 hours had significantly more WT% (Mean±SE, 15.2%±0.6%) than athletes who slept between 6-8 hours (MD [95%CI], -1.9% [-0.9%, -2.8%], p<0.01) and >8 hours (-1.7% [-0.4%, -3.1%], p<0.01). Athletes who slept >8 hours had significantly more REM% (15.4%±1.1%) than athletes who slept between 6-8 hours (-1.4% [-0.1%, -2.8%], p<0.05) and <6 hours (-1.7% [-0.3%, -3.1%], p<0.05). There were no significant relationships found between sleep duration, LS% and SWS% (p>0.05). For every one hour increase in $Sleep_{Hours}$ athletes decreased WT% by 0.5% [0.3%-0.8%] and increased REM% by 0.4% [0.1%-0.6%]. **CONCLUSIONS**: Increased sleep duration positively impacted aspects of sleep quality by decreasing WT% and increasing REM%, which may allow increases in neuronal and memory formation and decreases in non-functional sleep. Further investigation is warranted to elucidate facilitators of other aspects of sleep quality, such as restorative sleep (SWS), and to examine the extent to which training stress may influence sleep and recovery and vice versa.

1108   Board #4   May 31 8:00 AM - 10:00 AM

In-season Examination Of Sleep Quality, Hormone Function, Strength And Affective State Of Division-i Volleyball Athletes

Randy L. Aldret, Michael J. McDermott, Alanna G. Hoffpauir, Hannah Corley, Aimee Mattox, Stephanie Aldret, David M. Bellar. *University of Louisiana at Lafayette, Lafayette, LA.*

(No relevant relationships reported)

PURPOSE: Over the course of the 2017 competitive season, the researchers collected data from 20 Division 1 volleyball players. Beginning with the initial team meeting of the season, measures of sleep quality, hormone regulation and affective state were collected from each member of the team. **METHODS**: Sleep quality measures were gathered using wrist-worn actigraph device. Hormone regulation was measured via passive drool sample collection. Affective and emotional states data was collected digitally using an email link to two reliable and validated psychological surveys: Positive and Negative Affect Survey (PANAS); and the Depression, Anxiety, and Stress Survey (DASS-21). **RESULTS**: Repeated measure Anova did not reveal a main effect for week over the course of the season (F=1.31, p=0.38, range from 93.3% to 95.9%). Similar analysis did reveal a main effect for time for salivary cortisol (F=3.76, p=0.04), with post hoc testing revealing that week 6 significantly elevated over baseline (1.77 µg/dl± 1.08)and week 8 (0.42 µg/dl± 0.33), 9 (0.40 µg/dl± 0.26) and 10 (0.53µg/dl± 0.45) significantly reduced compared to baseline. Analysis of testosterone did not reveal a significant main effect for time (F=2.72, p=0.11). When testosterone to cortisol ratio was examined a significant main effect for time was revealed (F=8.89, p<0.01) with week 1,2,3,10,11 significantly elevated over baseline and week 6 significantly reduced compared to baseline. Analysis of DASS 21 data did not reveal main effects for time for Depression (F=0.70, p=0.72), Anxiety (F=1.00, p=0.60) or Stress (F=2.43, p=0.32). Analysis for PANAS positive scores revealed a significant main effect for time (F=3.78, p=0.032). For the PANAS positive all time points (weeks 1-11: average 32.0±10.8) were significantly lower than baseline (38.7±5.7). Analysis for PANAS negative score did not reveal a significant main effect for time (F=0.69, p=0.76).

CONCLUSIONS: While being a competitive scholarship athlete is stressful and time consuming, it is not all that defines the participants. Further examination of other factors, such as academic demands, along with social and family commitments should be studied to better understand their effects on the hormone and psychometric scores.

1109   Board #5   May 31 8:00 AM - 10:00 AM

Self-Reported, Current and Ideal Sleep Habits of Adolescent Athletes

Melissa L. Anderson, Kortney J. Dalrymple, Timothy J. Roberts. *GSSI, Bradenton, FL.*

Reported Relationships: M.L. Anderson: *Salary; This study was funded by the Gatorade Sports Science Institute. The views expressed in this abstract are those of the authors and do not necessarily reflect the position or policy of PepsiCo, Inc..*

BACKGROUND: Leading health organizations recommend adolescents obtain 8 to 10 hours of sleep each day. There is a growing body of literature that suggests many adolescents, including athletes, are not meeting these recommendations; however, barriers to obtaining adequate sleep are still largely unknown. **PURPOSE**: To quantify sleep habits in a group of athletes and to understand how their current habits compare with their self-reported ideal sleep durations. **METHODS**: One hundred seventy three adolescent team- and individual-sport athletes (16 ± 2 y; male: n=139, female: n=34) from 10 different sports completed both Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) surveys during a laboratory visit. The PSQI was analyzed to determine self-reported habitual bedtime, wake time, and sleep duration, as well as sleep quality over the previous month. The ESS was analyzed to determine self-reported ideal bedtime, wake time, and sleep duration. Data are presented as mean $\pm$ SD. A paired t-test was used to compare current and desired sleep durations. **RESULTS**: Habitual bedtime (n=171) was $22:37 \pm 0:46$. Habitual wake time (n=167) was $06:47 \pm 0:58$. Self-reported actual sleep duration was 7.6 ± 1.0 h with 54% of athletes obtaining less than the recommendation of 8 h of sleep per night. To feel their best, ideal self-reported bedtime (n=162) was $21:57 \pm 0:41$ and self-reported wake time (n=159) was $07:49 \pm 1:18$. Calculated ideal total sleep duration (n=158) was 9.9 ± 1.4 h, which was significantly longer than actual sleep duration (n=155; p<0.001). Habitual sleep quality, assessed as the mean Global PSQI score, (n=159) was 4.3 ± 2.2; however, 63 athletes (39.6%) had a score ≥ 5, which is the PSQI cutoff indicative of poor sleep quality. **CONCLUSIONS**: Self-reported habitual sleep duration in a group of adolescent athletes suggests the majority do not meet the minimum sleep duration recommendations and many have poor sleep quality. However, when reporting their ideal sleep habits, most athletes would prefer to obtain significantly more sleep, desiring durations at the top end of the recommendations even. This suggests lack of desire is not the main reason for sub-optimal sleep duration in this group. Therefore, researchers and practitioners should focus on identifying and creating solutions to overcome barriers to sleep.

1110   Board #6   May 31 8:00 AM - 10:00 AM

Sleep Coaching Augments the Physiological Benefits of Exercise Training

Eric V. Neufeld, Brett A. Dolezal, David M. Boland, Jennifer L. Martin, Christopher B. Cooper, FACSM. *David Geffen School of Medicine at UCLA, Los Angeles, CA.*

(No relevant relationships reported)

Exercise and quality sleep exert positive effects on each other. The practice of healthy sleep habits also enhances sleep quality and duration.
PURPOSE: To examine whether a multicomponent sleep coaching intervention (SC) combined with aerobic and resistance training programs would improve fitness and health measures more than the training program alone. **METHODS:** Thirty-eight healthy fitness club patrons (22 men) were randomized to receive SC (n = 19), consisting of twelve, 10-min education sessions between the trainer and participant to discuss sleep-related topics coupled with weekly, individualized sleep improvement assignments or equal-attention (EA) (n =19), consisting of identical training and education time, with education sessions discussing general wellness topics. All participants engaged in one hour of coached resistance training and remotely guided aerobic exercise thrice weekly for 12 weeks. Fitness measures (aerobic performance, body composition, muscle strength and endurance, lower-body power), sleep characteristics, heart rate variability (HRV), and biochemical assays were obtained at baseline and after the 12-week program. **RESULTS:** SC demonstrated greater improvements in aerobic performance measures [maximum oxygen uptake (0.44 ± 0.12 vs. $0.23+0.08$ L/min, $P < 0.001$), metabolic (lactate) threshold (0.64 ± 0.13 vs. 0.34 ± 0.13 L/min, $P < 0.001$) and ventilatory threshold (0.36 ± 0.13 vs. 0.05 ± 0.71 L/min, $P = 0.003$)], peak and average lower-body power (524 ± 190 vs. 300 ± 208 W, $P = 0.006$ and 212 ± 79 vs. 137 ± 58 W, $P = 0.005$, respectively), and body composition [decreased body fat percentage (-3.6 ± 2.6 vs. $-1.4\pm1.9\%$, $P = 0.011$) and fat mass (-2.7 ± 1.7 vs. -1.3 ± 1.6 kg, $P = 0.021$)]. Additionally, SC positively influenced the parasympathetic tone (HF-HRV: 2.6 ± 3.3vs. 0.3 ± 2.2 ms^2, $P = 0.036$) and glucose metabolism [fasting insulin (-1.6 ± 1.7 vs. 0.2 ± 1.2 mIU/L, $P = 0.004$) and fasting glucose (-8.4 ± 9.9 vs.

6.1 ± 8.8 mg/dL, $P < 0.001$)]. **CONCLUSION:** SC resulted in greater improvements in fitness measures, body composition, and HRV compared with an equal-attention control group. These findings have intriguing implications regarding the role of SC in maximizing health and physical performance.

1111   Board #7   May 31 8:00 AM - 10:00 AM

Effects Of Continuous Versus Interval Exercise On Sleep Profile In Young Healthy Males

Jorge Fernando Tavares de Souza, Solange Prado São José, Hanna Karen Moreira Antunes. *Universidade Federal de São Paulo, São Paulo, Brazil.*

(No relevant relationships reported)

The total sleep time of the population is decreasing every year and, in addition, the number of people complaining of poor sleep or sleep disorders is increasing. On the other hand, regular exercise is known as one of the tools that help to promote sleep hygiene. However, it is not known which type of exercise is best.
Purpose: To evaluate the effects of continuous running and interval running on the sleep profile of healthy young males.
Methods: 12 healthy males were recruited, all physically active, aged 23.6 ± 1.9 years and BMI of 24.9 ± 2.7 kg/m². The volunteers were all submitted to 3 different conditions: Baseline (BL), Continuous Running (CR) and Interval Running (IR). In the BL condition, no physical exercise was performed for 24h. In the CR condition, they were submitted to continuous running (5 minutes of warm-up, 30 minutes run at intensity 12-14 according to the Borg Scale, and 5 minutes of cool down). In the IR condition, they were submitted to interval running (5 minutes of warm-up, 6 bouts of 2.5 minutes at intensity 15-17 on the Borg Scale separated by 2.5 minutes recovery intervals, followed by 5 minutes of cool down). In the morning soon after waking up, volunteers completed 4 records: Sleep Diary, Visual Analog Pain Scale, Scale of Overall Quality of Recovery and STAI-state. The data analysis performed was one-way ANOVA with Duncan test and a significance level at $P < 0.05$. The study was approved by UNIFESP Ethics Committee (#1686/08).
Results: In the sleep diary, a decrease was observed in the scores in CR condition when compared to the BL (BL= 28.00 ± 3.19, CR= 23.36 ± 4.59, p= 0.01). In the waking sensation, a decrease was observed in CR condition when compared to the BL (BL= 8.13 ± 1.13, CR= 6.68 ± 1.82, p= 0.02). In the Visual Pain Scale, the CR condition presented higher scores when compared to the BL condition (BL= 1.12 ± 1.11, CR= 3.18 ± 2.48, p= 0.01). Finally, in the Overall Quality of Recovery Scale, the BL condition presented higher scores when compared to CR and IR conditions (BL= 17.08 ± 2.50, CR= 14.64 ± 2.94, IR= 14.58 ± 2.11, p= 0.02). No significant differences were found regarding STAI-state.
Conclusions: After more intense exercise volunteers had a more restful sleep when compared to continuous running. Thus, we concluded that interval exercise can be used in training to also improve sleep quality.
Financial support: CAPES

1112   Board #8   May 31 8:00 AM - 10:00 AM

The Effect of Total Sleep Time on Ultra-Endurance Triathlon Performance

Jacob N. Kisiolek[1], Kyle A. Smith[1], Daniel A. Baur[2], Brandon D. Willingham[1], Margaret C. Morrissey[1], Samantha M. Leyh[1], Patrick G. Saracino[1], Michael J. Ormsbee, FACSM[1]. *[1]Florida State University, Tallahassee, FL. [2]Elon University, Elon, NC.* (Sponsor: Dr. Michael Ormsbee, FACSM)

(No relevant relationships reported)

PURPOSE: The primary purpose was to determine the effect of sleep time on performance during a 3-day multistage ultra-endurance triathlon (stage 1: 10km swim, 144.8km bike; stage 2: 275.8 km bike; stage 3: 84.4km run). Secondarily, we determined if performance time predicts sleep time. **METHODS:** Eighteen triathletes (age: 37 ± 7.9y; height: 175 ± 7cm; weight: 70 ± 9kg) partook in sleep analysis pre, during, and post triathlon using an actigraphy wrist band. Participants wore the band to record sleep time for five days (1-2 days pre-race, 3 race days, 1-day post-race), except during racing. Bands were collected before each stage to download the previous night's data, then re-distributed after each stage. Performance times were recorded after each stage, and following total completion of the race. The data was analyzed via linear regression. **RESULTS:** Total sleep time (mean$\pm$SD; pre-race: 393.9 ± 81.1 min, pre-stage 1: 342 ± 90.2min, pre-stage 2: 347.5 ± 54.6min, pre-stage 3: 299.7 ± 107.0min, post-race: 308.8 ± 86.3min) significantly decreased over time (P<0.05). Sleep time predicted performance in multiple stages. Specifically, pre-stage 3 sleep time explained 30% and 43% of the variation in stage 3 performance (R^2=0.30, p=0.035), and total finishing time (R^2=0.43, p=0.008). Performance time also predicted sleep time. Specifically, stage 1 performance explained 37% and 47% of the variation in pre-stage 2 sleep time (R^2=0.37, p=0.010), and pre-stage 3 sleep time (R^2=0.47, p=0.005). Stage 2 performance explained 39% the variation in pre-stage 3 sleep time (R^2=0.39, p=0.014). Total race sleep time (Pre-stage 1, 2, and 3) was averaged; 33% of the variation in total finishing time can be predicted by average total racing sleep

time (R^2=0.33, p=0.015). No additional relationships were seen. A cutoff value was found at 401.6 min of average total race-night sleep time, indicating the top 25% of race finishers slept for ≥401.6 min. **CONCLUSIONS:** During a multistage ultra-endurance triathlon, performance time can be predicted by sleep time the night before. In addition, faster performance times during each stage predicts more sleep time. Based on our results, average total race-night sleep time of roughly 402 min (6.7h/night) leads to faster finishing time in the Ultraman Florida. This study was supported by FSU and FatigueScience.

C-12   Free Communication/Slide - **New Insights in Measurement of Physical Activity and Sedentary Behavior**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Mezzanine M100D

1113   **Chair:** Gregory J. Welk, FACSM. *Iowa State University, Ames, IA.*

(No relevant relationships reported)

1114   May 31 8:00 AM - 8:15 AM
Measuring Change in Physical Activity Across a Technology-Based Intervention
Whitney A. Welch, Bonnie Spring, Siobhan M. Phillips, Juned Siddique. *Northwestern University Feinberg School of Medicine, Chicago, IL.* (Sponsor: Ann M Swartz, FACSM)
(No relevant relationships reported)

PURPOSE: To characterize and compare the change in moderate to vigorous physical activity (MVPA) between an accelerometer and smart phone-based physical activity log across a three-week physical activity intervention. **METHODS**: Participants (N=204, 77% female, age=33±11y, BMI=28.2±7.1 kg/m²) in the Make Better Choices 1 (MBC1) Study were randomized to one of two activity-related intervention arms: 1) increase MVPA arm or 2) decrease sedentary active control arm. Participants wore an accelerometer while simultaneously completing a smart phone-based physical activity log for five weeks: a two-week baseline assessment phase and a three-week intervention follow-up phase. Linear mixed effects models were used to characterize the difference in MVPA between measurement methods across baseline and intervention. **RESULTS**: Physical activity logs show a 43.5 min/day (95% CI: 31.9, 55.1) difference in means between the two groups at follow-up and accelerometer results indicate a 12.3-min/day (95% CI: 9.5, 15.2) difference in means between the two groups at follow-up, with the increase MVPA group recording more minutes per day of MVPA. Correlations between the two measurement methods for the physical activity group increased from baseline (r=0.58, p<0.001) to intervention follow-up (r=0.68, p<0.001) and no change was seen in the active control group from baseline (r=0.59, p<0.001) to intervention follow-up(r=0.55, p<0.001). Intervention effect size when using the physical activity log was 0.48 and 0.54 when capturing change in MVPA using the accelerometer. **CONCLUSIONS:** Treatment effects measured in minutes per day were very different between measurement method, however, the standard deviations were similar. Similar effect sizes suggest smart phone-based activity logs may provide similar results to accelerometers for estimating intervention effects.

1115   May 31 8:15 AM - 8:30 AM
Validation Of A Research-grade Accelerometer In Estimating Free-living Sedentary Time
Albert Mendoza[1], Kate Lyden[2], John Sirard[3], John Staudenmayer[3], Catrine Tudor-Locke, FACSM[3], Patty Freedson, FACSM[3]. [1]*California State University, East Bay, Hayward, CA.* [2]*KAL Research|Consulting LLC, Denver, CO.* [3]*University of Massachusetts-Amherst, Amherst, MA.* (Sponsor: Patty Freedson, FACSM)
(No relevant relationships reported)

Research-grade accelerometers (RGA) are valuable tools to monitor sedentary behavior. Despite the broad appeal of RGA for researchers and clinicians, there is limited evidence of how well they estimate sedentary time (ST) in free-living settings. **PURPOSE:** To examine the accuracy and precision of ST estimates from an RGA worn on the hip and wrist in free-living settings. **METHODS:**Thirty-two participants were directly observed while completing three, 2-hour sessions on different days and wearing commonly used hip- and wrist-worn RGA's. A validated video-taped direct observation (DO) system was used to determine ST. For the RGA, ST was estimated using (1) the 100 counts/min cutpoint (hip RGA) and (2) random forest model using 15-sec raw acceleration data (Staudenmayer et al., 2015) (wrist RGA). Linear mixed models were used to compare the accuracy and precision of ST estimates from the hip- and wrist-worn RGA to DO measured ST. Pearson correlation coefficients were used to determine the association between DO measured and RGA estimated ST. **RESULTS:**

	Mean min (SD)	Bias	95% CI	r
DO (Criterion)	42.8 (42.3)			
RGA hip	93.4* (24.0)	50.7	43.3,58.1	0.59
RGA wrist	63.1* (25.2)	20.3	13.3,27.3	0.77

*, significantly different than criterion (p<0.05).

The hip- and wrist-worn RGA estimates of ST were significantly overestimated compared with DO. Precision, assessed as the 95% CI for the bias, was similar between the RGA hip and RGA wrist. The RGA ST min was moderately (RGA hip) to highly (RGA wrist) correlated with DO. **CONCLUSION:** The accuracy of ST estimates from RGA were affected by wear location and data processing technique. These results demonstrate the need for more research to elucidate how these factors influence estimates of ST from RGA in free-living settings. Funded by: NIH: 1F31HL129802-01

1116   May 31 8:30 AM - 8:45 AM
Validation of Activity Monitor Methods in Classifying Sedentary Behavior in Distinct Activity Domains
Julian Martinez, Mami M. Takeda, Sarah K. Keadle. *California Polytechnic State University San Luis Obispo, San Luis Obispo, CA.* (Sponsor: Todd Hagobian, FACSM)
(No relevant relationships reported)

PURPOSE: The present study compared sedentary time estimates from a thigh-worn monitor (AP) to a wrist and hip-worn AG monitor across five different activity domains in a free-living environment.
METHODS: Participants (n=16, mean age=26.9yrs, 69% female) wore two AG monitors (right hip, non-dominant wrist), and one AP accelerometer (thigh) for two, 2-hour sessions. Each participant completed 2 out of 5 activity domains that represent daily life: household (H, N=5), active leisure (AL, N=8), sedentary leisure (SL, N=6), work (W, N=7), and transportation/errands (TE, N=4).Sedentary time was estimated from the AG-hip data using: Sojourn 3x (S3x), 100 vertical count cut-point (V100), 200 vector magnitude cut-point (VM200), and the Crouter two-regression (C2) method. A random forest machine learning method (RF) was used to classify AG wrist data. Relationship between AG and AP methods were examined with Pearson correlations. A paired t-test was used to examine mean differences in overall sedentary time estimates, and a linear mixed effects model was used to test for any significant interaction between accuracy of AG methods by activity domain. P-values < 0.05 are considered statistically significant.
RESULTS: Compared to AP, correlations for AG methods were: S3x (R=0.82), VM200 (R=0.81), C2 (R=0.71), V100 (R=0.61) and wrist RF (R=0.68), (all p<0.05). Compared to AP, estimates were significantly higher for the S3x (mean diff [95%CI)] 9.4 (0.57, 18.3)min (p=0.02) and V100 (18.9[5.3, 32.4]min, p=0.003). The RF (-4.6 [-17.4, 8.2]min, 200VM (-1.2 [-10.8, 8.4] min), and C2 (2.2 [-9.8, 14.2]min), were not statistically different than AP. The accuracy of S3x did not differ by domain (0.05), while the accuracy of the 200VM, C2, 100V and RF estimates significantly differed by domain (p<0.05). VM200, C2 and RF overestimated sedentary time in the TE and H domains and underestimated in AL and SL.
CONCLUSIONS: The S3x method overestimated sedentary time compared to AP, but was the most precise and consistent across domains. These data highlight the importance of ensuring a range of activity domains in free-living validation studies. Future research should expand the sample and include direct observation measures of sedentary time compared to AP and AG.
Supported by Bill and Linda Frost Fund

1117   May 31 8:45 AM - 9:00 AM
Video-Recorded Validation of Wearable Step Counters Under Free-living Conditions
Lindsay Toth. *University of Tennessee, Knoxville, TN.* (Sponsor: David R. Bassett, Jr., PhD, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the accuracy of 14 step counting methods under free-living conditions during all waking hours of one day. **METHODS**: Twelve adults (mean±SD, age: 35±13 yrs) wore a chest harness that held a GoPro video camera angled down towards the feet. The GoPro continuously recorded video of all steps taken throughout the day. Simultaneously, participants wore two StepWatch [SW] devices on each ankle (each programmed with different settings), one activPAL [AP] on each thigh, four devices at the waist (Fitbit Zip [FZ], Yamax Digi-Walker SW-200 [DW], New Lifestyles NL-2000 [NL], and ActiGraph GT9X

[AG]), and two devices on the dominant and non-dominant wrists (Fitbit Charge [FC] and AG). The GoPro videos were downloaded to a computer and two researchers independently counted steps using a hand tally device, which served as the criterion method.
RESULTS: The SW devices captured between 95.3% and 102.8% of actual steps taken throughout the day (P>0.05). Seven step counting methods estimated less than 100% of actual steps; FZ, NL, AG with the Moving Average Vector Magnitude algorithm (MAVM) and without the low frequency extension (LFE), both worn on the hip, the FC worn the non-dominant wrist, and the AP on both the left and right thighs, capturing 69% to 81% of actual steps (P<0.05). Three methods estimated more than 100% of actual steps; AG with LFE worn on the hip and both wrists, capturing 128% to 220% of actual steps (P<0.05). Estimated steps from SW (with all settings), DW, FC on the dominant wrist, and AG (with LFE and MAVM) on both wrists did not significantly differ from actual steps (P>0.05).
CONCLUSIONS: Across all waking hours of one day, step counts differ between methods. Compared to hand counted steps, the SW device, regardless of settings, was highly accurate for counting all free-living steps.

1118   May 31 9:00 AM - 9:15 AM

Use of Consumer Monitors for Estimating Energy Expenditure in Youth

Andrew S. Kaplan, Samuel R. Lamunion, Paul R. Hibbing, Scott E. Crouter, FACSM. *University of Tennessee- Knoxville, Knoxville, TN.*

(No relevant relationships reported)

Consumer-grade physical activity monitors (PAMs) have been extensively examined for estimating energy expenditure (EE) in adults; however, few studies have examined their ability to estimate EE in youth. **PURPOSE:** The purpose of this study was to examine equivalence between predicted EE (consumer-grade PAMs) and measured EE (indirect calorimetry) in youth. **METHODS:** Ninety-five youth (mean(SD); age, 12.2(3.5) yr; 49% male) performed 30 min of supine rest and 16 structured activities ranging from sedentary behaviors to vigorous intensities. Each structured activity was performed twice: once for 60-90 s and once for 4-5 min. During all testing, participants wore an Apple Watch 2 (AW, left wrist) and Mymo Activity Tracker (MT, right hip). Subsamples wore two Misfit Shine 2 devices (MSH, right hip; MSS, right shoe, n = 27), a Samsung Gear Fit 2 (SG, right wrist, n = 44), and/or a Fitbit Charge 2 (FC, right wrist, n = 53). A Cosmed K4b^2 was used as the criterion measure of EE. Oxygen consumption was converted to EE in kilocalories (kcal), then summed over the whole trial to obtain gross EE. Net EE was calculated by subtracting the estimated basal EE (Schofield's equation) from the measured gross EE. For all PAMS, EE was recorded at the start and end of the trial, and the difference was used for analysis. 95% equivalence testing with ±10% equivalence zone was used to assess equivalence between the estimated (PAM) and measured (K4b^2) EE. All PAMs estimated gross EE, except for AW which estimated net EE, thus separate equivalence test was performed for the AW. Mean absolute percent error (MAPE) was used to assess individual-level error. **RESULTS:** Equivalence testing results and MAPE are summarized in Table 1.
CONCLUSION: Only the MT was equivalent to the K4b^2, however it also had the largest individual error. Caution is warranted when using consumer-grade PAMs in youth for tracking EE as there is a high degree of variability in device output.

Table 1. Mean EE±SD (kcal) and MAPE for six PAMs in youth.

	K4b^2 EE	Apple Watch
Net EE		
EE (kcal)	160±59 (143.9-175.9)#	75±42
MAPE	---	56.4

	K4b^2 EE	Mymo Tracker	Misfit Shine Hip	Misfit Shine Shoe	Samsung Gearfit 2	Fitbit Charge 2
Gross EE						
EE (kcal)	232±71 (209.1-255.6)#	236±108*	208±77	208±76	177±65	281±113
MAPE	---	42.1	17.6	21.8	33.9	39.1

*significantly equivalent to K4b^2 (p<0.05); #values in parentheses are equivalence zone

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1119   May 31 9:15 AM - 9:30 AM

Validity and Reliability of the Exercise Vital Signs Questionnaire in a Diverse Urban Population

Norberto Quiles[1], Lin Piao[1], Aston K. McCullough[2]. [1]*Queens College, Flushing, NY.* [2]*Teachers College, Columbia University, New York, NY.*

(No relevant relationships reported)

The Exercise Vital Signs (EVS) is a new brief (<30 seconds) physical activity (PA) questionnaire used by the Exercise is Medicine initiative within the American College of Sports Medicine. While the criterion validity of the EVS has been evaluated in a select number of ethnic groups, research on the validity and reliability of the EVS questionnaire in a diverse, urban sample is lacking. **PURPOSE**: To determine the validity and reliability of the EVS in a diverse, urban sample.
METHODS: An ethnically-diverse sample (White 33%, Latino 31%, Asian 21%, Black 15%) of N=39 participants [age *31*(10.4)] were asked to wear an accelerometer at the hip for 9 days and to complete the EVS at the beginning (T1) and end (T2) of the wear period. The criterion validity of the EVS-estimated minutes of weekly moderate-vigorous PA (MVPA) was determined against accelerometer-derived estimates of the total time spent in ≥10min bouts of MVPA using Spearman's correlations. EVS responses were used to predict subjects who were confirmed to meet current PA guidelines of ≥150 MVPA min/week via accelerometry using logistic regression. The EVS receiver operating characteristic area under the curve (AUC), sensitivity, and specificity were calculated. The concurrent validity of the EVS MVPA estimates was tested against accelerometer-derived steps/day using Spearman's correlations. The intraclass correlation coefficient (ICC) was calculated between the EVS responses at T1 and T2 in order to evaluate questionnaire test-retest reliability.
RESULTS: Reliability for the EVS questionnaire was strong (ICC= .98). There was a moderate correlation (*rho*= .58 at T2, *p*= <.01) between the EVS-estimated PA minutes/week and the accelerometer-derived MVPA minutes/week. There was also a moderate correlation (*rho*= .43 at T2, *p*= .006) between EVS-determined PA minutes/ week and the accelerometer-derived steps/day. The T2 EVS specificity and sensitivity were 56% and 78%, respectively, and the AUC was 0.74.
CONCLUSIONS: In a diverse, urban sample, the EVS questionnaire has acceptable validity and high test-retest reliability. The EVS may be a useful tool for identifying ethnically-diverse individuals not meeting current PA guidelines. Further research in larger ethnically-diverse samples is needed.

1120   May 31 9:30 AM - 9:45 AM

Validity of a Novel Objective Screening Test for Risk of Physical Inactivity in Toddlers

Aston K. McCullough, Carol Ewing Garber, FACSM. *Columbia University Teachers College, New York, NY.* (Sponsor: Carol Ewing Garber, FACSM)

(No relevant relationships reported)

PURPOSE. To evaluate the accuracy of the Objective Physical Inactivity Risk Assessment for Toddlers (OPIRA-T), a brief (15-60min) screening test for physical inactivity.
METHODS. Families (N=119) with children 24-35 months-old were recruited from an urban Early Head Start (EHS). Children's physical activity (PA) was measured for 7 days via hip-worn triaxial accelerometers. Cliff (2009) wear time criteria were applied to children's 15s epoch PA data, and Trost (2012) cut points were applied. Children not meeting respective moderate-vigorous PA (MVPA) and total PA (TPA) guidelines of 60min/day and 180min/day were determined using 7-day wear time data. Brief raw accelerometer data segments [15, 30, 45, 60min] were randomly extracted from the full 7-day wear data from periods when children were in the EHS. The raw signals were scored using our novel signal analysis algorithm (OPIRA-T). A classification tree (CART) was used to fit OPIRA-T scores as a predictor of children not meeting PA guidelines during the 7-day wear period. CART algorithm ROC area under the curve (AUC) and bootstrapped 95% CI were evaluated. OPIRA-T scores were also used to classify children at risk of physical inactivity using a custom cascaded 2-step algorithm (OPIRA-T screening test). The bootstrapped sensitivity, specificity, positive and negative predictive values for the OPIRA-T screening test were calculated. Descriptive statistics are presented as Mean(SD) and Frequencies (%).
RESULTS. Children [n=60; F: 53%; age: 29(4) months] with valid 7-day wear time data were included. Respectively, 75% and 32% of toddlers did not meet MVPA and TPA guidelines. OPIRA-T score and OPIRA-T screening test validation results appear in Table 1.
CONCLUSION. Within the EHS setting, OPIRA-T accurately identified toddlers at risk of physical inactivity from a brief period (15min) of objectively measured PA. Further research is needed on which classroom periods are the most reliable testing times for using OPIRA-T.

THURSDAY, MAY 31, 2018

Table 1. Accuracy of OPIRA-T scores and screening test in identifying toddlers at risk of insufficient daily activity according to current physical activity recommendations

Accuracy Indices	Observation Length			
	15min	30min	45min	60min
	n = 53	n = 60	n = 58	n = 55
OPIRA-T Scores (AUC [95% C.I.])				
Not Meeting MVPA[a]	0.96 [0.89, 0.99]	0.97 [0.91, 0.99]	0.92 [0.77, 0.99]	0.95 [0.86, 0.99]
Not Meeting TPA[b]	0.95 [0.87, 0.98]	0.94 [0.84, 0.98]	0.92 [0.81, 0.97]	0.90 [0.78, 0.97]
OPIRA-T Screening Test (%)				
Sensitivity	90%	93%	96%	96%
Specificity	92%	93%	92%	70%
Positive Predictive Value	94%	96%	96%	86%
Negative Predictive Value	86%	88%	92%	90%

[a]American Heart Association. The AHA's Recommendation's for Physical Activity in Children
[b]Institute of Medicine. Early Childhood Obesity Prevention Policies

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1121　　May 31 9:45 AM - 10:00 AM

Sensitivity of a Consumer Activity Tracker to Detect Changes In Lab-based and Free-living Activity Settings

Greg J. Petrucci, Jr., Patty S. Freedson, FACSM, Brittany R. Masteller, Melanna F. Cox, John W. Staudenmayer, John R. Sirard. *UMass Amherst, Amherst, MA.* (Sponsor: Patty S. Freedson, FACSM)

Reported Relationships: G.J. Petrucci: *Contracted Research - Including Principle Investigator; Misfit Shine™ Wearables (Fossil Group, Richardson, TX, USA).*

PURPOSE: Determine the sensitivity of a consumer activity tracker (CAT) to detect changes in physical activity (PA) measures during laboratory (LAB) and free-living (FL) conditions. **METHODS**: Twenty-one participants wore the CAT and ActiGraph GT3X+ accelerometer (AG) at the hip and dominant wrist during three, 1-hour LAB sessions: sedentary (SS), sedentary plus walking (SW), and sedentary plus jogging (SJ). For SW and SJ, participants performed 30-minutes of sitting, then 30-minutes of walking or jogging at 5.15 or 8.0 kph, respectively. Direct observation (DO) of steps served as the criterion measure for SW and SJ sessions. Devices were also worn during two FL conditions: 1) active week where participants met activity guidelines (ACT); 2) sedentary week, absent of purposeful activity (SED). The PA measures were: CAT and AG steps and kCals, CAT "points", and AG vertical axes counts. For LAB and FL, significant differences were examined by comparing non-overlapping 95% confidence intervals (C.I.'s) and linear mixed effects models, respectively. Linear mixed effects models were fit for differences (bias; absolute and percent) between CAT device estimated steps and DO step ($\alpha \le 0.05$). **RESULTS**: For all hip-worn CAT measures there was a significant step-wise increase (p < 0.05) from SS to SJ. For the wrist-worn CAT, there was a significant step-wise increase in steps and "points" from SS to SJ (p < 0.05). However, the wrist CAT kCal estimates were greater for SJ, compared to SS and SW, which were similar to each other [95% C.I.'s (95.5, 152.8) and (141.1, 378.9), respectively]. Compared with DO, CAT hip significantly underestimated steps by 3.5%, while CAT wrist significantly overestimated steps by 4.2%. AG estimates of kCals and counts showed a significant step-wise increase from SS to SJ (p < 0.05), however estimates of steps were greater for SJ, compared to SS and SW, which were similar to each other [95% C.I.'s hip: (2861, 3542) and (3433, 4789), wrist: (2068, 2803) and (1908, 2647)]. During FL conditions, all CAT and AG outcomes were sensitive to changes between ACT and SED (p < 0.0001). **CONCLUSIONS**: The hip-worn CAT was sensitive to changes during LAB and FL. CAT may be a useful tool for interventions where PA measures are used as exposure and/or outcome measures. **FUNDING:** UMass Institute of Applies Life Sciences and Fossil GroupTM

C-13　　Free Communication/Slide - **VO2max**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-Mezzanine M100F

1122　　**Chair:** Paul M. Gallo, FACSM. *Norwalk Community College, Norwalk, CT.*

(No relevant relationships reported)

1123　　May 31 8:00 AM - 8:15 AM

Fitness And Age-related Associations: Is VO$_{2peak}$ A Valid Measure For Older Adults?

Ryan J. Dougherty, Jacob B. Lindheimer, Aaron J. Stegner, Stephanie Van Riper, Jacob V. Ninneman, Ozioma C. Okonkwo, Dane B. Cook, FACSM. *University of Wisconsin - Madison, Madison, WI.* (Sponsor: Dane B. Cook, FACSM)

(No relevant relationships reported)

Cardiorespiratory fitness (CRF) is routinely investigated in older adults; however, the most appropriate CRF measure to use for this population has received little attention. **Purpose:** To (i) evaluate the reliability and validity of the oxygen uptake efficiency slope (OUES) as a sub-maximal measurement of CRF, (ii) examine demographic, risk-factor, and exercise testing differences in older adults who satisfied standardized criteria for a peak oxygen consumption (VO$_{2peak}$) test compared to those who did not and (iii) determine the difference between directly measured VO$_{2peak}$ values and OUES-predicted VO$_{2peak}$ values. **Methods:** One hundred ten enrollees from the Wisconsin Registry for Alzheimer's Prevention participated in this study. Participants performed a graded maximal exercise test and wore an accelerometer for 7 days. For each participant, the OUES was calculated at 75, 90 and 100% of exercise duration. VO$_{2peak}$ was recorded at peak effort, and one week of physical activity behavior was measured. **Statistical analyses:** Intraclass correlation coefficients (ICC), bivariate Pearson correlations and a one-way repeated-measures ANOVA examined the reliability and criterion validity. Independent samples t-tests and Cohen's effect sizes examined between group differences and linear regression was used to obtain the formula for OUES-predicted VO$_{2peak}$. **Results:** OUES values calculated at separate relative exercise durations displayed excellent reliability (ICC = .995; $p < .001$), and were strongly correlated with VO$_{2peak}$ (r_{range} = .801 - .909; $p < .001$). As hypothesized, participants who did not satisfy VO$_{2peak}$ criteria were significantly older than those who satisfied criteria ($p = .049$) and attained a directly measured VO$_{2peak}$ that was 2.31 mL·kg·min^{-1} less than their OUES-predicted VO$_{2peak}$ value ($d = .72; p = .003$). **Conclusions:** Older adults are less likely to satisfy VO$_{2peak}$ criteria, which results in an underestimation of their CRF. Without adhering to standardized criteria, VO$_{2peak}$ measurement error may lead to misinterpretation of CRF and age-related associations. Here, we conclude that OUES is a reliable, valid measurement of CRF which does not require consideration of standardized criteria.

1124　　May 31 8:15 AM - 8:30 AM

Evaluating The Influence Of Methodological Variables On The Determination Of Vo$_{2max}$ And The Lactate Threshold.

Nicholas Jamnick[1], Javier Botella[1], David Pyne, FACSM[2], David Pyne, FACSM[3], David Bishop, FACSM[1], David Bishop, FACSM[4]. [1]*Victoria University, Melbourne, Australia.* [2]*Australian Institute of Sport, Canberra, Australia.* [3]*University of Canberra, Canberra, Australia.* [4]*Edith Cowan University, Joondalup, Australia.* (Sponsor: Professor David Bishop, FACSM)

(No relevant relationships reported)

Graded exercise tests (GXTs) can be used to determine peak oxygen uptake (VO$_{2peak}$) and the lactate threshold (LT), and are commonly employed by sport scientists and coaches to evaluate and prescribe exercise training. Two critical methodological choices that influence these indices are GXT stage length (for VO$_{2max}$ and the LT), and the method used to calculate the LT. However, there has been little investigation of the effects of these choices on the validity of the derived indices. **PURPOSE:** To determine the influence of GXT stage length and method of calculation on the estimation of LT and VO$_{2peak}$. **METHODS:** Trained male cyclists (n=17) completed five GXTs of varying stage length (1, 3, 4, 7 and 10 min) on different days, each followed by a verification exhaustive bout (VEB) to confirm VO$_{2peak}$, and a series of 30-min constant power bouts to establish the maximal lactate steady state (MLSS). All tests except GXT$_1$ (which was performed first) were performed in a randomized order. VO$_2$ was assessed during each GXT and VEB, and 15 different LTs were calculated from four of the GXTs (3, 4, 7 and 10 min) - yielding a total 60 LTs. Agreement was assessed between the highest VO$_2$ measured during each GXT (VO$_{2peak}$), and between each GXT and subsequent VEB. Validity of the LTs derived from the GXTs was assessed using the MLSS as the criterion measure. VO$_{2peak}$ and LT data were analyzed

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using mean difference (MD), effect size (ES), intraclass correlation (ICC), and the coefficient of variation (CV). **RESULTS:** The VO_{2peak} value from GXT_1 was 61.0 ± 5.3 mL/kg/min and the peak power 420 ± 55 W (mean $\pm$ SD). The MLSS power was 264 ± 39 W. VO_{2peak} from $GXT_{3, 4, 7, 10}$ underestimated VO_{2peak} from GXT_1 (MD = -1.2, -2.1, -3.7 and -4.8 mL/kg/min; ES = 0.23, 0.36, 0.69 and 0.88; ICC = 0.82, 0.75, 0.63 and 0.77; GXT_1 vs. $GXT_{3, 4, 7, 10}$, respectively). The VO_{2peak} values from the GXT and VEB during GXT_1 and GXT_4 were within the error of the measurement (CV<3%). The Modified Dmax method (log-poly-MD_{max}) derived from GXT_4, with an alternate initial data point calculated using the log-log method, provided the most valid estimate of the MLSS (MD = 1.1 W; ES = 0.03; ICC = 0.96). **CONCLUSION:** The log-poly-MD_{max} derived from GXT_4 yielded the most valid estimate of the MLSS; however, the VO_{2peak} from the four longest GXTs (3, 4, 7 and 10 min) underestimated the VO_{2peak} from GXT_1.

1125   May 31 8:30 AM - 8:45 AM

Evaluation of VO²ᵖᵉᵃᵏ Calculations for the Boer 2 Through 5 Protocols

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(No relevant relationships reported)

PURPOSE: The purpose of this investigation was to determine whether individuals of varying fitness levels would self-select an appropriate exercise test from the Boer 1 - 5 graded (maximal) exercise testing protocols. The protocols were developed to be discreet for each of five fitness levels (1 - Clinical, 2- Moderately Fit, 3 - Fit, 4 - Highly Fit and 5 - Elite). It is hypothesized that calculated VO_{2peak} in each group will be different, while testing time will be statistically the same.
METHODS: Students from an exercise prescription lab course completed one of the five Boer protocols as a class assignment. Subjects completed a short survey and listened to a lecture regarding protocol selection. Subjects completed the grade exercise test and stopped the test when volitional fatigue was achieved. Treadmill testing time and calculated VO_{2peak} (from the intensity reached during the last two minutes) was recorded. A one-way ANOVA was completed with treadmill time and calculated VO_{2peak} as dependent variables and protocol selection as the independent variable.
RESULTS: N=83 (33 Male, 50 Female) Age 21.8 years (1.3), BMI 24.9 (4.3) There were no statistical difference between male and female results. Therefore, all subjects were pooled into the respective protocol. (No subjects completed Boer 1.)

	Boer 2 (N=9)	Boer 3 (N=50)	Boer 4 (N=20)	Boer 5 (N=4)
VO2Peak (ml/kg/min)	36.5 (2.2)*	43.3 (3.8)*	54.1 (4.5)*	64.0 (5.2)*
Time (min)	14.9 (2.6)	13.9 (2.1)	13.5 (2.2)	12.8 (1.5)

* (p<0.0001 compared to each of the other groups) Total time includes a three minute warm up. **CONCLUSIONS**: Subjects were able to determine an appropriate Boer 1 - 5 protocol and calculated VO_{2peak} was discreet between participants in each protocol. Treadmill time remained similar in each group, which does not occur when existing maximal protocols are used to determine aerobic fitness in subjects of varying fitness levels. Preliminary evidence would suggest that this is a viable method to test aerobic fitness in the population.

1126   May 31 8:45 AM - 9:00 AM

Change In VO₂max And Time Trial Performance To Interval Training Prescribed According To Ventilatory Threshold

Todd A. Astorino, Jamie DeRevere, Theodore Anderson, Patrick Holstrom, Erin Kellogg, Sebastian Ring, Nicholas Ghasb, Anders Rosland Nordstrand. *California State University--San Marcos, San Marcos, CA.*

(No relevant relationships reported)

Research shows that about 20 % of participants demonstrate no change in maximal oxygen uptake (VO_2max) in response to moderate intensity continuous training (MICT) (Bouchard et al 1999) or high intensity interval training (HIIT, Astorino & Schubert 2014). Approximately 50 % of this non-response is hereditary (Bouchard et al 1999) although the other 50 % is unexplored (Mann et al. 2015) and likely related to participants' habitual physical activity and dietary patterns, sleep, and traits of the training regime. In unfit adults, Wolpern et al. (2015) showed that MICT prescribed according to Ventilatory Threshold (VT) led to lower onset of individual non-response than when prescribed using HR. **PURPOSE:** To prescribe HIIT according to VT to monitor aggregate and individual responses in both VO_2max and time trial (TT) performance. **METHODS:** Eleven active (age and VO_2max = 28.9 ± 7.9 yr and 38.4 ± 4.5 mL/kg/min) men and women performed baseline testing including a VO_2max test on a cycle ergometer to determine peak power output (PPO) and ventilatory threshold (Caiozzo et al. 1986). Each subject also performed a 8.2 km cycling TT over three separate trials. Over a 3 wk period, they underwent 9 d of HIIT consisting of 8 – 10 60

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s bouts at work rate of 130% VT with a 75 s active recovery period. Training elicited an intensity = 89.2 ± 5.7 %PPO. VO_2max and TT were assessed within 96 h after training. Controls (CON) (n=6, age and VO_2max = 22.7 ± 2.3 yr and 40.4 ± 8.7 mL/kg/min) consisted of active individuals who completed two sessions of baseline testing separated by 3 wk. **RESULTS:** Data showed a significant groupXtime interaction for VO_2max (38.4 ± 4.5 mL/kg/min to 40.7 ± 4.8 mL/kg/min vs. 40.4 ± 8.7 mL/kg/min to 40.6 ± 8.7 mL/kg/min, p=0.017) and TT (923.1 ± 78.2 s to 899.4 ± 67.2 s vs. 921.2 ± 115.0 s to 924.3 114.4 s, p=0.007) between HIIT and CON. With 2Xtypical error = 0.11 L/min for VO_2max and 18.0 s for TT, 63 % of participants showed meaningful increases in VO_2max and TT in response to this low dose of HIIT. Two of 11 participants exhibited non-response in both variables. **CONCLUSION:** These preliminary data show that 9 d of HIIT at 130 %VT significantly increases VO_2max and TT performance, but these responses do not occur in everyone. It is possible that the volume or duration of HIIT used is inadequate to promote greater responses in habitually active individuals.

1127   May 31 9:00 AM - 9:15 AM

The Impact Of An Interval Training Program On Muscle And Cerebral Oxygenation Responses To Incremental Ramp Exercise.

Jan Boone, Kevin Caen, Kobe Vermeire, Jan Bourgois. *Ghent University, Ghent, Belgium.*

(No relevant relationships reported)

PURPOSE: To study the effects of interval training on cerebral and muscle (de) oxygenation and their relationship to improvements in VO_2peak obtained from incremental ramp cycle exercise.
METHODS: Ten male subjects performed incremental ramp exercise tests (50 Watt + 25 Watt.min⁻¹) prior to and following a six week training intervention. During the tests, muscle (M. Vastus Lateralis) and cerebral (de)oxygenation (O_2Hb and HHb) was recorded with Near-Infrared Spectroscopy (NIRO 200, Hamamatsu, Japan). The training sessions were performed 3 times a week and consisted of 6 bouts of 4 min cycling at the critical power, interspersed by 3 min recovery a work rate corresponding to the gas exchange threshold. The changes in the tissue oxygenation responses (muscle HHb and totHb, cerebral O_2Hb and totHb) was calculated by expressing these responses obtained from the posttest relative to those obtained in the pretest in which the amplitude was set to 100%.
RESULTS: Following the training intervention, the VO_2peak had increased from 52.4±3.5 ml.min⁻¹.kg⁻¹ to 56.4±3.8 ml.min⁻¹.kg⁻¹ (P<0.001) and peak power output from 384±36 Watt to 415±40 Watt (P<0.001). Muscle HHb amplitude had increased (P<0.01) with 64±50%, whereas also the muscle HHb/work rate slope had increased (P<0.01) from 0.52±0.14%.Watt⁻¹ to 0.99±0.57%.Watt⁻¹. The change in muscle HHb amplitude was correlated to the increase in VO_2peak (r=0.75, P=0.03). Muscle totHb amplitude increased with 85±79%, although this was not correlated to VO_2peak increase (r=0.22, P>0.05). Cerebral O_2Hb amplitude had increased (P=0.019) by 50±57% with no change in cerebral O_2Hb/work rate slope (0.89±0.47%.Watt⁻¹ vs. 1.00±0.42%.Watt⁻¹, P=0.58). Cerebral totHb did not show a change in amplitude (28±46%, P=0.24) nor in slope (0.67±0.15%.Watt⁻¹ vs. 0.73±0.27%.Watt⁻¹, P=0.58).
CONCLUSIONS: This study showed that the improvement in VO_2peak was predominantly related to an improved fractional O_2 extraction (i.e, amplitude of muscle HHb). However, interval training also induced an enhanced O_2 diffusive capacity (i.e., amplitude of muscle totHb) and cerebral oxygenation which might also affect maximal exercise performance.

1128   May 31 9:15 AM - 9:30 AM

Relationships Between Vo₂max And Blood Lactate During Exercise Across Different Populations

Inigo San-Millán[1], Jared Berg[2], Janel Martinez[1], Ryan Kohler[2], Charles Van Atta[2]. *[1]University of Colorado School of Medicine, Aurora, CO. [2]CU Sports Medicine and Performance Center; Boulder, Colorado, CO.*

Reported Relationships: I. San-Millán: *Consulting Fee; Ascent Nutrition, Institute of Motion Analysis (IMA). Contracted Research - Including Principle Investigator; Leomo, LLC. Ownership Interest (Stocks, Bonds); MuscleSound, Inc.*

BACKGROUND: Maximal oxygen consumption ($VO2_{max}$) has been considered for decades the gold standard to measure cardiorespiratory fitness. The field of exercise physiology has experienced an important shift towards cellular and exercise metabolism in the past decade. The measurement of blood lactate ($[La^-]_b$) as a biomarker of cellular metabolism reflecting the metabolic response to exercise is widely used nowadays to assess performance. While many laboratories around the world still use VO2 and $VO2_{max}$ to assess human performance, many others use $[La^-]_b$. The debate of weather $VO2_{max}$ or $[La^-]_b$ is the best approach to assess fitness and performance has escalated over the past decade. However, there is neither consensus nor studies showing which method is more appropriate to assess fitness and performance. **PURPOSE:** To show the relationships between $VO2_{max}$ and $[La^-]_b$ during

exercise across different populations. **METHODS:** 232 male subjects divided in 24 international-level professional cyclists (PC), 77 US domestic competitive cyclists (DC), 107 recreational cyclists (REC) and 24 sedentary men (SM) performed an incremental cycling test starting at 1.0 W·kg^{-1} with increments of 0.5 W·kg^{-1} every 5 min until volitional exhaustion. VO$_2$ and VO2$_{max}$ (ml·kg^{-1}) and [La$^-$]$_b$ (mmol·L^{-1}) were measured at the end of each step. Comparisons were done for each group by means a Student t-test. Pearson correlation coefficient was used to verify the relationships between the different variables studied. Statistical significance was set at $p<0.05$. **RESULTS:** The average correlations between the VO2 and the [La$^-$]$_b$ at each step of the cycling test were weak for PC ($r = 0.05 \pm 0.02$, $p<0.001$), DC ($r = -0.11 \pm 0.12$, $p<0.001$), REC ($r = 0.17 \pm 0.14$, $p<0.001$) and SM ($r = 0.13 \pm 0.21$, $p<0.001$). The average correlations between VO2$_{max}$ and the [La$^-$]$_b$ at each step of the incremental test was moderate for PC ($r = -0.50 \pm 0.14$, $p<0.001$) while weak for DC ($r = -0.36 \pm 0.15$, $p<0.001$), REC ($r = -0.27 \pm 0.26$, $p<0.001$) and SM ($r = -0.32 \pm 0.28$, $p<0.001$). **CONCLUSION:** Our study shows weak to moderate correlations between VO2, VO2$_{max}$ and [La$^-$]$_b$ across different populations. Since lactate is a more descriptive parameter of the metabolic responses to exercise, measuring [La$^-$]$_b$ over VO2 and VO2$_{max}$ is a more appropriate parameter to assess metabolic fitness and performance.

1129   May 31 9:30 AM - 9:45 AM

The Effect Of Stride Frequency Variations On Running Performance At The Velocity Of Vo$_2$Max

Boram Lim, Boe Burrus, Justus Ortega, Young Sub Kwon. *Humboldt State University, Arcata, CA.*

(No relevant relationships reported)

Running economy (RE) is considered to be a critical factor to improve running performance. Stride frequency (SF) is an important variable for determining RE. The importance of SF has gained more attention in recent years, especially for recreational runners. However, no previous research has investigated the interaction between running performance at the velocity of VO2max and SF. **PURPOSE**: To investigate the effect of five different SF conditions on running performance at the velocity of VO$_2$max. **METHODS**: Twelve male recreational runners (Age=25 ± 4.2yr, Height=1.70 ± 0.6m, Body Mass=70.9 ± 8kg) measured VO$_2$max (53.1 ± 5.4 ml/kg/min) and preferred stride frequency (PSF; 89.5 ± 4 / min) through a graded exercise test (GXT) and running session, respectively. Running speed was determined based on each individual's GXT results by using ACSM estimation equations for exercise metabolism. Participants ran on the treadmill at this constant speed (0% grade) with different SF conditions (PSF, ±5%, ±10%) until time to exhaustion. Data were analyzed using a one way ANOVA with repeated measures. **RESULTS**: The total running distance was statistically significant among SF variations ($p<0.05$). Specifically, A Tukey post hoc revealed that the total distance at four SF conditions (90%, 95%, 100%, 110% of PSF) was statistically significant compared to 105% of PSF ($p<0.05$). Additionally, the respiratory exchange ratio (RER) was no statistically significant among SF variations ($p=0.37$). **CONCLUSIONS**: The SF variations have a significant influence on running performance. The relationship between SF variations and RER were possibly related to the central governor theory to delay the onset of fatigue. These results suggest that recreational runners could use a 105% of PSF to improve performance with the better RE.

Table 1. The relationship between SF, Distance, and RER					
SF variations	90%	95%	100% (PSF)	105%	110%
Distance(mile)	1.00 ± 0.5 *Ψ	1.04 ± 0.5 *	1.32 ± 0.6*	1.64 ± 0.7	1.15 ± 0.7 *
RER	1.05 ± 0.05	1.05 ± 0.03	1.03 ± 0.03	1.01 ± 0.02	1.02 ± 0.03

Note. Results reported in mean ± SD. * $p < 0.05$, vs. 105% SF conditions. Ψ $p < 0.05$, vs. 100% PSF conditions.

1130   May 31 9:45 AM - 10:00 AM

Predictability Of VO$_{2max}$ From Three Commercially Available Devices

Luke D. McCormick. *Eastern Michigan University, Ypsilanti, MI.* (Sponsor: Dr. Karin Pfeiffer, FACSM)

(No relevant relationships reported)

Sports watches have been developed with a feature that predicts VO$_{2max}$ from a submaximal effort. **PURPOSE**: To examine the predictability of VO2max from two heart rate monitors (Device A and V) and a global positioning system (GPS) watch compared to measured VO2max. **METHODS**: Twenty-seven participants, 15 males and 12 females ages 18 to 55, came to the Running Science Laboratory at Eastern Michigan University on two occasions. During visit 1, participants arrived in a semi-fasted state (without caffeine or caloric consumption for 3 hours) and completed a maximal graded exercise test (GXT) to determine VO$_{2max}$. The participant determined a self-selected speed which remained constant throughout the test while only grade increased by 2% every 2 minutes until volitional exhaustion. A VO$_{2max}$ (ml/kg/min) was

reached if heart rate was ≥95% of age predicted max, RER was ≥1.05, and there was a plateau in VO$_2$ (< 2 ml/kg/min). During visit 2, participants first wore two heart rate monitors simultaneously (Device A and V) and were instructed to lie still for 6 minutes to allow for the devices to estimate VO$_{2max}$. After these values were obtained, these two devices were replaced by a GPS watch. Participants then completed a 15-minute submaximal outdoor run, and the GPS watch estimated VO$_{2max}$. Pearson correlations and a Repeated Measures ANOVA were utilized to compare estimated VO$_{2max}$ values from the three devices to measured VO$_{2max}$ from the GXT ($p<0.05$). **RESULTS**: Six participants were excluded due to having a VO2max less than 35ml/kg/min, not returning for the second visit, or a device malfunctioning. Device A (r=0.66; $p<0.001$), Device V (r=0.80; $p<0.001$), and the GPS watch (r=0.72; $p<0.001$) were associated with measured VO2max. A significant main effect was found among VO2max values (F (2.0, 39.6) = 14.0; $p<0.05$). There was a significant difference ($p<0.01$) between measured VO2max (51.0±9.1 ml/kg/min) compared to Device A (44.0±5.5), Device V (45.3±5.6), and the GPS watch (45.7±5.3). **CONCLUSIONS**: Even though there were moderate to strong relationships, all three watches underestimated VO2max compared to measured VO2max. However, the difference between measured VO2max and all three devices may fall within daily variation of VO2max. The three devices may serve as an appropriate measure of cardiorespiratory fitness from a submaximal effort.

C-14   Clinical Case Slide - **Cardiovascular II**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-101CD

1131   **Chair:** Paul D. Thompson, FACSM. *Hartford Hospital, Hartford, CT.*

(No relevant relationships reported)

1132   **Discussant:** Benjamin D. Levine, FACSM. *Texas Health Presbyterian Hospital Dallas, Dallas, TX.*

(No relevant relationships reported)

1133   **Discussant:** Rachel Lampert. *Yale University, New Haven, CT.*

(No relevant relationships reported)

1134   May 31 8:00 AM - 8:20 AM

Left Arm Cramping and Prominent Veins in a 19 year-old Women's Collegiate Soccer Player

Andrew Schleihauf, Kimberly Kaiser, Robert Hosey, FACSM. *University of Kentucky, Lexington, KY.*

(No relevant relationships reported)

History: 19-year old female collegiate soccer goalie with PMHx iron-deficiency anemia due to heavy menses presents with left arm cramping, numbness, and purple discoloration. She was doing an overhead weightlifting workout and felt numbness and a cramping sensation in her left arm while performing front squats. She then noticed a purple discoloration of her left arm along with prominent veins and presented to the training room. After being examined, she was sent to the emergency department. She denies having any previous episodes similar to this. She was on oral contraceptives due to heavy menses but has no personal or family history of clotting disorders.
Physical Exam: Constitutional: 5'9, 173 lb. BP 123/71, pulse 63, RR 14. Athletic build. *Extremities*: Left forearm pallid and mottled with engorged basilic and cephalic veins. Mild generalized edema and diffuse tenderness from forearm to upper arm. Radial pulse 2+ bounding, brachial and carotid pulse 2+
Differential Dx: Neurogenic thoracic outlet syndrome, vascular thoracic outlet syndrome, complex regional pain syndrome
Test and results: *Left UE Venous Doppler*: Occlusive DVT in mid subclavian vein near the clavicle extending to the axillary, proximal basilic and proximal brachial veins. There is thrombus in the proximal cephalic vein. The jugular, radial and ulnar veins were patent with normal augmentation, compressibility, and flow
Left UE Arterial Doppler: Normal flow and waveforms throughout
Final working diagnosis: Paget-Schroetter syndrome
Treatment and Outcome: She was placed on a heparin drip and underwent thrombolysis with catheter directed tPA. A balloon angioplasty was done of the left subclavian vein for a 3 cm occlusion and then she underwent a first rib resection 6 weeks after initial presentation. Upon arrival to school for the fall semester, she continued to have pressure, mild pain, and discoloration of her left arm with minimal exertion. Repeat ultrasound and angiogram showed no evidence of acute thrombus one-month post surgery. After continuing to get discoloration of her arm walking across campus, she underwent a venogram two months after surgery that showed a well-adhered thrombus in her subclavian vein. She is scheduled for a repeat angioplasty and has been unable to return to full soccer activity after 5 months.

Abstracts were prepared by the authors and printed as submitted.

1135   May 31 8:20 AM - 8:40 AM
Cardiovascular Football

Stephen Carek[1], Timothy Durkin[1], Michael Dillon[2], Floyd Burke[1], Katherine Edenfield[1], Guy Nicolette[1], James Clugston[1]. [1]University of Florida, Gainesville, FL. [2]Heart and Vascular Institute of Florida, Gainesville, FL.
(No relevant relationships reported)

History: A 19 year old male freshman football defensive lineman presented for his pre-participation examination. He denied any cardiac symptoms or family history of sudden cardiac death. Screening ECG did not demonstrate pathological electrocardiographic abnormalities for athletes. Screening echocardiogram was significant for moderate concentric left ventricular hypertrophy and an interventricular septal diameter of 1.41 cm. Physical Exam: African-American Male. Height 76.5 in, Weight 349.4 lbs, BMI 42.4, Arm span: height ratio 1.06, Cardiac exam without murmurs, rubs or gallops. No physical findings consistent with Marfan's Syndrome. Differential Diagnosis: Physiologic Left Ventricular Hypertrophy (Athlete's Heart), Hypertrophic Cardiomyopathy, Hypertensive Cardiomegaly Tests and Results 1. Cardiac MR (1)Moderate to borderline severe symmetric hypertrophy. Hyperdynamic left ventricular systolic function. Ejection fraction of 75%. (2) No evidence of hyper-enhancement with gadolinium. (3) Maximal interventricular septum thickness of 17 mm. (4) Left Ventricular End Diastolic Volume Index (LVEDVI)/Left Ventricular End Diastolic Mass Index (LVEDMI) ratio of 0.75 (less than 1.2 is more consistent with HCM). (5) Wall thickness to LVEDVI ratio is 0.23 (less than 0.15 suggests HCM). (6) Findings equivocal for the assessment of hypertrophic cardiomyopathy versus athlete's heart. 2. Transthoracic Echocardiogram with Color Flow Doppler and Spectral Doppler (1) Normal left ventricular size, structure, systolic function. (2) Mild LV asymmetric septal hypertrophy, septal thickness 1.6 cm, posterior wall thickness 1.3 cm. (3) No evidence of left ventricular outflow tract obstruction. (4) Normal global longitudinal strain imaging with normal strain-derived left ventricular systolic function. 3. Exercise Stress Test (1) No ischemic ECG changes or arrhythmia with stress. Final Diagnosis: Physiologic Left Ventricular Hypertrophy (Athlete's Heart) Treatment and Outcomes: After being withheld from football during this evaluation, he has since been cleared for participation and has not demonstrated any unusual symptoms, including lightheadedness, dizziness, syncope, chest pain or shortness of breath. He is scheduled for follow-up in 6 months with a repeat echocardiogram.

1136   May 31 8:40 AM - 9:00 AM
Chest Pain, Palpitations and Heart Murmur In A Basketball Player

Colin L. Conner[1], John Stock[2], Mitchell Cohen[1]. [1]Arizona Pediatric Cardiology, Phoenix, AZ. [2]Pediatric Cardiac Care of Arizona, Phoenix, AZ.
(No relevant relationships reported)

HISTORY: A 16 year old male competitive basketball player referred for a 3 month history of intermittent palpitations associated with chest pain at rest. Initially the symptoms were occurring once or twice a week, then once every 2 days, then occurring almost daily. The episodes are characterized by irregular heartbeat, followed by chest pain, with occasional shortness of breath. There is also chest pain associated with exercise. Characterized as burning which lasts 15-20 seconds. It does not change with activity level. He can usually play through the pain. He denies dizziness, presyncope or syncope. Also denies effort intolerance.
PHYSICAL EXAMINATION: Well developed in no distress. No thyromegaly. No pallor. Lungs clear. Regular rate and rhythm. Normal S1 and S2. I-II/VI nonspecific SEM heard at LUSB and RUSB in the supine position. Pulses 2+ and equal. Abdomen soft and non-tender.
DIFFERENTIAL DIAGNOSIS:
1. Musculoskeletal chest pain
2. Palpitations-probably benign
3. Innocent murmur
TESTS AND RESULTS:
ECG: sinus bradycardia, LVH, ST elevation right precordial leads, T wave inversion inferior leads
ECHOCARDIOGRAM: LVH with notable hypertrophy of left posterior wall (14 mm). Borderline LAE.
HOLTER MONITOR: rare PVC's and PAC's. One polymorphic couplet
CARDIAC MRI: borderline concentric LVH (max 12.8 mm: Z score 2.2), borderline LV wall mass. Borderline LAE. No regional wall motion abnormalities or delayed gadolinium enhancement
METABOLIC STRESS: peak VO2 93% predicted. Ventricular ectopy at rest, with exercise and in recovery: suppressed at max HR. PFT (post exercise): FVC decreased 15%; FEV1 decreased 14%; FEF 25-75% decreased 39%
CARDIAC CATHETERIZATION: normal LV end diastolic pressures. No myocardial bridge
GENE DX: negative
FINAL/WORKING DIAGNOSIS:
1. Left Ventricular Hypertrophy

2. Premature Ventricular Contractions
3. Exercise Induced Bronchospasm
TREATMENT AND OUTCOMES:
1. Implantable loop recorder
2. Allowed to return to play with AED on site
3. Albuterol MDI prior to exercise
4. Repeat Metabolic Stress in 6 months

1137   May 31 9:00 AM - 9:20 AM
New Heart Murmur in a Male Basketball Player

Emily Miller, Dena Florczyk. UCLA, Los Angeles, CA.
(No relevant relationships reported)

HISTORY: 20 year old African American male presents for his pre-participation examination. Upon reaching the cardiovascular screening questions answers yes to both "have you ever been told you have a heart murmur" and "sudden death before the age of 50 in a relative." At a visit two days prior he was told he had a heart murmur. His estranged father, with whom he had no relationship, passed away in his forties secondary to unknown heart disease. His father was reportedly born with "blue heart disease with a hole in his heart." The etiology behind his father's passing was unknown but he had a history of incarceration, alcohol and substance abuse. No other family history of cardiac disease. The athlete himself specifically denies any personal history of pre-syncope, syncope, chest pain with exercise, dyspnea on exertion, palpitations.
PHYSICAL EXAMINATION:
BP: 130/70 General: alert and oriented, no stigmata of Marfan's Cardiac: regular rate and rhythm, S1 S2, 1/6 systolic murmur when supine, resolved when standing or sitting, no increase with valsalva. Normal radial and femoral pulses Respiratory: clear to auscultation bilaterally
DIFFERENTIAL DIAGNOSIS: 1. Cardiomyopathy - hypertrophic vs restrictive vs dilated vs other 2. Hypertensive heart disease 3. Benign systolic ejection murmur - Still's vs VSD vs mitral valve prolapse 4. Athletic heart
TEST AND RESULTS: EKG: Normal sinus rhythm. Echocardiogram: Normal EF 55-60%, no valvular stenosis or regurgitation. No outflow tract obstruction. Apical portion of the LV with findings consistent with apical localized non-compaction of the myocardium. Normal LV wall motion and wall thickness.
FINAL WORKING DIAGNOSIS: Non-compaction of the left ventricle
TREATMENT AND OUTCOMES:
Clinically asymptomatic. Increased trabeculations noted on echo consistent with non-compaction of the LV but with preserved ejection fraction and without evidence of dilation. CAM monitor for 1 week - no evidence of arrhythmias. Treadmill stress test with stress echocardiogram - no evidence of ischemia or exercise induced arrhythmias; normal cardiac response to exercise. ASA 81 mg daily to reduce risk of stroke associated with LV non-compaction. Reassurance provided that while being physical active this risk is minimal. Cleared to participate in athletics. Repeat echocardiogram in one year.

1138   May 31 9:20 AM - 9:40 AM
Misleading Congenital Brain and Heart Abnormalities in a Syncopal Soccer Player

Michael E. Pitzer[1], Heather Bauby[2]. [1]Virginia Commonwealth University, Richmond, VA. [2]Randolph-Macon College, Ashland, VA.
(No relevant relationships reported)

HISTORY: A 19-yr-old female collegiate soccer player reported recurrent fainting episodes during a pre-participation physical examination after transferring from another school. She reported sustaining a sports-related concussion in December 2014 and subsequently developed frequent fainting spells, headaches, and recurrent numbness in her arms and legs. Fainting spells are not provoked by Valsalva-like circumstances. Fainting spells are not associated with chest pain, palpitations, racing heart, shortness of breath, or diaphoresis. During fainting spells altered cognition may last only a few seconds or up to thirty minutes. Fainting spells are not associated with tonic-clonic movements, tongue biting, bowel incontinence, or bladder incontinence. She had already undergone evaluation for these symptoms including a Neurology evaluation that included a normal electroencephalogram and a Cardiology evaluation that included an electrocardiogram and echocardiogram. Echocardiogram revealed an atrial septal defect (ASD) which was subsequently closed and fainting spells became less frequent after ASD closure. Prior clearance to participate in soccer was provided by all evaluating providers including Cardiologist, Neurologist, and Primary Care Physician.
PHYSICAL EXAMINATION: Normal cardiac and neurologic examination.
DIFFERENTIAL DIAGNOSIS: Vasovagal syncope, postural orthostatic tachycardia syndrome, migraine variant, postconcussion disorder, psychogenic seizures, and somatization disorder.
TEST AND RESULTS: **Brain MRI:** The cerebellar tonsils descend below the foramen magnum, consistent with a Chiari I malformation. No upper cervical cord syrinx. **Brain MRI with CSF flow sequences:** The ventral foramen magnum

remains patent and the ventricles are normal. There is decreased flow across the foramen magnum at the fourth ventricular outflow and posterior to the cerebellar tonsils. **Cervical spine MRI:** No syrinx. **Neurosurgical evaluation:** Asymptomatic Chiari 1 malformation. **FINAL WORKING DIAGNOSIS**: 1. Vasovagal syncope.2. ASD status post closure.3. Asymptomatic Chiari 1 malformation. **TREATMENT AND OUTCOMES**: The athlete was allowed to participate when she expressed understanding of the associated risks. Episodes of syncope continued to occur.

1139   May 31 9:40 AM - 10:00 AM

Evaluation And Management Of Recurrent Symptomatic, Exercise-induced Tachyarrhythmia

Michael Fitzgerald. *University of Kentucky, Lexington, KY.*

(No relevant relationships reported)

HISTORY: A 15-year-old high school sophomore presented to the ED with palpitations, chest pain, and lightheadedness that began during volleyball conditioning. She reported one similar episode several months earlier and was seen by pediatric cardiology for outpatient evaluation, which included resting ECG, 24-hour Holter monitor, and echocardiogram. While participating in consecutive scrimmages, she felt her heart racing and experienced dull, non-radiating substernal chest pain. Her symptoms prevented further participation and did not resolve with rest. Her heart rate was recorded as 195bpm at home.
PHYSICAL EXAMINATION: HR 186, RR 22, BP 107/68. Patient was diaphoretic but generally well appearing and in no acute distress. Cardiovascular exam revealed rapid heart rate with regular rhythm and identifiable S1 and S2 heart sounds without murmurs or clicks. Peripheral pulses were 2+ and symmetric, no JVD. Chest pain was not reproducible. Lungs were clear to auscultation bilaterally. Abdomen was soft and non-distended. Thyroid was symmetric and without nodules.
DIFFERNTIAL DIAGNOSIS:
1. Supraventricular tachyarrhythmia (SVT)
— AVNRT
— MAT
2. Sinus tachycardia
— hyperthyroidism
3. WPW syndrome
4. Ventricular tachycardia
5. Atrial fibrillation
TESTS AND RESULTS:
1. ECG
— narrow complex tachycardia with rate 184, QTc 441, and indeterminate PR
2. CMP
— creatinine 1.09
3. Troponins
— T0 <0.010
FINAL/WORKING DIAGNOSIS:
Exercise-induced SVT likely secondary to AVNRT
TREATMENT AND OUTCOME:
1. 1L IV fluid bolus
2. Vagal maneuvers - modified Valsalva technique (strain followed by passive leg raise for 15 seconds at 45 degrees)
— synchronized cardioversion was considered unnecessary with stable vital signs
— normal sinus rhythm (NSR) was achieved after 3 attempts
3. Outpatient referral to pediatric cardiology before return to activity
— previous outpatient testing was reviewed and within normal limits
— patient was given the option for antiarrhythmic management vs. catheter ablation - opted for catheter ablation
— cleared for activity with vagal maneuver education and return precautions for refractory SVT
4. Interim ED visit for refractory SVT
— vagal maneuvers were unsuccessful - adenosine was required to achieve NSR
— patient was ultimately trialed on metoprolol while awaiting EPS and ablation

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C-15   Clinical Case Slide - **Knee II**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-200F

1140   **Chair:** Aaron Rubin, FACSM. *Kaiser Permanente Sports Medicine Program, Fontana, CA.*

(No relevant relationships reported)

1141   **Discussant:** Anthony E. Annan. *Home, London, United Kingdom.*

(No relevant relationships reported)

1142   **Discussant:** Cindy Y. Lin. *University of Washington Medical Center, Seattle, WA.*

(No relevant relationships reported)

1143   May 31 8:00 AM - 8:20 AM

Knee Pain - Exercise

Samuel T. Dona, Dean Padavan, Robert Monaco, Steven Sclafani. *Atlantic Sports Health, Morristown, NJ.*

(No relevant relationships reported)

HISTORY: A 58-year-old male presented with a 4-week history of spontaneous knee pain. One year prior to presentation, he had bariatric surgery and increased his exercise regimen resulting in a 100 lb weight loss. He denies trauma or inciting injury. His pain localized to the posterolateral knee and is described as a 5/10 cramping pain. He describes a popping sensation and experiences a snapping moment in the lateral knee with deep squatting. He denies swelling and ecchymosis. He has tried ice, physical therapy and ibuprofen without relief.
PHYSICAL EXAMINATION: Focused left knee exam revealed a palpable cystic structure in the lateral popliteal fossa. There is tenderness over the lateral joint line with no instability of the proximal tibiofibular joint or biceps femoris tendon. Range of motion was 0-140° with pain greater than 120° of flexion. When the knee is brought into deep flexion, there is an audible pop over the lateral aspect of the knee. When the knee is then brought into extension, there is reproduction of an audible pop and snapping moment of the lateral knee at end range extension. Flexion McMurray's test is positive. Strength, reflexes, sensation, and pulses are normal throughout.
DIFFERENTIAL DIAGNOSIS:
1. Snapping biceps femoris tendon
2. Snapping popliteus tendon
3. Lateral meniscus tear
4. Iliotibial band friction syndrome
5. Proximal tibiofibular joint instability
TEST AND RESULTS:
Three view x-rays of left knee:
— Medial joint space narrowing. No acute fracture.
Dynamic ultrasound of the left knee:
— Normal biceps femoris tendon. Popliteal cyst noted.
MRI of left knee without contrast:
— Incomplete discoid lateral meniscus and small multiseptated popliteal cyst noted.
FINAL WORKING DIAGNOSIS: Left knee discoid lateral meniscus with subluxation of the meniscus
TREATMENT AND OUTCOMES:
1. Patient counseled on activity modification.
2. Dynamic ultrasound revealed no evidence of hamstring irregularities.
3. Unsuccessful ultrasound-guided aspiration of popliteal cyst attempted followed by an intra-articular corticosteroid injection.
4. After MRI evaluation, orthopedic surgery performed an arthroscopic partial meniscectomy of subluxing torn posterior horn and midbody saucerization of lateral meniscus.
5. He tolerated surgery well with no further subluxation of his meniscus in physical therapy.

1144   May 31 8:20 AM - 8:40 AM

Knee Effusion-gymnast

Reno Ravindran. *Nationwide Childrens Hospital, Columbus, OH.*

(No relevant relationships reported)

HISTORY: 12 y/o gymnast comes into the office complaining of right knee swelling with minimal pain for 3 days after a gymnastics competition. She does not recall a specific injury during the competition but noticed discomfort as the day went on. The swelling worsened later that evening. They were seen by their primary care provider

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Abstracts were prepared by the authors and printed as submitted.

who referred them in to sports medicine clinic. She does endorse similar swelling and pain 6 weeks ago that responded to ibuprofen and ice and resolved in 2-3 days. Denies locking, catching, popping or instability episodes in knee. Family history: unknown; adopted

PHYSICAL EXAMINATION: Inspection: Moderate sized effusion, no erythema. Range of motion full in flexion and extension with mild discomfort in full flexion. Palpation: Mild tenderness around patellar facets, mild medial joint line tenderness. Special Tests: Negative Lachmans, Negative McMurray's, Negative patellar apprehension, Mild pain with valgus stress at 30degrees. Proprioception: Engaged Hip exam normal

DIFFERENTIAL DIAGNOSIS: 1.Patellofemoral Syndrome. 2.MCL sprain. 3.Inflammatory process: JIA, Synovitis. 4.Patellar instability

TEST AND RESULTS: X-rays 4 view Within normal limits. MRI with and without contrast: Findings consistent with an inflammatory synovitis with a moderate knee effusion and moderate synovitis.2. Signal abnormality both deep and superficial to the medial collateral ligament may be secondary to strain. Labs: ESR 20mm/h, CBC normal, CRP: normal, ANA positive, Lyme serology positive

FINAL WORKING DIAGNOSIS: 1.Lyme Synovitis 2.Grade I MCL sprain

TREATMENT AND OUTCOMES: Currently undergoing antibiotic treatment with doxycycline 75mg BID for 4 weeks. Is also going through physical therapy in regards to MCL sprain.

1145 May 31 8:40 AM - 9:00 AM

Acute Knee Pain in Adolescent Basketball Player

Kristopher Paultre. *JMH/UM, Miami, FL.*

(No relevant relationships reported)

History:

14 y/o male basketball player presents to ED after sustaining an injury to his left lower extremity. This occurred during a school basketball game while landing from a jump shot. Patient stated he felt a pop in his left knee upon landing and rated pain a 9/10 severity. Immediately after, he had swelling with decreased ROM and was unable to flex/extend his knee due to pain.

PE:

Left Knee:

Edema was present with mild discoloration over the anterior of knee and severe tenderness upon palpation over anterior patellar tendon. Patient unable to perform active ROM. Passive ROM limited secondary to pain. Full scope of exam, including assessment of ligaments, menisci, and ROM also limited secondary to pain.

Bilateral Ankles:

No deformity noted b/l. Non-tender on palpation. Neurovascularly intact.

Differential Diagnosis:

Patellar dislocation

ACL tear Patellar tendon rupture Proximal tibia fractureDistal femur fracture Meniscal tear

Tests and Results:

X-rays of left femur (3 view), left knee (AP/ lateral), and left tibia/fibula (3 view): Findings showed a displaced type-3a tibial tuberosity avulsion fracture, displaced 1.5 cm with an associated knee effusion and intra-articular extension. No additional fractures noted on left femur, knee, tibia, or fibula.

Final/Working Diagnosis:

Closed left tibial tubercle avulsion fracture, displaced type-3A with avulsion of left quadriceps infrapatellar tendon.

Treatment and Outcome:

1.Open reduction and internal screw fixation of tibial tuberosity with repair of infrapatteller tendon

2.long leg walker cast placed

3.At 6 week follow-up visit, repeat x-rays showed anatomic alignment of the fracture site,good positioning of 2 fixation screws, and articular surface which was realigned. Knee immobilizer was discontinued and he was given walker for stability. Instructed to d/c use of walker once left knee felt stable and remain out of athletic activities until further evaluation. Referred to PT for Quad strengthening and ROM exercises.

4. At 5 month post injury visit, patient showed favorable progress. He had full ROM, improved strength, and was cleared to resume sports starting at a low level intensity. He was advised to gradually increase the duration and intensity of his training. Patient advised to continue knee mobility exercises and to f/u with PCP for routine Health care.

1146 May 31 9:00 AM - 9:20 AM

Soccer Knee Injury

Kameron Bazmi[1], Caitlin Cicone[1], Richard G. Chang[2]. *[1]SUNY Downstate, Brooklyn, NY. [2]Icahn School of Medicine at Mount Sinai, New York, NY.*

(No relevant relationships reported)

HISTORY: 19 year old male presented with right thigh weakness and difficulty walking for 2 years following a soccer injury that resulted in a right patellar dislocation. Patient was managed non-operatively for 1 year after the injury before

proceeding to surgical intervention. Subsequently, the patient underwent medial patellofemoral ligament reconstruction. Since the injury, patient reported weakness and atrophy of his right quadriceps, with no improvement after surgery. He denied numbness or pain, but did complain of intermittent right lower extremity buckling.

PHYSICAL EXAMINATION: Examination in the clinic revealed right quadriceps atrophy with mild right knee effusion. There was no tenderness to palpation along right quadriceps, knee joint line, patella or patellar tendon. There was limited active range of motion secondary to weakness, with passive range of motion through 0 to 90 degrees limited by pain. Manual muscle testing was 1/5 for right knee extension, 4-/5 for right hip abduction, all else 5/5. Lower extremity reflexes were 2+ and symmetrical, bilateral. There was right knee buckling during ambulation.

DIFFERENTIAL DIAGNOSIS: 1.Disuse atrophy 2.Lumbar plexopathy 3.Lumbar radiculopathy 4.Quadriceps muscle avulsion 5.Polymyositis 6.Diabetic polyneuropathy

TEST AND RESULTS: Electrodiagnostics

-Right femoral nerve showed prolonged onset latency

-The right sural nerve showed prolonged peak latency and slowed conduction velocity

-The right superficial peroneal nerve showed prolonged peak latency and mild slowed conduction velocity

-The right saphenous showed decreased amplitude

-Right vastus lateralis, rectus femoris, and vastus medialis showed decreased insertional activity, minimal to no recruitment; vastus lateralis most affected -Right demyelinating and axonal femoral neuropathy with the lesion at or distal to the right inguinal ligament & right sural and superficial peroneal sensory neuropathies

FINAL WORKING DIAGNOSIS: Primarily axonal femoral neuropathy

TREATMENT AND OUTCOMES:

1. Patient started physical therapy with a focus of strengthening quadriceps, hip abductors and core 2. Patient prescribed Meloxicam 7.5 mg to be used as needed 3. Patient was non-compliant with therapy for over 6 months, did not return to sport and eventually lost to follow up

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1147 May 31 9:20 AM - 9:40 AM

Chronic Medial Knee Pain in a Collegiate Basketball Player and Marching Band Member

Nicholas E. Anastasio, David Hryvniak. *University of Virginia, Charlottesville, VA.* (Sponsor: Robert Wilder, MD, FACSM)

(No relevant relationships reported)

History:

Patient 1:

A 17 year-old female collegiate basketball player presented with insidious onset right medial knee pain for the last 8 months. Pain waxed and waned with activity. No history of swelling, instability or locking. No numbness or weakness. Pain located diffusely over the medial knee and proximal medial tibia. Symptoms refractory to PT, patellofemoral kinesiotaping, medial arch support orthotics and NSAIDs. No relief following Medrol dose pack, intraarticular corticosteroid injection, or pes anserine bursa corticosteroid injection.

Patient 2:

A 19 year-old female collegiate marching band member presented with insidious onset right medial knee pain present for 4 years. Patient reported intermittent swelling but denied instability or locking. Symptoms were worse with walking and marching. Previous Rheumatologic consult unrevealing. Symptoms refractory to PT, knee sleeve, and patellar straps. No relief following right pes anserine bursa corticosteroid injection.

Physical Examination:

Patient 1 - Knee without effusion. Diffuse tenderness to palpation over the medial knee at and below mid medial joint line. ROM and strength normal. No laxity. Neurovascular intact.

Patient 2 - Knee without effusion. Tenderness to palpation over the medial joint line and distally over pes anserine. Tinel's sign positive over the medial femoral condyle. ROM and strength normal. No laxity. Neurovascular intact.

Differential Diagnosis:

1. Pes anserine bursitis

2. MCL bursitis

3. Patellofemoral syndrome

4. Medial meniscal tear

5. Medial patellar plica

6. Saphenous neuralgia

Test and Results:

Patient 1:

XR Knee - No fracture or joint effusion.

MRI knee - No meniscus tear. No internal derangement. Mild increased T2 signal within the superior lateral aspect of Hoffa's fat.

Diagnostic saphenous nerve block - 0.5% bupivacaine injected 2 inches cephalad to the medial joint line - 24 hours of relief.

Patient 2:

XR Knee - No fracture or malalignment.

MRI knee - Unremarkable MRI of the knee.

Labs - ESR 8, TSH 1.7

Final/Working Diagnosis:

Saphenous Neuralgia

Treatment and Outcomes:
Patient 1:
Saphenous nerve injection - 40 mg triamcinolone/0.5% bupivacaine - 5 months of relief.
US guided hydrodissection saphenous nerve - Full resolution for 1.5 years.
Patient 2:
US guided hydrodissection saphenous nerve - 6 months of relief.

1148   May 31 9:40 AM - 10:00 AM
Lingering Right Knee Pain - Mountain Biking

Andrew McBride. *University of Colorado - Denver, Aurora, CO.*
(Sponsor: John Hill, FACSM)
(No relevant relationships reported)

Title: Lingering right knee pain - mountain biking Authors: Andrew McBride, John Hill, FACSM, Michelle Wolcott Sponsor: John Hill, FACSM Institutions: University of Colorado - School of Medicine History: Patient is a 32 y/o previously healthy male who presented to sports medicine clinic with one month of right anterior knee pain. Pain began after he swerved to avoid dogs while mountain biking. He fell from his bike and directly struck his anterior right knee on a rock. He had immediate pain and swelling but continued riding. His pain did not resolve with ice and ibuprofen, if fact it gradually worsened especially with deep knee bending and mountain biking. He felt the knee was unstable but denied locking or catching. Physical Exam: Right knee: Neutral alignment; Normal gait; No effusion; Patellar apprehension with medial facet tenderness and patellofemoral crepitus; swelling of patellar tendon; Lachman with soft endpoint; slight Anterior drawer; medial joint line pain; Normal neurovascular exam Differential Diagnosis: ACL sprain/tear, Patellar tendonitis, Medial meniscus tear, Patellofemoral syndrome, Fat pad impingement Tests and Results: X-ray of right knee showing soft tissue edema with small osseous fragment around distal patella; MRI right knee showing severe patellar tendinosis with no internal knee derangement; Diagnostic U/S showing severely thickened (1.2 cm) patellar tendon with near complete disorganized fiber pattern with only mild neovascularity seen. Final Diagnosis: Traumatic patellar tendonitis Treatment and Outcomes: The patient initially tried rest, ice and ibuprofen with minimal relief. He later tried 4 visits with PT but pain worsened during these sessions.. He was referred to U/S clinic for possible percutaneous tenotomy. At this visit the tendon appeared so disorganized that it was recommended he follow-up with our knee surgeon to discuss surgical management options. He is currently in the surgical planning process, complete follow-up will be available in May 2018.

C-16   Clinical Case Slide - **Medical Issues II**

Thursday, May 31, 2018, 8:00 AM - 10:00 AM
Room: CC-200E

1149   **Chair:** William W. Dexter, FACSM. *Maine Medical Center, Portland, ME.*
(No relevant relationships reported)

1150   **Discussant:** Andrea Stracciolini, FACSM. *Children's Hospital Boston, Boston, MA.*
(No relevant relationships reported)

1151   **Discussant:** Francis G. O'Connor, FACSM. *Uniformed Services University, Bethesda, MD.*
(No relevant relationships reported)

1152   May 31 8:00 AM - 8:20 AM
Abdominal Pain - Professional Singer

Tamara Rial-Rebullido[1], Fernanda Gonzalez[2], Iván Chuli-Medrano[3]. *[1]International Hypopressive and Physical Therapy Institute, Vigo, Spain. [2]Universidad Autónoma de Durango, Durango, Mexico. [3]University of Alicante, Alicante, Spain.*
(Sponsor: Avery D. Faigenbaum, FACSM)
(No relevant relationships reported)

HISTORY: A 24-year-old male singer presented symptoms of trunk and abdominal pain, reduced breathing capacity and limited trunk mobility after six months of a laparoscopic Nissen fundoplication due to gastric volvulus associated with a paraesofagic hiatal hernia. His pain made it difficult to sing and perform sustained quality notes. He was referred to respiratory physical therapy. He was a non-smoker and not taking any medications. **PHYSICAL EXAMINATION:** Height 173 cm, weight 76 kg, body mass index 25.3 kg/m². Abdominal and thoracic examination revealed limited thoracic amplitude, diaphragmatic hypertonicity, altered sensitivity from T7 to T10, limited range of motion and pain during right and left trunk rotations and trunk extensions. Mild epigastric tenderness. Hemodynamically stable. **DIFFERENTIAL DIAGNOSIS**: 1. Dyspnea 2. Respiratory disease 3. Hernia **TEST AND RESULTS**: Visual Analog Scale revealed pain 7 under ribcage and xiphoid process. Cough hyperpressure test negative. Positive toe touch test. Breath-holding test positive. Negative thoracic amplitude test. **FINAL WORKING DIAGNOSIS**: Dysfunctional breathing and muskuloskeletal pain. **TREATMENT AND OUTCOMES**: 1. Progressive breathing exercises. 2. Diaphragm stretching exercises. 3. Hypopressive exercises. 4. Returned to singing after 10 weeks (3 sessions per week) when he had full trunk motion, no abdominal pain and was able to meet the demands of vocal performance.

1153   May 31 8:20 AM - 8:40 AM
Abnormal Weight Gain in a Collegiate Athlete - Swimming

Roberta Dennison. *Boston Children's Hospital, Boston, MA.*
(Sponsor: Kathryn E. Ackerman, MD, MPH, FACSM)
(No relevant relationships reported)

HISTORY: 21 year-old-female Division III collegiate swimmer presenting for evaluation of significant weight gain and declining performance. Patient reports 20 lb weight gain over 18 months without change in diet or exercise routine. She endorses 15+ hrs/wk of training between pool and dryland exercise. Over prior 6 months, she continued to gain weight despite diligent dietary adjustments and nutrition consultation. Patient was diagnosed with PCOS in high school. She reports long-standing issues with irregular menses, acne, and facial hair, which were previously managed with spironolactone, OCP, and metformin. Medications were discontinued 2 months prior to presentation, as they were no longer effective. Simultaneously, patient was started on bupropion as an appetite suppressant, but has not noticed any weight change since initiation.
PHYSICAL EXAMINATION:
Orthostatic Vitals:
Lying: BP: 115/75, HR: 58
Standing: BP: 110/70, HR: 64
Weight: 75.3 kg; Height: 165 cm; Body Mass Index: 27.7 kg/m²
GEN: Well-appearing young female in no acute distress. Alert and oriented x3.
HEENT: Normocephalic, atraumatic, with round facies. Significant coarse facial hair. EOMI. Thyroid is nontender without nodules. +Dorsocervical fat pad.
CV: RRR, no M/R/G
Resp: CTAB
Ext: Warm and well-perfused, no edema, moving all 4 extremities, gait stable.
Skin: Thin purple striae on breasts, abdomen, and inner thighs. + facial acne.
DIFFERENTIAL DIAGNOSIS:
1) PCOS
2) Hypothyroidism
3) Caloric surplus
4) Acromegaly
5) Hypercortisolism
TESTS AND RESULTS:
Labs:
Chemistry panel WNL
TSH 1.59 uIU/mL
Free T4 0.87 ng/mL
17-hydroxyprogesterone: 69 ng/dL
DHEAS: 559.3 mcg/dL (H)
LH: 11.8 IU/L
FSH: 4.36 IU/L
Testosterone: 53 ng/dL
Free testosterone: 11.3 pg/mL (H)
Sex hormone binding globulin: 25 nmol/L (L)
Free Androgen Index: 7.36 (H)
IGF-1: 275 ng/mL
Prolactin 19.92 ng/mL
24 hour urine cortisol: 65.5 mcg (H)
AM Cortisol following 1mg dexamethasone suppression test 8.5 ug/dL
FINAL/WORKING DIAGNOSIS:
Hypercortisolism
TREATMENT AND OUTCOMES:
Currently awaiting results of high dose dexamethasone suppression test to further determine pituitary vs. adrenal vs. ectopic origin of Cushing Syndrome.

1154   May 31 8:40 AM - 9:00 AM

Syncopal Episode in a College Football Player

Bjorn A. Jacobson, Richard A. Okragly. *TriHealth Bethesda Primary Care Sports Medicine Fellowship, Cincinnati, OH.* (Sponsor: Henry Stiene, FACSM)

(No relevant relationships reported)

HISTORY: A 20 year old African American college football player started to feel faint, walk slowly and then collapse during the end of a fitness session. Immediately triaged by his AT he was unresponsive to verbal or noxious stimuli, demonstrating brief decorticate posturing, tachypneic, with palpable pulses. The episode lasted 90 seconds. I arrived to find an alert and oriented male in no distress. Initially resistant, he did eventually agree to go to the ED. He stated he had taken 5 decongestant pills in the preceding 24 hours. He denied any preceding chest pain or palpitations, but did feel short of breath and light headed prior to collapsing. He said that he had a previous syncopal episode during exercise years ago that was reportedly secondary to dehydration.
PHYSICAL EXAMINATION: Initial exam on the field showed an alert, fully coherent and oriented well appearing male in no distress; pupils equal/reactive to light; no foaming of the mouth or tongue bite wounds; a regular rate and rhythm with no murmurs/gallops; lungs clear to auscultation; overall a benign physical exam. VS - BP 133/69, HR 63, RR 18, T 97.9F, SpO2 98%
DIFFERENTIAL DIAGNOSIS: 1) Vasovagal syncope or other reflex (neurally) mediated syncope 2) Cardiovascular syncope 3) Hypertrophic Cardiomyopathy 4) Metabolic (drug induced) syncope 5) Volume depletion orthostatic syncope 6) Seizure
TEST AND RESULTS: BMP, CBC, Cardiac Enzymes - Normal; Chest XR AP and Lateral - Normal; EKG - Sinus Rhythm, Normal Axis, ST elevation in leads V1-V5 followed by T wave inversions, Prominent QRS complexes (unchanged on 4 EKGs over 3 weeks); 2D Echo - LVEF 55-60%, mild concentric LVH, bicuspid aortic valve; Cardiac MRI - LVEF 55%, no LVH (wall thickness less than 11 mm), tricuspid aortic valve; Stress EKG (GXT) - Baseline EKG abnormalities normalized, negative for ischemia, Duke treadmill score 14 (low risk)
FINAL WORKING DIAGNOSIS: Vasovagal syncope/possibly related to pseudoephedrine
TREATMENT AND OUTCOMES: After extensive cardiac work up, baseline EKG repolarization abnormalities normalized with exercise testing. Given his normal cardiac MRI and normal stress testing he was cleared by cardiology for full athletic participation. He was advised to immediately notify us if he develops any recurrent symptoms. He is now completing his college football season without incident.

1155   May 31 9:00 AM - 9:20 AM

Headache and Near Syncope in a Soldier After Training

Robert H. Lutz. *Duke Sports Science Institute, Durham, NC.* (Sponsor: Shawn F. Kane, FACSM)

(No relevant relationships reported)

HISTORY: A 34 y/o male active duty Soldier presented to an Army clinic with headache, nausea and lightheadedness around 1000 in the morning. Symptoms started indoors in a classroom environment, two hours after conducting a challenging obstacle course. On a bathroom break he felt like he was going to pass out after urinating and knelt to the ground. He denied falling off an obstacle, striking his head or sustaining any injuries on the morning obstacle course. He was weak, nauseous, and dizzy, with a 4/10 headache. He had been previously well and reported no history of head injury, fever, or neck stiffness. He denied peri-oral tingling or numbness. During the evaluation, his headache increased in severity. Past medical history significant for radio frequency ablation for SVT 2007. The course medic verified there was no injury and reported the Soldier had recently been drinking a lot of water and protein shakes. Training for the three days prior to presentation included several prolonged, physically demanding events.
PHYSICAL EXAMINATION: Initial vitals: Pulse- 112, B/P- 115/69, respirations-28, SPO2- 99%, GCS- 15
General: Pt on gurney with eyes closed, responding appropriately to questions. Respiratory rate rapid and deep. The physical exam to include a complete neurologic exam was only remarkable for mild photophobia and a lack of carpal pedal spasms.
DIFFERENTIAL DIAGNOSIS:
1. Hyperventilation
2. Hyponatremia
3. Hypoglycemia
4. Arrhythmia
5. Migraine Headache
6. Micturition Syncope
7. Sub-acrachnoid Hemorrhage
8. Panic Attack
TESTS AND RESULTS:
-Glucose: 90, CMP and CBC normal, UA: 2+ ketones, myoglobin negative.
-ECG: sinus tachycardia, normal axis, normal intervals, no ischemic changes.
-Head CT: right-sided 2.8 cm epidural hematoma with 8mm of midline shift. No skull fracture identified.

FINAL/WORKING DIAGNOSIS:
Epidural Hematoma
TREATMENT AND OUTCOME:
1. Transfer to a tertiary care center for craniotomy and hematoma evacuation of the hematoma. There was a fine, non-displaced fracture of the temporal bone discovered at time of surgery.
2. No neurologic sequelae.
3. Cleared to return to training after 6 months of healing.
4. Investigation after the injury revealed the Soldier had sustained minor blow to the right side of the head 3 days prior to presentation.

1156   May 31 9:20 AM - 9:40 AM

Going the Distance Makes Me Tired: Seizure in a Cross Country Runner

Caitlin G. Waters, James Broadhurst, John H. Stevenson. *UMass Memorial Medical Center, Worcester, MA.* (Sponsor: Pierre Rouzier, FACSM)

(No relevant relationships reported)

HISTORY: 21 y/o M collegiate cross country runner presents to team doctor with hand shaking and body cramping after a strenuous 12 mile run. Complained of generalized weakness, abdominal and leg cramping, nausea, diarrhea, slight shaking of his hands, and thirst. Felt well prior to the run. Endorsed increased thirst this week and had been drinking water. Sent to the ER for IV hydration. On his way to the ER, he suddenly became unresponsive with stiffness, shaking, and frothing at the mouth.
PHYSICAL EXAMINATION: Temp: 36.9 Celsius, BP: 140/80, HR: 90-110, RR:21-27, SpO2: 100% on RA, GEN: Responsive, staring. Pale. NAD. Photosensitive. No rigidity. Clear speech. PSYCH: Answers "Yup." to most questions. Occ. confused. Alert. Oriented x3. HEENT: PERRL. EOMI. No LAD. Neck supple. No JVD. CARDIOPULM: CTA B/L. S1, S2, RRR, no MRG, ABD: Soft, NT, ND, no HSM, BS+ , EXT: No edema, capillary refill <2, SKIN: No rash, NEURO: CN II-XII testing limited, but grossly intact. Would not stick out tongue. Opens eyes on request. Normal grasp. Reflexes 2+ DTR's b/l.
DIFFERENTIAL DIAGNOSIS:Metabolic Derangement, Hyponatremia, Hypercalcemia, Hypoglycemia; Rhabdomyolysis/Dehydration; Toxic Encephalopathy; Drug Withdrawal; Intracranial Mass; CNS Infection; Epilepsy
TEST AND RESULTS:Initial Na 118, Anion Gap 17, Bicarbonate 15, Magnesium 1.5, initial CPK 917, CK rose to greater than 60,000 despite IV hydration, Toxicology Negative, CT head: questionable hypodensities in the medial temporal lobe, MRI Brain: normal, EEG: negative
FINAL WORKING DIAGNOSIS: Seizure induced by Hyponatremia Secondary to Psychogenic Polydipsia; Hyponatremia Induced Myopathy
TREATMENT AND OUTCOMES:Sodium corrected in the ICU over a few days. Patient drank a total of 48 oz prior to his run, and 160 oz post-run. Despite hydration and gentle correction of sodium, CK continued to rise. Rhabdomyolysis thought initially due to seizure and muscle breakdown in the setting of aggressive exercise; however, the delayed clearance of CPK raised concerns for glycogen storage deficiency vs genetic dysfunction. Referred to Genetics for a muscle biopsy to rule out glycogen storage deficiency, biopsy pending. Returned to cross country running with strict instructions regarding hydration, runs 5-8 miles without any issues.

1157   May 31 9:40 AM - 10:00 AM

Cotton Mouth In A Cross Country Runner.

Jason A. Kirkbride, Siobhan Statuta. *University of Virginia, Charlottesville, VA.* (Sponsor: John MacKnight, FACSM)

(No relevant relationships reported)

HISTORY: A 21-year-old Division I cross-country runner presented to the athletic training room the day he was to leave for ACC championships, concerned about his intolerable dry mouth, leg heaviness and worsening fatigue. He had an unintended weight loss of 15 pounds despite working with Sports Nutrition over the summer due to a baseline BMI of 17.9 and a history of a sacral stress fracture the prior year. He endorsed normal eating pattern, but often felt full secondary to increased fluid intake from his dry mouth. Over the past few days, he also noted the onset of blurry vision. His only medication was an Omega-3 supplement and he denied a family history of autoimmune diseases, but did have an uncle with Type II diabetes mellitus.
PHYSICAL EXAMINATION: Temp: 36.9 °C (Oral) HR: 54 beats per minute Orthostatic blood pressure: Supine: 112/72 Standing: 108/65 Weight: 61.3 kg BMI: 17.36 kg/m2 GEN: No acute distress, Thin. Cachectic appearing. HEENT: Eyes prominent where conjunctiva is visible around entire iris, no thyromegaly. Tongue and uvula covered with white scrapable film, no cervical lymphadenopathy. CV: Normal S1, S2, normal rhythm. No murmurs. Bradycardic (baseline for patient). NEURO: Alert, oriented x3, speech fluent, sensation intact. PSYCH: Quiet, slower to respond compared to baseline. "Spacey," but logical thinking. No tangentiality.
DIFFERENTIAL DIAGNOSIS: Relative energy deficiency in sport Overtraining syndrome Thyroid disease Anemia Viral illness/ Mononoculeosis Diabetes Mellitus Type 1 Malignancy Diabetes Insipidus

TEST AND RESULTS: Urinalysis: Color yellow, Appearance Clear, Specific Gravity 1.035, pH 6.5, Protein Neg., Glucose 3+, Ketone Moderate, Bilirubin Neg., Blood Neg., Nitrite Neg., Leukocyte esterase neg. CBC: WBC 7.3, Hgb. 16.6, Hct. 46, Plt. 268 CMP: Na 130, K+ 5.6, Cl. 88, Bicarb. 27, BUN. 39, Cr. 0.8, Glc. 870, Alk phos. 183, ALT 67, AST 35, Anion Gap 15 TSH 0.27, Free T4 0.9, Free T3 1.5 CRP 0.2 ESR 7 Ferritin 224 HIV Non-reactive Hgb. A1c 13.6
FINAL WORKING DIAGNOSIS:New onset Diabetes Mellitus Type 1 in diabetic ketoacidosis
TREATMENT AND OUTCOMES:Urgent transport to the emergency department for DKA management including insulin and intravenous fluids with several day admission. Endocrinology work-up in process. Plan to follow weekly x 6 weeks and held from sport the remainder of the semester.

C-33   Free Communication/Poster - **Acute Exercise - Cardiorespiratory Physiology**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1193   Board #1   May 31 8:00 AM - 9:30 AM
Aerobic Exercise Reduces The Pro-thrombotic Potential Of Circulating Microparticles in Healthy Individuals

Patrick J. Highton[1], David J. Stensel[1], Fernanda R. Goltz[1], Naomi Martin[2], Nicolette C. Bishop[1]. [1]Loughborough University, Leicester, United Kingdom. [2]De Montfort University, Leicester, United Kingdom.

(No relevant relationships reported)

PURPOSE: Microparticles (MPs) are extracellular vesicles shed upon cellular activation or apoptosis that possess pro-thrombotic functions via Tissue Factor (TF) expression. Aerobic exercise (AE) may impact circulating MPs, though recent research is conflicting. Previous other results may also reflect underlying circadian variations. This study investigated the impact of AE or rest with a standardized meal on MP phenotypes and pro-thrombotic potential over a morning period.
METHODS: 15 healthy males (22.9 ± 3.3 years; 81.9 ± 11.4 kg; VO_2 max 54.9 ± 6.5 mL·kg·min^{-1}; mean ± SD) completed 1 hr of AE (70% VO_2max) at 9am, and consumed a standardised meal (1170 kcal, 43% CHO, 17% PRO, 40% fat) at 10:45am. Venous blood samples were taken at 9am, 10am and 11:30am. Control trials included no exercise. MP phenotypes (platelet, neutrophil, monocyte and endothelial cell) and TF expression were assessed by flow cytometry.
RESULTS: Data are presented as mean ± SEM**.** Effect sizes are presented as η^2 (0.2 = small, 0.5 = moderate, 0.8 = large; Statistical Power Analysis for the Behavioral Sciences, Cohen, 1988). Total numbers of MP increased from 9am to 10am (1.62 ± 0.59 to 1.74 ± 0.73 x10^{10}/L, p = .016, η^2 = .105) in both conditions, but was unaffected by trial. All other phenotype counts remained unaffected by trial or time. The % of TF+ platelet-derived MPs reduced from 9am to 10am (44.0 ± 5.5 to 21.5 ± 2.4%, p = .001, η^2 = .582) in the exercise trial, but remained unchanged in the control trial (36.8 ± 4.7 to 34.9 ± 3.9%, p = .972). %TF+ neutrophil-derived MPs reduced from 9am to 11:30am (42.3 ± 4.4 to 25.1 ± 3.8%, p = 0.48, η^2 = .801) in the exercise trial, but remained unchanged in the control trial (28.5 ± 4.1 to 32.2 ± 2.5%, p = .508).
CONCLUSION: The increase in total MP count was not affected by exercise and may be due to diurnal variation – this warrants further investigation over a 24h period. Moderate intensity AE with a standardized meal seem to have little effect on absolute circulating MP
phenotype counts in this population. However, AE induced a large reduction in the % of platelet and neutrophil MPs that express TF, suggesting a mechanism via which AE can reduce cardiovascular risk via reduced TF-stimulated coagulation and thrombosis. This effect requires more investigation in clinical populations at greater cardiovascular disease risk.

1194   Board #2   May 31 8:00 AM - 9:30 AM
FURIN Variant Associations with Postexercise Hypotension are Ethnicity and Intensity Dependent

Burak T. Cilhoroz[1], Gregory A. Panza[2], Elizabeth D. Schifano[1], Garrett I. Ash[3], Lauren M.L. Corso[1], Ming-Hui Chen[1], Ved Deshpande[1], Amanda Zaleski[2], Paulo Farinatti[4], Beth A. Taylor, FACSM[2], Rachel J. O'Neill[1], Paul D. Thompson, FACSM[2], Linda S. Pescatello, FACSM[1]. [1]University of Connecticut, Storrs, CT. [2]Hartford Hospital, Hartford, CT. [3]Yale University, New Heaven, CT. [4]Rio de Janeiro State University, Rio de Janeiro, Brazil. (Sponsor: Linda S. Pescatello, FACSM)

(No relevant relationships reported)

Furin (paired basic amino acid cleaving enzyme) is a proprotein convertase subtilisin/kexin (PCSK) enzyme and important in pro renin receptor processing. *FURIN* variants have been identified to be involved in multiple aspects of blood pressure (BP) regulation, and targeting PCSKs is a promising future form of drug therapy.
PURPOSE: To examine the associations among *FURIN* variants and the immediate blood pressure (BP) response to bouts of acute exercise performed at different intensity, termed *postexercise hypotension* (PEH).
METHODS: Obese (30.9±3.6 kg m^{-2}) African American (n=14) (AF) and Caucasian (n=9) adults 42.0±9.8yr with hypertension (139.8±10.4/84.6±6.2mmHg) performed three random acute experiments: bouts of vigorous (VIGOROUS) and moderate (MODERATE) intensity cycling and control. Subjects were attached to an ambulatory BP monitor for 19 hr. We performed deep-targeted exon sequencing using with the Illumina TruSeq Custom Amplicon kit. Variant genotypes were coded as the number of minor alleles (#MA) and selected for additional statistical analysis based upon Bonferonni or Benjamini-Yekutieli multiple testing corrected p-values under time adjusted linear models for 12 hourly BP measurements, when all subjects were awake and ambulating; and for 19 hourly BP measurements, the total duration the BP monitor was worn.
RESULTS: After VIGOROUS over 19 hr, as *FURIN* #MA increased in rs12917264 (p=2.4E-04), rs6226 (p=2.4E-04), and rs75493298 (p=6.4E-04), systolic BP (SBP) decreased 30.4 to 33.7 mmHg; and in rs12917264 (p=1.6E-03), rs6226 (p=1.6E-03), and rs75493298 (p=9.7E-05), diastolic BP (DBP) decreased 17.6 to 20.3 mmHg among AF only. In addition, after MODERATE over 19 hr in *FURIN* rs74037507, as #MA increased, SBP increased 20.8 mmHg among AF only. Whereas, after MODERATE over the awake hours, as *FURIN* #MA increased in rs2071410 (p=6.1E-04), rs1573644 (p=6.1E-04), and rs6227 (p=6.1E-04), DBP decreased 12.5 mmHg among Caucasians only.
CONCLUSION: *FURIN* variants were associated with PEH after MODERATE and VIGOROUS over 19 hr among AF, and after MODERATE over the awake hours among Caucasians. *FURIN* appears to exhibit ethnicity and intensity dependent associations with PEH that merit further exploration among a larger, ethnically diverse sample of adults with hypertension.

1195   Board #3   May 31 8:00 AM - 9:30 AM
Repeatability of the Neurocardiovascular Responses to Isometric Handgrip in Young Adults

Gabrielle A. Dillon[1], Paul J. Fadel, FACSM[2], Lacy M. Alexander, FACSM[1], Jody L. Greaney[1]. [1]Pennsylvania State University, University Park, PA. [2]University of Texas Arlington, Arlington, TX. (Sponsor: Lacy Alexander, FACSM)

(No relevant relationships reported)

Blood pressure (BP) and muscle sympathetic nerve activity (MSNA) responses to isometric handgrip (HG) are primarily driven by the skeletal muscle metaboreflex. The magnitude of the pressor and sympathoexcitatory responses to isometric HG and isolation of the muscle metaboreflex with post exercise ischemia (PEI) are commonly used maneuvers to compare groups and assess aberrant neurocardiovascular regulation. However, the repeatability of these responses remains unclear. **PURPOSE:** Consistent with the NIH requirements for rigor and reproducibility in biomedical research, we sought to determine the intra-day repeatability of the neurocardiovascular responses to isometric HG and PEI in young adults. We tested the hypothesis that the increases in BP and MSNA during isometric HG and PEI would be repeatable within an individual. **METHODS**: Mean arterial pressure (MAP; finger photoplethysmography), heart rate (HR; ECG), and MSNA (peroneal microneurography) were measured in 8 (6 M; 24±1 yrs) healthy young adults at baseline and during isometric HG at 30% of maximum voluntary contraction followed by PEI to isolate the muscle metaboreflex. Subjects completed two trials separated by 15 min. Linn's repeatability coefficient (ρc) was used to assess repeatability. **RESULTS:** MAP and MSNA increased significantly during HG and PEI in all subjects during both trials (all P<0.05). The BP and HR responses to HG (MAP: Δ29±5 v. Δ32±4 mmHg, ρc= 0.68, 95%CI: 0.09 -0.92; HR: Δ14±3 v. Δ20±4 bpm, ρc= 0.56, 95%CI: 0.0-0.84) and PEI (MAP: Δ18±5 v. Δ18±5 mmHg, ρc= 0.62, 95%CI: 0.14-0.86; HR: Δ-1±1 v. Δ0±2 bpm, ρc= 0.74, 95%CI: 0.39-0.91) were repeatable. The increase in MSNA during HG (n=5; Δ14±3 v. Δ20±6 bursts/min, ρc= 0.44, 95%CI: -0.173-0.804) was only moderately repeatable; however, during

PEI better repeatability was found ($\Delta 12 \pm 3$ v. $\Delta 15 \pm 3$ bursts/min, $\rho c = 0.86$, 95%CI: 0.130 - 0.986). **CONCLUSIONS:** These preliminary data suggest that MAP and HR responses to isometric HG and PEI are repeatable within an individual. Likewise, the MSNA response to PEI was repeatable, however, there was less repeatability of the MSNA response to isometric HG. These initial findings have important implications for the assessment and interpretation of neurocardiovascular regulation during HG and PEI, particularly when group comparisons are being made.

1196   Board #4   May 31 8:00 AM - 9:30 AM

Ambulatory Blood Pressure Lower Following Aquatic Exercise than Land Treadmill Exercise

Dustin P. Joubert, Caitlin Hogan, Jessica Barnes, Taylor Todd, Joshua Warner. *Stephen F. Austin State University, Nacogdoches, TX.* (Sponsor: Stephen F Crouse, FACSM)

(No relevant relationships reported)

Blood pressure (BP) is an important marker of cardiovascular (CV) health. Aquatic (AQ) exercise training has been shown to reduce BP reactivity to exercise to a greater degree than land treadmill (LT) training. Furthermore, an acute bout of AQ exercise tended to elicit a greater post-exercise hypotensive response and augmentation in flow-mediated dilation (FMD). However, it is unclear how long the post-exercise hypotensive benefits last following an acute bout of AQ exercise. **Purpose:** To determine the effects of acute bouts of deep water aqua-jogging and land treadmill exercise on daytime ambulatory BP (AMBP) in pre-hypertensive, physically untrained men and women. **Methods:** Following resting BP screening, 12 subjects (9 male, 29 ± 13 years, 30.4 ± 6.1 kg·m^{-2}, $127 \pm 8/82 \pm 8$ mmHg) completed acute bouts of both AQ and LT exercise at 55% heart rate reserve for a duration of 30 minutes. Exercise sessions began at 0700 hours. Immediately following the exercise bout, subjects wore an AMBP device (Oscar 2, Suntech Medical), which was programmed to take measurements every 15 minutes throughout the day until 1600 hours. Sessions occurred on separate days with 2-7 days off between sessions. The order that the modes were performed was counterbalanced among the subjects. Subjects were required to abstain from alcohol, caffeine, nicotine, and exercise on the day of the session and 24 hours prior. Comparisons between modes were made by a dependent sample t-test. **Results:** All results are displayed in Table 1. **Conclusion:** Daytime AMBP was significantly lower following AQ than LT exercise. This is consistent with previous findings of a greater post-exercise hypotensive response in the 1-2 hours post AQ exercise. Previous research also demonstrated improved FMD and increased atrial natriuretic peptide levels following AQ exercise, which could potentially explain the reduced BP findings. These data further support the efficacy of AQ exercise for the promotion of CV health and BP regulation.

Table 1. Ambulatory Blood Pressure Response

Variable	Aquatic	Land	p-value
SBP (mmHg)	136 ± 9	140 ± 9	0.051
DBP (mmHg)	76 ± 6	81 ± 6	0.006*
MAP (mmHg)	96 ± 7	101 ± 6	0.007*
HR (bpm)	78 ± 12	78 ± 11	0.964
All values represent Mean ± SD. *p < 0.05			

1197   Board #5   May 31 8:00 AM - 9:30 AM

Effects of Different Exercise Modalities on Postprandial Hyperglycemia in Overweight and Obese Adults

Craig W. Berry, Conlan J. Varty, Kristina B. Arslain, Kevin D. Ballard. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)

(No relevant relationships reported)

Postprandial hyperglycemia (PPH) is directly associated with cardiovascular disease risk. A single bout of aerobic (AE) or resistance exercise (RE) lowers PPH the following morning in healthy adults. No studies have examined the extent to which prior exercise regulates PPH in overweight and obese adults, and whether differences exist between exercise modalities. **PURPOSE:** The purpose of this ongoing investigation is to determine the effects of different exercise modalities on PPH responses to an oral glucose tolerance test (OGTT) in overweight and obese adults. We hypothesize that a single bout of exercise performed 14-17 h prior to an OGTT will attenuate increases in blood glucose, independent of exercise modality. **METHODS:** Recruitment for the current study is ongoing. In a randomized, cross-over design, participants [n=6 (3 women); age=24.3 ± 5.1 y; BMI=32.4 ± 5.8 kg/m^2] completed three trials. For each trial, an OGTT (1 g/kg body weight) was preceded (14-17 h prior) by seated rest (control), a single bout of AE, or a single bout of RE. The AE bout consisted of 30 min of continuous moderate-intensity (~60% VO$_2$max) treadmill exercise. The whole-body RE bout consisted of 3 sets of 10 repetitions of the following exercises: leg press, chest press, seated leg extension, lat pulldown, shoulder press, and seated row. The weight used for each set was determined from the participant's previously determined 10-RM. Blood was obtained prior to and at 30 min intervals for

3 hours following glucose ingestion. Repeated-measures ANOVA and LSD post-hoc tests were used to evaluate differences within and between trials. **RESULTS:** Blood glucose did not differ between trials at baseline. A main effect due to time (P<0.001) was observed for glucose. Relative to baseline, blood glucose increased (P<0.05) by 26-53%, 18-45%, and 16-46% at 30-120 min post-ingestion in the control, AE, and RE trial, respectively. Glucose area under the curve did not differ between trials (P≥0.37). **CONCLUSION:** Preliminary findings from our ongoing study suggest that acute aerobic or resistance exercise performed the evening prior to an OGTT does not affect PPH responses in overweight and obese adults. **Supported by College of Education, Health, and Society Seed Grant and Miami University Committee on Faculty Research Grant.**

1198   Board #6   May 31 8:00 AM - 9:30 AM

Autonomic Modulation After Acute Resistance Exercise in Resistance-Trained Individuals

Alexa DeBord, Alaina Glasgow, Kathryn Geither, Leslie Sensibello, Jason C. Parks, Erica M. Marshall, Yu Lun Tai, J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.*

(No relevant relationships reported)

Differences in autonomic modulation between free-weight and weight machines resistance exercise is unknown. **PURPOSE:** To investigate the effects of acute free-weight (FW) and weight machines (WM) resistance exercise on heart rate complexity (HRC) and variability (HRV) in resistance-trained individuals. **METHODS:** Resistance-trained individuals were assigned to either a FW (n = 25) or a WM (n = 16) group. Autonomic modulation was collected at rest, and 15 (Rec1) and 25 (Rec2) min following acute resistance exercise (ARE) or a control. Sample Entropy (SampEn), indicative of vagal modulation, was used as a measure of HRC. HRV measurements included vagal modulation (normalized high frequency (HFnu)), and sympathovagal balance (LF/HF ratio). ARE for the FW group consisted of 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) on the squat, bench press, and deadlift, while the WM group utilized of 3 sets of 10 repetitions at 75% 1RM on the leg press, lat pull down, leg extension, chest press, and leg curl. A 2x2x3 ANCOVA was used to examine groups (FW, WM) across conditions (ARE, control) and time (Rest, Rec1, Rec2), with load as a covariate. **RESULTS:** The groups were similar (p>0.05) for age, height, weight, BMI, and baseline autonomic modulation, but differed for years of training. There was a significant group by condition by time interaction (p=0.03) for SampEn such that in the FW group (Rest: 1.5 ± 0.3; Rec1: 1.1 ± 0.3; Rec2: 1.1 ± 0.4) it was attenuated during Rec1 and Rec2 after ARE compared to rest and the control. In the MW group, while there were no significant differences from rest to Rec1 or Rec2, there was a significant difference from Rec1 to Rec2 (Rest: 1.4 ± 0.5; Rec1: 1.0 ± 0.3; Rec2: 1.3 ± 0.3) such that it differed from the control. There was also a significant group by time interaction for HFnu (Rest: $62.5 \pm 15.0\%$; Rec1: $29.5 \pm 18.9\%$; Rec2: $29.2 \pm 19.9\%$, p=0.002) such that it was attenuated compared to rest, and the control, in both groups. The LF/HF ratio (Rest: 61.0 ± 52.1; Rec1: 420.0 ± 424.7; Rec2: 456.7 ± 390.2, p=0.007) was augmented such that it differed from rest, and the control, in both groups. **CONCLUSIONS:** Based on our data the use of free-weight resistance exercises results in significant reductions in vagal modulation that are immediate, and maintained, up to 30 min, which does not appear to occur when using weight machines.

1199   Board #7   May 31 8:00 AM - 9:30 AM

Daily exercise Compared To Exercise On Alternating Days On Post-exercise Hypotension In prehypertensive Men

Zachary Zeigler, Conner Dreos, Tabor Morse, Rebecca Lentz, Ezekial Morse, Lydia Durnil. *Grand Canyon University, mesa, AZ.*

(No relevant relationships reported)

Purpose: Acute exercise can result in post-exercise hypotension (PEH) lasting up to 24-h. Whether exercise performed on consecutive days would lead to an accumulating PEH effect has yet to be determined. The purpose of this study was to compare daily exercise (DE) to exercise performed on alternating days (AE) and a control (CON) on PEH. **Methods**: Sedentary, PHTN men 18-30yr participated in this three-arm randomized cross-over trial. The primary comparison was the magnitude of PEH between three groups (control (CON), alternating exercise (AE), and daily exercise (DE)) and within each group over time (day 1, 2, and 3). Both exercise groups were prescribed the same exercise intensity (70-75%HRmax), and total duration of exercise (90min) on a cycle ergometer. DE performed exercise on three consecutive days (three bouts of 30min). AE performed exercise on two alternating days (2 bouts of 45min). After exercise sessions subjects remained in the laboratory for 1-h while BP was taken every 5min. **Results**: Eight overweight (BMI=29 ± 4kg/m^2), young (22 ± 2years), moderately fit (VO$_2$peak=34 ± 6ml.kg.min), PHTN ($126 \pm 10/73 \pm 6$mmHg) male subjects completed the study. There was a significant SBP condition by day effect such that on day three SBP (CON 120 ± 9, AE 123 ± 13, DE 118 ± 12 mmHg), and DBP (CON 73 ± 6, AE 70 ± 9, DE 68 ± 7 mmHg) were lowest during the post-exercise DE condition

(P < 0.001). **Conclusion**: In conclusion, the PEH effect appeared to accumulate during DE such that day 3 was the lowest of all conditions and days. It has been suggested that the current recommendation on training frequency should be changed from accumulating 30 min on most, preferably all days of the week, to *all days* of the week. Our preliminary findings support this notion.

1200   Board #8   May 31 8:00 AM - 9:30 AM

Upper and Lower-body Resistance Exercise With and Without Blood Flow Restriction on Pulse Wave Reflection

Yu Lun Tai, Erica M. Marshall, Alaina Glasgow, Jason C. Parks, Kathryn Geither, Leslie Sensibello, Ramon Oliveira, J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.*
(No relevant relationships reported)

Acute resistance exercise (RE) with blood flow restriction (BFR) on pulse wave reflection is unclear. **PURPOSE**: To evaluate the differences between acute upper-body RE (URE) and lower-body RE (LRE) with and without BFR on pulse wave reflection in resistance-trained individuals. **METHODS**: Pulse wave reflection was assessed at rest, and during recovery at 10 (R10), 25 (R25), 40 (R40), and 55 (R55) minutes after either URE or LRE with or without BFR in twelve resistance-trained individuals. The URE consisted of the lat pulldown and chest press while the LRE consisted of knee extension and knee flexion. The BFR condition consisted of 4 set of 30, 15, 15, and 15 repetitions at 30% 1-repetition maximum (1RM) while the non-BFR condition consisted of 4 sets of 8 repetitions at 70% 1RM. A 2x2x3 repeated measures ANOVA was used to evaluate the effect of group across conditions and time on pulse wave reflection. **RESULTS**: There were no differences for any variable between conditions. There were significant group by time interactions for brachial systolic blood pressure (BSBP), brachial diastolic blood pressure (BDBP), aortic systolic blood pressure (ASBP), and aortic diastolic blood pressure (ADBP) such that BSBP (rest: 120±9mmHg, R10: URE: 115±12mmHg, LRE:126±8mmHg; p<0.001) and ASBP (rest: 104±8mmHg, R10: URE: 102±10mmHg, LRE:109±8mmHg; p=0.005) were increased at R10 from LRE compared to URE and rest, with no difference from rest to R25, R40, or R55. BDBP (rest: 64±7mmHg, R10: URE: 60±6mmHg, LRE:67±6mmHg, p=0.001; R25: URE: 62±5mmHg, LRE:67±7mmHg, p<0.001) and ADBP (rest: 65±7mmHg, R10: URE: 60±6mmHg, LRE:69±6mmHg, p≤0.001; R25: URE: 63±5mmHg, LRE:69±7mmHg, p<0.001) were elevated at R10 and R25 from LRE compared to URE and rest, and no difference at R40 or R55. There were significant group by time interactions for augmentation index (AIx) (rest: 13.3±9.8%, R10: URE: 26.4±10.5%, LRE: 15.7±8.4%; p<0.001) and AIx normalized to 75bpm (rest: 3.7±11.7%, R10: URE: 25.4±14.0%, LRE: 15.8±13.5%; p=0.001) such that they were increased at R10 from URE compared to LRE and rest, and were fully recovered by R25. **CONCLUSIONS**: These data suggest that LRE significantly elevated blood pressure more so than URE, and that URE significantly increased pulse wave reflection more than LRE, regardless of whether they were completed with or without BFR.

1201   Board #9   May 31 8:00 AM - 9:30 AM

Blood Pressure Reactivity During Short-term Water Restriction in Young Adults

Joseph C. Watso[1], Matthew C. Babcock[1], Austin T. Robinson[1], Kamila U. Migdal[1], Sean D. Stocker[2], Megan M. Wenner[1], William B. Farquhar, FACSM[1]. *[1]University of Delaware, Newark, DE. [2]University of Pittsburgh, Pittsburgh, PA.* (Sponsor: William B Farquhar, FACSM)
(No relevant relationships reported)

Dehydration reduces plasma volume and concentrates electrolytes, increasing plasma osmolality (pOsm). Water deprivation (WD) studies in animals demonstrate that elevated pOsm is associated with altered sympathetic outflow and blood pressure (BP) regulation. However, it remains unclear if WD augments BP responses to sympathoexcitatory stimuli in humans. **PURPOSE:** We tested the hypothesis that WD elevates pOsm and consequently augments BP reactivity. **METHODS:** Twenty healthy young adults were recruited (10M/10W; age: 24±1 yrs; BMI: 24±1 kg/m²; BP: 109±2/61±2 mmHg) to complete two hydration conditions, in random order. A normal hydration (NH) and WD visit were separated by at least one week. Daily water intake for the NH condition was 23mL H_2O/kg bodyweight/day for 3 days prior to testing. The WD condition included a stepwise reduction in water intake over 3 days then a 16hr water restriction prior to testing. Beat-by-beat BP was measured continuously with finger photoplethysmography throughout a 10-min baseline, handgrip exercise (HG), post-exercise ischemia (PEI), and a cold pressor test (CPT). Isometric HG was performed at 30% of maximal voluntary contraction for 2 mins and PEI immediately followed with rapid upper arm cuff inflation to 250mmHg for 3 mins (to isolate the metaboreflex). Following HG & PEI, participants rested quietly for 10 mins prior to a 2-min hand-in-ice H_2O CPT. Peak responses were calculated as the absolute change in BP during the final minute of each perturbation from the respective baseline. **RESULTS:** Plasma volume, estimated by changes in hemoglobin and hematocrit, declined 5.6±1.4% during WD. POsm (287.0±1.0 vs. 290.0 ±1.0 mOsm/kg H_2O), urine

osmolality (481±137 vs. 708±42 mOsm/kg H_2O), urine specific gravity (1.015±0.002 vs. 1.022±0.001), and thirst rating on a 0-10 scale (1.7±0.4 vs. 6.7±0.4) were higher for the WD condition (p<0.05 for all), suggesting mild dehydration. Mean BP responses were augmented following WD during HG (Δ12.8±1.7 vs. 18.7±2.0 mmHg, p<0.05), PEI (Δ8.8±1.0 vs. 14.7±2.4 mmHg, p<0.05), and CPT (Δ14.9±2.0 vs. 18.6±2.3 mmHg, p=0.05). **CONCLUSION:** These preliminary findings suggest that short-term WD increases pOsm and augments BP responses during moderate intensity isometric HG exercise, PEI, and CPT, suggesting enhanced BP reactivity.

1202   Board #10   May 31 8:00 AM - 9:30 AM

Brachial Artery FMD Responses To Steady-State Moderate-Intensity And High-Intensity Interval Exercise In Mid-Spectrum Chronic Kidney Disease

Jeffrey S. Forsse[1], Matthew Peterson[1], Zacharias Papadakis[1], Fernando Gutierrez[1], Nicholas Schwedock[2], Burritt W. Hess[2], Jackson O. Griggs[2], D. Crawford Allison[3], Ron L. Wilson[3], Peter W. Grandjean, FACSM[1]. *[1]Baylor University, Waco, TX. [2]Family Health Center, Waco, TX. [3]Baylor Scott & White Health, Waco, TX.* (Sponsor: Dr. Peter W. Grandjean, FACSM)
(No relevant relationships reported)

Brachial artery flow-mediated dilation (FMD) is a nitric oxide-dependent measure of conduit artery endothelial function that is transiently potentiated by moderate-intensity steady-state exercise (SSE) in healthy adults. Whether exercise imparts similar effects in adults with Stage 3 or 4 chronic kidney disease (CKD) has not been reported. Moreover, a comparison of SSE and high-intensity interval exercise (HIIE) may add to clinically-relevant findings for improving vascular function in mid-spectrum CKD. **PURPOSE:** To determine the influence of SSE and a comparable amount of HIIE on post-exercise brachial artery FMD in patients diagnosed with secondary Stage 3 or 4 CKD. **METHODS:** Twenty participants (n = 6 men; n = 14 women; age 62.0 ± 9.9 yr; weight 80.9 ± 16.2 kg; body fat 37.3 ± 8.5% of weight; VO₂max 19.4 ± 4.7 ml/kg/min) completed 30 min of SSE at 65% VO₂reserve or HIIE by treadmill walking (90% and 20% of VO₂reserve in 3:2 min ratio) in a randomized crossover design. Both exercise conditions averaged ~ 65% VO₂reserve. Ultrasound measurements of brachial artery FMD were obtained by the same technician under standardized conditions just before, 1 hr and 24 hrs after exercise. FMD responses were analyzed using 2 (condition) by 3 (sample point) repeated measures ANOVAs. **RESULTS:** Brachial artery FMD responses were augmented 1 hr after exercise in both exercise conditions (p < 0.005 versus pre-exercise FMD). SSE (pre-exercise = 11.5 ± 1.3; 1 hr = 17.2* ± 1.8; 24 hr = 14.0* ± 1.1%) HIIE (pre-exercise = 12.5 ± 1.3; 1 hr = 15.6* ± 1.5; 24 hr = 15.8* ± 1.2%) **SUMMARY:** We report for the first time that brachial artery FMD can be augmented by a single episode of exercise in mid-spectrum CKD. SSE and HIIE, averaging ~65% of VO₂reserve, is equally effective at transiently improving conduit artery vascular function in this clinical population.

1203   Board #11   May 31 8:00 AM - 9:30 AM

Pulmonary Responses During Exercise On Dryland Vs. Immersible Ergocycle

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(No relevant relationships reported)

Water immersion can affect respiratory responses during exercise relative to exercise on dry land. Exercise training in an aquatic environment has added benefits relative to training on land, improving central hemodynamic responses as stroke volume (SV), cardiac output (Q) and heart rate recovery (HRR) as well as increasing cerebrovascular blood flow, relative to land-based exercise of a similar intensity, in healthy humans. **PURPOSE:** We sought to compare pulmonary responses during an incremental exercise done on immersible ergocycle (IE) vs dryland ergocycle (DE) at the same external power output (P_{ext}). **METHODS:** Ten (10) young healthy subjects (Age: 31±9 years; BMI: 23.3±1.9 kg/m²) performed incremental exercise tests on IE at chest level immersion and DE at equal external power output (P_{ext}). Pulmonary responses were measured and P_{ext} on IE was calculated according to the general fluid equation $F_d = \frac{1}{2}\rho Av^2C_d$. Tangential speed of the pedaling mechanism was calculated by $2\pi r$ (rpm), $2\pi (r/2)(rpm)$ and $\omega 2\pi (r/2)/360°(rpm)$, for pedals, paddles-rods, and legs, respectively, as used in previous studies. **RESULTS:** VO₂ (p=0.0087) and VCO₂ (p=0.0138) were significantly lower during exercise on IE at every stage of the incremental test relative to DE. No differences were detected between IE and DE for respiratory exchange ratio (RER) ventilation (V_E), breathing frequency (f), tidal volume (V_T), fraction of expired O_2 and CO_2 (FetO₂ and FeCO₂, respectively), time of inspiration (Ti), time of expiration (Te), time of respiratory cycle (Ttot), duty cycle (Ti/Ttot), and partial pressure of end tidal O_2 and CO_2 (PetO₂ and PetCO₂, respectively). **CONCLUSIONS:**

Abstracts were prepared by the authors and printed as submitted.

Exercise during water immersion results in a significantly lower mean VO_2, relative to a land exercise of equivalent power output. No differences were detected in the respiratory parameters suggesting that the lower VO_2 reached with IE is not attributed to changes in ventilation, but rather to central or peripheral convection (cardiac output) or diffusion (capillary O_2 extraction) factors. We have previously shown that hemodynamic factors (convection) are modestly improved, but not sufficiently to explain the large gap in VO_2 between IE and DE. We hypothesize that diffusion is improved by an unknown mechanism that remains to be explained.

1204   Board #12   May 31 8:00 AM - 9:30 AM

Blood Pressure Responses to Intermittent Physical Activity in Elementary School-Age Children

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to compare the acute effects of prolonged sitting on resting blood pressure (BP) with a similar duration of sitting combined with intermittent physical activity (PA) performed at varying intensities in healthy weight (HW) and overweight/obese (OW/OB) preadolescent children.
METHODS: Thirty-nine children (18 males, 21 females; ages 7-11 years; 33% OW/OB; 59% non-white) completed four experimental conditions in random order: 8 hours of sitting interrupted with 20, 2-minute low-intensity, moderate-intensity, or high-intensity PA breaks, or 20, 2-minute sedentary screen-time breaks. Exercise intensity corresponded with 25%, 50% and 75% of heart rate reserve, respectively. Using a digital BP monitor, BP was measured during each experimental condition in the morning (0800 hrs), midday (1200 hrs), and end-of-day (1600 hrs).
RESULTS: Across all time points, there were no significant between-condition differences observed in systolic blood pressure (SBP) (sedentary:101±2 mmHg; low:105±2 mmHg; moderate:102±2 mmHg; high:105±2 mmHg; p>0.05). SBP did however decrease significantly throughout the day for all conditions (morning:106±1 mmHg; midday:101±2 mmHg; end-of-day:103±1 mmHg; p=0.01). OW/OB children displayed a greater decline in SBP throughout the day compared to HW children (p<0.01). Across all time points, no significant between-condition differences were observed in diastolic blood pressure (DBP) (sedentary:61±2 mmHg; low:63±2 mmHg; moderate: 61±2 mmHg; high: 65±2 mmHg; p>0.05). No significant effects of time were observed in DBP (morning:63±1 mmHg; midday:62±1 mmHg; end-of-day:62±1 mmHg; p>0.05). At all time points, higher DBP were observed in OW/OB compared to HW children (HW:60±1 mmHg; OW/OB:64±2 mmHg; p=0.03).
CONCLUSION: Contrary to previous findings in adults, both interrupted and uninterrupted sitting resulted in a similar decrease in SBP throughout the day. The decline in SBP was greater in OW/OB children compared to HW children. Future research should examine the long-term effects of interrupted and uninterrupted sitting on resting BP in preadolescent children.

1205   Board #13   May 31 8:00 AM - 9:30 AM

Comparing the Changes in Cardiovascular Function After Acute Exposure to Tai Chi or Walking

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(No relevant relationships reported)

Hypertension is a major health concern throughout the United States and is a major cause of cardiovascular disease and recent research has indicated that central aortic pressures more accurately depict of pressure within the myocardium compared to commonly used brachial measures. **PURPOSE:** The purpose of this study was to compare the responses of Tai Chi and walking on measures of central and peripheral cardiac measurements when controlling for exercise intensity. **METHODS:** 15 pre-hypertensive subjects (2 males, 13 females; age = 20.7±3.77 years; body fat percentage = 24.26±10.27%) participated in Tai Chi (TC) and walking (WK) for 30 minutes on non-consecutive days. Central systolic (CSBP) and diastolic blood pressure (CDBP), augmentation index (Alx), pulse pressure (PP), heart rate (HR), and brachial systolic (BSBP) and diastolic blood pressure (BDBP) were measured prior to exercise and following exercise every 10 minutes for a total of 60 minutes in a seated position. A repeated measures ANOVA with two repeated measure factors was computed for each outcome measure. **RESULTS:** There were no significant differences between the two exercise forms. However, CSBP decreased 10 minutes after exercise in both exercise types (TC = 6.63±3.258 mmHG, p < .05; WK = 7±4.144 mmHG p < .05), and 40 minutes after exercise in both exercise types (TC = 6.07±3.33 mmHG, p < .05; WK = 8.2±3.15 mmHG, p < .05) compared to the before exercise measurement. BSBP also decreased in both exercise forms following 10 min of rest (TC=6.99±3.776 mmHG, p = .05; WK=8.8±3.20 mmHG p = .05), and 40 min (TC=8.46±3.07 mmHG, p = .05; WK=8.87±3.87 mmHG, p = .05) when compared to the initial resting measurement. A trend indicated that heart rate was lower during the Tai Chi rest periods when compared to walking during the 30th minute (TC= 73.73±12.31 bpm,

WK = 78.40±15.82 bpm, p = .051) and the 60th minute of rest (TC= 73.0±13.95 bpm, WK= 76.0±13.85 bpm p = .06). There were no significant changes in Alx, PP, or diastolic pressures. **CONCLUSIONS:** Central aortic pressure exhibits a post exercise hypotensive (PEH) effect similar to that of peripheral blood pressure. Both Tai Chi and walking elicited similar PEH effects on systolic blood pressure in prehypertensive individuals.

1206   Board #14   May 31 8:00 AM - 9:30 AM

Metabolic Responses to a Battling Rope Protocol Performed in the Seated or Stance Positions

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(No relevant relationships reported)

PURPOSE: To compare the levels of oxygen consumption (VO2) and heart rate (HR) responses elicited by a treadmill (TM) or bicycle (BK) VO2 max test with a standing or sitting battling rope protocol (BRP) (TM vs. standing BRP) (BK vs. seated BRP). To examine the associations between the peak HR and VO2 responses elicited from the two BRP with their respective VO2 max tests (TM vs. standing BRP) (BK vs. seated BRP).
METHODS: Forty healthy subjects, 24 females and 16 males, mean age 24.83 years, performed either a ramped VO2 max TM or BK test (respiratory exchange ratio > 1.0). At least 3 days later, the subjects who performed the ramped TM test did the standing BRP, and the subjects who performed the ramped BK test did the sitting BRP. Each BRP (standing and sitting) consisted of 15 seconds of double arm swings, followed by 45 seconds of rest for 10 rounds. The highest recorded VO2 and HR values (VO2 peak and HR peak, respectively) were recorded after each round.
RESULTS: Metabolic responses were significantly lower for the BRP in both sitting (VO2 peak and HR peak: p < .001) and standing (VO2 peak and HR peak: p < .001) as compared to the HR max and VO2 max values derived from the BK and TM tests. The BRP produced a VO2 peak that was 71.87% (sitting) and 68.37% (standing) of the subjects' VO2 max assessed via the BK and TM protocol, respectively. Moderate correlations were found between the VO2 during the seated (r = .61; p =.003) and standing (r=.43; p=.03) BRP and the BK and TM VO2 max tests, respectively. The HR peak elicited by the BRP done in sitting (r = .52; p = .009) and standing (r = .67; p = .001) had a moderate correlation with the HR max derived from the BK and TM tests. **CONCLUSIONS**: Both the seated and standing BRPs demonstrated the capacity to produce acute metabolic responses that may enhance aerobic capacity. Battling ropes may be a low cost, accessible option to improve cardiovascular endurance for individuals who cannot stand or move their lower extremities in a rhythmic manner to conduct aerobic exercise.

1207   Board #15   May 31 8:00 AM - 9:30 AM

Longer vs. Shorter Intervals Elicit Similar Cardiovascular But Significantly Different Metabolic Responses During Interval Cycling

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(No relevant relationships reported)

PURPOSE: Interval training (IT) is utilised to optimise adaptations to exercise training with some recent research interest in whether low volume IT is efficacious. Therefore the purpose was to determine whether using shorter intervals would elicit similar acute cardiorespiratory responses to longer intervals.
METHODS: Nine low active participants (8 males, 1 female) performed an incremental cycle test and then two experimental IT trials on an electronically-braked cycle ergometer at least 48 hours apart in a counter-balanced repeated measures study. Ventilatory threshold (T_{vent}) and peak oxygen uptake (VO_{2peak}) were calculated from the incremental cycle test. The participants then completed the two IT trials which consisted of six blocks of work and recovery at a ratio of 2:3 minutes for LONG, and a ratio of 1:1 minutes for SHORT, for work and recovery, respectively. The 'work' intensity of each IT trial was calculated as 50% of the difference between V O_{2peak} and T_{vent} (Δ50%) and the 'recovery' intensity was calculated as 80% of Tvent. SHORT was 12 minutes and LONG was 30 minutes, plus 5 minutes warm-up and 2 minutes cool down. Oxygen uptake (VO_2), respiratory exchange ratio (RER), heart rate (HR) and power (W) were recorded continuously. Rating of perceived exertion (RPE) was collected at the end of each interval. Blood lactate [La-] and systolic blood pressure (SBP) were recorded pre and post-exercise. Rate-pressure product (RPP) and energy expenditure (EE) were calculated. Participants reported which was their preferred session. Paired samples analyses were applied to quantitative data.
RESULTS: Mean RPE during work (13 ± 2 vs. 13 ± 3; p=0.421), mean VO_2 (2234 ± 404 vs. 2258 ± 483 mL^{-1}·min^{-1}; p=0.471), RPP (25412 ± 2456 vs. 24234 ± 2363; p=0.346), SBP (150 ± 12 vs. 140 ± 13 mmHg; p=0.204) and [La-] (7.30 ± 1.86 vs. 6.46 ± 2.15 mmol·L^{-1}; p=0.416) were not significantly different between SHORT and

LONG. However, mean RER (1.02 ± 0.09 vs. 0.99 ± 0.04; p=0.002) was significantly lower and energy expenditure (287 ± 81 vs. 473 ± 93 kcal; p>0.001) was significantly greater following LONG. SHORT was preferred to LONG by all 9 participants. **CONCLUSIONS**: LONG elicited significantly different metabolic responses with similar cardiovascular responses to SHORT but was perceived as less enjoyable.

1208   Board #16   May 31 8:00 AM - 9:30 AM

Oxygenation Characteristics during Knee Extension Exercise in Severe and Extreme Domain

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(No relevant relationships reported)

Near-infrared spectroscopy (NIRS) has been used to quantify oxygenation characteristics of skeletal muscle during exercise. Changes in total-[heme] and deoxy-[heme] have been used as an indices of diffusive and perfusive conductance, respectively. Total-[heme] and deoxy-[heme] have been shown to reach similar values at end exercise following exercise in the severe intensity domain It has further been suggested that time of exercise tolerance (T_{lim}) in the extreme domain (T_{lim} < 2 min) is too short for VO_2 kinetics to reach maximum values. It is unknown if total-[heme] and deoxy-[heme] characteristics reach similar values after exercise in the extreme domain as exercise in the severe domain. **PURPOSE**: We hypothesized that total-[heme] and deoxy-[heme] would be lower following exercise in the extreme domain than compared to exercise in the severe domain. **METHODS**: Six men (age 22 ± 3.1 yrs, 72.5 ± 6.5 kg; 178 ± 2 cm) performed 8 bi-lateral knee extension tests to task failure. First, one-repetition maximum (1RM) was determined by progressively increasing weight until a pre-determined range of motion could not be achieved. Subjects then performed 3 exercise tests in the severe intensity domain (T_{lim} = 2 - 15 min; S1 = 25.8 ± 2.7, S2 = 33.5 ± 4.3, S3 = 44.3 ± 6.9 % 1RM) and 4 in the extreme domain (60, 70, 80, 90% 1RM), in random order on non-consecutive days. A 1RM was performed 5 min before each exercise bout. Changes total-[heme], deoxy-[heme], and Sat% were measured on the L vastus lateralis. **RESULTS**: Total-[heme] at end exercise was not different between exercise intensities (p > 0.05). Total-[heme] at end exercise was not different (p > 0.05) than peak total-[heme] of the 1RM for the extreme domain exercise tests. However, total-[heme] at end exercise was greater than peak total-[heme] following severe intensity exercise (S1, p = 0.002; S2, p = 0.025, S3, p = 0.02). End exercise deoxy-[heme] and Sat% were not different (p > 0.05) compared to peak deoxy-[heme], and Sat%, respectively, of the 1RM. **CONCLUSIONS**: The current study showed that total-[heme], but not deoxy-[heme] or Sat%, is intensity- or time-dependent. These data suggest that diffusive O_2 conductance is compromised during extreme intensity exercise, whereas perfusive O_2 conductance is able to reach similar values regardless of intensity.

1209   Board #17   May 31 8:00 AM - 9:30 AM

Perceptual And Cardiovascular Responses To Very Low Load Exercise With And Without Blood Flow Restriction

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(No relevant relationships reported)

Low load (30% one repetition maximum (1RM)) exercise can produce growth if taken to failure. However, at very low loads, failure may not be possible. Applying blood flow restriction (BFR) may circumvent this by expediting fatigue and this effect may be pressure dependent. Although potentially efficacious, it is important to investigate the acute response in order to determine the utility of this stimulus. **PURPOSE**: To determine the cardiovascular and perceptual response to exercise with and without BFR. **METHODS**: Participants (n=21) completed high load (70% 1RM) and very low load (15% 1RM) exercise with (40% (15/40) and 80% (15/80) of arterial occlusion pressure (AOP)) and without BFR to failure (up to 90 reps) in the upper (biceps curl) and lower body (knee extension). AOP was determined pre and post exercise. Ratings of perceived exertion (RPE, 6-20) and discomfort (0-10+) were taken at pre and after each set. Significance was set at p ≤ 0.05. AOP presented as mean (SD) and perceptual responses presented as median (25th, 75th percentiles). **RESULTS**: There was no interaction for AOP in the upper body (p=.095) but there was a main effect of condition and time [change of 42 (16) mmHg]. The 15/80 condition [172 (23) mmHg] was greater than 15/40 [166 (22) mmHg] and 70% 1RM condition [162 (18) mmHg] but similar to 15%1RM [168 (19) mmHg]. There was an interaction for AOP in the lower body (p=.006). All conditions increased but at post the 15/40 [237 (30) mmHg] condition was greater than 15%1RM [218 (25) mmHg] and 70%1RM [200 (19)

mmHg] and the 15/80 [233 (24) mmHg] condition was greater than 70%1RM. RPE and discomfort in the upper body tended to be greatest with a high pressure. Within set 4, the RPE and discomfort were 17.5 (15, 20) and 7 (6, 8) for 15/80 which was greater than that observed with 15/40 [RPE: 15 (14, 19); discomfort: 6 (3, 8)]. In the lower body, RPE was higher for lower loads and discomfort tended to be greatest with higher pressure. Within set 4, the RPE and discomfort were 18 (15, 19) and 8 (6, 9) for 15/80 which was greater than that observed for 70%1RM [RPE: 16 (15, 17); discomfort: 4 (1, 6)]. **CONCLUSIONS**: Applying BFR with lower loads tends to augment the cardiovascular and perceptual response and often this appears greater for high pressure. These findings will need to be considered alongside any potential benefits of training with very low loads.

1210   Board #18   May 31 8:00 AM - 9:30 AM

Use of Compression Socks During a Marathon Does Not Mitigate Exercise-Associated Muscle Damage

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(No relevant relationships reported)

Compression socks have become increasingly popular with athletes due to perceived enhancement of exercise performance and recovery. However, research examining the efficacy of compression socks to reduce exercise-associated muscle damage has been equivocal, with few direct measurements of markers of muscle damage. **PURPOSE**: We investigated the influence of wearing compression socks during a marathon run on creatine kinase (CK) levels in endurance athletes running the 2013 Hartford Marathon. **METHODS**: Adults (n=20) were randomized to compression sock (SOCK; n=10) and control (CONTROL; n=10) groups. SOCK was naïve to wearing compression socks, and wore them during the marathon only. Age, anthropometrics, vital signs, training mileage, and finishing time were collected. Venous blood samples were collected 1 d before, immediately after, and 1 d following the marathon for analysis of plasma CK, a marker of muscle damage. **RESULTS**: Baseline plasma CK levels did not differ between CONTROL (89.3±41.2 U/L) and SOCK (100.0±56.2 U/L; p=0.633), and were within normal reference ranges for males and females. Immediately following the marathon (≤1hr), CK increased 273% from baseline (p=0.000 for time), with no difference in exercise-induced changes in CK from baseline between CONTROL (+293.9±278.2 U/L) and SOCK (+233.1±225.3 U/L; p=0.598 for time x group). The day following the marathon (≤24hr), CK further increased 1094% from baseline (p=0.000 for time), with no difference in changes in CK from baseline between CONTROL (+1191.9±1194.8 U/L) and SOCK (+889.1±760.2 U/L; p=0.529 for time x group). These similar trends between CONTROL and SOCK persisted despite controlling for potential covariates such as age, body mass index, and race finishing time (ps>0.291), which was also similar between groups (CONTROL: 4:20:42±0:38:33 hr vs. SOCK: 4:02:33±0:38:39 hr; p=0.333). **CONCLUSIONS**: Our results suggest the use of compression socks during a marathon do not appear to mitigate objectively measured markers of muscle damage (i.e., exercise-induced increases in CK) immediately following and 24hr after a marathon.

1211   Board #19   May 31 8:00 AM - 9:30 AM

Influence of Acute Exercise and Insulin on the Akt/eNOS Pathway in Rodent Aortic Smooth Muscle.

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(No relevant relationships reported)

Insulin resistance can contribute to endothelial dysfunction and subsequent cardiovascular disease. An acute bout of exercise has been shown to attenuate insulin resistance and enhance endothelial function, yet the underlying molecular mechanism(s) for this benefit in smooth muscle remains unclear. **PURPOSE**: To examine key proteins in the Akt/eNOS signaling pathway in response to an acute session of exercise with and without the presence of insulin. **METHODS**: Female Sprague-Dawley rats (n=25) were assigned to one of four groups: 1) sedentary control group without insulin injection (CON-ins), 2) control group with insulin injection (10mU/g; CON+ins), 3) exercise group without insulin injection (EX-ins), and 4) exercise group with insulin injection (EX+INS). Insulin or saline injections were administered 5-min prior to sacrifice. Under isoflurane anesthesia, blood and the descending aorta was harvested. Exercise cohorts were sacrifcied 3-hr after a 60-min swimming protocol. Plasma samples were analyzed for glucose, insulin concentrations, and markers of endothelial function (i.e., intracellular adhesion molecule, E-selectin, Von Willebrand factor, and adiponectin) using commercially available kits. Western immunobloting was used to determine total Akt (Akt), phosphorylated Akt (pAkt[Ser473]),

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total eNOS (eNOS), and phosphorylated eNOS (p-eNOS^{Ser1177}). **RESULTS**: Akt, eNOS, plasma glucose, and markers of endothelial function were similar among all cohorts. As expected, plasma insulin concentration was significantly (p<0.05) higher under insulin stimulated compared to non-insulin stimulated conditions, however exercise blunted this increase (CON+ins > EX+ins; p<0.05). Similarly, pAkt^{Ser473} was significantly (p<0.05) higher under insulin stimulated compared to non-insulin stimulated conditions, this effect was also attenuated with exercise (CON+ins > EX+ins; p<0.05). Conversely, p-eNOS^{Ser1177} was only significantly (p<0.05) enhanced in the EX+ins versus the EX-ins group. **CONCLUSIONS**: Insulin and acute exercise resulted in the greatest enhancement of p-eNOS^{Ser1177}, signifying enhanced endothelial function. This response cannot be completely attributed to increased pAkt^{473} suggesting that other kinases are likely responsible for the improvement in p-eNOS^{Ser1177} in the aorta.

1212   Board #20   May 31 8:00 AM - 9:30 AM

Effect of Aerobic Exercise on Artery Stiffness and Cerebrovascular Pulsatility in Hypertensive and Non-Hypertensive Adults

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(No relevant relationships reported)

Large elastic arteries (i.e. aorta, carotid) buffer pulsatile hemodynamics by dampening changes in pressure and flow. Stiffer central arteries, as seen in hypertension, transmit greater pulsatile hemodynamics into fragile cerebral vessels. Aerobic exercise is recommended for hypertensives (HTN), but its effects on artery stiffness and pulsatility in this group are unclear. **PURPOSE:** Investigate the effect of acute aerobic exercise on artery stiffness and cerebrovascular pulsatility in HTN and non-HTN adults. **METHODS:** 30 medicated HTN and 30 age, sex, and body mass index (BMI)-matched non-HTN adults (56±6 yrs, BMI 28.2±2.9 kg/m²; 32 men) underwent hemodynamic measures pre and 10 min post a 30-min cycling bout (55% peak oxygen consumption). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cf PWV) and carotid artery (CA) stiffness was assessed with PWV-β via Ultrasound. Aortic mean (MP) and pulse pressure (PP; via radial generalized transfer function), and CA PP were measured by tonometry. CA and middle cerebral artery (MCA) blood velocity pulsatility index (PI) were measured using Doppler. **RESULTS:** cf PWV, MCA PI and CA PI increased and aortic PP decreased, post exercise compared to pre in both groups (p<0.05). Aortic MP and CA PP, PWV-β were unaltered post-exercise. Aortic MP was greater in HTN vs non-HTN. No other significant effects were detected. **CONCLUSION:** Acute aerobic exercise increases aortic stiffness and cerebrovascular hemodynamic pulsatility in both non-HTN and HTN individuals. These data suggest medicated-HTN have similar vascular responses to early recovery from acute aerobic exercise as non-HTN.

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Table 1: Arterial stiffness and hemodynamic pulsatility pre/post acute exercise in non-HTN and HTN subjects.

Measure	non-HTN Pre	non-HTN Post	HTN Pre	HTN Post	Effects G	T	GxT
Aorta							
Mean pressure, mmHg	91±8	92±7	96±10	95±9	0.047	0.531	0.136
Pulse pressure, mmHg	33±9	32±7	33±7	30±7	0.175	0.005	0.595
cf PWV, m/s	7.9±1.1	8.1±0.9	8.2±1.3	8.7±1.5	0.081	0.001	0.221
Carotid artery							
Pulse pressure, mmHg	37±10	36±8	37±8	35±8	0.816	0.070	0.888
Blood velocity PI	1.43±0.34	1.49±0.34	1.34±0.26	1.42±0.26	0.356	0.001	0.530
PWV-β, m/s	6.3±1	6.3±0.9	6.6±1.3	6.8±1.5	0.209	0.204	0.602
Middle cerebral artery							
Blood velocity PI	0.78±0.12	0.82±0.12	0.76±0.11	0.78±0.11	0.314	0.003	0.513

HTN, hypertensive; cf, carotid-femoral; PWV, pulse wave velocity; PI, pulsatility index; G, group; T, time; GxT, group-by-time interaction.

1213   Board #21   May 31 8:00 AM - 9:30 AM

Kinetics of High-Sensitivity Cardiac Troponin Release Following a Strenuous Swimming Test

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(No relevant relationships reported)

PURPOSE: Athletes are susceptible to muscle injury during strenuous exercise. Exercise-induced release kinetics of high sensitivity cardiac troponin I (hs-cTnI) and hs-cTnT are unclear. We analysed hs-cTnI and hs-cTnT kinetics after a maximal swimming test and examined differences between age and gender. **METHODS**: Fifty adolescents (25 males, 25 females) and 16 adults (7 males, 9 females) participated in a 60-min maximal swimming test. hs-cTnT (Roche, 99th percentiles male=22, female=14 ng/L, and hs-cTnI (Beckman Coulter, 99th percentiles male=11, female=9 ng/L) were measured at rest, immediately post-exercise, and at 1, 3, 6, 12, and 24 h post-exercise. **RESULTS**: Mean baseline (0h) concentrations were: hs-cTnT male 3.4 ng/L, female 3.1 ng/L; hs-cTnI male 0.5 ng/L, female 0.5 ng/L. We observed a greater percentage of hs-TnI results > 99th percentile vs. hs-cTnT for genders. For males, this was at 6h (44% vs. 60%), 12h (20% vs. 44%) and 24 h (8% vs. 28%). For females this was at 6h (32% vs. 39%), 12h (3% vs. 19%) and 24h (0% vs. 10%). Until 3h both hs-cTnI and hs-cTnT presented similar percentages and no result over the 99th percentiles was observed for any hs-cTn value at rest. 13 subjects (10 males; 84.6%) had a maximum hs-cTnI over 50 ng/L. Medians were: hs-cTnI, 146 (IQ 89-247) ng/L and hs-cTnT, 77 (73-123) ng/L. There were no significant correlations between hs-cTn maximum concentration and age. However, significant differences (Mann-Whitney) in maximum concentration due to gender: hs-cTnT, (p=0.004) and hs-cTnI (p=0.018): hs-cTnT, (p=0.004) and hs-cTnI (p=0.018).**CONCLUSIONS**: We observed parallel increases, but different kinetics, between hs-cTnI and hs-cTnT in swimmers during maximal efforts. hs-cTnT appeared to increase earlier than hs-cTnI. Both assays peaked at 3h post-exercise, with higher hs-cTnI concentrations. Higher values were found in men, but no differences were found due to age. Clinicians need to be educated regarding these observations in healthy athletes.

1214   Board #22   May 31 8:00 AM - 9:30 AM

The Effects of Caffeine Ingestion on the Hemostatic Response to Simulated Firefighting Activities.

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(No relevant relationships reported)

PURPOSE: Sudden cardiac events are the leading cause of death among firefighters, a population that commonly overuses caffeine. The objective of this study was to examine the potential effects of caffeine on the hemostatic response to simulated firefighting activity.
METHODS: Twelve healthy male firefighters, wearing full personal protective equipment (PPE) and self-contained breathing apparatus (SCBA), completed two trials of a simulated firefighting activities course one hour after consuming either 6mg/kg body weight of caffeine or placebo. Blood samples and air levels from the SCBA were obtained pre-exercise and post-exercise. The effects of caffeine and simulated firefighting on outcome variables were assessed using repeated measures ANOVA.
RESULTS: Factor VIII increased more in the caffeine trial (Pre = 0.20 ± 0.13 IU/mL, Post = 0.43 ± 0.15 IU/mL) than the placebo trial (Pre = 0.21 ± 0.11 IU/mL, Post = 0.38 ± 0.15 IU/mL). tPA activity increased significantly ($P < 0.05$) by the same magnitude in both the placebo (Pre = 0.18 ± 0.18 IU/mL, Post = 3.23 ± 3.21 IU/mL) and caffeine (Pre = 0.18 ± 0.31 IU/mL, Post = 3.97 ± 3.53 IU/mL) conditions. PAI-1 activity significantly ($P < 0.05$) decreased from pre- to post-exercise in both the placebo (Pre = 33.86 ± 21.29 U/mL, Post = 28.77 ± 21.21 U/mL) and caffeine (Pre = 37.34 ± 28.81 U/mL, Post = 23.71 ± 19.42 U/mL) conditions. There was a trend (p = 0.05) for increased air consumption in the caffeine condition versus placebo condition.
CONCLUSIONS: Results from the present study suggest that caffeine elicits a higher coagulation response without concomitant increases in fibrinolysis during simulated firefighting.

1215   Board #23   May 31 8:00 AM - 9:30 AM

Exercise Duration Augments Inter-Arm Systolic Blood Pressure Difference

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(No relevant relationships reported)

Blood pressure is a universal measurement used to aid in appropriate clinical decision-making and monitor safe exercise participation. Inter-arm systolic blood pressure difference (ISBPD; difference of ≥10mmHg between arms) at rest is associated with vascular disease, arterial stiffness, and premature morbidity and mortality. The incidence ISBPD at rest is low (i.e. commonly reported as 10%), though the occurrence of ISBPD is known to increase with short-term (i.e. <5 min at 6 metabolic equivalents) moderate-intensity aerobic exercise. **PURPOSE**: To determine the exercise-induced ISBPD response during a prolonged steady-state bout of aerobic exercise. **METHODS:** Fifty-four individuals were studied on two separate occasions. On an initial visit, anthropometric measures and a VO_{2peak} test on a cycle ergometer were completed. On a subsequent visit, participants cycled at a workload equivalent to 50% of their VO_{2peak} for 30 min. Heart rate (HR) and systolic blood pressure difference (SBPD; measured sequentially using standard auscultation in both arms) were measured at rest, 5, 10, 20, and 30 minutes of exercise (EX-5, EX-10, EX-20, EX-30), and during an active recovery (AR). Descriptive and comparative (one-way ANOVA) statistics were generated. A binary logistic regression analysis was used to determine the change in the odds ratio (OR) of ISBPD given exposure to exercise. **RESULTS:** The incidence of ISBPD at rest was 19%. The occurrence of ISBPD increased to 35% at EX-5 and EX-10, and 46% at EX-20 and EX-30. Occurrence decreased to 20% during AR. Interestingly, each additional 1mmHg difference in SBPD at rest was associated with an increased OR of ISBPD at EX-5 (1.139), EX-10 (1.335), EX-20 (1.220), and EX-30 (1.196; p<0.05). Individuals in the highest tertile of systolic blood pressure (SBP) response during exercise presented with the greatest SBPD (10.7 mmHg) at EX-5. Finally, individuals identified as underweight and obese class II were more likely to present with ISBPD at rest and EX-20. **CONCLUSION:** The occurrence of ISBPD during moderate-intensity aerobic exercise increased with prolonged steady-state aerobic exercise. Body mass index and the magnitude of the SBP response to exercise may be linked to ISBPD incidence.

1216   Board #24   May 31 8:00 AM - 9:30 AM

Effects of Acute Vibration Exercise on Endothelial Function and Inflammation in Healthy Males

Anthony Kaleth, FACSM[1], Kelsey Rupert[1], Bruce Neff[2], Yameena Jawed[2], Eleni Beli[2], Maria Grant[2], Keith March[2], Mary Loghmani[2]. *[1]Indiana University-Purdue University Indianapolis, Indianapolis, IN. [2]Indiana University, Indianapolis, Indianapolis, IN.*
(No relevant relationships reported)

Endothelial progenitor cells (EPCs) are thought to play a key role in vascular regeneration, endothelial repair, and restoration of endothelial function. While studies have confirmed a relationship between exercise and EPCs, the mechanisms by which exercise mobilizes EPCs into circulation remains unknown. **PURPOSE**: To evaluate the effects of vibration training (VT*)* on the mobilization of angiogenic circulating progenitor cells (CPCs) and hematopoietic progenitors. We hypothesized that VT would increase the acute mobilization of angiogenic CPCs and decrease inflammatory marker levels. **METHODS**: 11 healthy males [18-30 yr (n=6) and 50-65 yr (n=5)] performed each of the following in random order on separate days: 1) standing on a vibrating platform only; 2) dynamic leg squat exercise (without vibration); and 3) in combination, i.e. leg squat with vibration. Blood samples were taken pre-and post-activity. **RESULTS**: Angiogenic CPCs increased 33% with vibration alone (p=0.02), 21% with exercise alone (p=0.02), and 34% with exercise plus vibration (p=0.004). VEGF levels were higher with vibration alone (p<0.005); TNFα increased with vibration (p<0.01); interleukin-6 (IL-6) approached a significant drop during vibration (p=0.056); and higher levels of IL-10 were found with vibration alone (p<0.03) and exercise alone (p<0.05). A decrease in IL-10 level was found when exercise and vibration were combined.
CONCLUSIONS: Our findings suggest vibration alone may have a pro-angiogenic effect taken together with higher VEGF and TNFα levels; more than with exercise alone or in combination. Furthermore, vibration alone may have greater anti-inflammatory effects, evidenced by a trend toward decreased inflammatory marker (IL-6) and a significant increase in anti-inflammatory marker (IL-10). Curiously, the anti-inflammatory effect was dampened when vibration was combined with exercise in that the drop in IL-6 did not approach significance and IL-10 levels were actually lowered, suggesting there may be a threshold for the optimal dose and/or combination effects. VT may be a viable option to increase stem/progenitor cell circulation levels and decrease inflammation with possible health benefits in multiple health conditions.

1217   Board #25   May 31 8:00 AM - 9:30 AM

Effects of Acute Resistance Exercise on Heart Rate Variability and Central Blood Pressure in Women

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(No relevant relationships reported)

INTRODUCTION: Heart rate variability (HRV) is defined as the beat-to-beat fluctuations of R wave to R wave and is an indirect measure of autonomic nervous system function, whereas central blood pressure (CBP) is indicative of the pressure load faced centrally on the aortic, coronary and carotid arteries. Both factors relate to cardiac health and are two variables that can be altered by exercise. **PURPOSE:** To determine the effects of acute resistance exercise on HRV and CBP in overweight women. **METHODS:** Eight overweight, non-resistance trained young women (BMI 27.17 ± 1.76; age 23.75 ± 4.13 years) volunteered to participate in three study sessions. The first session served to familiarize the subjects with the resistance protocol and obtain demographics. Sessions two and three consisted of either a control session of supine rest, or a resistance exercise session (composed of two sets of six total body, compound resistance exercises including a trap-bar deadlift, split squat, bench press, pull-up, bent-over row and shoulder press at a 2-0-2 tempo) lasting 30 min. A metronome and perceived exertion scale were used during exercise. HRV and CBP were measured before, and for 60 min after rest and exercise conditions. Repeated measures ANOVA's were used to analyze the data. **RESULTS:** The main finding was significantly lower values for standard deviation of N-N's (SDNN; a component of HRV) during the exercise condition, when compared to pre-exercise values (61.18 ms ± 32.15; 28.30 ms ± 17.69 immediate post exercise, p < .05, until 20 min post, 32.06 ms ± 16.55, p < .05). Values returned close to baseline at 60 min post exercise (64.33 ms ± 31.66, p > .05) No significant differences existed for systolic or diastolic CBP, or brachial blood pressures. **CONCLUSION**: Acute, total body resistance exercise depressed the SDNN component of HRV for up to 20 min post exercise, when compared to baseline values in a group of non-resistance trained, overweight women. Central blood pressure values did not change significantly after resistance exercise. Acute, resistance exercise temporarily lowers HRV in a group of overweight, young women.

1218   Board #26   May 31 8:00 AM - 9:30 AM

Cardiovascular Responses To Different Resistance Exercise Intensities In Young And Older Adults

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(No relevant relationships reported)

Older individuals are at increased cardiovascular risk both during rest and during physical effort. Acute resistance exercise (RE) conducted at high intensity significantly increases heart rate (HR), blood pressure (BP), and arterial stiffness in young individuals. The effects of high (HI) and low intensity (LI) RE performed until failure on cardiovascular responses are likely different among populations of different ages. **PURPOSE:** Compare the effects of acute HI and LI between young (Y) and older adults (O) on cardiovascular recovery responses. **METHODS:** 9 Y and 9 O performed two experimental sessions in randomized sequence, using leg press, with 4 sets until failure for HI (80% 1RM) and for LI (30% 1RM). Pre, 3-min and 30-min post-RE beat-to-beat BP waveforms were recorded by finger photoplethysmography from which the hemodynamic variables (HR, stroke volume [SV], cardiac output [CO], total peripheral resistance [TPR]) were derived. Left common carotid artery images were acquired by ultrasound and carotid compliance (CC) were calculated. Two-way ANOVAs were performed on raw (mean BP, HR, CO) and normalized (SV, TPR, CC) data. Data is presented as mean ± standard deviation. **RESULTS:** Following HI RE there was an increase in HR in Y (56 ± 8 to 95 ± 23) with no changes in O (64 ± 8 to 81 ± 12) at 3-min post-RE (interaction, p < 0.05), with similar increases in HR in Y and O following LI RE (Y: 56 ± 8 to 94 ± 12 and O: 66 ± 10 to 90 ± 13; time, p < 0.05). Y increased CO (6.1 ± 0.8 to 10.9 ± 3.2) and reduced TPR (0.81 ± 0.14 to 0.45 ±0.16) 3-min post HI RE while O did not change (CO 5.6 ± 0.9 to 7.6 ± 2.0 and TPR 1.02 ± 0.23 to 0.79 ± 0.24) (interaction, p < 0.05). No interactions were seen for the other variables. **CONCLUSION:** Aging impacts the hemodynamic recovery following HI RE but aging does not impact hemodynamic recovery following LI RE. These data suggest that LI RE may be a more desirable form of RE for older individuals.

1219   Board #27   May 31 8:00 AM - 9:30 AM

Heart Rate Variability During Submaximal Exercise And The Impact Of Gender And Race

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(No relevant relationships reported)

PURPOSE: To examine the effect of exercise duration on heart rate variability (HRV) and whether race or sex alters HRV during exercise. METHODS: Untrained participants (n=26, 46% male, 50% African-American [AA]) underwent fasting blood lipid and glucose tests and cardiovascular assessments (flow-mediated dilation [FMD], pulse wave analysis, and HRV). Maximal oxygen consumption (VO_{2max}) was used to prescribe a 30-min cycling bout at 50%VO_{2max}. Exercise intensity was similar across sex (Male 1.3±0.2L/min; Female 0.9±0.1L/min, P<0.001) and race (AA 1.1±0.3L/min; Cau 1.1±0.2L/min, P=0.23). HRV during exercise was assessed in 2 min increments before exercise (Pre-EX) and during steady-state submaximal exercise from 14-16 min (Mid-EX) and 28-30 min (End-EX). RESULTS: At rest, no race or sex differences were observed in blood lipids, fasting glucose, PWV or FMD (all P>0.05). VO_{2max} was significantly greater in males (29.9±6.7 vs. 25.3±4.4mL/kg/min; P<0.001). During exercise, heart rate was higher in females than males at Mid-Ex and Post-Ex (P<0.01). The natural logarithm of root mean square of successive differences (lnRMSSD) and high frequency (lnHF) significantly decreased from Pre-EX to Mid-Ex (P<0.001), and was similar from mid-EX to End-EX (lnRMSSD P=0.47; lnLF P=0.35). No race differences were observed in HRV during exercise (P>0.05). CONCLUSION: HRV was similar during exercise past 15 min, suggesting the time course of autonomic changes occurs early during exercise. No sex or race differences were observed in HRV during exercise, suggesting sex and race have similar cardiovascular responses during 30 min of submaximal exercise. However, it is plausible that intensity of exercise was not a sufficient stimulus for the sympathetic activity to observe differences between sex and race.

1220   Board #28   May 31 8:00 AM - 9:30 AM

Graduated Compression Socks Does Not Improve Cardio-respiratory Responses To Maximal Exercise

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(No relevant relationships reported)

Cardiovascular and Respiratory Research Laboratory, Franklin Pierce University, Rindge, NH
PURPOSE: The purpose of this study was to determine if the use of graduated compression socks (GCS) would improve cardio-respiratory responses to maximal exercise. METHODS: Eight healthy young participants (4 men and 4 women; age = 20.50 ± 1.41 years; height = 1.71 ± 0.12 m; weight = 72.34 ± 12.53 kg; body mass index = 24.65 ± 3.15kg/m²) performed a Cardiopulmonary Maximal Exercise Test (CPET) on a treadmill that consisted of 3 minutes warm-up at a speed of 4 mph at 0° grade followed by an increase in speed to 6 mph for 1 minute and then increases of 1 mph every minute until 8 mph with maintained grade (0°). After that, the grade increased 2° every minute until exhaustion, but the speed of the treadmill was kept constant. Each participant visit the laboratory twice to perform the CPET test in two different conditions: (1) wearing graduated compression socks (GCS); and (2) not wearing the graduated compression socks (NGCS) in a randomized and counterbalanced order. Peak oxygen consumption (VO₂peak), peak carbon dioxide production (VCO₂peak), peak respiratory exchange ratio (RER$_{peak}$), peak Heart Rate (HRpeak), and exercise time to exhaustion (ETE) were collected via metabolic cart system. RESULTS: There were no statistical differences in VO₂peak (NGCS = 49.94 ± 8.34 mL.kg⁻¹.min⁻¹ and GCS = 50.55 ± 8.67 mL.kg⁻¹.min⁻¹); VCO₂peak (NGCS = 4.19 ± 1.17 L.min⁻¹ and GCS = 4.34 ± 1.38 L.min⁻¹); RERpeak (NGCS = 1.41 ± 0.17 and GCS = 1.45 ± 0.16); HRpeak (NGCS = 191.63 ± 7.25 bpm and GCS = 190.75 ± 7.63 bpm); and ETE (NGCS = 512.36 ± 149.48 s and GCS = 528.15 ± 165.17 s) between non-graduated compression socks and with graduated compression socks, respectively. CONCLUSIONS: Based on the results, there were no statistical significant difference in any variables indicating that there was no effect of the passive external compression on the cardio-respiratory responses during maximal exercise. The conclusions drawn from our data need to be analyzed with extremely caution due to small sample size (n = 8). Therefore, more research need to be done to support these initial findings. **Research supported by New Hampshire-INBRE through an Institutional Development Award (IDeA), P20GM103506, from the National Institute of General Medical Sciences of the NIH".**

C-34   Free Communication/Poster - Respiratory

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1221   Board #29   May 31 8:00 AM - 9:30 AM

Easy Breather Exercise Table: A Feasibility Evaluation of a Medical Device to Facilitate Gravity Powered Ventilation

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(No relevant relationships reported)

Gravity powered ventilation is a concept that utilizes visceral pressure to facilitate pulmonary ventilation. Such a procedure may provide a form of complementary therapy for those with Chronic Obstructive Pulmonary Disease.
PURPOSE: Investigate if the Easy Breather Exercise Table (EBET) prototype is suitable for clinical studies in patients with Chronic Obstructive Pulmonary Disease (COPD). METHODS: The EBET bed uses arm power to tilt the supine subject from a Trendelenburg to a reverse-Trendelenburg position with the goal of assisting breathing. Healthy volunteers (N=40) operated the device for 15 minutes. Variables of interest: A body part discomfort scale (0 = no discomfort to 5 = very uncomfortable) administered at 0 and 13 minutes, a Borg scale rating of perceived exertion (0 to 10) at 14 minutes, and an end-of-session safety rating. RESULTS: Areas with the greatest discomfort at minute 13 and the associated percent reaching ≥ level 3 follow: Left elbow (5%), right elbow (5%), left wrist (23%), right wrist (28%), left hand (16%), and right hand (15%). Of these body parts, there was a significant (p ≤ 0.01) increase in discomfort from 0 to 13 minutes. Regarding exertion: 33% reported moderate to somewhat strong levels, while 13% reported strong levels. In terms of safety, 98% felt safe on the device, and 2% were undecided. CONCLUSION: Further clinical studies with the current EBET in COPD patients are not advised due to the discomfort and exertion in healthy volunteers. Safety data indicates tilting may be a viable means to achieve gravity powered ventilation, thus device modification is recommended.
Supported by grants from Exhale Fully, LLC, and University of North Carolina Wilmington

1222   Board #30   May 31 8:00 AM - 9:30 AM

Three Weeks of Respiratory Muscle EnduranceTraining Decrease the O₂ Cost of Walking In Obese Adolescents

Hailu K. Alemayehu[1], Desy Salvadego[1], Miriam Isola[1], Gabriella Tringali[2], Roberta De Micheli[2], Mara Caccavale[2], Alessandro Sartorio[2], Bruno Grassi, FACSM[1]. [1]University of Udine, Udine, Italy. [2]Istituto Auxologico Italiano, IRCCS, Milan and Piancavallo (VB), Italy.

(No relevant relationships reported)

Obese adolescents have an increased O₂ cost of exercise, attributable at least in part to an increased O₂ cost of breathing. In a previous work a short (3-wk) program of respiratory muscle endurance training (RMET) slightly reduced the O₂ cost of high-intensity cycling in these patients.
PURPOSE: We hypothesized that the effects of RMET would be more pronounced during walking on a treadmill compared to those described during cycling.
METHODS: Sixteen obese patients (age 16.0±0.8 yrs; height 1.80±0.05 m; body mass 127.7±14.2 kg; BMI 40.7±4.0 kg/m²) participated to the study. In the experimental group (RMET, n=8), subjects followed for 3 weeks a standard RMET protocol in addition to a multidisciplinary body mass reduction program, whereas controls (CTRL, n=8) did only the latter. Among other variables, heart rate (HR), and pulmonary O₂ uptake (VO₂) were measured during incremental exercise and 12-minute constant work rate (CWR) exercises at 60 (moderate-intensity) and 120% (high-intensity) of the gas exchange threshold (GET), determined before the interventions. The O₂ cost of walking (aerobic energy expenditure per unit of covered distance) was calculated as VO₂/walking velocity.
RESULTS: Body mass decreased both in CTRL (~4 kg) and in RMET (~5 kg). All subjects completed 12-minute CWR tests. VO₂ peak was not affected by both interventions. Both during moderate- and high-intensity walking, VO₂, the O₂ cost of walking and HR decreased in RMET, but not in CTRL. During heavy-intensity walking the positive slopes of the VO₂ and HR vs. time linear relationships from the 3rd to the 12th minute of exercise decreased in RMET, but not in CTRL.
CONCLUSIONS: In obese adolescents a short RMET program significantly lowered the O₂ cost of moderate- and high-intensity walking and improved exercise tolerance.
Funding by "Progetti di Ricerca Corrente" from the Istituto Auxologico Italiano Istituto di Ricovero e Cura a Carattere Scientifico (Milan, Italy).

1223　Board #31　May 31 8:00 AM - 9:30 AM

Individual Variability in the Leg Blood Flow Response to Expiratory and Inspiratory Resistive Loading

Tim A. Hardy, Marcelle P. Ribeiro, Bryan J. Taylor. *University of Leeds, Leeds, United Kingdom.* (Sponsor: Lee M. Romer, FACSM)
(No relevant relationships reported)

BACKGROUND. Fatiguing inspiratory muscle work initiates the inspiratory muscle metaboreflex causing a time-dependent increase in muscle sympathetic nerve activity (MSNA) and a decrease in leg blood flow (Q_L). Fatiguing contractions of the expiratory muscles also facilitates an increase in MSNA. However, the effect of fatiguing expiratory muscle work on Q_L is somewhat unknown. **PURPOSE.** To determine the effect of expiratory resistive loading (ERL) compared to inspiratory resistive loading (IRL) on Q_L in healthy humans. **METHODS.** Five healthy men ($n = 2$, 30 ± 6 y) and women ($n = 3$, 29 ± 5 y) performed ERL and IRL at 65% of maximal expiratory and maximal inspiratory mouth pressure (MEP; MIP) to task failure. Respiratory frequency was maintained at 15 breaths/min with an inspiratory duty cycle of 0.5. Q_L (via Doppler ultrasound) and mean arterial pressure (MAP) (via finger photoplethysmography) were measured before, during and up to 3 min after ERL and IRL. Expiratory and inspiratory muscle fatigue was assessed by measuring the reduction in MEP and MIP from pre- to post-ERL and IRL. EMG was measured in each leg to ensure no muscular contraction occurred. **RESULTS.** Task failure occurred at 10.6 ± 2.4 min for ERL and at 20.6 ± 8.8 min for IRL; each subject performed ≥ 7 min of ERL and IRL. There was a $21 \pm 4\%$ reduction in MEP and a $7 \pm 5\%$ reduction in MIP from before to after ERL and IRL, respectively ($P < 0.05$). Despite an increase in group mean MAP from rest to during ERL (14 ± 14 mmHg, $P = 0.035$) and IRL (12 ± 6 mmHg, $P = 0.021$), there was no change in group mean Q_L across time during either ERL or IRL ($P > 0.05$). There was, however, substantial individual subject variability in the Q_L response to loaded breathing. During ERL, Q_L decreased relative to baseline values at min 3 ($-29 \pm 20\%$) and min 7 ($-17 \pm 6\%$) in 2 of the 5 subjects; Q_L increased by $15 \pm 7\%$ from rest to min 7 in the remaining 3 subjects. Similarly, there was a reduction in Q_L from rest to min 3 ($-23 \pm 9\%$) and min 7 ($-16 \pm 3\%$) in 2 of the 5 subjects during IRL; Q_L increased by $60 \pm 26\%$ from baseline to min 7 in the remaining 3 subjects. There was no significant change in MAP or Q_L during ERL and IRL trials at 2% of MEP and MIP. **CONCLUSION.** Leg blood flow appears to decrease in some but not all healthy humans in response to ERL. Indeed, we report substantial individual variability in the leg blood flow response to both ERL and IRL.

1224　Board #32　May 31 8:00 AM - 9:30 AM

Hypercapnic and Hypoxic Ventilatory Responses are Non-Normally Distributed: A Retrospective Analysis

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(No relevant relationships reported)

Hypercapnic ventilatory response (HCVR) and hypoxic ventilatory response (HVR) are common procedures used to describe an individual's responsiveness to inhaled increases in CO_2 and decreases in O_2 respectively. To our knowledge there are no studies of HCVR or HVR of a grand enough scale to determine normative values or a 'typical' response. No description of the distribution of values, yet, is available in the literature such that little can currently be said about population-based differences. **PURPOSE:** To characterize the distribution of and establish reference values for ventilatory responses of the broad population using readily accessible sources. **METHODS:** Previously published dissertations and peer-reviewed manuscripts ($N=25$) were used to obtain subjects' responses ($N=312$, age = 29.4 ± 13.2 yrs). HCVR tests ($n=262$) were analyzed using the slope of the linear regression line relating P_ACO_2 to minute ventilation (V_E), $l*min^{-1}*mmHg^{-1}$. HVR was calculated using either the calculated slope of the linear regression relating V_E to oxyhemoglobin saturation, $l*min^{-1}*\%^{-1}$ ($n=105$) or using the hyperbolic shape parameter (A) of the curve relating V_E to P_AO_2 ($n=170$). Confidence intervals for mean and median values were calculated using bootstrapping procedures. **RESULTS:** Data are presented mean/median; ±95% CI width. HCVR values displayed a right skewed non-normal distribution (skew = 5.25, p <.05), mean 2.67; ±0.70 $l*min^{-1}*mmHg^{-1}$, median 2.00; ±0.51 $l*min^{-1}*mmHg^{-1}$ (IQR: 1.50). HVR A values showed a non-normal right skewed distribution (skew = 0.92, p <.05), mean 131.8; ±23.62 $l*min^{-1}*mmHg^{-1}$, median 112.50; ±58.25 $l*min^{-1}*mmHg^{-1}$ (IQR: 118.99). Linearized HVR values using %SaO2 was also a right skewed non-normal distribution (skew=1.33, p<.05), mean 0.35; ±0.10 $l*min^{-1}*\%^{-1}$, median 0.26; ±0.23 $l*min^{-1}*\%^{-1}$ (IQR: 31.00). **CONCLUSION:** This analysis allows researchers to better place into context assessments of HCVR and HVR by providing distribution parameters derived from the literature. However, as HVR measures contrast due to methodological differences, distribution parameters remain infirm. In an effort to strengthen these distributions, researchers should include individual responses when reporting results of studies.

1225　Board #33　May 31 8:00 AM - 9:30 AM

Comparing Ventilatory Mechanics Between Face Mask and Mouthpiece During High-Intensity Exercise

Jessica Freemas. *Indiana University, Bloomington, IN.*
(No relevant relationships reported)

Purpose:
A snorkel-like mouthpiece and the Hans Rudolph mask are used interchangeably to collect ventilatory data. Since the mask has a greater amount of dead space (250ml vs. 41ml) it may affect operating lung volumes and mouth pressure. Therefore, the aim of this study was to compare ventilatory mechanics while breathing through the mouthpiece and the mask during high-intensity exercise.
Methods:
Seven recreationally active, healthy males [age (mean ± SD) = (27 ± 1 yr.); VO$_2$max = 53.4 ± 6.1 ml·kg⁻¹·min⁻¹] visited the laboratory on 3 separate occasions. Visit one consisted of a VO$_2$max test and familiarization of the maximal graded flow volume loop (MFVL) procedure. During visits two and three, participants performed two 5-min cycle bouts at 90% of their power output at VO$_2$max. During one bout participants breathed through the mouthpiece; during the other bout, they breathed through the mask. The initial order of the devices used was randomized between subjects and then reversed on the subsequent visit. Both visits included a pre- and post-MFVL procedure, and participants were instructed to perform an inspiratory capacity (IC) maneuver every 30 seconds of exercise. Minute ventilation (V_E), mouth pressure (Pm) (cmH20), and tidal volumes (V_t) (L/s) were collected in the last minute of exercise.
Results:
V_E was not significantly different ($p = 0.919$) between the mouthpiece (158.1 ± 18.4 L/min) and mask (158.9 ± 11.2). Furthermore, no significant differences were observed in P_m ($p = 0.542$), V_t ($p = 0.303$), and percent flow limitation (%FL) ($p = 0.98$) between the two breathing devices.
Conclusion:
The extra dead space in the Hans Rudolph mask does not significantly alter breathing mechanics. Therefore, the mask can be used as a more comfortable alternative to the mouthpiece during near maximal exercise.

1226　Board #34　May 31 8:00 AM - 9:30 AM

Cycling Time Trial Performance with Addition of External Dead Space

Vincent P. Georgescu, Aaron B. McMichael, Jayvaughn T. Oliver, Erica M. Larson, Jonathon L. Stickford. *Appalachian State University, Boone, NC.*
(No relevant relationships reported)

When athletes have the ability to self-select their work rate, it is unknown how the addition of external dead space (DS), a potent ventilatory stimulus, will influence cycling power and ventilatory dynamics. **PURPOSE:** To examine mechanical power, ventilatory dynamics, and perceptual responses during a fixed-work cycling time trial (TT) in trained male cyclists under a condition of increased DS. **METHODS:** Eleven trained cyclists completed pulmonary function testing and a peak aerobic capacity (VO$_{2peak}$) test on a cycle ergometer during the initial visit. During the second visit, subjects completed a familiarization TT. During visits three and four, subjects completed TTs with (TT$_{DS}$) or without (TT$_C$) the addition of DS. Mechanical power, elapsed time, metabolic and ventilatory parameters, and perceptual responses were measured throughout each TT. Statistical differences between TT$_{DS}$ and TT$_C$ were tested each 20% interval of the TT using Student's paired t-tests. Data are expressed as means ± SD. **RESULTS:** Subjects displayed normal pulmonary function upon study entry. Time to completion was greater in TT$_{DS}$ compared with TT$_C$ (536 ± 34 vs. 489 ± 34 s, p<0.05) as a result of reduced power at 40-100% of TT$_{DS}$ completion compared with TT$_C$ (Δ=-10.2±8.7%). Additionally, minute ventilation (V_E) was similar at 40-100% of TT$_{DS}$ completion compared with TT$_C$ (Δ=0.9±11.0%). However, integrated inspiratory mouth pressure ($\int P_m$) was greater throughout TT$_{DS}$ compared with TT$_C$ (p<0.05), and arterial pulse saturation (SpO$_2$) fell at a greater rate throughout TT$_{DS}$ compared with TT$_C$ (-2.2±0.8 vs. -1.3±0.4 % per interval, p<0.01). Rating of perceived breathlessness (RPB) was significantly greater at 20% and 40% of TT$_{DS}$ compared with TT$_C$, but was not different during the remaining intervals. **CONCLUSION:** Power output during a cycling time trial is reduced in response to increased ventilatory stress in an effort to balance the additional ventilatory work and potential impact to blood gas tensions. Additionally, the fact that V_E and RPB were largely similar between conditions suggests that these parameters may play an important role in the determination of self-selected work rates. Supported by the Office of Student Research and Graduate Student Association Senate at Appalachian State University.

1227   Board #35   May 31 8:00 AM - 9:30 AM

Characterizing The Mechanics Of Breathing In Swimmers

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(No relevant relationships reported)

During freestyle swimming, the hydrostatic pressure of water limits expansion of the lungs and chest wall, and narrows airways >2 mm in diameter. Moreover, the horizontal body position causes blood to shift from the extremities to the chest, which reduces lung compliance. Thus, during freestyle swimming, the mechanics of breathing are altered, which likely increases the work of breathing (W_b). However, no previous studies have quantified W_b during freestyle swimming.
PURPOSE: To compare W_b during freestyle swimming relative to cycling, and to characterize the differences in the cardiorespiratory responses to swimming relative to cycling in the same individuals. **METHODS:** Seven collegiate swimmers (n=4 male, n=3 female; age= 22±2 y) performed a graded swim test while tethered to a resistance apparatus. On a separate day subjects performed a graded cycle test. During swimming and cycling, metabolic and ventilatory parameters were measured using a customized metabolic cart, and inspired W_b was quantified using an esophageal balloon catheter. **RESULTS:** Swimming and cycling elicited statistically similar maximal oxygen uptakes (3.87±0.92 vs. 4.20±0.83 l·min^{-1}, p=0.143). However, minute ventilation (V_E)(118±3 vs. 154±25 l·min^{-1}) and heart rate (164±19 vs. 183±8 beats·min^{-1}) were significantly lower during swimming relative to cycling (both p<0.05). Total inspired W_b was higher at a V_E of 50 l·min^{-1} (+27±16 J·min^{-1}) and a V_E of 100 l·min^{-1} (+53±22 J·min^{-1}) during swimming compared to cycling (both p<0.05). Periods of inter-breath apnea were observed at lower ventilations while swimming, resulting in decreased breathing frequency (V_E=50 l·min^{-1}, 19±6 vs. 22±4 breaths·min^{-1}, p<0.05), and were not observed at higher ventilations (V_E=100 l·min^{-1}, 37±11 vs. 35±7, p>0.05). Peak inspired flow was greater while swimming, when matched for V_E (+0.26±0.73 l·sec^{-1}, p<0.05). **CONCLUSION:** We found that swimming resulted in a higher inspired W_b, at a V_E of 50 and 100 l·min^{-1} compared to cycling. We interpret our findings to mean that the horizontal body position and hydrostatic pressure on the chest wall requires swimmers to generate greater inspiratory pressures to sustain adequate V_E during exercise.
Funding: Natural Sciences and Engineering Research Council of Canada

1228   Board #36   May 31 8:00 AM - 9:30 AM

Effect of Growth and Changes in Body Composition on Cycling Efficiency in Normal Weight and Obese Children

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(No relevant relationships reported)

PURPOSE: Efficiency refers to the amount of work performed for a given energy consumption. Excess body weight is known to increase resting oxygen uptake, but not net oxygen uptake or mechanical efficiency during non-weight bearing exercise such as cycling in prepubertal children. We examined whether the VO_2/WR slopes during incremental exercise were affected by changes in body composition after 1 year in normal weight and obese 10-12 year-old children.
METHODS: 17 children (9 obese) underwent an incremental exercise test on a cycle ergometer and dual energy x-ray absorptiometry at baseline and at 1-year follow-up. A VO_2/WR slope was calculated from measured VO_2 and WR (r^2 = 0.97 ± 0.1). No intervention was prescribed during the year between testing.
RESULTS: There were no mean differences in the VO_2/WR slope between normal weight and obese children during the incremental exercise test at baseline or 1-year follow-up (P=0.715). Over 1 year, obese children gained 8.1±4.6kg and normal weight children gained 4.3±1.9kg of body mass (P=0.048). Obese children gained 2.6kg more lean body mass than normal weight children (P=0.018), with no differences in percent fat or fat weight gained over 1 year. There were no significant associations between changes in body mass, percent fat, fat mass, or lean body mass and changes in VO_2/WR slope in normal weight or obese children.
CONCLUSIONS: Muscular efficiency (VO_2/WR slope) during cycling exercise is similar between normal weight and obese children and does not appear to be related to relatively short-term changes in body composition.
Supported by funds from NIH R01HL136643, Texas Health Presbyterian Hospital Dallas, Dr. Pepper Snapple, and King Charitable Foundation Trust
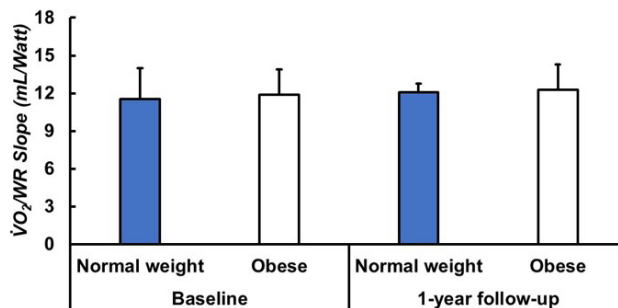
Figure 1: $\dot{V}O_2$/WR slope was not different between normal weight and obese children at baseline or at 1-yr follow-up.

1229   Board #37   May 31 8:00 AM - 9:30 AM

Blunted Sympathetic Vasomotor Outflow To Inspiratory Resistive Breathing During Exercise In Women Compared to Men

Keisho Katayama[1], Joshua R. Smith[2], Kanako Goto[1], Kaori Shimizu[1], Mitsuru Saito[3], Koji Ishida[1], Teruhiko Koike[1], Satoshi Iwase[4], Craig A. Harms, FACSM[5]. *[1]Nagoya University, Nagoya, Japan. [2]Mayo Clinic, Rochester, MN. [3]Toyota Technological Institute, Nagoya, Japan. [4]Aichi Medical University, Nagakute, Japan. [5]Kansas State University, Manhattan, KS.* (Sponsor: Craig Harms, FACSM)
(No relevant relationships reported)

It has been reported that in young men high inspiratory muscle work at rest and during exercise reflexively increases muscle sympathetic nerve activity (MSNA), with corresponding increases in arterial blood pressure (ABP). This sympathoexcitation occurs through an inspiratory muscle-induced metaboreflex. Young women have attenuated inspiratory muscle metaboreflex-induced increases in ABP compared to age-matched men. One potential mechanism is less sympathetic vasomotor output in women compared to men. **PURPOSE:** We compared changes in MSNA and cardiovascular variables during leg cycle exercise with increased inspiratory muscle resistance in men and women. **METHODS:** Eight young women (19.5±0.2) and seven men (20.3±0.3) completed the study. The subjects performed two 10-min submaximal cycle ergometer exercises in a semirecumbent position. The first 5-min was spontaneous breathing, and latter 5-min half was voluntary hyperventilation with or without inspiratory resistive breathing. Mean arterial blood pressure (MAP) was measured using finger photoplethysmography and MSNA was recorded via microneurography of the arm at the elbow. **RESULTS:** During exercise with inspiratory resistive breathing, MSNA burst frequency was significantly increased accompanied by an increase (p<0.05) in MAP in both men and women. Women had significantly less of an increase in MSNA (Women: +9.6±1.0 vs. Men: +14.6±2.4 bursts/min) and MAP (Women: +22.8±5.7 vs. Men: +32.2±2.0 mmHg) as compared to men. **CONCLUSION:** These results suggest that lesser sympathetic vasomotor outflow partially contributes the attenuated inspiratory muscle-induced metaboreflex during exercise in young women. Supported by JSPS KAKENHI Grant Number 15H3079.

1230   Board #38   May 31 8:00 AM - 9:30 AM

Spirometry Values In Recreational Runners Are Acutely Lower After Prolonged Exercise

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(No relevant relationships reported)

PURPOSE: Prolonged endurance running may acutely reduce spirometric lung function. This study examined changes in spirometric lung function before and immediately after prolonged endurance exercise (running/walking) in a large sample. This study also examined if presence or absence of exercise-induced bronchoconstriction (EIB) was related to finishing time.
METHODS: Recruitment was obtained at the pre-race expo, where an informed consent form was signed. Pre- and post-race spirometry measurements were obtained in seventy-nine participants who participated in the 2008 ING (Internationale Nederlanden Groep) Georgia half-marathon (n = 66) or marathon (n = 13). Mean ambient temperature was 47ºF (range 43-50ºF); mean ambient relative humidity was 88% (range 76-100%). Spirometry was performed 24 hours before the marathon or half-marathon and then again about 25 minutes (SD 7) after finishing it.

RESULTS: The post-race forced expiratory volume in 1 second (FEV_1) and forced vital capacity (FVC) were statistically lower by ~10% compared to pre-race, and peak expiratory flow decreased by ~8% compared to pre-race. About 30% of the participants, regardless of sex, demonstrated a post-exercise reduction in FEV_1 by at least 10% compared to pre-race. EIB was the most probable explanation for the reduction in FEV_1 post-race. There was no difference in spirometric lung function changes between men and women, nor between participants completing the marathon versus half-marathon. Presence or absence of a 10% reduction in FEV_1 (i.e., EIB) did not predict finishing time, only the distance run, age, body mass index, and sex affected finishing time (adjusted R^2 = 0.82).
CONCLUSIONS: Prolonged endurance exercise reduced spirometric lung function by about 10%, but did not affect finishing times among recreational runners/walkers.

1231   Board #39   May 31 8:00 AM - 9:30 AM
Exercise-Induced Diaphragmatic Fatigue Is Determined By The Work Of Breathing In Healthy Men

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(Sponsor: A. William Sheel, FACSM)
(No relevant relationships reported)

It has been purported that diaphragmatic fatigue (DF) may occur relatively early during high-intensity exercise. However, studies examining the temporal characteristics of exercise-induced DF are limited by incongruent methodology. **PURPOSE**: To determine the time-course of exercise-induced DF during high-intensity exercise. **METHODS**: Eight healthy adult males (25 ± 5 yrs, 182 ± 8 cm, 74.5 ± 5.8 kg) performed a maximal incremental exercise test on a cycle ergometer on Day 1. A constant load time-to-exhaustion (TTE) exercise test was conducted on Day 2 at 60% delta between the calculated gas exchange threshold and peak work rate (85-90% of maximal oxygen consumption). On Days 3 and 4, constant load exercise tests were performed at the same intensity to either 50 or 75% TTE in random order. Assessment of DF was made by measurements of transdiaphragmatic twitch pressure ($P_{di,tw}$) using cervical magnetic stimulation. **RESULTS**: DF ($\geq$ 20% decrease in $P_{di,tw}$) was present in 2/8 subjects after 50% TTE, 6/8 subjects after 75% TTE and all subjects after 100% TTE. The magnitude of fatigue at 100% TTE (35.0 ± 12.1%) was significantly greater than 75 (23.6 ± 6.4%) and 50% TTE (15.5 ± 5.7%) (both P < 0.01), and 75 to 50% TTE (P < 0.01). Ventilation, the mechanical work of breathing (WOB), and pressure-time products responded similarly between trials (P > 0.05). The accumulated WOB was significantly greater after 100 (3,420 ± 1,093 J) compared to 75 (1,792 ± 611 J) and 50% (877 ± 427 J) TTE (both P < 0.01), and after 75 compared to 50% TTE (P < 0.01). A significant relationship was found between the magnitude of DF and cumulative diaphragmatic force output (r = 0.785; P < 0.001). **CONCLUSION**: Our data indicate that exercise-induced DF is proportional to the cumulative WOB; thus, the ability of the diaphragm to generate pressure progressively declines throughout exercise.
Supported by NSERC and FAPESP (grants no. 2016/08999-5 and no. 2014/10145-9).

1232   Board #40   May 31 8:00 AM - 9:30 AM
Prevalence of Exercise Induced Bronchoconstriction in Recreational Adult Hockey Players as determined by Sport Specific Field Exercise Challenge Test

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(No relevant relationships reported)

BACKGROUND: Exercise induced bronchoconstriction (EIB) is provoked by exercise and results in narrowing of the airways. Studies have shown an EIB prevalence of 11-50% in athletic populations. The diagnosis of EIB is dependent upon objective measurement of respiratory function, as respiratory symptoms are unreliable. Cold and dry ambient conditions contribute to the severity of EIB. The environmental conditions and manner of exertion an athlete is exposed to in ice hockey are significantly different than any current standardized laboratory test to evaluate for EIB. In a prior study of elite women hockey players, 39.5% presented symptoms of asthma and 21% demonstrated EIB. Sport-specific field exercise challenge tests (SSFECT) have been validated for the assessment of EIB, and are more sensitive than laboratory challenges in elite winter athletes.**PURPOSE**: To use a SSFECT to determine the prevalence of EIB in adult recreational ice hockey players, and the correlation between reported symptoms and diagnosis by this method.
METHODS: Participants were 18 males and 2 females (mean age of 34.7 yrs, mean height of 1.78 m); who participated in 1 of 2 recreational ice hockey leagues in Chicago, IL. Using a Piko-1 portable spirometer, FEV1 was measured prior to the hockey game and immediately following periods 1, 2, and 3. All respiratory measurements occurred with hockey equipment adorned. Airway response was expressed as the percent fall in FEV1 from the baseline value. Diagnosis of EIB was given if athletes had a greater than 10% decrease in FEV1 from baseline measured at any time point. Athletes also completed an intake questionnaire prior to testing which included clinical symptoms, exercise history, and past medical history.
RESULTS: EIB was diagnosed in 3/20(15%) athletes. A prior diagnosis of asthma or exercise induced asthma was reported in 5/20 (25%) athletes, yet only one of these had a decrease of > 10 % of FEV1 as measured by this test. Of the three EIB+, two were symptomatic (67%); and of the EIB-, 9/17 (53%) reported respiratory symptoms. Diagnosis of EIB was consistent for all three periods in all but one athlete. Mean FEV1 for the three periods was 4.08, 4.07, and 4.07 respectively.
CONCLUSIONS: Symptoms remain unreliable for diagnosis of EIB. SSFECT can be utilized for diagnosis of EIB in ice hockey athletes.

1233   Board #41   May 31 8:00 AM - 9:30 AM
Improving The Accuracy Of A Turbine Spirometer At Low Flow Rates

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(No relevant relationships reported)

The turbine spirometer is a popular laboratory device used to measure respiratory volumes and flows during exercise, and while performing gross, voluntary respiratory manoeuvres (i.e., inspiratory capacity efforts). Indeed, these devices have been incorporated into many commercially-available pulmonary function and metabolic systems. Yet, while the turbine spirometer may provide accurate/reliable measurements of respiratory volumes at modest-to-high flows, these devices perform poorly at low flow rates. **PURPOSE:** To improve the accuracy of a turbine spirometer over an extended range of low flows using the "weighted averaging technique" described by Yeh *et al.* (*J Appl Physiol*, 53(1): p280, 1982). **METHODS:** A commercially-available turbine spirometer was interfaced with a custom-designed microcontroller unit (MCU). The MCU recorded discrete rotations of the turbine rotor, and the corresponding rotational frequency (*f*rot). Repeated 5-fold cross-validation was used to determine the optimal number of bins in *f*rot and iterations used in the Weighted Averaging algorithm. This method yielded a discrete array of calibration constants (*K*) across a relevant range of *f*rot (<1-1800 Hz). The accuracy of this "nonlinear" calibration curve was compared to that obtained by assuming a constant *K* across all frequencies (i.e., flows). Over 200 calibrations strokes were recorded using a 3 L syringe. **RESULTS:** By assuming a constant *K* (15.6 mL·pulse^{-1}), the turbine spirometer exhibited an average volume error of +94 mL (+3.1%) over a 95% confidence interval ($CI_{95\%}$) of -856 to +375 mL (-28.5 to 12.5%). Conversely, applying the nonlinear *K* curve resulted in an average volume error of <0.001 mL (<0.001%) and a $CI_{95\%}$ ranging from -60 to +60 mL (-2.0 to 2.0%). Importantly, the nonlinear *K* curve provided accurate (within ±3%) volume measurements down to 0.33 Hz (~7 mL·s^{-1}). **CONCLUSIONS:** The "weighted averaging technique" improved the accuracy/reliability the turbine spirometer to within ±3% across an interval of flows ranging between ~0.01 to 20 L·s^{-1}.

1234   Board #42   May 31 8:00 AM - 9:30 AM
Baseline Ventilatory Thresholds Determine Cardiorespiratory Adaptations to High-Intensity Interval Training in Obese Participants

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(No relevant relationships reported)

PURPOSE: To study if cardiorespiratory fitness (CRF) evolution after high intensity interval training (HIIT) depends on training intensity relative to ventilatory thresholds (VTs).
METHODS: A sample (n=134) of sedentary participants with obesity (54±9 years, BMI 31.6±5.6 kg·m^{-2}, 42% female) trained for 16 weeks, 3 days·week^{-1} alternating bouts of 70-90% of peak heart rate (HR). CRF was evaluated before and after training using a graded cycle-ergometer exercise tests (GXT) until exhaustion. Starting at rest, oxygen consumption (VO_2), power output (PO), and HR, were determined at ventilatory threshold (VT_1), respiratory compensation threshold (VT_2) and at maximal values ($_{PEAK}$). Participants were separated in two groups according to the relationship between the training intensity (target-HR based) and the VTs location. One group (BelowVTs) was composed for those who trained below their VTs (n=74), whereas the other group (AboveVTs) for those who trained above their VTs (n=60).
RESULTS: Before intervention, age and body composition were similar in both groups. While at baseline, VO_2 at $_{PEAK}$ was higher in AboveVTs (P=0.005), at VT_1, and VT_2, was similar in both groups. After training, both groups improved their VO_{2PEAK} by 11-12% (P<0.001) without differences between groups (P=0.880). However, in BelowVTs group, 54% of the VO_2 improvement occurred below VT_1, 12% between VTs and 33% above VT_2, whereas for AboveVTs, 96% of the VO_2 improvement occurred below VT_1, 0% between VTs and 4% above VT_2.

CONCLUSIONS: Target-HR based HIIT improves VO_{2PEAK} in middle-aged individuals with obesity independently of the VTs location. However, the extent of the widening of exercise workloads tolerated after the onset of metabolic acidosis (i.e., improvements above VT_2) and exercise workloads supplied solely with oxidative metabolism (i.e., improvements at VT_1) depends if the workload chosen for training fall above or below the workload at both VTs.

1235   Board #43   May 31 8:00 AM - 9:30 AM

The Impact Of An Eight Week Apnea Training Program On Spleen Volume And Hematological Values

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(No relevant relationships reported)

PURPOSE: Apnea training has recently been proposed as a simple and cheap method to stimulate erythropoietin (EPO) production and increase hemoglobin (Hb) concentration and hematocrit (Hct). This study aimed to investigate both acute and chronic effects of apnea on spleen volume and hematological values through an 8-week apnea training program.
METHODS: Thirteen subjects daily performed five static apneas. Before, halfway through and after the apnea training period, subjects performed five maximal breath-holds at the laboratory. Baseline values for and changes in splenic volume, [Hb], Hct, reticulocyte count (RET%) and EPO were assessed.
RESULTS: A strong spleen contraction in response to acute apnea was observed with volume reductions of $50 \pm 10\%$ (p<0.001). An acute increase in [Hb] from 156 ± 11 g L^{-1} to 159 ± 9 g L^{-1} (+2%, p<0.05) was seen immediately after the last apnea. Apnea training did not improve acute effects for neither spleen volume (p=0.868), [Hb] (p=0.358) nor Hct (p=0.421). Although no differences in baseline Hct, RET% and EPO were found (p>0.05), the apnea training program did increase baseline spleen volume by $24 \pm 27\%$ (p<0.05) and baseline [Hb] by $3.3 \pm 5\%$ (p<0.05).
CONCLUSIONS: Our results show an apnea-specific training effect, as it was demonstrated that both baseline spleen volume and [Hb] had increased after eight weeks of apnea training. These increases suggest improved oxygen storage and transport capacity which might be beneficial for both elite athletes and anemic patients. In contrast, acute spleen contraction and temporarily increases in Hb remained unaltered after training.

1236   Board #44   May 31 8:00 AM - 9:30 AM

Sex Differences in Diaphragmatic Fatigue: Implications for Performance

Joseph F. Welch, Bruno Archiza, Jordan A. Guenette, Christopher R. West, A. William Sheel, FACSM. *University of British Columbia, Vancouver, BC, Canada.* (Sponsor: William Sheel, FACSM)

(No relevant relationships reported)

Inspiratory muscle fatigue (IMF) is associated with a sympathetically mediated metaboreflex, resulting in time-dependent sympathoexcitation, including increased heart rate, mean arterial pressure and limb vascular resistance that impairs tolerance to exercise. Women may be more resistant to IMF relative to men and therefore, may experience an attenuated inspiratory muscle metaboreflex. **PURPOSE**: To examine sex-based differences in *a*) the cardiovascular response to inspiratory pressure-threshold loading (PTL) and *b*) the effect of prior-induced IMF on subsequent exercise performance. **METHODS**: Healthy men ($n = 9$) and women ($n = 9$) completed a maximal incremental cycle test on day 1. On day 2, subjects performed PTL to task failure followed by a constant load submaximal time-to-exhaustion (TTE) exercise test (85% peak work rate). On day 3, subjects performed the same exercise test without prior-induced IMF. Diaphragmatic fatigue was assessed by measuring transdiaphragmatic twitch pressure ($P_{di,tw}$) in response to cervical magnetic stimulation. Heart rate (HR) and mean arterial pressure (MAP) were measured beat-by-beat throughout PTL via photoplethysmography, and low-frequency systolic pressure (LF_{SBP}, surrogate for sympathetic vasomotor tone) calculated from arterial waveforms using power spectrum analysis. **RESULTS**: At task failure of PTL, the severity of IMF was similar between sexes (W = $23 \pm 6\%$, M = $24 \pm 8\%$ reduction in $P_{di,tw}$, $p = 0.33$). However, time to task failure was significantly longer in women than men (27 ± 11 vs. 16 ± 11 min, $p = 0.02$) and consequently, women tended to produce greater cumulative diaphragmatic pressure ($46,805 \pm 16,723$ vs. $32,288 \pm 20,752$ cmH$_2$O $\cdot$ s^{-1}; $p = 0.06$). Furthermore, women exhibited less of an increase in HR (13 ± 8 vs. 19 ± 12 bpm, $p = 0.01$) and MAP (10 ± 8 vs. 14 ± 9 mmHg, $p = 0.02$) during PTL, and significantly lower LF_{SBP} (27 ± 12 vs. 38 ± 7 mmHg², $p = 0.04$) compared to men. Prior-induced IMF resulted in the premature termination of exercise that did not differ on the basis of sex (W = $15 \pm 19\%$, M = $16 \pm 19\%$ decrease in TTE, $p = 0.89$). **CONCLUSIONS**: Inspiratory muscle endurance time is significantly longer in women than men. Fatiguing contractions of the diaphragm elicit a blunted cardiovascular response in women, whilst IMF contributes to exercise impairment independent of sex.

C-35   Free Communication/Poster - **Blood Flow Restriction**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1237   Board #45   May 31 8:00 AM - 9:30 AM

Corticomotor Function During Blood Flow Restricted Arm Crank Ergometry

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(No relevant relationships reported)

Low-intensity exercise with blood flow restriction (BFR-LI) may be used as an alternative to high-intensity (HI) exercise. The underlying neurophysiological mechanisms of adaptation remain elusive. **PURPOSE:** To examine corticomotor and metabolic function during HI and BFR-LI arm ergometry. **METHODS:** Twelve males (age: 23.9 ± 3.75 yrs, BMI: 25.3 ± 4.26 kg•m^{-2}) completed three 15-minute arm ergometry conditions: HI, low-intensity (LI), and BFR-LI. HI was completed at 60% of maximal power output, while LI and BFR-LI were completed at 30% of maximal power output. In the BFR-LI condition, cuff pressure to the proximal biceps brachii was set to 70% of occlusion pressure. Single-pulse transcranial magnetic stimulation was delivered to the left primary motor cortex to measure motor evoked potentials (MEPs) in the right biceps brachii at baseline, 1, 10, and 15 minutes post-exercise. Blood lactate (BL) was measured at baseline, immediately and 5-minutes post-exercise. Relative VO_2 and HR were recorded at 2 minute intervals during the exercise protocol. Each dependent variable was analyzed using within-subject repeated-measures ANOVA to evaluate condition x time interactions. **RESULTS:** MEP amplitudes throughout exercise were not different between conditions ($p = 0.883$). A significant main effect of time indicated an overall elevation in all conditions in MEP compared to baseline (0.80 ± 0.51 mV), 10 minutes (1.16 ± 0.74 mV), and 15 minutes (1.04 ± 0.47 mV; $p < 0.001$). BL following HI was 45% greater ($p = 0.03$) and 50% greater ($p < 0.001$) than the BFR-LI and LI conditions, respectively. A similar trend was seen at 5-minutes post-exercise. The HI condition resulted in HR values of (162 bpm±4 bpm) at the completion of exercise. This was higher than LI (117 ± 5 bpm) and BFR-LI (125 ± 5 bpm; $p < 0.001$). VO_2 values were significantly higher with HI (24.0 ± 1.1 ml•kg•min^{-1}) when compared to LI (11.4 ± 1.2ml•kg^{-1}•min^{-1}) and BFR-LI (13.7 ± 0.8ml•kg^{-1}•min^{-1}) ($p < 0.001$). **CONCLUSION:** High intensity arm ergometry elicited the highest VO_2, HR, and BL values, suggesting greater metabolic demands. Despite higher physical demands, MEP amplitudes increased for all conditions, suggesting similar responses in corticospinal excitability. Supported by: 2017 International Research Opportunities Program from the University of New Hampshire.

1238   Board #46   May 31 8:00 AM - 9:30 AM

Acute Muscle Fatigue In Men And Women Following Upper-limb Low-intensity Blood-flow Restricted Exercise

Afonso Borges[1], Carolina Teodósio[1], Pedro Matos[1], Pedro Pezarat Correia[1], Pedro Mil-Homens[1], Pedro Fatela[2], Goncalo V. Mendonca[1]. *[1]Faculdade de Motricidade Humana, Lisboa, Portugal. [2]Universidade Europeia, Lisboa, Portugal.* (Sponsor: Bo Fernhall, FACSM)

(No relevant relationships reported)

Low intensity blood flow restricted exercise (LIBFRE) elicits acute changes in torque output and muscle activation. The magnitude of these changes affect the chronic adaptions to this type of training. Despite its widespread use by men and women, it is not known whether the acute impact of LIBFRE follows a sexually dimorphic pattern. This is important because, when compared to men, women have muscle fibers of smaller diameter, higher density of type I muscle fibers, higher muscle capillarization and heightened muscle perfusion. All these factors likely influence blood flow, as well as acute muscle fatigue, during LIBFRE. **PURPOSE**: To explore whether muscle fatigue post-acute LIBFRE and high intensity resistance (HI) training follows a sexually dimorphic pattern. **METHODS** 62 healthy young persons (31 men: 21.7 ± 2.3; 31 women: 22.0 ± 2.0 yrs) were included in this study. One-repetition maximum (1RM) was determined in each participant before training. Participants completed 4 sets of unilateral biceps curl with (30+15+15+15 reps) and without BFR (10+10+10+10 reps). HI was performed at 75% 1RM and LIBFR at 20% 1RM with BFR (60% of arterial occlusion pressure). Maximum voluntary contraction (MVC) was measured at pre- and post-training time points. Muscle fatigue was quantified as the percent difference between pre- and post- training MVC. **RESULTS**: Both HI and LIBFR training protocols induced significant muscle fatigue in men and women from pre- to post-training (p<0.05). HI was more fatiguing than LIBFRE in both sexes (HI: ~ 35% vs. LIBFRE: ~ 25%, p<0.05). These results were sustained even after controlling

for the differences in volume load between protocols. As importantly, the magnitude of torque decrement was similar between men and women after HI and LIBFR training (p>0.05). **CONCLUSIONS:** Performing upper-limb LIBFRE, using a multiple-set training protocol, is less fatiguing than HI resistance exercise in both men and women. Additionally, this effect is independent of differences in volume load between exercise protocols. Torque decrements in response to LIBFR and HI do not follow a sexually dimorphic pattern, providing evidence that there is no need to establish different guidelines for men and women when prescribing upper-limb LIBFR exercise. Supported by the Portuguese Science Foundation PTDC/DTP-DES/5714/2014.

1239   Board #47   May 31 8:00 AM - 9:30 AM
Postactivation Potentiation during Blood Flow Restricted Complex Training
Christopher J. Cleary, Dylan A. DiScenza, Summer B. Cook, FACSM. *University of New Hampshire, Durham, NH.* (Sponsor: Summer B. Cook, FACSM)
(No relevant relationships reported)

Complex training incorporates a high-load (HL) resistance exercise, such as the back-squat, with a biomechanically similar plyometric exercise, like a vertical jump (VJ), to elicit postactivation potentiation (PAP). This often results in an enhanced rate of muscular force development in the form of a higher VJ. Low-load blood flow restricted (BFR) resistance exercise is an alternate modality to HL resistance exercise, but its use during complex training has never been evaluated. **PURPOSE**: To compare how HL and BFR complex training impacts PAP measured through VJ height and electromyography (EMG). **METHODS:** Twelve healthy males that had been resistance training at least 3 times per week for the past 2 years (mean $\pm$ SD; age: 20.4 $\pm$ 0.9 years, body mass: 83.6 $\pm$ 6.7 kg, stature: 1.81 $\pm$ 0.5 m, back-squat 1-RM: 147.9 $\pm$ 25.2 kg) completed two randomized exercise sessions separated by ~1-week. Prior to each session, the VJ was performed, then either the HL (2 sets of 5 repetitions at 85% 1-RM) or BFR (2 sets of 30 at 30% 1-RM with BFR) complex training sessions, with a VJ 4-minutes after each set were performed. EMG data of the left vastus lateralis and hamstrings were collected, quantified to root-mean square values, and expressed as a percentage of the 1-RM squat. PAP percent was defined as the post-squat VJ height divided by the pre-squat VJ height and multiplied by 100. Data were analyzed using a within-subjects repeated-measures ANOVA between the two conditions and sets. Post-hoc tests in the form of t-tests were conducted if data reached significance. **RESULTS:** Neither condition induced PAP (PAP percent > 100%), but the HL condition was greater than the BFR condition (96.1 $\pm$ 4.8% to 90.8 $\pm$ 8.5%, p = 0.034). EMG activation was greater during the HL condition in the vastus lateralis (HL: 104.6 $\pm$ 27.7% to BFR: 79.6 $\pm$ 33.4%, p = 0.002) and the hamstrings (HL: 112.3 $\pm$ 59.6% to BFR: 51.9 $\pm$ 30.2%, p = 0.001). **CONCLUSION:** Despite EMG amplitude being greatest for the HL condition, PAP did not occur. Similarly, BFR complex training also did not produce PAP. Fatigue and unsatisfactory rest periods should be investigated in future protocols. Supported by: 2017 Summer Undergraduate Research Fellowship Grant from the University of New Hampshire.

1240   Board #48   May 31 8:00 AM - 9:30 AM
Muscular Responses To Very Low Load Resistance Exercise With Blood Flow restriction In The Upper Body
Samuel L. Buckner, Matthew B. Jessee, Scott J. Dankel, J Grant Mouser, Kevin T. Mattocks, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. *The University of Mississippi, University, MS.*
(No relevant relationships reported)

Low load exercise performed to failure appears to elicit a similar skeletal muscle response to that of high load exercise. There may be a point where a load becomes too low to elicit an anabolic response. In situations where the load becomes too low, blood flow restriction (BFR) might augment the response. **PURPOSE**: Examine the acute skeletal muscle response to high load exercise and low load exercise with and without BFR. **METHODS**: 20 participants completed four conditions in the upper body (one condition per arm) over 2 visits. Conditions consisted of elbow flexion exercise to failure using a traditional high load [70% 1RM, (HL)], low load [15% 1RM, (LL)], low load with moderate BFR [15% 1RM + 40%BFR (BFR40)], or low load with greater BFR [15% 1RM + 80%BFR (BFR80)]. Torque and muscle thickness were measured prior to, immediately post, and 15 min post exercise. Muscle electromyography (EMG) amplitude was measured throughout. Repeated measure ANOVA was used to determine differences. Results are displayed as mean (SD). **RESULTS**: There was an interaction (p < 0.001) for changes in muscle thickness. Immediately post-exercise all low load conditions demonstrated greater swelling compared to the HL condition [Pre to Post Change: LL= 0.56cm (0.22), BFR40 = 0.53cm (0.19), BFR80= 0.55cm (0.20), HL = 0.28cm (0.13)]. Muscle thickness remained elevated above baseline 15 min post exercise in all conditions, but was maintained to a greater extent in the low load conditions relative to HL exercise [Pre to 15 min post difference: LL= 0.46cm (0.16), BFR40 = 0.39cm (0.13), BFR80= 0.44cm

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(0.19), HL = 0.21cm (0.12)]. There was an interaction for acute changes in torque (p $\leq$ 0.001). The LL, BFR40 and BFR80 conditions decreased 20 Nm (11), 24 Nm (11), 26 Nm (13) respectively, and to a greater extent compared to the HL condition [15 Nm (9)]. Torque remained depressed at 15 min post. In the last three repetitions, there was a main effect of time (p < 0.001). EMG amplitude was higher during set 2 [70 (23) %MVC] compared to set 1 [65 (22) %MVC], set 3 [62 (20) %MVC] and set 4 [64 (21) %MVC]. **CONCLUSIONS:** Very low load exercise (with or without BFR) appears to result in greater acute muscle swelling, greater muscular fatigue and similar EMG amplitude compared to HL exercise. Further study is needed to determine if these acute changes would manifest muscular adaptations.

1241   Board #49   May 31 8:00 AM - 9:30 AM
Sex Differences In The Estimation Of Blood Flow Restriction Before Exercise
Goncalo V. Mendonca, Afonso Borges, Carolina Teodósio, Pedro Matos, Pedro Mil-Homens, Pedro Pezarat Correia. *Faculdade de Motricidade Humana, Lisboa, Portugal.* (Sponsor: Bo Fernhall, FACSM)
(No relevant relationships reported)

Arterial occlusion pressure (AOP) is typically used to normalize blood flow restriction (BFR) during low intensity blood flow restricted exercise. AOP varies as a function of individual factors such as limb circumference and systolic blood pressure (BP). Despite strong evidence for sexual dimorphism in muscle blood flow, sex-related differences in AOP estimation have not been previously explored. **PURPOSE:** To determine whether the relationship of upper-limb AOP with arm circumference and systolic BP differs between men and women. **METHODS:** 62 healthy young persons (31 men: 21.7 $\pm$ 2.3; 31 women: 22.0 $\pm$ 2.0 yrs) were included in this study. Arm circumference, resting BP and AOP were taken during a single testing session. Resting BP and AOP were measured twice (post-5 and 30 min of seared rest) to examine their stability over time. Multiple linear regression analysis was used to determine whether the relationship of AOP with arm circumference and resting BP differed between sexes. Prediction accuracy was assessed with the mean absolute percent error and Bland-Altman plots. **RESULTS**: Men had higher systolic BP and larger arm circumference than women (p<0.05). Nevertheless, AOP was similar between sexes (men: 138.5 $\pm$ 11.8; women: 136.4 $\pm$ 11.3 mmHg). Arm circumference, systolic BP and sex were all significant predictors of AOP (p<0.05), explaining 42% of its variance. For women, the prediction equation was: AOP = 35.278 + (1.711 x arm circumference) + (0.47 x systolic BP). For men, the prediction equation was: AOP = 35.278 + (1.711 x arm circumference) + (0.47 x systolic BP) - 5.704. The absolute percent error was similar in both sexes (men: - 0.55 $\pm$ 7.12; women: - 0.39 $\pm$ 6.31%, p>0.05). Bland-Altman plots showed that the mean difference between actual and estimated AOP was nearly zero in both groups (men: -0.14; women: -0.01 mmHg), with no systematic over or under-estimation. **CONCLUSIONS**: Arm circumference, systolic BP as well as sex are all significant predictors of upper-limb AOP. Their measurement allows the indirect estimation of BFR pressure within the context of exercise training. Supported by the Portuguese Science Foundation PTDC/DTP-DES/5714/2014.

1242   Board #50   May 31 8:00 AM - 9:30 AM
Blood-flow-restricted Training Augments Improvements In Muscle K$^+$ Handling, Antioxidant Capacity And Exercise Performance In Men
Danny Christiansen, Jens Bangsbo. *University of Copenhagen, Copenhagen, Denmark.*
(No relevant relationships reported)

Exercise performance is partly limited by the muscle potassium ion (K$^+$) transport capacity, which is determined by the function of the Na$^+$,K$^+$-ATPase (NKA). Studies *in vitro* suggest high levels of reactive oxygen species (ROS) compromise NKA function, and increased antioxidant content protects against NKA dysfunction. However, it remains unknown in humans if ROS affect muscle K$^+$ handling, and if this capability is related to the antioxidant capacity. Exercise with reduced muscle blood flow (blood flow restriction, BFR) promote ROS production, which is important for increases in NKA and antioxidant content. Whether BFR may augment increases in muscle K$^+$ handling and NKA content in humans are yet to be explored. **PURPOSE**: To examine if BFR can augment training-induced improvements in muscle K$^+$ handling and exercise performance, and if these changes are related to an increased antioxidant capacity in men. **METHODS**: Ten healthy men (25 $\pm$ 4 y) performed 6 weeks of interval cycling without (CON-leg) or with BFR (170 mmHg, BFR-leg). Before and after training, catheters were inserted into the fem. artery and vein in both legs, and blood flow was assessed by ultrasound Doppler, to determine thigh K$^+$ release during single-legged, knee-extensions at 25% (Ex1) and 90% W_{max} (Ex2) under intravenous infusion of placebo (saline) or N-acetylcysteine (NAC). A muscle biopsy was collected before and after Ex2 to assess catalase activity, and NKA and antioxidant content in type-I and II fibres. **RESULTS**: Performance of the CON-leg (11%) and BFR-leg (23%) increased with training (p<0.05), with a greater increase in BFR-leg (p<0.05, 12%). After training, K$^+$ release was attenuated in Ex2 in the BFR-leg (p<0.05), but

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not in CON-leg (p>0.05). Before training, NAC attenuated K⁺ release in Ex1 (p<0.05), but not in Ex2 (p>0.05), in both legs. After training, the effect of NAC was blunted and catalase activity increased in the BFR-leg only (p<0.05). NKA-isoform and antioxidant content are currently being analysed. **CONCLUSION**: BFR training augments improvements in muscle K⁺ handling and exercise performance in men. These effects are related to an increased muscle antioxidant capacity. In addition, ROS appear involved in the regulation of muscle K⁺ release during submaximal exercise in humans. Supported by the Danish Ministry of Culture (FPK.2015-0017)

1243   Board #51   May 31 8:00 AM - 9:30 AM

Very Low Load resistance Exercise Is Augmented By Blood Flow Restriction In The Lower Body

Matthew B. Jessee, Samuel L. Buckner, Kevin T. Mattocks, J Grant Mouser, Scott J. Dankel, Zachary W. Bell, Takashi Abe, Jeremy P. Loenneke. *The University of Mississippi, University, MS.*

(No relevant relationships reported)

Low load exercise to failure has been shown to elicit muscle hypertrophy similar to high load exercise. However, if the load is very low [i.e. 15% of one repetition maximum (1RM)], the contraction intensity may not disrupt blood flow enough to induce failure. Although unknown, the application of blood flow restriction (BFR) during very low load exercise may be necessary in order to reach failure. **PURPOSE**: To compare the acute responses associated with a hypertrophic stimulus during lower body exercise using a traditional high load (70% 1RM), very low load (15% 1RM) with no BFR, or in combination with moderate (40% arterial occlusion pressure (AOP)) or high (80% AOP) BFR pressure; coded as 70/0, 15/0, 15/40, and 15/80 respectively. **METHODS**: 22 participants completed 4 sets of unilateral knee extensions to failure (up to 90 repetitions) with each condition. Muscle thickness (MTh) and maximal voluntary contractions (MVC) were assessed before (Pre), immediately following (Post), and 15 minutes after exercise (15-Post). Electromyography (EMG) amplitude of the rectus femoris (RF) and vastus lateralis (VL) was assessed during the last 3 repetitions of each set. Data presented as mean (SD) with p≤0.05. **RESULTS**: There was an interaction for MTh, however, follow up tests revealed no differences within time points. Overall, MTh increased from Pre to Post [0.48 (0.17) cm], decreased at 15-post [-0.11 (0.18) cm], but remained elevated over Pre [0.36 (0.07) cm]. There was an interaction for MVC and follow up tests revealed differences at Post [15/80 < 15/0, 15/40, < 70/0] and 15-Post [15/0 < 15/80, 70/0]. All conditions decreased MVC at Post [-111.1 (48) Nm] and increased from Post to 15-Post [79.2 (43.1) Nm]. There was a main effect of condition for RF EMG, with 70/0 being greater than 15/80 [83 (37) vs. 57 (27) %MVC]. For VL EMG, there was a main effect of condition [70/0 > 15/80, 15/40, 15/0] and time [set 1< 2, 3, 4]. Typically, VL EMG was greater for 70/0 [106 (70) %MVC] compared to 15/0 [73 (21)], 15/40 [72 (30)], and 15/80 [64 (21)]. **CONCLUSIONS**: BFR with a higher pressure seemed to augment the acute muscular response to very low load exercise, making it closer to the response observed during high load exercise. This suggests that a higher BFR pressure may be necessary to induce hypertrophy when resistance training with very low loads.

C-36   Free Communication/Poster - Measurement of Physical Activity and Sedentary Behavior

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1244   Board #52   May 31 9:00 AM - 10:30 AM

The National Collaborative on Childhood Obesity Research's Measures Registry and User Guides: Highlights and Reach

David R. Brown, FACSM[1], Rachel Ballard[2], Jill Reedy[2], David Berrigan[2], Amanda Samuels[3]. *[1]Centers for Disease Control and Prevention, Atlanta, GA. [2]National Institutes of Health, Bethesda, MD. [3]FHI 360, Washington, DC.*

(No relevant relationships reported)

There are many types of physical activity and food intake measures. These measures often lack validity and reliability, making it difficult to compare findings across childhood obesity research and evaluation studies.
Purpose: The National Collaborative on Childhood Obesity Research's (NCCOR) Measures Registry (nccor.org/mruserguides) promotes consistent use of high-quality, comparable measures and methods across childhood obesity studies. The Registry User Guides extend the reach and usefulness of these resources. Herein we describe the Registry and User Guides and examine their reach to nutrition, physical activity, and obesity researchers and practitioners.

Methods: A search of peer reviewed literature published 1999-2009 was conducted. Measurement experts reviewed and abstracted articles meeting inclusion criteria in four domains: physical activity, diet, physical activity environment, and food environment. The Registry was launched in 2011 and has been updated on an ongoing basis since August 2015. In 2017, subject matter experts authored four User Guides for the measurement domains. The Guides include case studies to help users' select appropriate measures. The number of web visitors to the Registry and Guides was tracked providing an indicator of reach.
Results: The Registry contains 1207 published studies of validation research using measures of physical activity (n=403), diet (n=330), physical activity environment (n=273), and food environment (n=331). Measures include GIS (n=127); 24-hour dietary recall (n=52); food frequency (n=69); electronic monitor (n=121); environmental observation (n=153); questionnaire (n=498); record or log (n=97), and other (n=207). Over 17,100 unique visitors have accessed the Registry since its launch, including visitors from 41 countries. Since their release there have been over 8000 page views of the User Guides from 3633 unique visitors.
Conclusion: The NCCOR Measures Registry and User Guides can assist researchers and practitioners conducting childhood obesity prevention research and evaluation to select high quality, comparable measures of physical activity, diet, and the environments in which these behaviors occur. Website traffic reflecting access to the materials indicates a large reach.
Supported by the JPB Foundation

1245   Board #53   May 31 9:00 AM - 10:30 AM

The Effect of Activity Courses on Student's Physical Activity In and Out of Activity Courses

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(No relevant relationships reported)

Recent research indicates that 51.7% of adults meet the 2008 Physical Activity (PA) Guidelines (Tainya et al, 2017). Activity courses are offered at 87% of 4-year colleges and Universities which directly facilitate some increase levels of PA during class time (Strand et al, 2010) and have been shown to increase PA outside of class (Annesi et al, 2017). The Physical Activity Vital Sign is a clinical tool designed to screen for PA in adults. **PURPOSE:** The aim was to use PAVS to analyze the relationship between PA level changes throughout the semester, PA intensities spent in class, and how many students met the 2008 PA Guidelines for Americans. **METHODS:** Subjects self-enrolled in one PA course. Each subject (n=41; 31 females, 10 males; 21.4 years ± 4.50) completed an emailed questionnaire (Qualtrics) at the beginning, middle, and end of the class term (weeks 2-3, 8, and 16), and wore an accelerometer (Actigraph wGT3X-BT accelerometers with a 15 second epoch collection rate) while in the class at the same three timepoints (Freedson 1998 counts). The Qualtrics Survey included: Demographic information (at timepoint 1 only), and PAVS Survey. **RESULTS:** The mean PAVS score was 180.1 minutes ± 146.6, 217.2 minutes ± 167.5, and 226.76 minutes ± 173.3 for each timepoint respectively. The percent of subjects who met PA recommendations increase from 41.6% to 63.4%. PAVS score was not significantly different from time point one to timepoint three $t_{(40)}$=-1.949, p=0.058, even when controlling for sex (Males: $t_{(9)}$ = -1.340, p=0.213; Females: $t_{(31)}$ = -1.594, p=0.122). For the each timepoint, PAVS scores were not significantly correlated to time spent in PA intensities during the activity class: $r_{PAVS-1-Sedentary}$=-0.28, p=0.864; $r_{PAVS-1-Light}$= 0.022, p=0.890; $r_{PAVS-1-Moderate}$=0.021, p=0.897; $r_{PAVS-1-Vigorous}$= 0.144, p=0.370, : $r_{PAVS-2-Sedentary}$=0.081, p=0.613; $r_{PAVS-2-Light}$= -0.050, p=0.757; $r_{PAVS-2-Moderate}$=-0.111, p=0.491; $r_{PAVS-2-Vigorous}$= 0.022, p=0.893, : $r_{PAVS-3-Sedentary}$=0.078, p=0.628; $r_{PAVS-3-Light}$= -0.214, p=0.179; $r_{PAVS-3-Moderate}$=-0.169, p=0.290. **CONCLUSION:** PAVS was not a significant predictor of PA intensity in college level activity course nor did it significantly change throughout the semester. However, students who met PA requirement increased from (41.6%) to (63.4%) at the end of the semester.

1246   Board #54   May 31 9:00 AM - 10:30 AM

Comparison of Previously Used Methods for Analyzing Global Positioning System Plus Accelerometry Data from Recess

Kimberly A. Clevenger[1], Karin A. Pfeiffer, FACSM[1], Cheryl A. Howe, FACSM[2]. *[1]Michigan State University, East Lansing, MI. [2]Ohio University, Athens, OH.*

(No relevant relationships reported)

Global Positioning System (GPS) receivers plus accelerometry can identify how physical activity (PA) varies by schoolyard location, but the accuracy and comparability of existing approaches to analyzing this data are unknown. **PURPOSE**: To compare previously used methods for analyzing GPS plus accelerometry data from recess. **METHODS**: Children (N=23) wore an accelerometer and GPS on their hip for two recesses to determine location and PA intensity (counts/sec or classified by cut-points). Recesses were videotaped, and location and PA intensity were coded. Five approaches for interpreting GPS and accelerometer data were used and compared to the video: 1) graduated color *dot* map, 2) 1 m fishnet *grid*, 3) *hot spot* analysis with

Getis Ord G* statistic, 4) *zonal* approach, and 5) *interpolation* of a continuous surface of intensity over the schoolyard. For the *zonal* approach, weighted kappa compared GPS and video location second-by-second, and paired t-tests compared proportion of time in each location and intensity for GPS plus accelerometry versus video (*p*<0.05). **RESULTS**: *Hot spot* analysis revealed significant (*p*<0.01*)* clusters of high counts/sec on the field and court and near the swings, which was supported by *dot* and *grid* maps. *Interpolation* indicated a high intensity peak in the court. These patterns were supported by video observation. Weighted kappa was 0.76, and there were no differences in time spent in each zone according to GPS versus video (court: 45.2 vs. 43.7%, fixed equipment: 31.1 vs. 33.2%, field: 23.7 vs. 26.2%). Sedentary behavior was higher according to GPS versus video overall (22.1 vs. 12.1%) and for court (21.9 vs. 10.1%) and fixed equipment (19.7 vs. 7.1%). Moderate-to-vigorous PA was lower according to GPS versus video overall (43.9 vs. 62.2%) and for court (42.6 vs. 68.6%) and fixed equipment (45.2 vs. 80.6%). **CONCLUSIONS**: GPS plus accelerometry accurately classified location, and the PA patterns identified by *dot*, *grid*, and *hot spot* were similar to video. Quantification of the proportion of time in each intensity by location was not similar to video, possibly due to missing data or differences in how accelerometer and video intensity are classified. Interpolation is not an appropriate analysis for this research question and is not recommended for future use.
Funded by OU Interdisciplinary Research Grant

1247   Board #55   May 31 9:00 AM - 10:30 AM
Implications Of Direct Observation Methods For Describing Drivers Of Children's Physical Activity

Chelsey R. Schlechter[1], Justin M. Guagliano[2], Richard R. Rosenkranz, FACSM[2], David A. Dzewaltowski[3]. *[1]Kansas State University, University of Nebraska Medical Center, Manhattan, Omaha, KS. [2]Kansas State University, Manhattan, KS. [3]University of Nebraska Medical Center, Omaha, NE.* (Sponsor: Richard R. Rosenkranz, FACSM)
(No relevant relationships reported)

Direct observation (DO) is a popular objective method to describe children's physical activity (PA) and setting context. DO is a category of methodologies that vary by the time unit of analysis (e.g., total setting time or segmented setting time) and sampling method (e.g., momentary or continuous). We propose that the DO method determines the temporal variability in data collected, and therefore defines the ecological processes that can be studied.
Purpose: To examine implications of DO methods for observing drivers of children's PA.
Methods: Research assistants (RA) video-recorded basketball practices (*n* = 24) from 12 boys' and girls' teams (2 practices/team) where children (*n* = 105, 7-12y, mean ± *SD* = 9.4 ± 1.1y) wore ActiGraph GT1M accelerometers. RAs coded each practice using two DO systems. SOFIT uses momentary time sampling and observes every 20 seconds over total practice time (TPT) to assess percentage of TPT in PA, in different contexts types (e.g., fitness, skill), and in PA within context across TPT. Our alternate method (CLOUDEE) uses continuous sampling to define continuous context time segments during practice. Metrics calculated from CLOUDEE were frequency, duration, and order of segments, and %time spent in PA within segments. Inter-rater reliability was calculated on a subset of practices (*n* = 5/system). We analyzed accelerometer data using Evenson et al. cut-points and paired the data with context time segments from CLOUDEE. **Results:** Inter-rater reliability was >85% for both systems. Most of TPT, assessed by SOFIT, was spent in skill (mean ± *SE* = 47.4 ± 0.8%). Fitness had the greatest percentage of MVPA (moderate-to-vigorous physical activity) (mean ± *SE* = 81.6 ± 3.2%) across TPT. Using CLOUDEE, we identified 256 time segments (mean/practice ± *SE* =10.7 ± 2.5) during practices. Skill segments occurred most frequently (mean/practice ± *SE* = 3.5 ± 2.3; mean length ± *SE* = 4.75 ± 3.41 minutes). Free-play segments were the most frequently occurring first segment in the practice routine (81.8%; mean length ± *SE* = 4.32 ± 2.51) and had the greatest %time spent in MVPA (mean ± *SE* = 57.7 ± 2.8%). **Conclusion:** The systems comprise distinct methods and thus examined different processes as drivers of children's PA. When using DO, researchers should ensure appropriate methods are used to examine the ecological process of interest.

1248   Board #56   May 31 9:00 AM - 10:30 AM
Evaluation Of In-School Physical Activity During Recess, P.E., And Academically-Related Movement Activities

Robert Booker, Riley Galloway, Trisha Doering. *Missouri State University, Springfield, MO.* (Sponsor: Barbara A Bushman, FACSM)
(No relevant relationships reported)

PURPOSE: Schools provide ample opportunity to address physical inactivity patterns, which have been established as a crucial risk factor of health concerns. As evidence of associations between morbidity and progression of childhood obesity to adult obesity expand along with the inverse relationship between school year and physical activity

(PA), an urgency remains for schools to implement mandatory policies addressing the accumulated moderate-to-vigorous physical activity (MVPA) per week. The purpose of this study was to quantify in-school PA levels among elementary students during recess, P.E., and academically-related movement activities (ARMA) and determine if state-wide recommended levels of MVPA are being met.
METHODS: Third through sixth grade students (N=71) volunteered to participate in the evaluation of PA levels during recess, P.E., and ARMA during summer school. Accelerometry data was obtained to quantify the amount of PA being achieved. Data collection commenced at the beginning of and ceased at the end of each school day for five consecutive days. Accelerometers were used to provide tri-axial movement analysis according to 5-second 'epochs' to quantify levels of PA. A one-way ANOVA was employed to examine PA between grades.
RESULTS: Of the weekly recess minutes offered (332.39 ± 24.49), 31% classified as MVPA while 35.44% was completely sedentary. Combining sedentary and light accounted for 68.09% of the total time. Of the weekly P.E. minutes offered (72.75 ± 31.29), 23.83% classified as MVPA while 41.44% was completely sedentary. Combing sedentary and light accounted for 72.8% of the total time. Of the weekly ARMA minutes offered (14.93 ± 17.65), 15% classified as MVPA while 35.37% was completely sedentary. Combining sedentary and light accounted for 63.5% of the total time. Percentages significantly increased across each category after omitting 6th grade due to inflation.
CONCLUSION: Overall, students failed to achieve recommended amounts of MVPA during school hours and recommended amounts of P.E. of at least moderate intensity although there was opportunity to achieve both. This research provides insight to PA levels and potential health status of children during school hours, which confirms the need for enhanced attention to meeting state standards of school-related PA.
Grant Funding: N/A

1249   Board #57   May 31 9:00 AM - 10:30 AM
Accuracy of Wrist-Worn Activity Monitors during Wheelchair Use

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(No relevant relationships reported)

Activity monitors are used to track activity and exercise intensity in the bi-pedal population, however, there is a lack of studies examining these devices for those using manual wheelchairs. **PURPOSE**: To assess activity monitor accuracy during wheelchair use (WC). **METHODS**: Forty-four subjects (non-wheelchair users; age=26.7±4.9 yrs, ht=1683.7±10.2 cm, wt=76.75±16.7 kg) wore six commercially-available wrist activity monitors (FF, FC, & PL on the right wrist; GV, MV, & LT on the left wrist) and a heart rate (HR) monitor while walking 150m in an indoor hallway at a self-selected pace. Subjects traversed the same path in a wheelchair. Video was used to determine actual counts using a hand tally (AC). During WC, a count was recorded as the hand went forward and again as the hand recovered for each hand. Repeated measures ANOVA determined significant differences between the counts. Error was calculated as [(monitor counts-actual counts)/actual counts]*100. Alpha was set at .05 for all tests. **RESULTS**: During walking, FF, FC, PL and MV (263.7±37.3, 270.5±29.6, 228.5±49.9, & 264.6±30.3 counts, respectively) were significantly lower than AC (286.4±24.4 counts), p<.05, except for LT (267.3±41.4 counts) and GV (281.1±24.4 counts), p>.05. During WC use, FF (305.7±83.7 counts) and FC (306.6±80.8 counts) were significantly greater than AC (273.9±101.3 counts), p<.05. PL (279.2±92.7 counts) was not significantly different than AC. Similarly, MV (248.1±63.8 counts) and LT (344.6±128.2 counts) were significantly different than AC (297.1±98.1 counts), p<.05, whereas GV (299.0±116.8 counts) was not significantly different than AC. During walking, PL had greatest error (20.8±15.3%), followed by FF (7.8±11.3%), MV (7.4±8.2%), LT (6.8±13.5%), FC (5.9±7.4%), and GV (2.3±4.1%). Error was high in all conditions during WC use, with LT exhibiting the greatest error (29.6±21.0%), followed by FC (23.5±20.3%), FF (21.9±20.1%), GV (18.9±21.75%), MV (18.5±14.3%), and PL (16.2±12.8%). **CONCLUSION**: Although substantial error is still evident, PL seems to be the most accurate for wheelchair use among the devices assessed. Manufacturers should consider developing an activity monitor specifically for wheelchair users.

1250   Board #58   May 31 9:00 AM - 10:30 AM
Assessment of Physical Activity & Sedentary Behavior in Individuals with Chronic Low Back Pain

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(No relevant relationships reported)

Low back pain affects >80% of adults in their lifetime, with 4-14% experiencing chronic low back pain (CLBP). Exercise training can reduce pain in CLBP patients, but activity patterns in this population have yet to be well-described, with existing data coming solely from self-report measures. **PURPOSE:** Our aim was to describe physical activity (PA) and sedentary (SED) behaviors and compare patterns assessed using objective vs. self-report measures in individuals with CLBP. **METHODS:**

Measures of PA and SED were obtained from ActiGraph and activPAL accelerometers and the International Physical Activity Questionnaire (IPAQ) in individuals with CLBP (N=57; 52% female; 43±10 years old). Accelerometer data were processed using the Sojourns Including Posture (SIP) method and the IPAQ was scored to calculate time spent in moderate and vigorous PA (MVPA) and SED. Minutes of MVPA and SED from each method were analyzed descriptively (means (SD)) and compared using correlation coefficients and Bland-Altman Plots. **RESULTS:** Objective data demonstrated that few (12.3%) participants met recommended levels of PA. Contrasting this, self-report data showed that 81.7% were active enough to meet guidelines. Average minutes of MVPA per week in bouts of 10+ minutes measured objectively and subjectively were 57.1 (59) and 430.1 (330) minutes, respectively. Objective and subjective measure of MVPA were weakly correlated (r=0.25), and the Bland-Altman plot demonstrated wide limits of agreement (311.3 and -1097) and a systematic bias for over-reporting PA. For SED, mean minutes per day measured objectively and subjectively were 530.3 (85.7) and 458.3 (138.8), respectively. Measures were also weakly correlated (r=0.13). The Bland-Altman plot had wide limits of agreement (373.2 and -229.3) and demonstrated a systematic bias for under-reporting SED. **CONCLUSION:** Objective data demonstrate that patients with CLBP are inactive and highly sedentary. Their tendency to under-report SED and over-report MVPA indicates they may lack awareness regarding their actual levels of these behaviors. The identified disconnect between perceived and actual PA and SED behavior in the CLBP population suggests that addressing these misconceptions may be critical for the success of future interventions aiming to alter movement patterns to reduce pain.

1251 **Board #59** **May 31 9:00 AM - 10:30 AM**

Development of Step Count Cut-Points for School Day Sedentary Behavior

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(No relevant relationships reported)

PURPOSE: No study has established step count cut-points for varying minutes of accelerometer-assessed sedentary behavior accrued during the school day in children. The purpose of this study was to establish step count cut-points for discriminating children meeting sedentary behavior ranging from 3-hours to 6-hours per 7-hour school day.
METHODS: Participants were a convenience sample of 2,119 children (mean age = 8.5 (1.9) years) recruited from 5 schools from the Mountain West region of the U.S. Step counts and time in sedentary were assessed using ActiGraph wGT3X-BT triaxial accelerometers that were worn during the entirety of a 7-hour school day for one school week. Average censored step counts and minutes in sedentary behavior were calculated across 3 to 5 days. Receiver operating characteristic (ROC) curves were employed to derive step counts discriminating children that met 3-hours (180 minutes) to 6-hours (360-minutes) of sedentary time ($\leq$ 100 accelerometer counts per minute) per school day via calculation of the maximum Youden's J statistic. The sedentary count cut-points were derived from Evenson et al. (2008) using 15-second epochs (25 counts per 15-seconds). However, within the ActiLife software, sedentary cut-points were multiplied by four to align with 60-second epochs.
RESULTS: Area-under-the-curve (AUC) scores ranged from AUC = 0.92 (95% C.I.: 0.90-0.93; $p < 0.001$) for meeting at least 3-hours per school day of sedentary to AUC = 0.78 (95% C.I.: 0.75-0.81, $p < 0.001$) for meeting at least 6-hours of school day sedentary. Approximately 4,090 steps best-discriminated children meeting 3-hours of school day sedentary (Sensitivity = 87.4%, Specificity = 78.3%, Accuracy = 85.5%) and approximately 2,465 steps best discriminated children meeting 6-hours of school day
sedentary (Sensitivity = 60.9%, Specificity = 75.9%, Accuracy = 74.1%).
CONCLUSION: Step counts can discriminate with reasonable accuracy children that meet at least 6-hours of school day sedentary and with good accuracy children that meet 3-hours of school day sedentary.

1252 **Board #60** **May 31 9:00 AM - 10:30 AM**

Comparing Two Generations of ActiGraph Accelerometers: Coronary Artery Risk Development in Young Adults (CARDIA)

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(No relevant relationships reported)

PURPOSE: To examine the comparability of the ActiGraph 7164 uniaxial accelerometer and the ActiGraph wGT3X-BT triaxial accelerometer (low frequency extension) in wear time, count based estimates (vertical axis), and average time/day in physical activity of different intensities. **METHODS:** Data are from 87 CARDIA

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participants, aged 48-60 years, who simultaneously wore the 7164 and wGT3X-BT accelerometers at the waist in 2015-16, with wear time $\geq$4 or 7 days, $\geq$10 hr/day. Freedson adult cut points (ct/min) were used to define sedentary (<100), light (100-1951), moderate (1952-5724), and vigorous activity ($\geq$5725). Paired difference tests were used to compare mean or median values between the two accelerometers. Agreement was evaluated using intraclass correlation coefficients and Bland-Altman plots. A calibration formula applied to the wGT3X-BT values was obtained by linear regression. **RESULTS:** Minute by minute within-person correlations of ct/min/day averaged r=0.74, despite the $\geq$10 year age of the 7164 devices. Total recorded wear time min/day was nearly identical between the 7164 and wGT3X-BT (881.5 ± 70.9 vs. 880.3 ± 78.1, p=0.72). Linear regression of the wGT3X-BT on the 7164 ct/min/day passed very close to the origin; therefore, the slope of the 7164 ct/min/day (1.088) was the calibration proportionality. After calibrating the wGT3X-BT values (dividing by 1.088), no differences were observed between the 7164 and wGT3X-BT in total accelerometer ct/day (310,184 ± 129,189 vs. 307,085 ± 135,362, p=0.48), average ct/min/day (349.5 ± 139.5 vs. 346.5 ± 147.2, p = 0.54), sedentary (513.2 ± 93.6 vs. 509.6 ± 98.6, p=0.23), light (335.3 ± 81.5 vs. 338.7 ± 81.1, p=0.22), or moderate min/day (31.0 ± 21.9 vs. 30.3 ± 23.4, p=0.31). A significant difference was observed for vigorous min/day in the total sample (0.2 ± 1.0 vs. 0.0 ± 0.3, p<0.01), and also among those with >0 vigorous min/day (N=28, 2.8 ± 4.5 vs. 1.3 ± 2.9, p=0.01). Intraclass correlation coefficients showed excellent agreement for all measures (ICC range = 0.97-0.99). Bland-Altman plots demonstrated acceptable levels of agreement. **CONCLUSIONS:** After applying a calibration formula, the 7164 and wGT3X-BT are comparable for total wear time, count based estimates, and average min/day in sedentary, light, and moderate activity, but not for vigorous activity.

1253 **Board #61** **May 31 9:00 AM - 10:30 AM**

Statistical Assessment of Yoga Posture Acquisition using a 3D Room Sensor

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(No relevant relationships reported)

Many innovative information technology applications use gestures as input. We are exploring gesture analysis for incorporation into exergames for personalized medical interventions using yoga as therapy (YT). **PURPOSE:** A data-driven machine learning solution for gesture detection was used to classify captured yoga poses with high accuracy. The research goal is to test whether a machine learning algorithm in a basic computer video exergame can assess yoga skill acquisition in targeted select populations as a means to promote healthy physical activity. **METHODS:** Convenience sample of 20 adult students, male and female of any race/ethnicity, were briefly instructed and shown poses to perform, while recorded by the Kinect attached to a PC. Three yoga sessions (pre-test, mid-way and a post-test) were captured during the regularly scheduled yoga class which met twice weekly for 75 minutes, over a 10-week period. **RESULTS:** We recorded 6 yoga instructors while performing a series of yoga postures, and recorded clips were tagged or labelled in all of the frames in the recordings that defined a yoga gesture by consensus of two yoga instructors. Default settings produced solutions with high True Positives (99.5%) and low False Positives (0.03%) for most yoga postures sampled. Depth stream and skeleton coordinates for the 20 participants were acquired and analyzed against the previous trained solution. Analysis of summary statistics was done for five yoga poses comparing initial, mid-session, and final session captures. Sensitivity showed consistent trends for Mountain, Forward Bend, and Upward Salute. For Mountain, Sensitivity went from 0.78 to 0.87, while the expert test clip scored 0.94. Informedness also showed similar consistent trends for those poses. Based on these results the higher sensitivity score predicts greater training and closer the postures were to the "gold standard". **CONCLUSIONS:** Gesture analysis for yoga alignment training may be a useful tool for the development of home and clinical yoga therapy for hard to reach populations. The experimental exergame developed here provides a tool that scores the performance of yoga postures and provides improvement metrics. Our plans are to target special aging populations with YT, and study the potential effects of body mass and age on posture alignment and limb stretch.

1254   Board #62   May 31 9:00 AM - 10:30 AM

Muscular Strength Attenuates Adverse Effects Of Overweight On Cardiometabolic Risk Factors But Not In Its Counterparts With Higher Fat Among Collegiate Students

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(No relevant relationships reported)

PURPOSE: The aims of the study were to: 1) analyze differences in composite metabolic syndrome score (MetScore) and fatness across body mass index (BMI) categories in college students; and 2) to determine whether fit individuals have significantly lower MetScore, fewer individual metabolic syndrome components, and less fatness than unfit individuals in each BMI category. **METHODS**: A total of 1,795 college students (61.4% female, mean age = 20.7 ± 2.9 years old), ranging between the ages of 18 and 30 years participated in the study. Muscular strength was estimated using a hand-held dynamometer and used to classify adults as fit or unfit. A MetScore was computed as a sum of the typified Z-scores per age and gender from the following components: waist circumference, triglycerides, high-density lipoprotein cholesterol, glucose, and systolic and diastolic blood pressure. **RESULTS**: MetScore, percentage of body fat, and visceral adiposity increased linearly across the BMI categories among college students (all $p<0.001$). Individuals who were overweight and fit had lower MetScore (-0.6 SD; P =0.02), body fat percentage (-2.6%; P <0.001) and visceral adiposity (-0.2; P =0.01) than unfit peers. Moderately fit, obese individuals had significantly lower visceral fat levels than unfit, obese peers (-3.0; P =0.03). **CONCLUSIONS**: These results suggest that adequate muscular strength may help to attenuate cardiometabolic risk that is associated with being overweight and obese, and that weight loss could be recommended to all individuals with obesity, including those who are currently defined as fit.

1255   Board #63   May 31 9:00 AM - 10:30 AM

Accelerometer Positioning Issues and Implications for Contemporary Analysis Methods

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(No relevant relationships reported)

PURPOSE: While accelerometry is widely used to objectively measure physical activity (PA), methods are not standardized. The aim of this work was to understand how accelerometry output (vector magnitude, VM) differs between accelerometers worn on the non-dominant wrist (NDW), dominant wrist (DW), and hip, and if their relationships differ by activity type and intensity.
METHODS: Forty participants (16.8 - 64.2 yr) completed sedentary and PAs in a laboratory while wearing accelerometers on the NDW, DW, and hip. 1-s VM values were compared across locations by activity type and intensity. Oxygen consumption was measured with a portable VO$_2$ analyzer.
RESULTS: The figure shows mean VM for all activities, by increasing intensity. When grouped by intensity, the DW and hip had significantly different VM for light (LPA), moderate (MPA), and vigorous (VPA) PA. The NDW and hip had significantly different VM for LPA and VPA. The DW and NDW had significantly different VM for LPA and MPA.
CONCLUSION: The differing trajectories, and the differential relationships between VM from the NDW, DW, and hip indicate that accelerometer output differ based on activity type and intensity. This non-systematic error prevents scaling or comparing data collected at different wear locations, including the NDW and DW. Additionally, accelerometer data were processed using the accelerometer software. MVPA estimates from the NDW, DW, and hip differed by an average of 13.8 mins (range: 0 - 36), for the 3 hours analyzed. This indicates that substantial error is possible, and analysis methods are not interchangeable across locations. Site-specific analysis methods are needed for accurate, comparable estimates of PA.

Mean Vector Magnitude by Wear Location
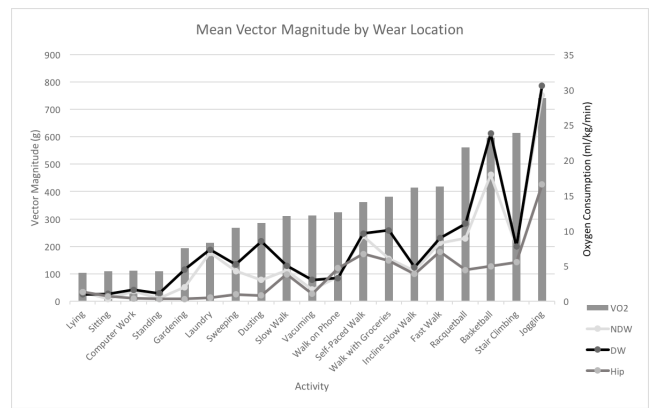
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Evaluation Of Physical Activity And Sedentary Time In Women Of Varying BMI Using Accelerometers And IPAQ

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(No relevant relationships reported)

Purpose: To evaluate measures of physical activity in women among varying body mass index (BMI) categories using accelerometers worn on the wrist and thigh. In addition, to determine if measures of sedentary time among women are similar among BMI categories using the International Physical Activity Questionnaire (IPAQ) and an accelerometer worn on the thigh. **Methods**: Thirty five women (24.0 ± 0.7 y) participated in this study. There were 13 normal weight (18.5-24.9 kg m^{-2}), 10 overweight (25.0-29.9 kg m^{-2}), and 12 obese ($\geq$30.0 kg m^{-2}) participants that wore the ActivPal (AP) on the thigh and Actigraph GT3x-BT (AG) on the wrist twenty four hours per day for seven consecutive days. After seven days participants completed the IPAQ. **Results**: The AG recorded significantly more steps per day than the AP within each BMI category ($p<0.01$). There were no differences among BMI categories for physical activity or sedentary time using objective measures ($p>0.05$). There was an insignificant trend for IPAQ Met minutes to increase with higher BMI categories. Sedentary time was similar among BMI categories using IPAQ ($p>0.05$). **Conclusion**: Steps per day may vary depending on the location of the accelerometer which may limit comparisons to other reported findings. Obese groups may tend to report more physical activity when using questionnaires. However, physical activity recorded using objective monitors may tend to find smaller differences among BMI categories. BMI category does not appear to impact measures of sedentary time by objective monitor (AP) or questionnaire (IPAQ).

1257   Board #65   May 31 9:00 AM - 10:30 AM

Comparing Hip and Wrist Accelerometer Estimates of Moderate-Vigorous Physical Activity Across Activity Domains

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(No relevant relationships reported)

PURPOSE: Both hip/thigh and wrist-worn accelerometers are used to estimate moderate-vigorous intensity physical activity (MVPA). Few studies have directly compared these MVPA estimates in free-living environments across distinct activity domains. The purpose of this study was to compare AG wrist estimates of MVPA to AG-hip and the thigh-worn AP in five activity domains.
METHODS: Fifteen adults (10F and 5M; age 18-36y) participated in two, 2-hr sessions that were categorized by activity domains; household (H, N=5), active leisure (AL, N=8), sedentary leisure (SL, N=6), work (W, N=7), and transportation/errands (TE, N=4). Participants were given general instructions (e.g., at least 45 min spent on household-related behaviors), but sessions took place in the participants' natural environment. During the sessions, participants wore AG (non-dominant wrist, right hip) and AP on the right thigh. MVPA was estimated for AG-hip using machine learning (S3x), Freedson (F), Crouter (C2), and Sasaki (VM) methods. The AG-wrist data was processed using a random forest (RF). Pearson correlations and paired t-tests were used to compare MVPA estimates across methods. Linear mixed effects models were used to test if there was a significant difference in MVPA estimates between wrist and hip methods across activity domains. P-values <0.05 were considered statistically significant.

RESULTS: Correlation between wrist RF and the hip methods ranged from R=0.63-0.66, while hip/thigh methods were all highly correlated (R=0.94-0.99). The AL domain had the highest time spent in MVPA (between method range: 50.7-60.6 min), while SL (range: 1.3-15.8 min), and W (range: 2.0-23.5 min) were the lowest. Wrist estimates of MVPA were significantly higher than the S3x (+10.8 min), F (+15.3 min), AP (+12.7 min), and VM (+12.1 min), all p<0.01. The estimates of MVPA from the RF were not significantly different than C2, p=0.11. Agreement between methods did not differ by activity domain (p>0.05).
CONCLUSIONS: The wrist RF method was moderately correlated with hip/thigh measures and consistently produced higher estimates of MVPA compared to hip/thigh algorithms, across all activity types. Future research using direct observation as a criterion measures is needed. Supported by Bill and Linda Frost Fund.

1258   Board #66   May 31 9:00 AM - 10:30 AM

Impact Of Placement Of Wrist-worn Activity Monitors During The Lab And Free-living Settings

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(No relevant relationships reported)

Wrist-worn activity monitors have been widely used to measure heart rates, step counts, and/or calories. While the versatility of altering the wearing locations (i.e., left vs. right; distal vs. proximal) may prove appealing, the influence of monitor placement on the outcome measurements needs to be examined. **PURPOSE:** This study was to examine the difference in measurements of heart rates, step counts, and calories estimated from the Fitbit monitors worn at different locations. **METHODS:** Thirty-two healthy male and female, aged 26.03 ± 6.59 years, participated in this study. Participants wore Fitbit monitors at four different locations [Right Proximal (RP), Right Distal (RD), Left Proximal (LP), Left Distal (LD)]. Lab testing consisted of four 5-min phases: slow and brisk walking and jogging at 53.6, 107.3, 160.9 m/min on a treadmill and a recovery. Free living activities involved ten 5-min activities with different intensity levels (e.g., stretching, climbing stairs, jogging). Heart rates, step counts, and calories were recorded during various activities. Repeated measures ANOVAs were performed with a monitor placement as a within-subjects factor on 14 lab and free-living activities for each outcome measurement. Bonferroni technique was used to adjust the alpha level of .004 (.05/14). The Greenhouse-Geisser (G-G) adjusted *F* and degrees of freedom were reported. **RESULTS:** Overall, there were no significant differences in measurements of heart rates, step counts, and calories estimated from the four Fitbit monitors during the lab activities. In free-living activities, step counts were significantly different during climbing stairs, $F(2.86, 88.76) = 5.16$, G-G p = .003 and sports, $F(1.24, 38.40) = 27.93$, G-G p < .001. Step counts estimated from LD (446 ± 49) were significantly higher than Fitbit monitors worn at RP (413 ± 61) and RD (417 ± 49) when climbing stairs. Fitbit monitors worn at LP (649 ± 64) and LD (642 ± 70) estimated significantly higher step counts than Fitbit monitors worn at RP (587 ± 75) and RD (565 ± 73) as participated in sports. **CONCLUSION:** This study revealed that monitor placement does not make a significant influence on the measurements of heart rates and calories during the lab and free-living settings. Further studies on the impact of monitor placement against criterion measures are warranted.

1259   Board #67   May 31 9:00 AM - 10:30 AM

Pregnancy Walking Cadence Does Not Vary By Trimester

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(No relevant relationships reported)

PURPOSE: Walking is the most commonly reported mode of physical activity among the general population and also among pregnant women. Pregnancy-related changes in walking speed, gait dynamics, and total physical activity have been reported in past research, but free-living step cadences and their rates of change across pregnancy have not been studied. The purpose of this study was to describe free-living stepping cadence in pregnant women and examine differences between second and third trimester women. **METHODS**: Fifty pregnant women were recruited for this study and n=45 was the analytic sample size; 46.7% were in their second trimester (13-25 weeks) while 53.3% were third trimester (≥26 weeks). Participants completed a survey of demographic characteristics and wore an accelerometer on their non-dominant wrist for 7-8 days; they were instructed to wear the device as much as possible during waking hours. These accelerometer data were downloaded in 60-sec epochs, allowing for determination of min-by-min walking cadence, defined as steps/min. Mean steps/day, mean cadence, median cadence, maximum cadence, peak cadence (average cadence over the 30 minutes of highest cadence in each day), mean time spent in moderate- to vigorous-intensity physical activity (MVPA, time spent with cadence ≥100 steps/min), and mean daily time spent in several cadence

ranges (0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, 90-99, 100-109. 110-119, 120-129, 130-139, 140-149, 150-159, 160-169, <50, <100, ≥100, and ≥130 steps/min) were calculated for each participant. Between-trimester differences were determined using independent-samples t-tests. **RESULTS**: Average daily steps were 11,060.1±2,955.3; 66.7% of second trimester and 54.2% of third trimester women met daily step recommendations of 10,000 steps/day, but 0.0% of the sample accumulated the recommended 150 min/wk of MVPA. There were no differences by trimester for cadence at any step rate. **CONCLUSIONS**: Overall, pregnant women accumulated high numbers of steps per day but at low cadences; neither daily steps nor cadence varied from second to third trimester. These data suggest that steps and MVPA recommendations are not equivalent and therefore should not be used interchangeably, especially during pregnancy.

1260   Board #68   May 31 9:00 AM - 10:30 AM

Application of Geographic Information Systems (GIS) Methods in Walkability Assessment

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(No relevant relationships reported)

PURPOSE: Walkability is a measure of how friendly an area is to walking. Emerging evidence has shown that neighborhood walkability has the potential to increase physical activity and reduce the risk of chronic diseases. Increasing the amount of walking is a prevalent topic for many urban planners and policymakers. A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, and present spatial or geographic data and it offers good promise for walkability assessment. The purpose of this study was to provide a systematic overview of the applications of GIS in the measurement of walkability. **METHODS**: Keyword and reference searches were conducted in PubMed and Web of Science, and the inclusion criteria included: (1) study design: cohort studies, pre-post studies, or cross-sectional studies; (2) research topic: walkability assessment through geographic information systems (GIS) methods; (3) language: articles written in English; and (4) article type: peer-reviewed articles or theses. A total of 397 articles were identified in the search, among which 328 were excluded in the title and abstract screening and 15 were excluded after full-text review. The remaining articles (n = 54) were carefully evaluated and results were summarized. **RESULTS**: The primary applications of GIS data/methods in the walkability-related research included (1) visualization of the spatial distribution of roads, walking trails, and basic environmental features; (2) construction of advanced walkability environmental indicators; and (3) assessment and comparison of the walkability of the built environment. Study design and features, including population density, street pattern, land-use mix, access to recreational facilities, varied considerably across studies, and this is probably because of lack of established guidelines and protocols in this field. Meanwhile, unique features of GIS methods such as relating information from different sources and capability of collaborating with pedometer data had a very promising future in measuring walkability. **CONCLUSIONS**: The GIS-based approach has great potential to supplement walkability assessment. However, there is still little evidence supporting the efficacy of GIS, and more studies investigating this promising area of research are called for.

1261   Board #69   May 31 9:00 AM - 10:30 AM

Moderate And Vigorous Intensity Walking Cadence (Steps/min) Thresholds In 41-60 Year Old Adults

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(No relevant relationships reported)

Research establishing a strong relationship between cadence (steps/min) and intensity has primarily been conducted with young adult samples. **PURPOSE:** To identify reasonable heuristic (evidence-based, rounded, practical) cadence thresholds associated with absolutely-defined moderate (3 metabolic equivalents; METs) and vigorous (6 METs) intensity ambulation in middle-aged adults. **METHODS:** Ten men and 10 women from each 5-year age group between 41-60 years of age performed a series of 5-min treadmill bouts separated by 2-min rest. Bouts began at 0.5 mph and increased in 0.5 mph increments until participants: 1) chose to run, 2) achieved 75% of their predicted maximum heart rate, or 3) reported a rating of perceived exertion (RPE) > 13. Cadence was determined via direct observation. Oxygen consumption (VO_2) was measured using an indirect calorimeter. METs were calculated from the final two minutes of each stage by dividing VO_2 in mL/kg/min by 3.5. Receiver Operator Characteristic (ROC) models were used to predict moderate and vigorous intensity from cadence. Optimal cadence thresholds were identified using Youden's index. The cadence-intensity relationship was also quantified using a segmented regression model with random coefficients. Optimal positive predictive values of candidate thresholds were assessed to determine final heuristic values. **RESULTS:** Data were complete for

all 80 participants (40 men, 40 women; age=50.2±5.9 years; BMI=26.0±4.0 kg/m²; height=171.0±9.2 cm). ROC cadence thresholds for moderate and vigorous intensity were 98.5 and 117.3 steps/min, respectively. All sensitivity values were over 90% and all specificity values were over 80%. The relationship between cadence and METs was explained by two distinct linear regression trends displaying a breakpoint at 97.6 steps/min. Cadence explained 78% of the overall variance in intensity. Cadence thresholds (95% Prediction Intervals) for 3 METs and 6 METs were 101.7 (54.9 - 111.8) and 132.1 (122.0 - 142.2) steps/min, respectively. Heuristic values for moderate and vigorous intensity were 100 and 130 steps/min, respectively. **CONCLUSIONS:** Cadences of 100 and 130 steps/min are reasonable heuristic values respectively identifying moderate and vigorous intensity walking in middle-aged adults.

1262   Board #70   May 31 9:00 AM - 10:30 AM

Comparison of Physical Activity Guideline Compliance Estimates Among Active Youth Using Different Step-Based Definitions

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(No relevant relationships reported)

Among youth, several investigations have quantified steps/day thresholds corresponding to compliance with current physical activity guidelines (≥ 60 min/day of moderate-to-vigorous physical activity [MVPA]) while other reports have identified cadence (steps/min) cut-points consistent with MVPA. However, empirical applications of these two methods for use in estimating compliance to current physical activity guidelines are scant within the literature. **PURPOSE:** To compare physical activity guideline compliance estimates using steps/day thresholds and step-defined MVPA methods among a sample of active adolescents. **METHODS:** Step-based physical activity was assessed minute-by-minute using the waist-worn Fitbit Zip™ over a 7-day period among 291 adolescent soccer players (64.9% female, age: 15.2 ± 1.2 yrs, BMI: 22.1 ± 3.4 kg/m²) providing ≥ 4 days of valid data (≥ 10 hr/day of wear time). Compliance to current physical activity guidelines was quantified as: 1) mean steps/day ≥ 10,500 for boys or ≥ 9,500 for girls, and 2) mean step-defined MVPA (time spent at 100+ steps/min) ≥ 60 min/day. Compliance estimates were compared between methods using McNemar's test. **RESULTS:** Participants accumulated 11,100 ± 3,217 steps/day (boys: 12,201 ± 3,543 steps/day; girls: 10,506 ± 2,865 steps/day) and 36.9 ± 16.8 min/day of step-defined MVPA (boys: 42.9 ± 18.7 min/day; girls: 33.7 ± 14.8 min/day). Compliance to current physical activity guidelines among the overall sample significantly varied between the steps/day thresholds and step-defined MVPA methods (63.2% and 9.6%, respectively; χ^2 = 154.0, p < 0.001). Within sex compliance estimates also varied for the steps/day thresholds and step-defined MVPA methods among boys (65.7% and 15.7%, respectively; χ^2 = 49.0, p < 0.001) and girls (61.9% and 6.3%, respectively; χ^2 = 103.0, p < 0.001). **CONCLUSION:** Significant heterogeneity in physical activity guideline compliance estimates was observed between the steps/day thresholds and step-defined MVPA methods. It is possible that the sporadic nature of physical activity observed among youth is being obscured by the 1-min measurement epoch used herein, thereby lowering expected values of daily step-defined MVPA and associated physical activity guideline compliance estimates. Support: USDA-AFRI 2013-67001-20418

1263   Board #71   May 31 9:00 AM - 10:30 AM

Physical Activity Category Classification Using The Actigraph Gt9x In Youth

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(No relevant relationships reported)

The ActiGraph GT9X includes an inertial measurement unit (IMU) equipped with a triaxial gyroscope which has been shown to be a perfect classifier of sedentary behavior (SB) in adults. To date, there has been no research to explore the application of the gyroscope in youth. **PURPOSE:** The purpose of this study was to compare the use of the accelerometer and gyroscope for classifying SB and continuous walking and running (CWR) in youth. **METHODS:** Participants (N=52, mean±SD; age, 13.3±3.1 years; BMI, 20.5±5.0 kg/m²) completed sixteen activities ranging from SB to vigorous intensity. Activities were grouped as SB (lying, computer gaming, internet, reclining, and book reading), CWR (fast over-ground walking, slow over-ground walking, and over-ground running), and intermittent activities (e.g. stair walking, sweeping, stationary cycling, basketball). A GT9X was worn on the right hip, both wrists, and both ankles. Primary accelerometer data were sampled at 90 Hz and converted to the Euclidean norm minus one (ENMO) in milli-G's per second. Gyroscope data were sampled at 100 Hz and converted to vector magnitude (GVM) and reported in mean degrees per second. ENMO and GVM were assessed for classifying the following: 1). SB from all other activities and 2). SB first, then CWR from the remaining 11 activities using the mean coefficient of variation (CV) per 10-s. Thresholds were developed using receiver operating characteristics (ROC) Performance was assessed using area under the curve (AUC), sensitivity, and specificity. Performance **RESULTS**: ENMO and GVM classify SB well across all attachment sites (AUC ≥ 95.7%).

When classifying CWR after removing SB, ENMO CV had AUC between 85.0%-87.9%, while GVM was lower and more variable with AUC between 53.3%-74.7%. **CONCLUSION**: Overall, ENMO and GVM are excellent classifiers of SB in youth across all attachment sites. GVM is less effective than ENMO for classifying CWR, but has potential for future use and should continue to be explored.

	Site	Threshold ENMO	Threshold GVM	Sensitivity ENMO	Sensitivity GVM	Specificity ENMO	Specificity GVM	AUC ENMO	AUC GVM
SB	Hip	36.46	8.25	0.90	0.92	0.91	0.92	95.70	96.90
SB	Left Wrist	24.09	13.87	0.92	0.90	0.94	0.92	97.50	96.00
SB	Right Wrist	26.02	18.46	0.90	0.87	0.95	0.93	96.50	95.60
SB	Left Ankle	50.21	10.21	0.96	0.95	0.93	0.93	97.70	98.00
SB	Right Ankle	62.20	11.48	0.93	0.93	0.94	0.94	97.90	98.00
CWR	Hip	17.65	57.21	0.81	0.55	0.91	0.56	85.00	53.30
CWR	Left Wrist	27.35	49.31	0.82	0.51	0.87	0.67	86.30	59.10
CWR	Right Wrist	28.29	46.38	0.84	0.62	0.88	0.61	87.20	60.70
CWR	Left Ankle	16.86	45.89	0.83	0.68	0.88	0.72	87.40	73.00
CWR	Right Ankle	16.48	45.08	0.83	0.71	0.91	0.72	87.90	74.70

1264   Board #72   May 31 9:00 AM - 10:30 AM

Validation of Automatic Activity Detection on Wearable Activity Trackers

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(No relevant relationships reported)

Purpose: If sufficiently valid, wearable activity trackers are promising tools for health-related research. Recent models claim to identify the type of activity being performed, but no studies have reported the validity of these features. The purpose of this study was to determine the accuracy of automatic activity detection on 4 wrist-worn, physical activity trackers; specifically, the correct type, duration, and start time of select activities.
Methods: 69 healthy adults were recruited via flyer, email, or word of mouth to complete at least one of four activity modules, comprised of activities automatically detectable by the trackers. Module A, completed on a treadmill, consisted of 3 activities separated by a 10-min rest (15-min walk, 15-min run, and 25-minute continuous series of 5-min walk, 15-min run, 5-min walk). Module B, consisted of 3 activities separated by a 10-min rest (15-min outdoor walk, 15-min outdoor run, and 15-min bout on an elliptical trainer). Module C consisted of 15 min of outdoor cycling and Module D consisted of 15 min of freestyle swimming (only one tracker was used in Module D as others are not waterproof). The actual activity type, duration, and start/stop times were recorded, then compared to device data (recognized activity type, duration, and start times).
Results: Participants (N=69) were 26.3 ± 8.7 years old, had a BMI of 23.8 ± 4.0 kg/m², and were 60.9% female. Participants reported an average rating of perceived exertion of 11.9 (6 - 19). The percentage of correctly identified activities by the four trackers was 94.7% (93.5 - 97.1) for treadmill walking, 97.7% (93.8 - 100.0) for treadmill running, 45% (35.3 - 59.4) for running in the treadmill series, 97.8% (97 - 100) for outdoor walking, 100% for outdoor running, 70.4% (3.1 - 93.9) for the elliptical, 83.1% (44.1 - 97.1) for outdoor cycling, and 87.5% for swimming. Lower accuracy for the elliptical was driven down by a low accuracy of 3.1% for one tracker.
Conclusion: The four wearable activity trackers were best at detecting outdoor running and worst at detecting running in the 25-minute treadmill series. Overall, the trackers were better at detecting ambulatory activities, apart from running in the treadmill series, than detecting swimming, cycling, or using an elliptical. This research was funded through startup funds through UW - Madison.

1265   Board #73   May 31 9:00 AM - 10:30 AM

Dominant Vs Non-dominant Wrist: A Comparison Of Steps Per Day

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(No relevant relationships reported)

With the increased popularity of activity monitors over the past decade, step counting has become a prevalent method of assessing physical activity. Although most manufacturers suggest to wear monitors on the non-dominant (ND) wrist, some consumer-grade devices can be initialized to be worn on the dominant (D) wrist. Only one study has compared the step count accuracy of devices worn on the D and ND wrists across various treadmill speeds and it found no significant differences between the D and ND wrist step counts. However, the effect of D vs ND wear on step count may be different under free-living conditions. **PURPOSE:** To compare

step counts between D and ND wrist-worn devices and hand-counted steps, under free-living conditions. **METHODS:** Twelve participants (mean±SD, age 35±13 years) wore an ActiGraph GT9X and Fitbit Charge (FC) on the D and ND wrists. The FC was initialized for each participants' D or ND wrist. A GoPro was affixed to the participant's chest and pointed down at the feet to video record the steps taken during all waking hours of one day and hand-counted steps from the video served as the criterion. Raw GT9X data were processed with the ActiLife step counting algorithm, with and without low frequency extension (AGL and AG, respectively), as well as the company's Moving Average Vector Magnitude algorithm (AGM). Fitbit step counts were recorded by the participant at the beginning and end of the day and used to obtain steps/day. Repeated measured ANOVAs were used to compare estimates between devices (AGL, AG, AGM, FC) and wrists (D and ND). For each step counting method, accuracy was determined by calculating percent of hand-counted steps. **RESULTS:** There was no significant device x wrist interaction (p<0.05). Across all step counting methods, there was a significant difference in steps per day between D and ND wrist $(F(1,11)=11.81, p=0.006)$ with the D wrist recording 1,253 more steps than the ND wrist. Percent of hand-counted steps for devices worn on the D wrist were: FC: 4%, AG: 122%, AGL: 220%, AGM: 91% and for ND wrist: FC: 77%, AG: 109%, AGL: 196%, AGM: 84%. **CONCLUSION:** Users of activity monitors should be aware of the differences in steps per day when using the D and ND wrists, even for the devices that allow the user to enter the appropriate wrist location during initialization.

1266   Board #74   May 31 9:00 AM - 10:30 AM

Revising Free Text Inputs In Physical Activity Self-report Methods: Lessons From The ACT24

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(No relevant relationships reported)

PURPOSE: To examine the change in total Metabolic Equivalent of Task (MET) minutes reported by the Activities Completed over Time in 24 Hours (ACT24) physical activity self-report tool for different activity types after recoding free text entries and assigning updated MET values. **METHODS**: Men and women aged 50-70 years participating in a measurement error study on diet and physical activity were administered 6 ACT24 recalls spaced evenly over 12 months. Participants that completed at least 1 recall (n=1,023) were included in the analyses. Free text activity entries were recoded and either assigned to an existing ACT24 activity category or placed into a new activity category. Recoded free text activities, pre-defined activities, and gaps (no information recorded) were then assigned MET values from the 2011 Compendium of Physical Activities. The subsequent change in MET minutes was calculated after each of these adjustments. **RESULTS**: Participants completed 5,311 ACT24 recalls, of which 2,712 (51.1%) contained at least 1 free text entry; free text entries constituted less than 5% of all activities. Recoding free text entries increased the total reported MET minutes by 0.004% (+434.8 MET minutes), and applying the updated compendium values to all entries further increased the total by 6.3% (+743,920.9 MET minutes). Recoding free text had the largest positive effect for the "caring for or playing with others" activity category (+36.3%, or +6,455.1 MET minutes), and the largest negative effect for the "shopping, errands, and appointments" activity category (-15.4%, or -4,925.0 MET minutes). Updating MET values had the largest positive effect on "bicycle repairs" (+81.9%, or +1,226.5 MET minutes), and the largest negative effect on "covering plants" (-49.0%, or -202.0 MET minutes), although these activities were rarely reported (12 and 3 times, respectively). **CONCLUSIONS**: Recoding free text activities negligibly changes the total MET minutes reported in the ACT24, although more dramatic adjustments do occur within certain specific activity categories. Presence of free text is a data management burden that may provide little additional information, and efforts should be made for best activity classification in instrument design to eliminate the need for free text.

1267   Board #75   May 31 9:00 AM - 10:30 AM

Diurnal Patterns of Physical Activity Illustrate Important Time-of-Day Differences Between Younger and Older Adults.

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(No relevant relationships reported)

Physical activity is an important risk factor for disease and functional outcomes across the age spectrum. Measurement of objective physical activity by accelerometry has become common in recent years and is often reported as total or average daily physical activity. However, accelerometry data provides the opportunity to also quantify differences in diurnal patterns of physical activity that may elucidate contributors to changes in physical activity with aging. **PURPOSE:** To evaluate differences in objectively measured PA, overall and by time of day, between younger and older

adults. **METHODS:** Physical activity (PA) was measured using wrist-worn ActiGraph accelerometers continuously over 7 days in 58 older adults (50% women, aged 72±6 yrs) and 56 younger adults (54% women, age 21±2 yrs), and body composition was measured using dual energy x-ray absorptiometry. PA data was smoothed into one-minute intervals and expressed as the vector magnitude of counts (VMC) per minute across the three axes. Diurnal patterns of activity were modeled as the average VMC over six 4-hour time bins. Subjects were categorized by age group (young or old), and the association between the mean of the VMC and age group was modeled overall and across each time bin using linear regression, adjusting for sex, fat-free mass, and fat mass. **RESULTS**: Total 24-h PA was lower in older adults compared to younger adults $(2.1 \times 10^6 \pm 0.8 \times 10^6$ vs. $2.8 \times 10^6 \pm 0.9 \times 10^6$ VMC, p < 0.0001). However, when examining diurnal patterns, early morning (4:00am-8:00am) and morning (8:00am-noon) PA was higher in older adults compared to younger adults (p<0.001 for each period) in fully adjusted models. In the remaining time bins, younger adults had higher PA than older adults (p<0.01 for each period). **CONCLUSION:** Consistent with previous studies, total daily PA was lower in older adults compared to younger adults. Importantly, examining PA across the day highlighted significant differences in activity volumes between younger and older adults that provide evidence to inform future interventions to improve PA profiles in both younger and older individuals.

1268   Board #76   May 31 9:00 AM - 10:30 AM

Organized Physical Activity Participation From Pre-puberty To Adulthood: A Longitudinal Study In U.S. Females

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(No relevant relationships reported)

PURPOSE: Physical activity yields health benefits across the lifespan. Longitudinal data are needed to evaluate translation of childhood activity patterns to adult activity habits. We hypothesized that activity patterns would differ in gymnasts (GYM) vs. non-gymnasts (NON), and childhood activity would correlate with young adult levels. **METHODS**: Female GYM and NON were recruited in 3 cohorts: 1997/8, 2003/4, 2008-12. Organized physical activity participation (OPA h/wk) was recorded to yield annual means, excluding physical education. Pediatric OPA was recorded quarterly (1997-1999) and semi-annually (1999-2017), with parental assistance as needed. After age 18 yrs, OPA was recorded annually. GYM were defined by training ≥6 h/wk for ≥1 yr. Separate GYM and NON OPA curves were generated using cubic smoothing spline mixed effect models with 95% confidence intervals (Fig 1a, chronological age: CA; Fig 1b, gynecological age: GA, centered at menarche= time 0). Intra-individual (intraclass) correlation coefficients were evaluated (ICC). **RESULTS**: Data are included for 211 girls. GYM OPA is highest circum-menarche, peaking before high school (GA -2 to +1 yrs; CA 10-15 yrs). NON OPA is highest post-menarche, during high school (GA 0 to +5 yrs; CA 14-17 yrs). GYM OPA is significantly higher than NON throughout school and peak lean mass accrual, but curves converge at GA +3 yrs or CA 18 yrs. Inter- and intra-subject variability was higher in GYM (10.4; 22.7) than NON (4.7; 8.6), with similar, medium effects for ICC (GYM= 0.32, NON= 0.35), suggesting activity level tracking across growth. **CONCLUSIONS**: GYM are active early and maintain high activity throughout growth, while NON increase OPA parallel with middle & high school sport programs. OPA dropped in both groups after high school. These data suggest that girls who start life active maintain high activity. Our data likely represent "health-conscious" individuals; future research is needed in more generalizable cohorts.

FIG 1A

FIG 1B
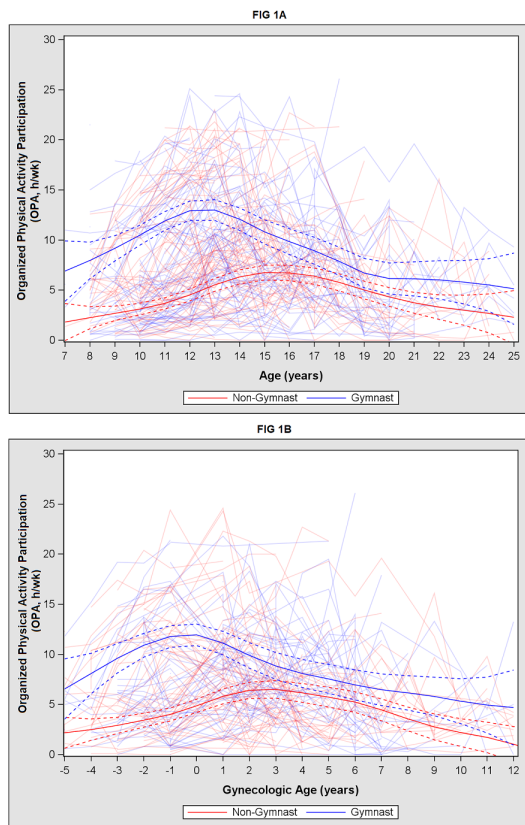
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Predicting Resistance Training Exercise Repetitions Using A Wrist-worn Activity Monitor

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(No relevant relationships reported)

While wrist-worn physical activity monitors have been used to quantify exercise volume for aerobic activities, limited research has utilized activity monitors to quantify resistance training exercises. **PURPOSE**: The purpose of this study was to develop an improved method for predicting repetitions during resistance training exercises. The validity of this method was tested during an unstructured training session. **METHODS**: While wearing a wrist-worn, accelerometer-based activity monitor, 144 participants (73 M, 71 F) completed 12 different upper- and lower-body dumbbell resistance training exercises. Each participant completed one set of 12 repetitions using a lightweight (<7 kg) set of dumbbells. This data was used to develop a repetition counting algorithm by comparing minimum and maximum values for the largest X, Y, or Z plane acceleration peak/valley during each exercise. Participants were then asked to complete an unstructured, free-living resistance training exercise session. Within the training session, they were asked to complete at least one set of at least five reps of the original 12 dumbbell resistance training exercises used in the algorithm development phase of the study. A research assistant observed the training session and recorded details about the exercises, resistance, and repetitions for each exercise. A mixed-model RM ANOVA was utilized to compare the predicted repetitions to the observed repetitions for the 12 exercises. Pairwise comparisons with Bonferroni adjustment were utilized to identify the location of differences. **RESULTS**: During the free-living training sessions, a total of 2293 sets of the 12 dumbbell exercises were completed by the study participants. Mixed-model RM ANOVA indicated a significant main effect ($p<0.05$). Post-hoc analysis indicated significant differences between the predicted and observed repetitions for five of the 12 exercises. However, the differences for all exercises were within 1.2 repetitions of the actual repetitions. Across all exercises, the predicted algorithm was within 0.3 repetitions of the actual repetitions (range: 0.0 to 1.2 reps). **CONCLUSION**: While some significant differences occurred for five of the 12 exercises, the repetition prediction model was a valid method for predicting repetitions for the selected dumbbell exercises.

1270   Board #78   May 31 9:00 AM - 10:30 AM

Modifying Accelerometer Cut-points Affects Criterion Validity in Free-living Youth and Adults

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(No relevant relationships reported)

In accelerometer-based physical activity (PA) measurements, it is common to scale a cut-point so it can be applied to data with a shorter epoch length. For example, 2020 counts per min (60-s epochs) could be divided by 4, giving 505 counts per 15 sec (15-s epochs). Researchers assume that scaling to a shorter epoch results in more moderate-to-vigorous PA (MVPA), compared to long epochs. However, no studies have compared modified estimates to a criterion measure (CM) of indirect calorimetry. **PURPOSE:** To assess the criterion validity of accelerometer estimates when using cut-points as intended (i.e. the epoch length for which they were originally developed, usually 60-s), versus modifying them for use with a different epoch length. **METHODS:** Free-living data were collected in 53 youth (2 hr each) and 29 adults (6 hr each) wearing a hip-worn accelerometer and a portable indirect calorimeter. Measured oxygen consumption (VO_2, $mL \cdot kg^{-1} \cdot min^{-1}$) was converted to metabolic equivalents (METs), by dividing by measured resting VO_2 (youth) or $3.5 mL \cdot kg^{-1} \cdot min^{-1}$ (adults). METs were then coded as sedentary behavior (SB, METs ≤ 1.5), light PA (LPA, 1.6-2.9 METs), and MVPA (METs ≥ 3.0). Accelerometer data were processed using 3 youth and 3 adult cut-points as intended, plus 5 other epoch lengths, totaling 6 estimates (1, 5, 10, 15, 30, and 60-s epochs). Mean SB, LPA, and MVPA times were compared to the CM using one-way repeated measures ANOVAs and Bonferroni-adjusted post-hoc tests. **RESULTS:** For youth, mean MVPA time in shorter epochs was further from the CM than when using the cut-points as intended, and 1- and 5-second epochs differed significantly from the CM by 23.7%-62.7% for all cut-points ($p \leq 0.04$). In contrast, for adults, mean MVPA time using shorter epochs was closer to the CM than when using cut-points as intended, although all estimates differed non-significantly by 6.6%-50.9% ($p = 0.10$-0.99). For both groups, mean SB and LPA time when using cut-points as intended differed non-significantly from the CM by 7.3%-41.0% ($p > 0.05$), while using shorter epochs led to significant differences in some cases. **CONCLUSION:** Modifying cut-points led to variable error for different intensities in youth and adults. Therefore, it is most appropriate to use accelerometer cut-points as intended, which also ensures comparability between studies.

1271   Board #79   May 31 9:00 AM - 10:30 AM

Harmonizing Physical Activity Data across Cohorts in the Lifetime Risk Pooling Project

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(No relevant relationships reported)

PURPOSE: The Cardiovascular Lifetime Risk Pooling Project (LRPP) is an individual-level pooled data set from 20 U.S. cohort studies. LRPP is used to describe the development of cardiovascular disease (CVD) risk across decades of follow-up and different race and sex groups. Many of the cohorts have participant-reported physical activity (PA); however, before PA data can be used in pooled cohort analyses we must harmonize the original units (i.e. convert to a common scale and distribution). **METHODS**: We tested the feasibility for harmonization of moderate-vigorous intensity PA (MVPA) using 8 of 20 the cohorts (ARIC, Atherosclerosis Risk in Communities; CARDIA, Coronary Artery Risk Development in Young Adults; CHS, Cardiovascular Health Study; FHS, Framingham Heart Study; FOS, Framingham Offspring Study; JHS, Jackson Heart Study; MESA, Multi-Ethnic Study of Atherosclerosis; and WHI, Women's Health Initiative). We recomputed MVPA variables with varying degrees of granularity ranging from MET-min/week, cohort specific z-scores, and a dichotomous variable of active (meeting 2008 PA Guidelines) vs. insufficiently active (not meeting guidelines). To examine concurrent validity, we examined unadjusted cross-sectional associations of MVPA (at first visit with PA data) with BMI separately in all 8 cohorts and then pooled. **RESULTS**: When evaluating the concurrent validity of MVPA variables with BMI, 7 of the 8 cohorts demonstrated similar inverse associations with BMI (CHS, MESA, CARDIA, FOS, FHS, JHS, ARIC; pooled z-score: n=46865, β= -0.53, CI -0.58 - -0.47, p<.0001). Harmonization of MET-min/week was possible for 2 cohorts (CHS, MESA; n=11965, median=846.3, q1=241.9, q3=2004.6); and dichotomous variable for 3 cohorts (CHS, MESA, CARDIA, n=17106, 62% meeting 2008 PAGs). **CONCLUSIONS**:A cohort specific z-score allows for inclusion of a reliable measure of MVPA to be pooled from most cohorts. Detailed PA research on specific patterns and doses is possible within the subset of cohorts with more granular measures available. We plan to harmonize additional cohorts and develop and test the validity of other variables for use in the LRPP. This harmonization provides a valuable dataset to explore longitudinal patterns in PA and their associations with the development of CVD across the life course in a large, diverse cohort.

1272 Board #80 May 31 9:00 AM - 10:30 AM

Automated Detection of Wheelchair Propulsion Using a Single Wrist Accelerometer

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(No relevant relationships reported)

Purpose: Physical activity (PA) provides important health benefits such as improved cardio-metabolic health, mental health, and cognitive functioning. However, the majority of this evidence is based on research conducted in ambulatory populations. Research informing the relationship between PA and health among manual wheelchair users (MWU's) is limited. One of the barriers is the lack of valid and reliable PA measures for the population. In the current study, machine learning (ML) techniques were used to develop activity recognition models to automatically identify episodes of active self-propulsion in manual MWU's wearing a single wrist-mounted accelerometer.
Methods: 11 adult MWU's (males= 8; 7 paraplegic; 4 tetraplegic) completed a series of activity trials while wearing an ActiGraph GT9X accelerometer on the non-dominant wrist. Activities included: sitting quietly, being pushed, self-propulsion, and completing manual tasks such as drinking water, working on an iPad, and folding laundry. Trials were categorised into 3 classes: sedentary (SED), manual tasks (MT), and self-propulsion (SP). 15 time-domain features from the X, Y, and Z axis were extracted from 1 s windows with 50% overlap and inputted into 3 supervised learning algorithms Decision Tree (DT), Random Forest (RF), and Support Vector Machine (SVM). Performance was evaluated using leave-one-subject-out (LOSO) cross validation. To determine if the resultant models generalized to new data, performance was also evaluated in an independent sample of MWU's (n = 14).
Results: Cross-validation F1-scores for the DT, RF, and SVM classifiers were 0.83, 0.84 and 0.85, respectively. Classification accuracy was consistently good to excellent for SED (86.0% - 92.7%), MT (76.0% - 82.4%), and SP (76.0% - 76.8%). In the independent sample, F1-scores for the DT, RF, and SVM classifiers were, 0.80, 0.81, and 0.82, respectively. Classification accuracy remained good to excellent for SED (83.9% - 92.0%), MT (70.5% - 79.3%), and SP (74.2% - 77.6%)
Conclusion: ML models trained on simple time-domain features from a single wrist-worn accelerometer can be used to differentiate active self-propulsion from other activities in MWU's. The models generalized well to new data and could help researchers evaluate the effectiveness of interventions to promote PA in MWU's.

1273 Board #81 May 31 9:00 AM - 10:30 AM

Validity And Reliability Of The Past Questionnaire Among Women

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(No relevant relationships reported)

Purpose: To determine the validity and reliability of the Past-day Adults' Sedentary Time (PAST) questionnaire using the activPAL (AP) as the criterion measure.
Methods: Thirty four women (23.7 ± 4.6 y; 25.4 ± 6.2 kg m⁻²) wore the AP on the thigh and Actigraph GT3x-BT (AG) on the wrist for twenty four hours. The PAST was administered the day after the assessment day (T1) and within twenty four hours of T1 (T2). The AG was used to determine sleep time for the day assessed, which was then subtracted from the total sit/lie time recorded by the AP (sit/lie time-sleep time) to determine total sedentary time. Spearman correlation coefficients and Bland-Altman plots were calculated to determine validity and reliability of the PAST using AP. **Results:** The correlation between T1 and T2 for all PAST questions demonstrated good positive correlations ($p< 0.001$) including total sedentary time except for the last question on "sitting/lying for other purposes" which was fair ($r= 0.431$, $p=0.011$). The Bland-Altman plot revealed a mean difference of 33.7 minutes of T2 and T1 of the PAST with no significant bias ($p> 0.05$). However, using the AP as the criterion the mean difference for T1 (T1-AP) was 167.0 mins while the mean difference for T2 (T2-AP) was 200.7 mins with both demonstrating significant positive bias ($p≤0.001$).
Conclusion: The PAST is a reliable instrument when re-administered within twenty four hours. However, participants tend to over-report their sedentary time especially once reported sedentary time is >600 minutes per day. Therefore, researchers should be cautious when using the PAST in populations that report a high amount of sedentary time (e.g., >600 minutes).

1274 Board #82 May 31 9:00 AM - 10:30 AM

Comparing Accelerometry Methods in an Older Adult Physical Activity Intervention and Associations with Health Outcomes

Katie Thralls[1], Suneeta Godbole[2], Todd Manini, FACSM[3], Eileen Johnson[4], Jacqueline Kerr[2]. [1]*San Diego State University/ Univeristy California San Diego, San Diego, CA.* [2]*Univeristy California San Diego, San Diego, CA.* [3]*Univeristy of Florida, Gainesville, FL.* [4]*Univeristy California Berkeley, Berkeley, CA.*

(No relevant relationships reported)

BACKGROUND: Advancements in accelerometry have led to different methods to process the data for physical activity (PA) in older adults.
PURPOSE: The purpose of this study was to: 1.) Compare five different methods for analyzing PA in older women; 2.) Assess the relationship between changes in PA and changes in physical function and depressive symptoms over six months for each analysis method.
METHODS: Older adult females (N=144, M_{age} = 83.3 ± 6.4yrs) wore a hip accelerometer for 6 days and completed measures of physical function and depressive symptoms at baseline and 6 months. Accelerometry data were processed by 5 different methods to estimate PA: a 1041 vertical axis cut point, a 15-sec vector magnitude (VM) cut point (Evenson), a 1-sec VM algorithm (Activity Index) , a machine learned (ML) algorithm from 39 features, and an individualized cut point derived from the median counts of rapid 400-meter walk. Generalized estimating equations and a confusion matrix were used to compare and contrast PA minutes/day. Linear mixed models for each processing method tested the associations between changes in PA and changes in physical function and depressive symptoms.
RESULTS: Baseline comparisons between methods for minutes/day of PA and for each minute of PA are in Table 1. There were significant differences between some methods but not others, and methods estimated 6-month change in PA from 4 minutes to over 20 minutes. All methods, except the individualized cut point had a significant positive relationship between change in PA and improved physical functioning. There was also a significant relationship between changes in PA and decreased depressive symptoms for all methods except the individualized cut point.
CONCLUSIONS:
Time spent in PA differs by the choice of data processing method. Results from individualized cut points are counter to methods that use absolute cut points. Additional research is needed to understand these discrepancies.

Table 1.					
Confusion Matrix for each method with percent (%) overlap between methods for each minute of PA and differences (*) between methods for total minutes/day at baseline					
Method	Individual 400MW	Evenson	Activity Index	1041cpm	ML
Individual 400MW		31%*	25%*	42%*	17%*
Evenson			61%	69%*	42%*
Activity Index				63%	60%
1041cpm					43%
ML					

Note. * indicate significant differences based on total minutes/day ($p<.05$); cpm: counts per minute; ML: Machine Learned; MW: meter-walk

1275 Board #83 May 31 9:00 AM - 10:30 AM

Accuracy And Reliability Of A Consumer-grade Activity Tracker Among Older People: A Pilot Study

Catherine Patrick, Michael A. Smith, Antonio Harris, Melissa Powers. *University of Central Oklahoma, Edmond, OK.*

(No relevant relationships reported)

Activity trackers are popular devices used to track and encourage physical activity; although the accuracy of activity trackers among older people is unknown.
PURPOSE: The purpose of this pilot study was to evaluate the accuracy and reliability of step counts from a consumer-grade activity tracker by comparing step counts to a research-grade accelerometer and video recording. **METHODS:** Ten volunteers (mean age = 71.20±6.00 years) agreed to participate. Two participants did not complete the second round of testing. Researchers collected height, weight, and age. The activity tracker and accelerometer were set-up using manufacturer's procedures. Participants wore the activity tracker and accelerometer as they walked 96 meters around an indoor gym floor at their normal walking pace. The walk was also video recorded to determine observational step count confirmed by two researchers. The same procedures were repeated on a second, non-consecutive day. Data collected from the activity tracker were compared to the accelerometer and observed step count. In addition, step counts from the first walk were compared to step counts from the second walk. **RESULTS:** At

the first walk, the activity tracker was found to significantly underestimate step counts by 16.00 steps when compared to the observed step count, $t(7) = -2.69$, $p = .031$. The activity tracker step count was not different than the accelerometer step count. At the second walk, no differences in step counts were observed between the activity tracker and the accelerometer or the observed step count ($p > .05$). In addition, no differences in step counts were observed between walk 1 and walk 2 using the activity tracker, accelerometer, and observed step count. **CONCLUSION:** Although preliminary, these data indicate fair accuracy and good reliability of a consumer-grade activity tracker when compared to the research-grade accelerometer and observed step count. We suggest this pilot study be extended to include additional participants and comparisons of other activity trackers. Activity trackers are widely used to measures physical activity, but their accuracy and reliability remains questionable especially among older people. Additionally, products and upgrades are made available so quickly that research on the accuracy and reliability of these devices is difficult to obtain.

1276   **Board #84**   May 31 9:00 AM - 10:30 AM
Accuracy of Fitbit Surge and Smartphone Apps at Measuring Cycling Distance and Speed

Jose L. Gamez, Ivan A. Figueroa, Merrill D. Funk. *University of Texas Rio Grande Valley, Brownsville, TX.*
(No relevant relationships reported)

Purpose
To determine the accuracy of Fitbit Surge and two smartphone applications at measuring distance and speed while cycling outside.
Methods
Thirteen college-aged students (Mean±SD; BMI: 25.2±3.0kg/m²; 10 males, 3 females) consented to participate in one measurement session. A 0.75 mile trail along a sidewalk around the university campus was used for 3 separate trials using a mountain bike, Android smartphone running Google-Fit (G-Fit) and S-Health (SH), and Fitbit (FB) provided to each participant. A researcher rode along with each participant the entire study using a cycle computer as the standard for speed and distance. The first lap consisted of walking 0.25 miles, cycling 0.15 miles at a slow speed, cycling 0.20 miles at a fast speed, and cycling 0.15 miles at a moderate speed. The second lap consisted of 1 lap at a moderate speed. The third lap consisted in 1 lap at a slow speed. After every lap a researcher recorded the data from the phone and the Fitbit. Mean bias and mean absolute percent error (MAPE) were calculated to describe speeds and distances recorded on each device compared to the cycle computer.
Results
Thirteen participants completed all 3 trials though 2 were excluded due to a malfunction with the smartphone apps causing partial data to be collected, leaving 11 included in this analysis. Results are as follows:

Trial 1	FB Mean Bias±SD	FB MAPE	G-Fit Mean Bias±SD	G-Fit MAPE	SH Mean Bias±SD	SH MAPE
Distance (miles)	0.02±0.01	2.5	0.03±0.06	7.7	0.02±0.01	2.75
Average Speed (mph)	0.41±0.27	6.1	0.93±0.6	13.2	0.63±0.4	0.1
Max Speed (mph)	0.83±0.53	6.5	4.17±0.6	33.0	1.65±1.36	14.1
Trial 2						
Distance (miles)	0.02±0.02	4.9	0.02±0.06	7.0	0.02±0.02	3.5
Average Speed (mph)	0.45±0.2	4.8	1.31±0.82	13.6	0.53±1.36	14.1
Max Speed (mph)	5.98±1.19	41.5	4.43±1.0	29.2	0.44±2.03	11.5
Trial 3						
Distance (miles)	0.02±0.01	3.1	0.02±0.04	5.4	0.04±0.04	5.3
Average Speed (mph)	0.29±0.26	5.0	0.43±0.32	7.4	-1.37±2.07	23.7
Max Speed (mph)	1.51±0.57	9.2	6.59±2.14	37.4	1.44±0.59	8.6

Conclusion
The Fitbit Surge was most accurate at measuring speed and distance for cycling followed by the S-Health app and lastly the Google-Fit app.

1277   **Board #85**   May 31 9:00 AM - 10:30 AM
Smartphone Carrying Location and Accuracy of Popular Pedometer Smartphone Apps While Jogging

Merrill D. Funk, Murat Karabulut. *University of Texas Rio Grande Valley, Brownsville, TX.*
(No relevant relationships reported)

Common pedometer smartphone apps suggest multiple acceptable sites where the phone may be carried to obtain accurate measurements, however, the phone location may have a significant effect on outcomes reported by the app. **PURPOSE:** To determine if smartphone location has a significant effect on the accuracy of popular smartphone pedometer applications at measuring steps while jogging on a treadmill. **METHODS:** Fifty-two participants (Mean±SD; 22.9±4.2yrs; BMI: 24.8±4.1kg/m²; 22 Male, 30 Female) consented to jog on a treadmill at 5 mph for 500 steps, while using a pedometer and 4 smartphones placed in commonly used locations (pocket, armband, waistband, hand). All smartphones were simultaneously running 5 applications throughout the trial: Moves, Google-Fit (G-Fit), Runtastic, Accupedo, and S-Health. Steps were verified using a hand tally counter. Zero, negative, and significant outlier values were replaced with the mean value for that app. A separate one-way repeated measures ANOVA was used for each app with the pedometer and tally counter. Significance was set at p<0.05. Pairwise comparisons with Bonferroni corrections were used for post-hoc analysis. Mean bias scores were calculated between the step count for each app and the tally counter. **RESULTS:** Repeated Measures ANOVA detected significant differences between phone locations and the step counter for only G-Fit (p=0.029) and Runtastic (p<0.01), while other apps were not different by location (p>0.05 for all). Using pairwise comparisons, G-Fit did not show significant differences with the tally counter for any of the phone locations (p>0.05) while pairwise comparisons for Runtastic indicated differences between the arm and hand locations compared to the tally counter (p=0.039, p=0.007, respectively). Lowest mean bias values for each app were as follows: Moves, arm (mean bias ± SD; 5.8 steps ± 103.3 steps); G-Fit, hand (13.7 ± 135.4); Runtastic, waist (8.6 ± 37.1); Accupedo, pocket (17.5 ± 46.9); S-Health, arm (-1.6 ± 26.9). **CONCLUSION:** The pocket, arm, waist, and hand all appear to produce relatively accurate step counts for pedometer smartphone apps while jogging on a treadmill. Although the phone location and app did not result in significant changes in step count, some locations and apps were better at providing more consistent and accurate results.

C-37   Free Communication/Poster - **Physical Activity and Health in Older Adults**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1278   **Board #86**   May 31 9:00 AM - 10:30 AM
Predictors of Central Blood Pressure in Older Adults

Emma Albin, Nathan Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)
(No relevant relationships reported)

Purpose: To investigate the predictors of central blood pressure (BP) in older adults, which is suggested as an emerging marker of future cardiovascular diseases, independent of peripheral BP.
Methods: This cross-sectional study included 304 older adults aged ≥65 years (mean age 72). Central and peripheral BP were measured using Uscom BP+ while seated. Demographic (age, sex), lifestyle (smoking, alcohol intake), body composition by DXA (body weight and fatness), cardiometabolic (peripheral BP, resting heart rate [RHR], blood glucose and lipids), and physical activity (PA) (sitting time, daily steps) and fitness variables (cardiorespiratory fitness [CRF], handgrip strength) were identified as potentially predictive of central BP and included in the prediction model.
Results: Univariate regression revealed that age (p<0.001), body weight (p=0.041), percent body fat (%BF) (p=0.049), total cholesterol (TC) (p=0.042), fasting glucose (p=0.032), CRF (p=0.001) and peripheral systolic BP (PSBP) (p<0.001) were significant for central systolic BP (CSBP). Body weight (p<0.001), %BF (p<0.001), TC (p=0.005), RHR (p=0.002) and peripheral diastolic BP (PDBP) (p<0.001) were significant for central diastolic BP (CDBP). Stepwise multivariate linear regressions with p<0.2 for entry and p<0.05 for staying in the model were used to identify significant predictors of central BP. In the multivariate regression, PSBP (β=0.89, p <0.001) and male sex (β=-1.94, p<0.001) were identified as significant predictors for CSBP, and PDBP (β=0.99, p<0.001) and TC (β=0.01, p <0.011) for CDBP that accounted for 91.6% and 93.5% of the total variance in CSBP and CDBP, respectively. When stratified for BP medication, PSBP and PDBP remained significant in participants both with (33%) and without (67%) BP medication, but sex and TC remained significant only in participants without BP medication, suggesting a possible effect modification by BP medication. When stratified by PA and CRF (400m walk

test), the CSBP model was stronger for the active group (≥5,000 steps/day; R^2=0.97) than the inactive (R^2=0.89) and stronger for the high (upper third; R^2=0.95) CRF than moderate (middle third; R^2=0.91) or low (lower third; R^2=0.90) CRF groups.
Conclusion: The results suggest that peripheral BP is the strongest predictor of CBP for older adults.

1279　　Board #87　　　　　May 31 9:00 AM - 10:30 AM

Physical Activity Patterns Among Older Central Pennsylvania Cancer Survivors: A Comparison With BRFSS National Data

Wayne Foo, Kathryn Schmitz, FACSM. *Penn State Cancer Institute, Hershey, PA.* (Sponsor: Kathryn Schmitz, FACSM)
(No relevant relationships reported)

Adults can participate in a variety of physical activities to meet current federal physical activity guidelines. The differences between activity patterns of cancer survivors and the general population are not well understood. This knowledge may be useful in modifying physical activity promotion guidelines specific to cancer survivors.
PURPOSE: To compare physical activity patterns of older cancer survivors living in Central Pennsylvania (CPA) to that of a national sample of Americans using the Behavioral Risk Factor Surveillance System (BRFSS) data (≥50 years old).
METHODS: We mailed BRFSS-based questionnaires to cancer survivors living in CPA, identified using the Pennsylvania Cancer Registry. Using this data (N=541) and the 2015 BRFSS national data (N=441,456), we categorized specific types of physical activity (PA) into ten major activity types using classifications from the Compendium of Physical Activities. We fit multivariate logistic regression models to estimate the prevalence odds ratios of activity participation for each activity type. Bonferroni method was used to control for inflated error due to multiple testing (p<0.005). Effect modification by sex was analyzed for activity types that were significant in the model.
RESULTS: Walking was the most common activity in both cohorts (CPA: 58%; BRFSS: 49%), followed by garden/lawn activities (CPA: 19%; BRFSS: 14%), and then conditioning activities (CPA: 9%; BRFSS: 11%). A higher proportion of CPA cancer survivors reported at least one activity (87%) compared to the national sample of Americans (66%). Compared to the national sample, CPA cancer survivors were 1.5 times more likely to report walking (OR=1.51; 99.5% CI: 1.16-1.97), 1.4 times more likely to report garden/lawn activities (OR=1.43; 99.5% CI:1.03-1.97), 1.7 times more likely to report household activities (OR=1.67; 99.5% CI:1.06-2.61), and 3.8 times more likely to report fishing/hunting (OR=3.79; 99.5% CI: 1.38-10.46). No significant effect modification by sex was found.
CONCLUSIONS: In general, CPA cancer survivors were more likely to report participating in at least one PA. Programs aimed to increase PA among CPA cancer survivors may want to focus on walking, domestic activities such as household and garden/lawn activities, as well as outdoor activities such as fishing and hunting.

1280　　Board #88　　　　　May 31 9:00 AM - 10:30 AM

Associations of Body Fatness and Cardiorespiratory Fitness on Central Blood Pressure in Older Adults

Markus H. Flynn, Nathan F. Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-Chul Lee, FACSM)
(No relevant relationships reported)

Purpose: To investigate the associations of percent body fat (PBF) and cardiorespiratory fitness (CRF) on central blood pressure (BP), which is suggested as a greater predictor of cardiovascular disease (CVD) than peripheral BP and more closely related to CVD risk factors.
Methods: This cross-sectional study included 302 older adults aged ≥65 years (mean age 72) from the Physical Activity and Aging Study (PAAS). PBF was assessed via a DXA scan and divided into sex-specific quartiles. CRF was evaluated by a 400-meter walk test and divided into sex-specific quartiles based on completion time in minutes. Central BP was analyzed using an Uscom BP+ (Uscom Ltd., Australia). Elevated central BP was defined as sex-specific, central systolic or diastolic BP above the 75th percentile in this sample. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) of having an elevated central BP across PBF and CRF.
Results: In this study, 106 older adults (34.9%) had elevated central BP. Compared to the lowest PBF quartile 1 (lowest 25%), ORs (95% CIs) of having an elevated central BP in the next quartiles 2, 3, and 4 were 1.79 (0.81-3.94), 2.86 (1.31-6.23) and 4.23 (1.85-9.70), respectively, after adjusting for age, sex, blood pressure medication usage, current smoking status, and CRF. However, CRF was not significantly associated with an elevated central BP after adjusting for the previously listed confounders and PBF (trend P=0.21). In the stratified analyses by CRF, we found that higher PBF was associated with increased prevalence of elevated central BP in both lower CRF (lower 50%) (trend P<0.01) and higher CRF (upper 50%) halves (trend P=0.02).
Conclusion: These results suggest that higher PBF, independent of CRF, is associated with an increased prevalence of elevated central BP in older adults. However, further prospective studies are warranted.

1281　　Board #89　　　　　May 31 9:00 AM - 10:30 AM

Predictors of Diagnostic Variables of Sarcopenia in Older Adults

Nathan Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)
(No relevant relationships reported)

Purpose: To investigate potential predictors of diagnostic variables of sarcopenia in older adults including demographic factors (e.g., age and sex), aerobic and resistance physical activity (PA), cardiorespiratory fitness (CRF), and body composition.
Methods: This cross-sectional study included 304 older adults ≥65 years (mean age 73, range 65-95). PA and sedentary variables were assessed using a self-report survey and daily steps using an accelerometer based pedometer (Omron HJ-321). CRF was the time to complete a 400m walk in minutes, thus higher number in minutes indicates a slower walking, which is a lower level of CRF. Body composition was percentage body fat (%BF) measured by DXA and body mass index (BMI). Diagnostic variables of sarcopenia include appendicular lean mass (ALM) (kg/height in meter^2) measured by DXA, handgrip strength (kg), and gait speed (m/s) from 4 meter walk test. **Results:** Univariate regression revealed significant relationships between ALM and CRF (p=0.012), light intensity (1.5-3.0 METs) aerobic PA (p<0.001), vigorous intensity (≥6.0 METs) aerobic PA (p=0.008), age (p<0.001), male sex (p<0.001), and %BF (p<0.001). Handgrip strength was related to CRF (p<0.0001), light intensity aerobic PA (p=0.002), vigorous intensity aerobic PA (p=0.002), resistance PA (p=0.031), age (p<0.001), male sex (p<0.001), and %BF (p<0.001). Gait speed was related to CRF (p<0.0001), daily steps (p=0.003), age (p<0.0001), and %BF (p=0.018). Stepwise variable selection (p<0.2 to enter the model, p<0.05 to remain in the model) was used to find significant predictors of diagnostic variables of sarcopenia. ALM was predicted by CRF (β=-0.15, p<0.001), %BF (β=-0.12, p<0.001), BMI (β=0.25, p<0.001), and male sex (β=0.29, p<0.001) (model R^2=0.93); grip strength was predicted by CRF (β=-2.50, p<0.001), age (β=-0.26, p<0.001), and male sex (β=14.6, p<0.001) (model R^2=0.63); and gait speed was predicted by CRF (β=-0.11, p<0.001) (model R^2=0.24).
Conclusion: Cardiorespiratory fitness, measured by a simple 400m walk test, was identified as a significant predictor of all three diagnostic variables of sarcopenia in older adults.

1282　　Board #90　　　　　May 31 9:00 AM - 10:30 AM

The Difference of Body Composition According to Smart Phone Proficiency in Korean Elderly

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(No relevant relationships reported)

Purpose : Previous studies have shown associations of sedentary behavior with biomarkers of cardiometabolic risk, however the relationship between the proficiency of smart phone usage and obesity has not yet been studied. We examined the difference of body mass index (BMI) according to smart phone proficiency in the elderly.
Method : Experimental subjects included 101 elderly (50 male, 51 female) over the age of 60 who participated the local senior education program at several senior welfare service centers in Seoul, South Korea. They were divided into three groups according to proficiency of smart phone usage. Fitness characteristics related to smart phone usage were evaluated by measuring cardiorespiratory endurance, grip strength, pinch strength, eye-hand coordination and body composition. Also, smart phone proficiency was evaluated by a self-reported questionnaire and a smart phone usability task that composed of two categories: usage of the smartphone device itself and usage of phone applications. The differences in BMI of the subjects was analyzed by ANCOVA adjusting for independent variables including age, grip and pinch strength, eye-hand coordination, education and incomes. **Results** : There was a significant difference in BMI among the three groups after adjustment of age, grip and pinch strength, eye-hand coordination, education and incomes. The self-reported questionnaire showed a significant difference in BMI between high proficiency and low proficiency groups (high 25.07±2.51, low 23.52±2.19; p=.015). Smart phone usability task results also showed a significant difference in BMI among the three groups (high 25±2.64, low 23.08±2.59; p=.002 and high 25±2.64, middle 23.7±1.61; p=.011). **Conclusions** : These results suggest that high smart phone proficiency shows increased BMI in the elderly. This study suggests that people over 60 who have high smartphone proficiency should be cautious of an increased BMI score.

1283   Board #91   May 31 9:00 AM - 10:30 AM
Associations of Cardiorespiratory Fitness and Percent Body Fat with Health-Related Quality of Life in Elderly
Heather Danzer, Nathan Meier, Duck-chul Lee, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)
(No relevant relationships reported)

Purpose: To investigate the cross-sectional associations of cardiorespiratory fitness (CRF) and percent body fat (PBF) with Health-Related Quality of Life (HRQoL) in older adults.
Methods: Participants comprised 282 older adults aged ≥65 years (mean age 74) from the Physical Activity and Aging Study (PAAS). CRF was assessed by time in minutes to complete a 400-meter walk, and PBF was assessed by Dual-energy X-ray absorptiometry (DXA) and categorized into sex-specific quartiles for each CRF and PBF. HRQoL was assessed by the 36-Items Short Form Health Survey (SF-36) and categorized based on physical component scores (PCS) including physical health, physical role, bodily pain, and general health dimensions and mental component scores (MCS) including vitality, social functioning, emotional role, and emotional health dimensions. Average score below 50 (range 0-100) was used to define both low PCS and low MCS, indicating lower HRQoL, based on the population mean score of 50. However, due to having limited cases (n=20) for both low MCS and low PCS groups were combined into one overall HRQoL for analysis. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) of having a low overall HRQoL across CRF and PBF quartiles.
Results: Compared to the lowest CRF quartile 1 (lowest 25%), ORs (95% CIs) of having a low overall HRQoL in the next higher CRF quartiles 2, 3, and 4 were 0.29 (0.08, 1.01), 0.16 (0.03, 0.85), and 0.14 (0.02, 0.85), respectively, after adjusting for age, sex, smoking, alcohol intake, physical activity, and PBF (trend p=0.01). This result indicates that the two higher CRF levels (quartiles 3 & 4) are significantly associated with lower odds of having a low level of HRQoL, suggesting better overall HRQoL. However, PBF was not significantly associated with overall HRQoL after adjusting for the confounding including CRF in this study population (trend P=0.24). In the stratified analysis by PBF, although not significant due to further reduced number of cases, similar trends were observed for both low (lower 50%, lean) and high (upper 50%, fat) PBF groups.
Conclusion: This study suggests that higher CRF, independent of PBF, is associated with better HRQoL in older adults. However further exploration from prospective studies are needed.

C-38   Free Communication/Poster - Nutrition Status and Assessment
Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1284   Board #92   May 31 8:00 AM - 9:30 AM
Preschool Breakfast Menus That Meet Dietary Guidelines: Comparing What Is Served And Consumed By Children
Stacie M. Kirk, Erik P. Kirk, FACSM. *Southern Illinois University Edwardsville, Edwardsville, IL.*
(No relevant relationships reported)

Preschool menus must meet the Dietary Guidelines for Americans. However, what is actually served and consumed by children is not restricted, potentially affecting consumption of a balanced diet. **PURPOSE:** Compare preschool breakfast menus meeting dietary guidelines to what is actually served and consumed by children. **METHODS:** Fifty-two preschool children (mean±SD, age 3y and 10m ± 8m) from a university early childhood center participated in the 10-week study. Each day, 15 children were randomly selected for nutritional analysis of their breakfast. Prior to and immediately after consumption, a picture of the child's tray was taken using digital photography. If a child had additional servings, additional pictures were taken. Analysis of energy and nutrient content for menus, food served, and food consumed was completed using Food Processor Nutrition Analysis by ESHA. Food color (white, brown, orange, yellow, red, green, other) was determined by observation during analysis. A food preference survey was administered verbally to children immediately after each meal. **RESULTS:** There was a significant (p<0.05) difference for total kilocalories (kcals) between menu (356 ± 117), served (330 ± 157) and consumed (184 ± 136). There was a significant (p<0.05) difference for grams of carbohydrate between menu (59.0 ± 17.6g) and served (54.2± 29.5g) compared to what was consumed (29.0 ± 19.6g). There was a significant (p<0.05) difference for grams of fat between menu (9.3 ± 6.8g), served (8.6 ± 8.1 g) and consumed (5.1 ± 7.2g). There was a significant (p<0.05) difference for protein between menu (11.7 ± 3.3g), served (11.2 ± 6.6g) and consumed (6.7 ± 6.6g). The majority of food served was white (47.7%), brown (18.7%), or orange (14.8%) with minimal yellow (8.8%), red (7.0%) or green (0.0%)

foods. Children described food as yummy (77.0%), okay (9.4%), and yucky (13.6%). Consumption of vegetables (0.0%) was significantly (p<0.05) lower than dairy (79.9%), fruits (66.1%), grains (70.8%), and meats (70.4%). Children consumed a high percentage (50.0%) of fats/sweets. **CONCLUSION:** The amount of food consumed at breakfast was significantly less than was indicated on the menu and amounts served, indicating that children were not meeting the dietary recommendations as intended, potentially contributing to long-term health consequences.

1285   Board #93   May 31 8:00 AM - 9:30 AM
Risk Behaviors, Energy Balance and Physical Activity of University Students of a Nutrition School
Eduardo Gómez-Infante[1], Oswaldo Ceballos-Gurrola[2], María Cristina Enriquez-Reyna[2]. *[1]Universidad Estatal de Sonora, Hermosillo, Mexico. [2]Universidad Autónoma de Nuevo León, San Nicolás de los Garza, Mexico.*
(No relevant relationships reported)

The development of chronic noncommunicable diseases during youth could affect the performance and professional achievements of university students. Differences in consumption of alcohol or tobacco, energy balance and physical activity levels may have an influencing effect in the levels of obesity that affect Mexico. **PURPOSE**: To analyze the differences regarding the consumption of alcohol or tobacco in the relationship between energy balance and the physical activity level among students of a Nutrition School.
METHODS: In this study, we engaged a group of 380 university students from a Nutrition School (292 female). Habitual behaviors including consumption of alcohol and/or tabacco, 24-hour reminder, energy balance (caloric-nutritional consumption between energy expenditure) and physical activity level (International Physical Activity Questionnaire) were measured.
RESULTS: No differences were found between the energy balance and the physical activity level in men. In the whole sample alcohol consumption ($OR = 1.215$, IC $95\% = .721 - 2.045$) was associated with increased risk of low physical activity level (<600 METs). In participants who consumed alcohol a negative association was found between energy balance and the physical activity level ($r = -.132$, $p < .05$), with greater values for women ($r = -.184$, $p <. 05$). Women who consumed tobacco showed a tendency to decrease their level of physical activity ($r = -195$, $p < .05$).
CONCLUSIONS: Alcohol and tobacco consumption affected the energy balance and the physical activity level of university students of a Nutrition School. Especially in women, these habits should be modified to prevent the development of diet-dependent diseases.

1286   Board #94   May 31 8:00 AM - 9:30 AM
Nutritional Status of Rock Climbers
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(No relevant relationships reported)

The physically intense nature of rock climbing requires that athletes maintain optimal nutrition to meet physical demands and minimize predisposition to injury. Although the sport of rock climbing has grown, limited research has been conducted on nutritional intake of these non-traditional athletes. **PURPOSE:** To quantify nutritional intake of rock climbers. **METHODS:** Following written informed consent, 3-day food recalls were obtained from 25 female and 15 male rock climbers [mean ± SD; age = 22.4 ± 3.2 yr; ht = 170.5 ± 10.4 cm; wt = 64.9 ± 8.9 kg; basal metabolic rate (BMR) = 2687.6 ± 354.6 kcals] to ascertain energy, macronutrient, and micronutrient intake. **RESULTS:** MANOVAs indicated a significant main effect between DRIs and rock climber nutrient intake by macronutrients ($F_{30,197} = 12.243$; $P < .0001$), vitamins ($F_{30,197} = 12.091$; $P < .0001$), and minerals ($F_{18,201} = 20.475$; $P < .0001$). Post hoc analyses indicated that female climbers were significantly lower in energy intake (1878.1 ± 542.9 vs. 2400.0 kcals; $P < .0001$), protein (77.1 ± 24.0 vs. 135.0 g; $P < .0001$), carbohydrates (240.8 ± 79.6 vs. 330.0 g; $P < .0001$), vitamin D (3.8 ± 5.0 vs. 15.0 μg; $P < .0001$), vitamin E (5.7 ± 4.0 vs. 15.0 mg; $P < .0001$), magnesium (219.7 ± 116.4 vs. 310.0 mg; $P = .002$), and potassium (1992.2 ± 803.1 vs. 4700.0 mg; $P < .0001$), but higher in sodium intake (2689.1 ± 933.9 vs. 1500.0 mg; $P < .0001$) than DRIs, respectively. Male climbers were significantly lower in energy intake (2124.8 ± 472.3 vs. 3000.0 kcals; $P < .0001$), protein (91.5 ± 23.0 vs. 169.0 g; $P < .0001$), carbohydrates (270.0 ± 76.5 vs. 413.0 g; $P < .0001$), fiber (27.6 ± 12.3 vs. 38.0 g; $P = .002$), unsaturated fat (55.0 ± 20.6 vs. 69.0 g; $P = .034$), saturated fat (22.4 ± 9.3 vs. 33.0 g; $P < .0001$), vitamin D (3.5 ± 3.8 vs. 15.0 μg; $P < .0001$), vitamin E (8.2 ± 64.0 vs. 15.0 mg; $P < .0001$), and potassium (2467.3 ± 910.7 vs. 4700.0 mg; $P < .0001$), but higher in vitamin C (139.2 ± 80.3 vs. 90.0 mg; $P = .021$), riboflavin (1.8 ± 0.9 vs. 1.3 mg; $P = .011$), niacin (20.9 ± 11.6 vs. 16.0 mg; $P = .021$), iron (16.2 ± 9.1 vs. 8.0 mg; $P = .009$), and sodium (2658.5 ± 684.0 vs. 1500.0 mg; $P < .0001$) than DRIs, respectively. **CONCLUSION:** Both gender differed significantly from nutritional recommendations. Given that energy and macronutrient intake are closely related to athletic performance, ensuring that optimal nutrition is achieved must be a priority.

1287   Board #95   May 31 8:00 AM - 9:30 AM

Nutrition and Energy Expenditure of Retired Professional Contact Sport Athletes and Non Contact Sport Controls

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(No relevant relationships reported)

Background: Chronic traumatic encephalopathy (CTE) is a neurodegenerative disorder suspected to be caused by repetitive mild traumatic brain injuries from playing contact sports. Other possible etiologies linked to brain health, nutrition, and general lifestyle have received far less attention. **Purpose:** To compare physical health, diet, and Exercise Energy Expenditure (EEE) of retired professional contact sport athletes and healthy non contact athlete controls. **Methods:** Participants completed an extensive battery of cognitive tests, were assessed on advanced imaging, and were evaluated for psychological and physical health. Participants completed the Yale Physical Activity Survey to determine EEE/physical activity and the Food Frequency Questionnaire to obtain a yearlong diet recall using Nutritionist Pro software. **Results:** Contact Athletes (n=21, 56 ± 11 yrs, 29.7 ± 3.6 kg/m^2) were significantly more overweight (n=21, 57 ± 9 yrs, 24.5 ± 2.6 kg/m^2, $p < 0.001$). Calculated kilocalorie intake was not significantly different, however, the total hours spent doing common types of physical activities was significantly lower in Contact Athletes (22.5 ± 18.7 hrs/wk vs 51.1 ± 15.0 hrs/wk, $p < 0.001$). No significant differences were seen in intake of macronutrients, but intake of many brain healthy micronutrients, including copper ($p = 0.019$), selenium ($p = 0.037$), folate ($p = 0.02$), manganese ($p = 0.002$), and riboflavin ($p = 0.047$) was significantly lower in Contact Athletes. **Conclusion:** Although retired professional contact sport athletes have similar energy intake as controls, they spend less time doing physical activities per week and consume a diet deficient in some brain healthy nutrients. This may relate to the greater degree of being overweight in the former Contact Athletes. Nutritional and cardiovascular factors should be considered in the evaluation of cognitive disorders in former contact sport athletes.

1288   Board #96   May 31 8:00 AM - 9:30 AM

Nutritional Habits And Body Composition Assessment In International Soccer Referees

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(No relevant relationships reported)

PURPOSE: Soccer referee has responsibility to verify and enforce the rules of the game and control players' behavior during matches. In order to be able to directing a football game, to have a good decision-making ability and to be close to the action the referee must be in optimal physical condition. Physical demands and nutrition are highly interrelated: the study of body composition is a method for assessing the balance between these two aspects closely related to sport performance. The aim of the present study was to evaluate nutritional habits and resulting body composition in international soccer referees called for the FIFA World Cup 2018. **METHODS:** 60 soccer referees (SR) (39.2 ± 4.2 years) were enroll in this study. The variables of body mass, height, skinfold thicknesses, body circumferences (waist, hip and biceps) were collected with the purpose of estimating Sum of 7 skinfold thicknesses ($\sum$7sk), Fat Mass (FM %), Fat Mass, Fat Mass index (FMI kg/m^2). The skinfold thickness are been evaluated with International Society for the Advancement of Kinanthropometry methodology. For the evaluation of nutritional habits (NH), athletes answered a 24 h food recall. The variables of carbohydrates (CHO), protein (PRO) and fat (FAT) are expressed in % and g/kg. Micronutrients in terms of vitamins and minerals are been collected. The data are been compared with the international guidelines. **RESULTS:** The data collected regarding the body composition describe a normal weight population (BMI = 23.3 ± 1.5 kg/m^2), but with a FM% of 11.4 ± 2.5 and a FMI of 4.9 ± 1.3 kg/m^2 above the normal range. The $\sum$7sk was 63.7 ± 17.3 mm. About NH we observed: -CHO 44.6 %, 3.1 g/kg; -PRO 16.5 %, 1.1 g/kg; -FAT 41.4 %, 1.3 g/kg; The minerals below the normal range was Calcium (661.8 ± 187.3 mg/die), Zinc (10.3 ± 2.5 mg/die), Magnesium (295.6 ± 81.8 mg/die) Iodine (21.2 ± 9.3 µg/die). The vitamins below the normal range was Folic Acid (381.0 ± 118.4 µg/die) and Vitamin A (1282.4 ± 484.1 UI/die). **CONCLUSIONS:** NH are inadequate for this category, CHO and PRO are below and the FAT above the international guidelines. These data suggested that nutritional intervention would be appropriate. Therefore, the nutritional habits must be adapted to their daily physical activities, during match refereeing, to obtain better performance.

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Examination of Female Athlete Triad Components in a College Dance Company

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(No relevant relationships reported)

Dancers are at an increased risk for the female athlete triad (Triad) due to the discipline required in dance training and the importance placed on aesthetic appearance. Subjective judging and body size expectations may promote restrictive eating behaviors, which can lead to menstrual disturbances and poor bone mineral density (BMD). **PURPOSE:** To examine the prevalence of: (1) Triad components in collegiate, female dancers, and (2) low energy availability (LEA) in collegiate, female dancers with or without disordered eating. **METHODS:** A cross-sectional cohort study examined dancers (n=26) in a collegiate dance company (height: 165 ± 6.9 cm; weight: 56.41 ± 7.0 kg). Dependent variables for this study included Triad risk (e.g. LEA with or without eating disorder (ED), menstrual dysfunction, and low BMD). Participants completed a demographic survey, menstrual cycle questionnaire, Eating Disorder Inventory-3, ED symptoms checklist, a 7 day online dietary and exercise log, and were measured for height, weight, DXA scan (BMD), and resting metabolic rate (RMR) through indirect calorimetry (MedGem). Exercise energy expenditure (EEE) was calculated using Ainsworth equation and energy availability (EA) was calculated by EA= ((EI-EEE)/fat free mass). **RESULTS:** Overall, 73.0% of dancers were at risk for the Triad [1 component (69.2%); 2 components (3.8%)]. Most dancers were at risk for LEA (69.2%), with 61.5% of dancers with LEA and ED risk combined. Menstrual dysfunction lasting greater than 6 months was present in 7.7% of the dancers, and no low BMD was present in any participants. Overall, 88.5% of dancers displayed ED Risks (risk by EDI-3 and/or EDI SC). Energy assessment included: RMR = 1155.8 ± 206.5 kcal/day; energy intake (EI) = 1473.9 ± 321.5 kcal/day; EEE = 884.7 ± 324.9 kcal/day, and EA = 22.3 ± 19.4 kcals/kg^{-1}FFM/day. Average bone mineral density Z-score was $1.15 \pm .76$. **CONCLUSIONS:** Almost 75% of the dancers were at risk for 1 component of the Triad. Specifically, LEA with ED risk was the most common Triad component displayed in this collegiate dance population. Overall, collegiate dancers are a high-risk population not only for the Triad, but also for ED risk. Early recognition is key and qualified healthcare professionals should be accessible for these populations to integrate prevention and intervention strategies.

1290   Board #98   May 31 8:00 AM - 9:30 AM

Examination of Female Athlete Triad Components in College Softball Athletes

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(No relevant relationships reported)

Softball athletes are commonly overlooked when examining the Female Athlete Triad (Triad - low energy availability [LEA], menstrual cycle dysfunction [MCD], and low bone mineral density [BMD]) and eating disorder risk (ED). However, they engage in lengthy practices/games and anecdotally have poor eating habits and weight management issues which in turn may put them at risk. **PURPOSE:** Estimate the prevalence of Triad components in collegiate softball athletes. A secondary purpose is to examine LEA with or without ED. **METHODS:** Female NCAA Division I Softball athletes (n = 17; age 19.6 ± 1.1; height 168.6 ± 5.2 cm; weight 72.5 ± 11.23 kg) participated in this cross-sectional study. Participants completed demographic survey (age, academic status, etc.), Eating Disorder Inventory-3 (EDI-3), EDI-3 symptom checklist and menstrual cycle questionnaire. Each participant completed a DXA scan to examine BMD and completed a 7-day online dietary and exercise log. Ainsworth equation calculated exercise energy expenditure (EEE), and energy availability (EA) was calculated by EA= ((EI-EEE)/FFM). **RESULTS:** All collegiate softball athletes (n=17) were at a high risk for LEA with EA below 30 kcal/kg FFM/day for 6 of 7 days and 70.6% having LEA for 7 of 7 days of the study. Additionally, 82.3% (n = 14) were at risk for LEA with ED behaviors. None of the participants were at risk for low BMD (3.28 ± 0.9); however 29.4% (n = 5) of the participants were at risk for amenorrhea and LEA. Energy needs revealed: RMR 1874 ± 276.9 kcal, EI was 1338 ± 313.5 kcals and EEE 811 ± 130.5 kcals, and EA 7.8 ± 6.4 kcals^{-1}kg^{-1}FFM. Eating Disorder behaviors consisted of 47.1% dieting, 17.6% binge eating, 5.9% purging, 11.8% diet pills, and 47.1% used exercise to control weight 25-50% of the time. Additionally, 82.3% were at risk for EDs. **CONCLUSIONS:** Overall softball athletes are indeed at risk for at least 1-2 Triad components, more specifically LEA with ED risk behaviors and LEA with menstrual dysfunction. Education on energy needs specific for their sport demands may be beneficial for long term health and overall performance. Additional prevention and intervention strategies to decrease the risk for EDs is warranted in collegiate softball athletes.:

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Pre-competition Weight Loss Strategies To Achieve The Desired Category Weight In Combat Sports Collegiate Athletes

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(No relevant relationships reported)

PURPOSE: To describe the proportion of college combat athletes that follow some dietary and non-dietary strategies to loss body weight before a competition.
METHODS: We evaluated 80 college athletes (21.1 ±2.7 y; 51 males, 29 females) from different combat sports (wrestling 23, boxing 7, judo 21, karate 14, and taekwondo 15; 77.5% of the sample had competitions at national level and 21.3% at international level). We applied a questionnaire to account for some of the followed dietary and non-dietary strategies to achieve the desired competition weight three months before a state tournament. The questionnaire consisted of 35 items. The questions asked the subject if he/she usually perform that strategy for pre-competition weight loss. Also, the questionnaire asked the subjects about if they showed some of the most common side effects of weight loss. The results were reported as frequencies and proportions.
RESULTS: The most common dietary strategies for pre-competition weight loss were to reduce or avoid the consumption of fats and flours and sugars (Table 1). On the other hand, the most common non-dietary strategies to pre-competition weight loss were increasing physical activity and using sauna (Table 1). The most common side effect related to pre-competition weight loss was overall fatigue (39, 48.8%), followed by low performance in trainings (30, 37.5%), susceptibility to diseases (29, 36.3%) and irritability or aggressiveness (27, 33.8%).
CONCLUSIONS: The reduction of fat consumption and the increase of physical activity were the most common strategies for pre-competition weight loss. Some extreme strategies were also reported but not as common. Some of the mechanisms of these strategies may be related to the side effects of weight loss and not just for the weight loss itself. A comparison by sex and by type of sports deserves further analysis.

Table 1. Proportion of dietary and non-dietary strategies for pre-competition weight loss		
Dietary strategies	(n=80)	(%)
Reduce the amount of food consumed	41	51.3
Reduce water and beverages consumption	30	37.5
Increase physical activity and reduce consumption of food and beverages	38	47.5
Reduce or avoid fat consumption	69	86.3
Reduce or avoid flours and sugars consumption	63	78.8
Reduce or avoid animal source foods consumption	13	16.3
Reduce or avoid dairy consumption	39	48.8
Non-dietary strategies		
Use of sauna	24	30
Use of laxatives	8	10
Use of diuretics	7	8.8
Induce vomiting	1	1.3
Increase physical activity	69	86.3

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Fulfillment Of The Daily Protein Intake Recommendations In College Athletes Compared By Sex

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(No relevant relationships reported)

PURPOSE: To compare by sex the proportion of college athletes that consume protein below, inside and above the recommended amount.
METHODS: We evaluated 341 athletes (192 males and 149 females) from different sports. Food intake was evaluated through a 24-hour reminder for a habitual training day. Afterwards, daily protein intake was estimated and then calculated for g/kg body weight. Afterwards, subjects were categorized into one of three categories according to their daily protein intake: below (<1.4 g/kg/day); inside (1.4 to 2.0 g/kg/day), and above (>2.0 g/kg/day) the recommended amount (as suggested by the International Society of Sports Nutrition). The results were counted and expressed as percentage of subjects at each category. The 95% confidence interval (CI) was calculated for each percentage. This analysis was performed in both male and female athletes and compared by sex
RESULTS: The general characteristics of the evaluated subjects for age, weight, height and BMI were 21.2 ± 2.1 y, 74.7 ± 14.1 kg, 176.2 ± 6.9 cm, 24.0 ± 3.8 kg/m^2 for males, and 20.6 ± 1.9 y, 61.5 ±11.2 kg, 163.4 ± 6.6 cm, 23.0 ± 3.7 kg/m^2 for females, respectively. We observed that the number of male athletes that consumed protein below and inside the recommended amount was the same (61 subjects each; 31.8%, CI 25.2 - 38.5), and the remaining 70 subjects (36.4%, CI 29.5 - 42.3) consumed above the recommended amount of protein. Similarly, the majority of the female athletes consumed above the recommended protein amount (55 subjects; 36.9%, CI 29.1 - 44.7), followed for those who ingested below (53 subjects; 35.6%, CI 27.8 - 43.4) and inside (41 subjects; 27.5%, CI 20.2 - 34.8) the recommended amount. There were no significant differences by sex (p >0.05).
CONCLUSIONS: The proportion of athletes consuming protein below, inside and above the recommended amount were similar regardless of sex. Most of the male and female athletes consumed more than 2.0 g/kg/day.

1293   Board #101   May 31 8:00 AM - 9:30 AM

Adequacy Of The Nutritional Intake In Volleyball Male College Athletes After Receiving Nutritional Counseling

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(No relevant relationships reported)

PURPOSE: To compare the adequacy of nutritional intake in male volleyball athletes after receiving nutritional counseling for two different training sessions.
METHODS: 13 volleyball male college athletes were enrolled. The athletes carried out a training plan which was based on training volleyball only (VO) 4 days/week and volleyball plus resistance training (VR) 2 days/week for 12 weeks. Athletes received nutritional plans according to the nutritional requirements for both VO and VR. We evaluated their food intake with a 24-h dietary recall. This evaluation was performed three times for each training day. The days evaluated were randomly selected during the study. The mean intake for each training type was calculated and compared with the indicated nutritional plan to calculate the % of adequacy. Data were reported as median, minimum - maximum, and compared between training types.
RESULTS: Only 7 athletes completed the study. It was observed that the athletes were closer to 100% of the total energy (ENG) requirement on VO (112.6%, 88.9-140.4) compared to VR (130.4%, 108.4-157.3), although there wasn't a significant difference (p = 0.10). For carbohydrates (CHO), the days of VO were closer to 100% (99.5%, 76.1-123.9) while in VR they were above (110.9%, 85.3-185.3), but not significanlyt different (p = 0.29). Otherwise, the protein intake (PRO) was adequate on VR (103.4%, 63.2-133.8) compared to VO (81.1%, 58.4-108.7) which were below the indicated and different compared with VR (p = 0.01). Fat intake were well above the indicated amount for both training types, nonetheless there was a significant difference (p = 0.01) between the days of VO (200.9%, 132-293.3), which were closer to the indicated plan than the VR days (280.2%, 176-354.7) (Figure 1).
CONCLUSIONS: In this study, subjects showed better adequacy to the indicated plan for protein intake on VR days, the opposite was true for fat intake. Similar adequacy was observed for carbohydrate and energy regardless of the day.
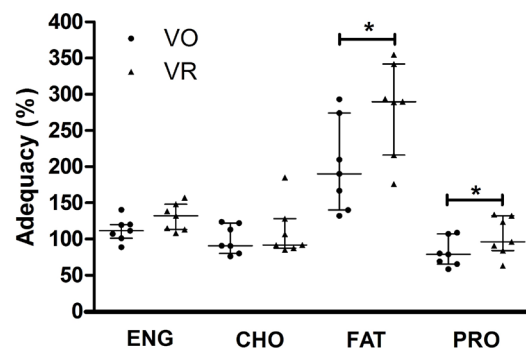
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Comparison Of Blood Markers In College Athletes With Different Protein Intake

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(No relevant relationships reported)

PURPOSE: To compare the concentration of several blood markers between different absolute and relative protein intake groups by sex in college athletes.
METHODS: We evaluated 248 athletes (138 men [21 ± 3 y, 74 ± 14 kg, 176 ± 7 cm], 110 women [21 ± 2 y, 62 ± 12 kg, 164 ± 7 cm]) that competed at national level. We estimated the protein intake by a 24-hour reminder of a habitual training day. Subsequently the ingestion of absolute (g/day) and relative (g/kg/day) protein of each athlete was estimated. Then, the sample was divided by sex and by quartiles (Q) of protein intake (absolute and relative). In addition, blood chemistry was performed to evaluate uric acid, urea, creatinine, cholesterol, and triacylglycerides, which were compared between protein Q. We only analyzed the data of subjects who had the 24-hour reminder and their blood chemistry within a period of no more than 30 days difference.
RESULTS: The concentrations in creatinine, urea, uric acid and cholesterol in males showed no significant differences between absolute protein intake Q. However, there was a trend (p = 0.10) for differences on triacylglycerides concentration between Q2 and Q4 of absolute protein intake. No blood marker showed significant differences between Q of relative protein intake. In the case of females, no blood marker had a significant difference between Q of absolute protein intake. Similarly, there were no significant differences in the concentration of creatinine, uric acid, triacylglycerides and cholesterol among Q of relative protein intake. However, there was a significant difference (p=0.04) in urea concentrations between Q2 and Q4 of relative protein intake. All the mean concentrations fell within the normal ranges.
CONCLUSIONS: In this study, no significant differences were found in blood markers among both male and femlae college athletes who consumed more protein than those consuming less. However urea may differ with different protein intake amounts in female athletes.

Table 1. Blood markers according to different protein intake levels by sex								
	Q1		Q2		Q3		Q4	
	g/day	g/kg/day	g/day	g/kg/day	g/day	g/kg/day	g/day	g/kg/day
Males (n 34 per Q)								
Creatinine	0.97 ±0.20	0.99 ±0.19	1.04 ±0.18	1.0 ±0.16	1.01 ±0.16	1.04 ±0.21	0.99 ±0.24	1.0 ±0.21
Urea	21 ±3	29 ±4	29 ±2	29 ±2	28 ±3	29 ±4	29 ±4	28 ±3
Uric acid	4.7 ±1.3	4.6 ±1.1	4.6 ±1.1	4.7 ±1.2	4.2 ±1.0	4.3 ±1.2	4.6 ±1.0	4.5 ±1.0
Triacylglycerides	79 ±31	82 ±33	70 ±26	75 ±31	76 ±24	79 ±30	97 ±47	87 ±42
Cholesterol	170 ±27	171 ±25	164 ±21	159 ±22	163 ±28	167 ±34	169 ±32	168 ±26
Females (n 27 per Q)								
Creatinine	0.87 ±0.20	0.88 ±0.20	0.91 ±0.17	0.90 ±0.17	0.94 ±0.21	0.89 ±0.19	0.93 ±0.18	1.00 ±0.18
Urea	27 ±4	28 ±4	27 ±3	26 ±3	27 ±4	27 ±3	28 ±2	29 ±3
Uric acid	4.0 ±1.2	3.9 ±1.2	3.7 ±0.9	3.7 ±0.9	4.1 ±1.2	4.1 ±1.0	4.4 ±1.2	4.4 ±1.3
Triacylglycerides	76 ±39	79 ±37	70 ±25	66 ±26	69 ±30	69 ±23	81 ±31	83 ±37
Cholesterol	163 ±22	166 ±21	167 ±21	164 ±28	168 ±30	164 ±27	162 ±26	166 ±25

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Blood Markers In College Athletes According To Their Vegetable/Animal Protein Intake Rate

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(No relevant relationships reported)

PURPOSE: To compare the blood markers of a group of college athletes with low vegetable/animal protein intake rate against a group of college athletes with high vegetable/animal protein intake rate.
METHODS: We included 141 college athletes (83 males; 58 females). We evaluated their total protein intake (vegetable and animal protein) with a 24-h dietary recall.

Their vegetable/animal protein intake rate was calculated and the sample was divided in tertiles adjusted by sex. We also evaluated cholesterol, triacylglycerides, glucose, uric acid, urea, and creatinine levels by blood samples. The blood markers were compared between the first (low vegetable/animal protein intake ratio, T1) and the third (high vegetable/animal protein intake ratio, T3) tertiles.
RESULTS: The absolute (151±82 g vs 106±4 g; p=0.03) and relative (2.1±1.0 g/kg vs 1.4±0.6 g/kg; p=0.02) protein intake was higher in males in the T1 than T3. The animal protein intake was higher in T1 than T3 (126±76 g vs 60±28 g; p=0.001), and vegetable protein intake was higher in T3 than T1 (24±14 g vs 48±17 g; p=0.001). There were no significant differences in the blood markers between males in T1 vs T3. In females, the absolute (140±51 g vs 63±2 g; p=0.001) and relative (2.2±1.0 g/kg vs 1.1±0.6 g/kg; p=0.001) protein intake was higher in T1 than T3. Similarly, the animal protein intake was higher in T1 than T3 (118±46 g vs 34±15 g; p=0.001), however, the vegetable protein intake was similar for both tertiles (T1 23±10 g vs T3 29±16 g; p=0.19). The creatinine blood concentration was significantly higher in T1 compared with T3, and there was a trend for difference in urea blood concentrations (table 1). All other blood markers did not show significant differences; and all markers were within normal values.
CONCLUSIONS: A low vegetable/animal protein intake rate may not affect the blood markers in male athletes. However, in female athletes it may be related with higher creatinine blood levels.

Table 1. Blood markers according to the vegetable/animal protein intake rate by sex.				
Sex	Blood marker	T1	T3	p
Males (n 28 per tertile)	Urea	29 ±4	28 ±3	0.35
	Uric acid	4.6 ±0.9	4.4 ±1.1	0.36
	Creatinine	1.01 ±0.21	0.97 ±0.16	0.42
	Triacylglycerides	94 ±44	81 ±34	0.30
	Cholesterol	159 ±33	167 ±31	0.36
	Glucose	73 ±10	72 ±9	0.79
Females (n 19 per tertile)	Urea	29 ±3	27 ±3	0.09
	Uric acid	4.5 ±1.4	3.8 ±1.2	0.12
	Creatinine	0.95 ±0.16	0.85 ±0.15	0.04
	Triacylglycerides	75 ±29	83 ±36	0.45
	Cholesterol	162 ±29	167 ±19	0.59
	Glucose	75 ±10	75 ±9	0.92

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Carbohydrate Intake in Mexican Soccer Players in Different Training Sessions

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PURPOSE: To investigate if carbohydrate intake in professional soccer players is the same during moderate and high intensity training and whether intake is within the recommended range established by the American College of Sports Medicine (ACSM) (30-60 g/h).
METHODS: A cross-sectional study was conducted in professional soccer players (17-37 years old) of four Mexican First Division teams (N=123) in which carbohydrate (CHO) intake in grams per hour was determined by drinking ad libitum a sports beverage with 6% of CHO or water, or any other source of CHO (gels, fruit) preferred by the player during moderate training intensity (CHI n=24, Wet Bulb Globe Temperature (WBGT) 23 ºC, humidity 51%, duration 100 min; RAYm n=25, WBGT 34ºC, humidity 42%, duration 80 min) and high intensity (SAN n=22, WBGT 32 ºC, humidity 41%, duration 125 min; XOL n= 25, WBGT 25ºC, humidity 13 %, duration 90 min; and RAYh n=27, WBGT 17ºC, humidity 69%, duration 80 min), determined by their coach. Moderate intensity versus high intensity CHO intake comparisons were analysed by Student's T test for independent samples.
RESULTS: CHO intake of soccer players in moderate intensity training was (mean ± SD) 17 ± 14 g/h and in high intensity was 14 ± 13 g/h. For moderate intensity training sessions, only 14% of the players met the CHO intake recommendations and for high intensity training sessions only 12% of the players met the recommendations When comparing moderate intensity versus high intensity between RAYm versus Rayh there was not significant difference in the ingestion of CHO (p>0.05).
CONCLUSIONS: Soccer is a high intensity intermittent sport that requires a large supply of energy from the glycolytic pathway; thus, CHO intake is important to have a constant fuel supply during training sessions with moderate to high intensity beyond 60 minutes and games. We observed that Mexican professional soccer players do not consume the minimum recommended CHO intake for moderate-high intensity

training exercise (30-60 g/h) as recommended by ACSM for exercise lasting 1-2 hours. Therefore, it is important to educate soccer players about the importance of consuming the recommended amount of CHO during training sessions and games.

1297   Board #105   May 31 8:00 AM - 9:30 AM
Omega-3 Index in Division I Collegiate American Football Athletes

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(No relevant relationships reported)

American football athletes are exposed to repetitive head impacts (RHI) that, even in the absence of a clinically discernible head injury, result in quantifiable neurological damage. Pre-clinical studies utilizing rodent models indicate that traumatic brain injuries (TBI) can cause a reduction in neuronal omega-3 fatty acids (n-3FAs), specifically docosahexaenoic acid (DHA). Pre-injury administration of n-3FAs, however, has shown to effectively allay the pathological response to TBI. Furthermore, one study has demonstrated the potential neuroprotective effect of DHA supplementation in American football athletes evidenced by a marked reduction in blood biomarkers of axonal injury. Given that the American diet is scarce in the n-3FAs DHA and eicosapentaenoic acid (EPA), the potential neuroprotective effect of n-3FA supplementation may uniquely benefit American football athletes. **PURPOSE:** This descriptive study sought to examine the omega-3 index, an indicator of n-3FA status, in American collegiate football athletes not supplementing with n-3FAs. **METHODS:** One hundred twelve (n = 112) athletes participated in this study. Blood was obtained via finger stick and collected on blood spot cards pre-treated with an antioxidant cocktail. The dried blood samples were analyzed by gas chromatography for fatty acid (FA) levels (expressed as a % of total blood FAs). A regression formula (r = 0.98) was used to estimate the percentage of DHA and EPA in red blood cell phospholipids (omega-3 index). **RESULTS:** Levels of DHA, EPA, and alpha-linolenic acid (ALA) were (mean ± SD) 2.27% ± 0.01% (range = 1.1% - 5.2%), 0.39% ± 0.00% (range = 0.2% - 1.2%) and 0.39% ± 0.00% (range = 0.1% - 1.0%), respectively. Mean omega-6 levels were 9.55 ± 1.72 (range = 4.5 - 13.9) times higher than n-3FAs levels. The mean omega-3 index was 4.35% ± 0.01% (range = 2.8% - 8.0%). Sub-optimal n-3FA levels (i.e., an index < 8.0%) were observed in 99.12% of participants. **CONCLUSION:** These data suggest that dietary intake of the n-3FAs DHA and EPA may not be adequate in American collegiate football athletes. Though the current evidence relates n-3FA deficiency to an increased risk for cardiovascular risk, American football athletes may derive neuroprotective benefit from n-3FA supplementation with little to no risk.

1298   Board #106   May 31 8:00 AM - 9:30 AM
Association between Leptin and Measures of Bone Density and Lean Mass in Long Distance Runners

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(No relevant relationships reported)

Leptin levels have been associated with greater bone mineral content (BMC) and lean mass (LM) in women. **PURPOSE**: To explore the association of fasting leptin levels and BMC and LM in female collegiate long-distance runners.
METHODS: BMC (g) and LM (g) was determined via dual-energy X-ray absorptiometry in 10 female collegiate long-distance runners (age: 22.2 ± 3.3 years; weight: 53.2 ± 6.0 kg; height: 163.6 ± 8.4 cm) with a mean BMI of 19.8 ± 1.4 kg/m² within the same running team. Fasting leptin (ng/mL) was measured via enzyme-linked immunosorbent assay. Regression analyses with leptin and fat mass (g) as predictors and BMC and LM as outcomes were used to explore the association between leptin and BMC and LM.
RESULTS: Fasting leptin (3.39 ± 1.45 ng/mL) showed a statistically significant positive association with BMC (2079.57 ± 195.30g; r=0.89, p = 0.001) explaining 75% of the variance. Adding fat mass (10333.48 ± 1903.25 g) into the model increased the variance by 22%. The association between leptin and LM (39620.11 ± 5361.65 g) was also positive (r=0.87, p = 0.001) with LM explaining 77% of the variance. Adding fat mass as predictor did not change the model.
CONCLUSIONS: Leptin is directly associated with bone health and muscle mass showing the importance of leptin towards homeostasis of these two body tissues.

1299   Board #107   May 31 8:00 AM - 9:30 AM
Effects Of 6-week Resistance-type Exercise Training On Serum 25-hydroxyvitamin D Concentrations In Young Men

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(No relevant relationships reported)

Previous studies suggest that higher levels of physical activity is positively related to serum 25-hydroxyvitamin D [25(OH)D] concentrations, regardless of the sun exposure duration. However, the response of 25(OH)D concentrations to resistance-type exercise training is unclear.
PURPOSE: To clarify whether there is a direct effect of a 6-week resistance-type exercise training on serum 25(OH)D concentrations in young men.
METHODS: Eighteen young men were randomized into a no-exercise control group (n=9; 26.7 ±2.1 years; body mass index (BMI) =22.4 ±0.7 kg/m²) and a resistance-type exercise training group (supervised resistance-type exercise training was performed 3 times/wk for a 6-wk period from March to April; n=9; 24.4 ±1.1 years; BMI =22.9 ±1.0 kg/m²). Serum 25(OH)D concentrations and iPTH were assessed using commercial ELISA kits. Lean body mass and percent body fat were determined by dual energy X-ray absorptiometry (DXA). Muscle strength was assessed regularly by 1-repetition maximum strength testing. Physical activity (PA) was assessed using an ActiGraph GT3X triaxial accelerometer and quantified as time spent in moderate- and vigorous physical activity (MVPA). Two-way repeated measures ANOVA was used to detect time, group, or time x group interaction effects.
RESULTS: Serum 25(OH)D concentrations were unchanged after 6-week resistance-type exercise training (Pre: 27.8±2.0 nmol/L, Post:31.0±2.2 nmol/L, P=0.65). But a significant increase was found in the no-exercise control group (Pre: 26.2±1.4 nmol/L, Post: 34.3±2.9 nmol/L, P < 0.05). After 6-week resistance-type exercise training, lean body mass and muscle strength was significantly increased (P<0.05), while percent body fat was not changed (P=0.06).
CONCLUSION: The present study indicates that 6-week resistance-type exercise training could inhibit the seasonal increase in serum 25(OH)D concentrations. Further research is needed to determine the underlying mechanisms explaining the negative effects of resistance-type exercise training on 25(OH)D concentration.

1300   Board #108   May 31 8:00 AM - 9:30 AM
Limited Knowledge about the Potential Chronic Effects of Excessive Iron Intake among College Distance Runners

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(No relevant relationships reported)

While distance runners' knowledge related to iron deficiency has been previously examined, knowledge of the potentially negative chronic effects of high iron intake has never been assessed. **PURPOSE**: To investigate college distance runners' knowledge concerning issues related to basic iron-related nutrition and chronically high iron intakes, as well as influences on the choice to supplement with iron. **METHODS**: Ninety-eight college distance runners (54 F; 44 M) were recruited from three Division I programs in the northeastern U.S. to participate in a 22-question, pen-and-paper questionnaire. The questionnaire examined respondents': 1) prior diagnosis of iron deficiency (yes/no); 2) knowledge of foods containing iron (100 points possible); 3) confidence in their ability to identify iron-rich foods (5-point Likert scale from no confidence to high confidence); 4) status for currently taking a multivitamin containing iron or standalone iron supplement (yes/no and mg consumed/day); 5) knowledge index of the positive and negative health and performance effects of iron (score range 0-24); and 6) whether or not a coach has ever recommended they take an iron supplement (yes/no). Descriptive statistics were used to describe the data. **RESULTS**: Only 29.6% of respondents reported an iron deficiency diagnosis at some point in life; however, 46.3% were taking either a standalone iron supplement or a multivitamin that contains iron. Of those supplementing with iron, 88.9% reported taking more than 45 mg/day, the tolerable upper limit. Approximately three-fourths (73.6%) of respondents reported moderate or high confidence in their ability to identify iron-rich foods; however, respondents' mean score on the iron knowledge index was 43/100 points. Respondents' mean score on the knowledge index of positive and negative health and performance effects of iron was only 7.5 out of 24 possible points. Finally, 52% of respondents reported that a coach has suggested iron supplementation at some point in their running career. **CONCLUSION**: College distance runners demonstrated limited knowledge about iron-rich foods as well as the potential negative chronic effects of high iron intake. Coaches may often be operating outside of their scope of practice by directly recommending iron supplementation to runners.

THURSDAY, MAY 31, 2018

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1301   Board #109   May 31 8:00 AM - 9:30 AM

Macronutrient And Supplementation Distribution Evaluation From Athletes Training For The Ironman Triathlon.

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(No relevant relationships reported)

PURPOSE: We aimed to evaluate the macronutrient and supplementation distribution of athletes training to an Ironman triathlon. **METHODS**: 13 athletes of both genders were training to the 2017 Florianópolis Ironman and were selected to be part of the study. We registered the complete food and supplements amount ingested during one day of long training (>5h). All records were calculated for calories and divided in 3 periods, before, during and after the training session (and the rest of the day). We calculated total caloric ingestion and the macronutrient distribution was relativized to each athlete body weight. **RESULTS**: Before: All athletes had most of the calories from carbohydrates, and in 77% of the athletes, protein ingestion was less than 15% of the ingested amount for this period. During: 92% of the reports showed that carbohydrate was more than 70% of the ingested calories to this period. 85% of the athletes ingested up to 10% of protein and 61% up to 10% of lipids, and 23% of the athletes ingested 0 calories from lipids during the training session. After: Protein was heavily ingested after the training session when compared to the other periods, however the most prevailing nutrient of the period was still the carbohydrates. Total consumption: all athletes consumed more than 50kcal/kg of body weight, with most of the calories coming from carbs. Regarding the supplements, more than half of the evaluated group consumed palatinose before and/or during the training. Beta alanine, glutamine and BCAA were also reported by most of the group. **CONCLUSIONS**: Our study reassures carbohydrates as the most used energy source to endurance activities and puts in evidence the importance of nutritional advising in this kind of activity, since most of the athletes have had problems with feeding during the competitions, fact that reinforces the importance of training the intestine to tolerate a larger amount of carbohydrate during exercise.

1302   Board #110   May 31 8:00 AM - 9:30 AM

Comparison Of Dietary Habits Between Volunteer Firefighters And Non-firefighters

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(No relevant relationships reported)

As the global burden of cardiovascular disease (CVD) rises, public health-related interventions aimed at prevention have gained increased attention. Physicians and public health officials may be unaware that CVD or cardiac events are related to more than half of the line-of-duty deaths in firefighters (FF). Diet is one of the main modifiable CVD risk factors, yet poor diet and the risk factors it contributes to, including obesity, continue to be an issue as the prevalence of obesity is high in FF. Dietary patterns can also influence other risk factors like blood pressure, lipid levels, body composition and glucose metabolism. However, healthy diets are not always feasible for FF, due to the fast-paced unpredictable nature of work, and thus FF often rely on quick meals that may not be nutritiously optimal. Limited research has examined FF dietary intake and preferences. **PURPOSE:** To examine the dietary habits of local volunteer FF and compare these to adult non-FF in the area. **METHODS:** 76 adults (36 FF, 37.0 ±11 years, BMI 30.4 ±5.7 kg/m²; 40 non-FF, 30.6 ±11 years, BMI 28.3 ±5.7 kg/m²) were studied. All participants completed a 3-day dietary recall, and had height and weight measured. Three-day diet recalls were obtained from volunteer FF who attended dietary workshops in their firehouse and from non-FF adults in the area who were interested to find out their dietary habits. Data was analyzed using Diet Analysis Plus. **RESULTS:** Macronutrient composition of the diets were similar. The FF average diet was 2037.9 ±597.3 calories; including 34.8% fat, 46.0% carbohydrates, and 17.8% protein. The average diet for non-FF adults was 2185.7 ±405.9 calories; including 34.1% fat, 48.6% carbohydrates, and 17.8% protein. FF had significantly lower levels of vitamin B-6 (1.7 ±0.9 vs 2.3 ±1.2 mg), folate (498.3 ±253 vs 685.7 ±375 µg), and vitamin C (50.8 ±48.5 vs 111.9 ±87.8 mg) intake compared to non-FF, respectively, p<0.05. FF diets were lacking in several key micronutrients, including calcium (961.8 ± 410 mg), magnesium (227.1 ±138mg), potassium (2177.7 ± 1059 mg), and vitamin D (4.2 ±4.6 µg). For these, >90% of the FF diets did not meet recommended levels. **CONCLUSION:** These data suggests that volunteer FF exhibit deficiencies in several micronutrients and may benefit from diets that encourage increased consumption of fruits and vegetables.

1303   Board #111   May 31 8:00 AM - 9:30 AM

Effects of Recovery Nutrition on Body Composition and Session RPE in Collegiate Tennis Players

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(No relevant relationships reported)

Athletes often overlook the psychological and physiological importance of recovery nutrition in athletic performance. Little research has investigated the role of recovery nutrition on perceived exertion in college athletes. **Purpose:** To examine the perceived and physiological effects of regular, whole food, recovery nutrition on session rating of perceived exertion (RPE) and body composition in collegiate athletes. **Methods:** Female tennis players (n=8, age 20.1±1.4 years; weight 66.8±6.9 kg) volunteered for the 8-week study during their competitive season. Air displacement plethysmography was used to estimate fat mass (FM) and fat-free mass (FFM) at baseline, 4-week, and end of the 8-week intervention. Seven training sessions (60 min), consisting of high intensity strength and power exercises, were performed during each 4-week phase of the study. Athletes continued their normal pattern during the first 4-weeks (T1) and were provided with standardized recovery nutrition at the conclusion of each training session for the second 4-weeks (T2). RPE on a scale of 0-10 was reported immediately after each training session. Recovery nutrition consisted of a 3" red apple, 7" banana, 1.05 oz. peanut butter spread, and an 85g bagel or 99g gluten-free bagel. Nutritional composition for a standard snack bag was 680kcal, 106g carbohydrate, 17.8g protein, 24.7g fat, while a gluten-free snack bag totaled 740kcal, 107g carbohydrate, 18.8g protein, 31.7g fat. Participants were instructed to consume all foods within an hour of the training session. Repeated measures ANOVA was used to examine changes in session RPE and body composition over time. **Results:** There was a main effect of recovery nutrition on session RPE (p<0.001) with a lower RPE reported in T2 (3.53±1.24) than T1 (4.50±1.44). FM and FFM decreased 0.05kg and 0.28kg, respectively; however, changes were not significant (p>0.05). Athletes reported an increased quality of training with recovery nutrition. **Conclusions:** Four weeks of recovery nutrition resulted in a ~10% decrease in session RPE in female tennis players. Further, athletes perceived they trained harder during the sessions with recovery nutrition. Future research would be beneficial to determine the direct effects of recovery nutrition on performance.

1304   Board #112   May 31 8:00 AM - 9:30 AM

Does Exclusion of Trunk Region Improve Accuracy of DXA Lean Soft Tissue from Non-Fasted Assessments?

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(No relevant relationships reported)

PURPOSE Although body composition assessment ideally takes place after an overnight fast, this is not always possible. When assessed by dual-energy x-ray absorptiometry (DXA), the trunk region is most affected by acute food and fluid intake. Therefore, the purpose of this analysis was to determine if DXA appendicular lean soft tissue (ALST) and ALST-derived skeletal muscle mass (SMM) are less susceptible than total lean soft tissue (LST) to error introduced by acute food and fluid intake due to the exclusion of the trunk region. **METHODS** Forty-eight adults were assessed by whole-body DXA scans after an overnight fast and again the same afternoon following the consumption of a standardized diet (51 ± 37 min after food consumption). Body regions were manually specified by a single trained operator based on the NHANES Body Composition Procedures Manual. Whole-body LST and ALST were obtained from DXA output, and ALST-derived SMM was calculated using a validated equation. ALST, SMM and LST were analyzed using ANOVA with repeated measures, and metrics of reliability were calculated (constant error [CE], total error [TE] and 95% limits of agreement [LOA]). **RESULTS** Acute food and fluid consumption artificially increased the quantity of ALST (p<0.001), SMM (p=0.003) and LST (p<0.001). The changes were smaller for ALST (CE: 196 grams; 0.9% of mean) and SMM (CE: 222 grams; 0.9% of mean) than LST (CE: 755 grams; 1.6% of mean). However, TE relative to mean values was higher for ALST (2.7%) and SMM (2.7%) than LST (2.1%). The 95% LOA were similar for ALST (±1072 g), SMM (±1212 grams) and LST (±1277 grams), but were greater for ALST (5.0%) and SMM (5.0%) than LST (2.7%) when expressed relative to the mean. **CONCLUSIONS** Use of the ALST or ALST-derived SMM minimizes the systematic error (CE) associated with acute food and fluid ingestion as compared to total LST. However, due to greater variability in individual CEs, the TE is slightly higher for ALST and SMM than LST. This is likely due to the variability introduced when designating the appendicular and truncal regions, which appears to outweigh the error removed by exclusion of the trunk region. Although elimination of the trunk region is

theoretically appealing for non-fasted DXA assessments (i.e. ALST and SMM), it is apparently inferior to utilizing whole-body LST as indicated by the higher 95% LOA and TE.

1305   Board #113   May 31 8:00 AM - 9:30 AM

Food Intake And Fluid Balance Varies Between Individuals During A 120 Km Running Race

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(No relevant relationships reported)

Continuous data collection on fueling and food strategies of ultramarathoners during competition is scarce. Existing publications mostly report nutrient intake without much detail of fluid balance and foods consumed.
PURPOSE: To provide an overview of the consumption of carbohydrates and fluids, fluid balance and types of foods during a race comprising 10-14 hours of continuous exercise.
METHODS: Pre-race height, cm (Cescorf stadiometer) and pre- and post-race body weight, kg (Seca scale S760 mechanical) were measured. All food products were labeled and weighed (g) pre- and post-race (Cresta, CKS750). Continuous observation of food and beverage intake was performed as all runners were accompanied by a research team member on a bicycle using pre-defined lists and action cams (SJCAM, SJ4000) to record all items consumed. Fluid excretion collection was done using urine bags (Roadbag®). Results are expressed as mean±SD and range (min-max) or as percentage (%).
RESULTS: The average temperature was 7.0°C with a humidity of 67%. Five runners performed the 120 km run with an average duration of 12:19±1:29 hours (9:50-13:49). They reported 38±10 (25-48) food and beverage consumption events over the race which consisted of 4-7 different preferred food items per person. This resulted in an average carbohydrate intake of 44±19 g/h and fluid intake of 421±127 ml/h. Runners lost 2.5±1.6 kg (-0.2-3.8) of total weight during the race. The average urine excretion was 0.8±0.5 kg (0.3-1.4). This resulted in an estimated sweat loss of 6.6±2.3 kg (4.6-10.1) and four out of five runners reported a lower post-race body weight of 4±2% (0-6). During the first 60 km of the race the preferred foods and beverages were energy gels, water and sports drinks. After this, food preferences suggested a more mixed pattern including the use of cola, chocolate milk and fruit.
CONCLUSIONS: Runners consume, on average, fewer carbohydrates and fluids than recommended due to a high variability in intake. As urine excretion was relatively low, mostly a high sweat rate contributed to a lower post-race weight. Although non-specific sports nutrition foods and beverages were used, runners preferred the use of commercial sports nutrition products the most.

C-39   Free Communication/Poster - **Correlates and Behavioral Aspects of Physical Activity**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1306   Board #114   May 31 9:00 AM - 10:30 AM

Physical Activity, Sedentary Behavior and Sleep in Adolescents - Weekday and Weekend Patterns

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(No relevant relationships reported)

In adolescents sleep behavior differs markedly between weekdays and weekend days. The implications of this disparity for the associations among sleep, physical activity and sedentary behavior are unclear. **PURPOSE:** To determine if there are significant differences in physical activity and sedentary behavior between students who experience adequate vs. inadequate sleep, analyzing weekday and weekend data separately. **METHODS:** The School Sleep Habits Survey was used to measure total sleep time on weekends and weekdays. Sleeping ≥8 hours per night was considered adequate sleep (AS), while sleeping <8 hours was considered inadequate sleep (IS). Accelerometry was used to measure sedentary behavior (SB) and total physical activity (PA) on weekdays and weekends. SB was determined by the total minutes/day below 100 counts/minute, while PA was determined by the total minutes/day at, or above 100 counts/minute. The sample consisted of 261 9th grade adolescents. Over half were male (59%). A majority were African American (52%). Average weekday PA was compared between the AS group and the IS group using weekday sleep data. The same was done using weekday SB. Average weekend PA was compared between the AS group and the IS group using weekend sleep data. The same was done using weekend SB. T-tests were used to determine significant differences between groups. **RESULTS:** There were more students in the AS group (n = 156) than the IS group (n = 96) on weekends,

and more students in the IS group (n = 169) than the AS group (n = 92) on weekdays. There were no statistically significant differences between PA and SB levels by sleep group, on weekends and weekdays. **CONCLUSION:** Students who experienced adequate levels of sleep did not differ in their levels of PA from those who experienced inadequate sleep. This was the case on weekends and weekdays. Similarly, students who experienced adequate levels of sleep did not differ in their levels of SB from those who experienced inadequate sleep. This was also the case for weekends and weekdays.

1307   Board #115   May 31 9:00 AM - 10:30 AM

Social Cognitive Theory Role in Physical Activity Behavior and Health-Related Quality of Life in Parkinson's

Melinda S. Hill, PhD. *The Ohio State University, Columbus, OH.*
(Sponsor: Brian C. Focht, PhD, FACSM, CSCS, FACSM)
(No relevant relationships reported)

Parkinson's disease (PD) is a chronic neurodegenerative disease of the brain, characterized by motor symptoms-tremor, rigidity, bradykinesia, slowness/smallness, and postural instability-as well as non-motor symptoms including anxiety, depression, sleep disorders, and cognitive deficits. Physical activity (PA) may slow the progression of PD and improve the health-related quality of life (HRQoL) of patients. **PURPOSE:** This observational cross-sectional study examined correlates of lifestyle behaviors and health-related quality of life by analysis of the relationships between demographic, PA, and psychosocial variables in this population of 500 idiopathic PD patients. **METHODS:** Study aims included examining: the relationship of self-efficacy (SE), outcome expectations (OE), and self-regulation (SR) with PA and HRQoL; the relationship between PA and HRQoL; determination if social cognitive theory (SCT) constructs mediate the relationship between PA and HRQoL in Parkinson's patients. Statistical analysis included: descriptive statistics on all variables; bivariate correlations to determine the significance of relationships between SCT constructs, PA, and HRQoL using Pearson's correlations for scale level data and Spearman's correlations for ordinal data. Data analysis of primary study aims was conducted using multiple linear regression analysis. The indirect effects in the mediation model were analyzed using Dr. Andrew Hayes' PROCESS. **RESULTS:** Participants self-reported a mean of slightly over 200 minutes of moderate to vigorous physical activity (MVPA) per week. SE and SR were the most significant predictors of PA (p&lt.001). SE, OE, and SR were predictive of physical HRQoL (p&lt.001). To a smaller extent, SE, OE, and SR were predictive of mental HRQoL (p&lt.001). Results further indicated that SCT correlates mediated the relationship of PA and physical HRQoL (p=.0851). **CONCLUSIONS:** These results suggest self-selected participation based on a high interest in PA. Self-reported average weekly mMVPA was much higher than expected. Future studies should attempt to validate self-reported physical activity with some type of validated exercise measurement tool. These results suggest further consideration of SCT constructs in the design of interventions targeted to Parkinson's patients.

1308   Board #116   May 31 9:00 AM - 10:30 AM

Self-Selected Intensity of Four Different Modes of Aerobic Exercise in Sedentary Adults

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(No relevant relationships reported)

The prescription of self-selected intensity (SSI) exercise has shown promise as a method to increase physical activity and cardiorespiratory fitness. SSI allows control over the exercise stimulus, promotes positive affect, and is often an intensity known to induce health-fitness benefits.
PURPOSE: To compare SSI between Treadmill, Elliptical, Upright Cycle, and Recumbent Cycle exercise in sedentary adults (<90 min of aerobic activity per week). **METHODS**: Ten subjects (8 w, 2 m; 31 ± 10 yr, VO_2max: 33 ± 9 ml·kg^{-1}·min^{-1}) completed five submaximal exercise trials on separate days. The first four, one trial per mode completed in random order, were 30-min each: 5 min warm-up, 20 min SSI, 5-min cool-down. Oxygen consumption (VO_2; ParvoMedics) and heart rate (HR; Polar) were monitored continuously. Ratings of perceived exertion (RPE; OMNI Scale) and affective responses (AR; Feeling Scale) were collected every 5 min. The fifth trial was a submaximal graded treadmill test to predict VO_2max. The mean values from the 20-min SSI were compared between modes using repeated-measures ANOVA. Pairwise comparisons were performed using Bonferroni corrections for significant ANOVAs.
RESULTS: ANOVAs were significant for VO_2 ($F_{3,27}$=8.6, p<.05), %VO_2Reserve ($F_{3,27}$=7.8, p<.05), Kcal ($F_{3,27}$=9.7, p<.05), and HR ($F_{3,27}$=4.2, p<.05). For each, Elliptical was significantly greater than Recumbent Cycle (20.4 ± 5.3 vs 15.4 ± 3.6

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ml·kg⁻¹·min⁻¹; 58.5 ± 14 vs 41.3 ± 11 %VO₂Reserve; 218 ± 51 vs 160 ± 39 Kcal; 87.0 ± 7 vs 72.5 ± 9 %APMHR). Treadmill was also significantly greater than Recumbent Cycle for VO₂ (20.8 ± 6.4 ml·kg⁻¹·min⁻¹) and Kcal (211 ± 57 Kcal).
CONCLUSIONS: The mean SSI during all four modes of exercise is in line with the ACSM position stand for developing and maintaining cardiorespiratory fitness, which states that subjects with a mean VO₂max <40 ml·kg⁻¹·min⁻¹ can improve cardiorespiratory fitness with intensity prescriptions as low as 30% VO₂Reserve.

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Using Ecological Momentary Assessment to Explore Proposed Indices of Exercise Readiness and Subsequent Exercise Behavior

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(No relevant relationships reported)

Flexible Nonlinear Periodization (FNLP) was developed to preserve training quality in athletes by matching workload demand to pre-exercise mental and physical states. The degree of "readiness to train" is purportedly determined via a six-part checklist: coach-athlete interactions, injury status, hydration, fatigue ratings, vertical jump power, and initial performances. Prior to adapting FNLP for untrained populations, it is important to examine if similar factors predict exercise behavior in a free-living context. **PURPOSE**: Use ecological momentary assessment to determine time-lagged and concurrent effects of factors suggestive of readiness on exercise behavior. **METHODS**: Participants (N=29, 24±6y, 55% female, 76% white) received text message prompts to their personal smartphones at 9:30am, 1:30pm, 5:30pm, and 9:30pm over 14 consecutive days. Each prompt contained a link to a survey (Qualtrics) that assessed perceptions of core affect, fatigue, bodily discomfort (e.g. pain, stiffness), and hydration, as well as self-efficacy to exercise in the subsequent four-hour block. Exercise type and duration were also collected in each survey and used to calculate bout volume expressed as MET-minutes. On average, participants were active, accumulating 1116±596 MET-minutes of structured exercise per week (min=150, max=2074). Lagged and concurrent prediction analyses were conducted using three-level (time of day, day of week, individual) linear mixed models in SAS. **RESULTS**: Self-efficacy was the only variable predictive of MET-minutes in a subsequent four-hour time block (t=7.18, p<0.0001, R²=0.43). Fatigue was the only variable concurrently related to self-efficacy (t=-3.38, p=0.0017, R²=0.18). Concurrent correlates of fatigue (R²=0.60) included core affect (t=-8.51, p<0.0001) and discomfort (t=8.66, p<0.0001) with a trend for perceived hydration (t=-1.72, p=0.09). **CONCLUSIONS**: These findings continue to support self-efficacy as a strong predictor of future exercise behavior. While measures of fatigue, affect, discomfort, and hydration did not directly predict exercise behavior, the observed inter-relationships provide some support for the key assumption of FNLP. Replication of these results in relevant target populations is necessary prior to implementing FNLP-based interventions.

1310   Board #118   May 31 9:00 AM - 10:30 AM

Affect, Eating Attitudes, And Exercise Dependence Of Personal Trainers With Different Years Of Experience

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(No relevant relationships reported)

PURPOSE: To examine the affect, eating attitudes, and exercise dependence of personal trainers with different years of experience. **METHODS:** Data were collected from female personal trainers (*n* = 17; 36±10 yrs of age; 146±21 lbs) at health/fitness centers in the Midwest. Participants completed a demographic survey, Positive Affect and Negative Affects Scale, Eating Attitudes Test (EAT-26), and Exercise Dependence Scale-Revised (EDS-R). Pearson correlation coefficients were calculated between the personal trainer's years of experience (*M* = 6.9±1.7yrs, *Md* = 4yrs, *Range*: 25yrs) and the dependent variables of affect, eating attitudes, and exercise dependence. One-way ANOVAs also were performed with personal trainers (PT) categorized in three groups based on years of experience as a PT: Novice (NPT: *n* = 6; *M* = 1.8±0.9yrs), Intermediate (IPT: *n* = 6; *M* = 5.2±1.6yrs), and Experienced (EPT: *n* = 5; *M* = 15.2±7.4yrs). **RESULTS:** Personal trainer's years of experience was related to positive affect (*r* = .58, *p* = .01), EAT-26 Diet subscale (*r* = -.43, *p* = .08) and Total score (*r* = -.47, *p* = .05), and EDS-R subscales of Withdrawal Effects (*r* = -.44, *p* = .08), Reduction in Other Activities (*r* = -.50, *p* = .04), and Intention (*r* = -.42, *p* = .09). Compared to IPT and EPT, NPT reported less Positive Affect (*Ms* = 32.3, 39.3, 45.8, *p* = .001). On the EAT-26, IPT reported more Oral Control than EPT but not NPT (*Ms* = 1.8, 3.8, 0.60, *p* = .07). As for EDS-R, NPT reported more Withdrawal Effects than IPT but not EPT (*Ms* = 12.8, 6.7, 8.0, *p* = .04) and more Reduction in Other Activities than EPT but not IPT (*Ms* = 7.8, 5.7, 4.6, *p* = .08). **CONCLUSION:** In general, novice personal trainers reported less positive affect, more symptoms of exercise dependence, and poorer eating attitudes. If left unchecked, novice PTs may be at risk of developing clinical levels of exercise dependence and eating disorders, and these dangerous behavioral patterns may be passed along to their clients. These findings suggest that

less experienced personal trainers may benefit from strategies aimed at increasing awareness of eating disorder and exercise dependence behavior patterns. As with most new professionals, establishing a good support network is important, and connecting with more experienced personal trainers may help improve affect and more positive eating and exercise behaviors.

1311   Board #119   May 31 9:00 AM - 10:30 AM

Explore Factors Associated with Exercise Behavior among the Older Chinese Adults in the Rural Area

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(No relevant relationships reported)

Purpose. The purpose of the study was to explore factors that are associated with exercise behavior among the older Chinese adults in the rural area.
Method. The data of 2586 older Chinese adults (males=1320, females=1259, age M=69.65, SD=8.0) in the rural area were analyzed from the National Health Service survey in Fujian, China. The t-test and χ2-test were carried out to compare the differences between older Chinese adults living in the rural area who did not exercise and who exercised at least once a week, on age, family income, education level, whether having partner, whether having chronic disease or pain, as well as the physical function levels. All data were collected in 2013.
Results. The results showed that there were significant differences between individuals who did not exercise and who exercised at least once a week on the following variables: age (M=69.8, SD=8.1, M=68.6, SD=7.1, respectively, p<.01), family income (M=32178¥, SD=34430, M=38017¥, SD=30991, respectively, p<.05), education level (with elementary education or above, 49.5% vs. 68.3% respectively, P<.001), having a partner (72.9% vs. 80.8%, respectively, P<.05), having difficulties on movement (16.0% vs. 8.4%, respectively, P<.05), having difficulties on self-care (10.7% vs. 5.8%, respectively, P~.05), and having difficulties on daily activity (14.6% vs.7.2%, respectively, P<.01). There were no significant differences between individuals who did not exercise and who exercised at least once a week, on the following variables: having at least one chronic disease (44.7% vs. 45.3%, respectively) and suffering from pain (28.1%vs. 22.7%, respectively), both Ps>.05.
Conclusion. The older Chinese adults in the rural areas were more likely to exercise if they were younger, had higher income and education level, had a partner, and had no difficulties on physical functions.

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Physical Activity Postings On Social Media: Physical Activity And Self-presentation Differences Between Sharers And Non-sharers

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(No relevant relationships reported)

Purpose: Sharing about physical activity (PA) on social media (SM) provides an opportunity for receiving social support from online social networks and may be related to PA levels (Pinkerton et al, 2017). People desire to be perceived positively by others, this is particularly true for SM users (Kaplan & Haenlein, 2010). As an individual shapes the content shared over SM networks, that individual may idealize their character rather than presenting an authentic version (Goffman, 2002). This study examined whether people who post about PA on SM differed in their PA levels and self-presentational efficacy (SPE) when compared to those who do not post. A secondary purpose was to describe the type of SM use across both sharers and non-sharers. **Methods:** A convenience sample of 113 kinesiology students (62M, 44F) completed a cross-sectional survey that included the Godin Leisure Time Exercise Questionnaire (Godin & Shepard, 1985) and the self-presentational efficacy scale (15 items; Gammage, Hall, & Ginis, 2004). This scale asked about confidence to present themselves in a positive fashion with regards to specific outcomes such as 'being in good shape' and 'looking fit and toned' in terms of SPE. Independent t-tests were conducted to compare sharers with non-sharers. **Results:** Students self-identified as sharers of PA on SM (*n*=39, 34.5%; 23M, 16F) or non-sharers (*n*=66, 58.4%; 38M, 28F). There were significantly different levels of PA, with those who posted about PA on SM reporting higher levels of activity (*M*=51.4, *SD*=22.5) than those who did not post about PA on SM (*M*=42.2, *SD*=22.3; *p*=.046). There were also significantly different levels of SPE, with those who posted about PA on SM having higher levels of SPE (*M*=75.1, *SD*=17.6) than those who did not post about PA on SM (*M*=64.5, *SD*=22.4; *p*=.014). Minutes spent on SM reported was similar between sharers (*M*=86.2min/day, *SD*=60.8) and non-sharers (*M*=104.8min/day, *SD*=84.9; *p*=.245). The most commonly used SM platforms for both sharers and non-sharers were Instagram (sharers: *n*=34, 87.2%; non-sharers: *n*=57, 86.3%) and Snapchat (sharers: *n*=33, 84.6%; non-sharers: *n*=54, 81.8%). **Conclusion:** Students who use SM to post about PA had higher levels of SPE and PA, suggesting the need for future research to explore how SM use may affect or be affected by self-presentation and PA levels.

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Exploring Physical and Mental Readiness to Exercise in Inactive Men and Women: A Thematic Analysis

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(No relevant relationships reported)

Flexible Non-Linear Periodization (FNLP) was designed by Kraemer & Fleck to optimize athletic performance and prevent burnout by basing athletes' daily training regimens on their personal "readiness to train" (physical/mental states pre-exercise). FNLP-based prescriptions may be an effective approach in improving exercise behavior of inactive adults. However, it is necessary to operationally define readiness in specific populations, particularly between genders. **PURPOSE**: Identify and compare the underlying themes relating to readiness to complete low-demand (LDB) and high-demand (HDB) aerobic bouts between men and women who do not engage in regular aerobic activity. **METHODS**: Via Qualtrics, 1,059 respondents completed the online survey. After quality control, 166 respondents (49 ± 13y, 61.4% female) met the criteria of reporting <90 min/week of moderate aerobic activity (25.7 ± 26.3 min/week). Respondents described mental/physical states necessary to complete a LDB (10-min slow stroll) and a HBD (60-min jog). Data were analyzed using content and thematic analysis. **RESULTS**: To complete the LDB and HDB, themes among men and women included *body integrity* (free from pain/illness) and *positive affect*. A unique theme emerged for the LDB, in that many men and women indicated it could be completed under *normal or worse circumstances*. A primary difference between genders is, to complete the LDB, women needed to feel *rested*, which was not reported by men. While a theme relating to *motivation* emerged for both bouts, it appears motivation to complete the LDB is rooted in a need for change (change of scenery, clear head), where as motivation for the HDB related more to completing the bout itself (focused, determination, committed). For the HDB bout only, men and women indicated a need to feel *fueled* (enough food, hydrated), adequately *conditioned*, and *energized*. **CONCLUSIONS**: Little difference was noted between inactive men and women regarding indices of readiness. Three uncovered themes (body integrity, fueled, energized) parallel factors from Kramer & Fleck's proposed six-item readiness checklist: injury status, hydration level, and fatigue ratings. These factors represent the more personal, non-performance aspects of the checklist, providing initial support for adapting FNLP for inactive populations.

1314   Board #122   May 31 9:00 AM - 10:30 AM

Examination of Personality Related to Individuals' Reported Primary Mode of Exercise

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(No relevant relationships reported)

Personality has been linked to various exercise behaviors. It is possible that personality dimensions are associated with the type of exercise one chooses to engage in. **PURPOSE**: To examine the relationship between personality dimensions, based on the Five Factor Model (FFM), and primary exercise modalities. **METHODS**: 576 adults (34.5 ± 11.4 yrs; 46.7% male), currently participating in any form of regular exercise, completed an online survey. The survey included questions related to their primary mode of exercise (PME) and items for the Big Five Inventory (BFI). The BFI assesses the FFM dimensions: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. PMEs were divided into 5 main groups: CrossFit® Training ($n=90$), Group Exercise ($n=59$), Aerobic Training ($n=116$), Resistance Training ($n=142$), and Sport ($n=142$), with two other categories concurrently assessed: High Intensity Training ($n=13$) and Other ($n=14$). **RESULTS**: Significant ($P < 0.05$) Spearman's correlations were observed between frequency of exercise and Agreeableness ($\rho = 0.160$), Conscientiousness ($\rho = 0.284$), Neuroticism ($\rho = -0.256$), and Openness ($\rho = -0.083$). A multivariate ANOVA revealed significant differences ($P<0.001$) between PME and Extraversion ($P<0.001$, $\eta^2_p = 0.062$), Agreeableness ($P<0.001$, $\eta^2_p = 0.165$), Conscientiousness ($P<0.001$, $\eta^2_p = 0.323$), Neuroticism ($P<0.001$, $\eta^2_p = 0.129$), and Openness ($P<0.001$, $\eta^2_p = 0.073$). **CONCLUSIONS**: These findings suggest that differences exist between personality dimensions and individuals' preferred exercise modality. As physical inactivity is a growing prominent public health concern, identifying an individual's personality and suggesting exercise modalities based on these differences may aid in exercise interest and adherence.

1315   Board #123   May 31 9:00 AM - 10:30 AM

The Relationship Among Resilience, Personality, Anxiety and Fitness in Recruit Firefighters

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(No relevant relationships reported)

Resilience (R), the ability to adapt to and rebound from adversity, has been linked to Post-Traumatic Stress Disorder (PTSD) susceptibility and to buffer against stressful events. Fitness has also been related to psychological health, thus it is of interest to examine whether R is related to personality and anxiety, as well as indices of fitness in firefighters (FFs), a group exposed to various stressors. **PURPOSE**: Examine R, personality, anxiety and fitness among recruit FFs. **METHODS**: Recruit FFs ($N=145$ males, 26.4 ± 4.0 yrs, BMI=27.1 ± 4.5) entering a 6-week FF training academy completed individual difference measures [e.g., Dispositional Resilience Scale (DRS-15), Trait Anxiety Inventory (TAI; 32.3 ± 8.0), International Personality Item Pool 50 (IPIP-50)]. The DRS-15 provided a Total score (49.5 ± 4.8) and subscores for Challenge (Ch: 13.9 ± 2.4), Commitment (Cm: 17.6 ± 2.1), and Control (Cl: 18.0 ± 2.0). The 5 personality dimensions of Extraversion (E: 33.9 ± 7.0), Emotional Stability (ES: 39.3 ± 6.6), Conscientiousness (C: 38.8 ± 4.7), Openness (O: 36.1 ± 5.4), and Agreeableness (A: 40.0 ± 5.2) were derived from the IPIP-50. **RESULTS**: Only C was associated with aerobic capacity ($r= 0.20$); no other fitness relationships were found. Significant ($P<0.005$) relationships were found between total R and TAI ($r= -0.57$) along with the personality dimensions of ES ($r= 0.46$), A ($r= 0.38$), O ($r= 0.35$), C ($r= 0.35$), and E ($r= 0.24$). Of the R subscales, Cm had the most consistent and strongest relationships with personality ($r_s= 0.30 - 0.57$). **CONCLUSIONS**: Findings support the relationship between R (especially sense of Commitment) and personality, but not fitness, in these FFs. Including the relationship between anxiety and personality, levels of resilience may influence susceptibility to PTSD (i.e., interpretation of stressful events), symptom severity of PTSD, and recovery from PTSD. With respect to traumatic experiences encountered during firefighting, these relationships may aid in understanding how FFs handle stress.

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Physical Activity Perceptions and Behavior of Pregnant Women with Past Miscarriage and Infertility Experiences

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(No relevant relationships reported)

Perceptions that pregnant women have towards physical activity (PA) appear to affect levels of participation. Qualitative findings indicate that past adverse prenatal experiences may elevate pregnant women's PA concerns regarding the health of the baby. **PURPOSE**: We investigated whether PA outcome expectancy differed among pregnant women with past miscarriage or infertility experiences compared to pregnant women without. Additionally, we examined whether moderate-to-vigorous PA (MVPA) and PA discussion with a healthcare provider (HCP) differed between these two groups. **METHODS**: Pregnant women ($N=497$) completed an online survey and answered multiple questions about past pregnancy experiences, and current PA perceptions and behavior specific to various PA modalities. These included: walking, light and intense jogging, cycling, and swimming, prenatal yoga, aerobic dance, and resistance training exercises. PA outcome expectancy for each modality was assessed on an 11-pont Likert scale. Participation in each was defined as PA > 0 min/wk. MVPA was dichotomized as meeting the guideline (MVPA ≥150 min/wk) or not. Participants were also asked questions regarding PA discussion with a current HCP. Mann-Whitney U-tests were performed to examine outcome expectancy differences between women with past adverse prenatal experience and those without. Chi-square analyses were conducted to examine differences in meeting the MVPA guideline, HCP discussion, and PA modality participation. **RESULTS**: A total of 170 women (30.5%) reported past miscarriage or infertility experiences. PA outcome expectancy for these women did not significantly differ from women without past adverse prenatal experience for any specific modality of activity. However, women with past miscarriage or infertility were less likely to meet the current MVPA guideline [$\chi^2(1) = 4.32$, $p=.04$]. Participation in specific PA modalities was not significantly greater for women without past adverse prenatal experience, nor was the occurrence of PA discussion with a HCP. **CONCLUSIONS**: Pregnant women with past miscarriage or infertility did not perceive PA differently but did perform less MVPA than women without past adverse experiences. Longitudinal examinations of PA perception and behavior are needed among this subpopulation.

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Older Adults' Narratives Of Physical Activity And Health: Intrinsic Goal Pursuits, Autonomy, And Healthy Identities

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(No relevant relationships reported)

The benefits of physical activity extend across the lifespan, but the psychological processes supporting active aging are not often addressed for older adults. This research explores older adults' narratives of health and physical activity experiences and applies a Self-Determination Theory (SDT) framework for understanding how basic needs are accommodated in physical activity contexts. **PURPOSE:** To examine the life-history narratives of older adults with regard to physical activity, sport participation, and health. **METHODS**: Narrative interviews were conducted with 51 older adults (65-95 yrs) to elicit life-history narratives regarding 1) experiences in physical activity and sport; 2) current perceptions of health, and 3) identity as a healthy or unhealthy person. The semi-structured interviews ranged from 1-3 hours and fostered in-depth accounts of individual's life histories. Interviews were transcribed verbatim and data was subjected to thematic narrative analysis. **RESULTS**: Data supported a SDT approach (Ryan & Deci, 2001; Ryan, Huta, & Deci, 2006) to understanding the connection between goal pursuits, achievement, and well-being. Contexts and activities that supported participants' perception of autonomy (e.g., "I have choices about the activities that are available"), competence (e.g., "I can successfully participate"), and sense of belonging (e.g., "The people are very supportive and I feel welcome") were related to participants' articulation of healthy activity as a first-order, intrinsic goal (e.g., "I golf because I love movement, not for any other reason"). Participants demonstrated an age-related shift in understanding physical activity and health. Older participants (88 ± 5 yrs) more often narrated physical activity as a first-order, intrinsic goal (e.g., movement for movement's sake), whereas younger participants (70 ± 5 yrs) more often narrated physical activity as a lower-order, extrinsic goal (e.g., "I am physically active because my doctor told me I needed exercise and/or I want to be healthier"). **CONCLUSIONS**: This research supports the SDT contention that intrinsic goal pursuits relate to greater well-being and highlights the importance of fostering perceptions of autonomy support, competence, and relatedness for physical activity among older adults.

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Examination Of The Association Between Values And Physical Activity In A Behavioral Program

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(No relevant relationships reported)

Theory-based approaches imply that values may be a construct that influences motivation and adherence to health behavior change. **PURPOSE:** This study examined the associations between individual values and change in physical activity in adults enrolled in a 6-month behavioral weight loss intervention. **METHODS:** Baseline data for 67 participants (age = 44.2 ± 9.0 years; body mass index = 32.6 ± 3.9 kg/m^2) and 58 participants at 6 months (age = 43.9 ± 9.2 years; body mass index = 32.6 ± 4.0 kg/m^2) were analyzed. The 6-month behavioral weight loss intervention included prescribed moderate-to-vigorous physical activity of 150 to 250min/wk. Only participants prescribed physical activity within the intervention were included in the statistical analysis. Assessments at baseline and 6 months included: 1) self-reported leisure-time physical activity, 2) personal values, 3) perception of engaging in physical activity would have on their values. **RESULTS:** At both baseline and 6 months, the three most frequently identified values were marriage/couples/intimate relationships (75.9%), family (60.3%), and parenting (56.9%). Spearman correlation coefficients were not statistically significant between change in leisure-time physical activity and perception of the impact engaging in a physical activity will have on their values at baseline (range of r's: -0.029 to 0.154, p's range: 0.364 to 0.927) and 6 months (range of r's: -0.018 to 0.098, p's range: 0.564 to 0.916). **DISCUSSION:** Self-reported values did not change following participation in a behavioral weight loss intervention. Perceptions of how engagement in physical activity would alter values were also not associated with change in leisure-time physical activity. These results suggest that linking physical activity to values would not impact the magnitude of improvement in leisure-time physical activity within the context of a comprehensive behavioral weight loss intervention. However, this warrants additional investigation to determine if interventions specifically linking values to physical activity would elicit similar effects.

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Anthropometry, Physical Functioning, And Quality Of Life In The Exercising Diabetic Patient

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(No relevant relationships reported)

Among U.S. adults, more than 35% are obese and 9% are diagnosed with diabetes. Obesity and diabetes impair daily functioning and associate with poorer subjective quality of life (QOL). Exercise is an effective intervention for weight loss, functional improvement, and amelioration of psychological symptoms; however, the precise characteristics of prescription to optimally enhance QOL in this population are not well defined. **PURPOSE:** To evaluate QOL predictors in subjects with type 2 diabetes undergoing structured exercise. **METHODS:** 61 subjects with diabetes were randomized into one of two 10-week exercise interventions; 38 subjects completed the program. Group 1 (n=23) participated in organized interval training with professional supervision twice weekly; group 2 (n=15) performed the same supervised interval training but also performed two 60-min unaccompanied walking sessions per week. At baseline and follow-up, demographic, anthropometric, functional, and QOL data were collected. Multiple linear regression determined the effect of exercise, physical functioning, and anthropometric indices on QOL outcomes. **RESULTS:** At baseline, subjects were 67.9 ± 9.1 years of age, 42.1% male, and they had a composite QOL score of 58.9 ± 18.1. Older age and three assessments of physical functioning associated with higher baseline QOL; obesity associated with a trend for higher QOL (p=0.054). From baseline to posttest, QOL improved 17.7% (p<0.001). Group assignment was not a significant predictor of this change (p=0.998). Women improved more than men (p=0.031), and improvement in physical function associated with greater improvements in QOL. At the end of the intervention, age (p=0.022) and physical function corresponded to elevated QOL. Group assignment was not a significant predictor (β=9.3; p=0.098). At baseline (p<0.001), change scores (p=0.021), and at follow-up (p<0.001), the six-minute walk was the most pronounced variable of physical functioning to correspond to QOL. **CONCLUSION:** Exercise improved QOL for subjects with diabetes. Additional walking didn't help. Older men and especially women improved more. This may be a consequence of attention, as supervised sessions provided marked improvement. It may be important for exercise aimed at improving psychological wellbeing to include companionship.

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The Role of Gratitude in Intrinsic and Extrinsic Exercise Motivation

Allison Hicks, Savannah Neace, Marci DeCaro, Paul Salmon. *University of Louisville, Louisville, KY.*
(No relevant relationships reported)

PURPOSE: To determine the role of positive psychology in the prediction of exercise motivation. Specifically, we examine the construct of gratitude in association with intrinsic and extrinsic exercise motivation. **METHODS**: One hundred predominantly female (84%) undergraduate participants (age: M=19.78, SD=2.43) responded to online survey questionnaires including demographics, subjective health, gratitude (GRAT-R) and Exercise Motivation (EMI-2). **RESULTS**: Hierarchical regressions including theoretically derived control variables (age, sex, minority status and subjective health) explored the role of gratitude in the prediction of intrinsic and extrinsic exercise motivation. Gratitude was significantly positively associated with intrinsic motivation (β=.397, p<.001), but not extrinsic motivation (β=.225 , p=.07). In analyzing gratitude subscales, Sense of Abundance was positively associated with intrinsic motivation (β=.296, p<.01), and Social Appreciation was positively associated with both intrinsic (β=.497, p<.001) and extrinsic motivation (β=.401, p<.001). In further examining subscales of the EMI-2, total gratitude scores were significantly positively correlated with Stress Management (r=.411, p<.001), Revitalization (r=.386, p<.001), Enjoyment (r=.411, p<.001), Challenge (r=.390, p<.001), Affiliation (r=.254, p<.01), Ill-Health Avoidance (r=.250, p<.05), Positive Health (r=.356, p<.001), Weight Management (r=.201, p<.05) and Strength/Endurance (r=.310, p<.01). **CONCLUSIONS**: Gratitude positively predicted exercise motivation, particularly intrinsic motivators of exercise. These findings suggest that positive psychological practices are associated with attitudes that encourage health behavior change.

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Mindfulness and Intrinsic Exercise Motivation—The Mediating Role of Exercise Self-Efficacy

Savannah M. Neace, Allison Hicks, Paul Salmon, Marci DeCaro. *University of Louisville, Louisville, KY.*

(No relevant relationships reported)

TITLE: Mindfulness and Intrinsic Exercise Motivation: The Mediating Role of Exercise Self-Efficacy
AUTHORS: Savannah Neace, Allie Hicks, Marci DeCaro, Paul Salmon
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PURPOSE: We examined the role of mindfulness in predicting exercise motivation. Mindfulness is associated with health, but its influence on exercise motivation is largely unexamined. We tested the relationship between mindfulness and exercise motivation, using self-efficacy as a possible mediator of this relationship.
METHODS: Undergraduates (N = 100; 84% Female, 80% Caucasian) completed online questionnaires assessing demographics, Mindfulness (MAAS), exercise self-efficacy (SEE), and exercise motivation (EMI-2).
RESULTS: Hierarchical regressions controlling for age, sex, and minority status examined relationships among mindfulness, exercise self-efficacy, and exercise motivation. Mindfulness was positively associated with intrinsic (β=.210, p<.05), but not extrinsic motivation (β=.086, p<.438). Mindfulness was also positively associated with exercise self-efficacy (β=.244, p<.05. Exercise self-efficacy was positively associated with both intrinsic motivation (β=.484, p<.000) and extrinsic motivation (β=.218, p<.05). Mediation analysis revealed that exercise self-efficacy fully mediated the relationship between mindfulness and exercise motivation (β=.210, p<.05; β= .186, p<.285). Exploratory analyses examined correlations between facets of the EMI-2 and mindfulness and exercise self-efficacy. Mindfulness was significantly correlated with two intrinsic facets [Revitalization (r=.220, p<.028), Enjoyment (r=.254, p<.011)]. Exercise self-efficacy was significantly correlated with five intrinsic facets [Revitalization (r=.500, p<.000), Enjoyment (r=.499, p<.000), Challenge (r=.508, p<.000), Affiliation (r=.216, p<.05), Positive Health (r=.284, p<.01)] and one extrinsic facet [Competition (r=.344, p<.000)].
CONCLUSIONS: Mindfulness is moderately predictive of intrinsic exercise motivation, however, exercise self-efficacy largely mediates this relationship.

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The Mediating Effect of Perceived Health on the Relationship Between Physical Activity and Subjective Well-being

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(No relevant relationships reported)

Subjective well-being (SWB) is a critical indicator of positive youth development. Physical activity (PA) has been identified as a potential correlate of SWB. But the underlying mechanism for the association between PA and SWB has remained largely unexplored.
PURPOSE: To examine the association between the PA and SWB in college students, and to determine if the perceived health mediated the association between them.
METHODS: 1209 college students (631 male and 578 female, mean age = 19.63 years) voluntarily completed a questionnaire consisting of four parts: Subjective Happiness Scale with four 5-point Likert items assessing Happiness, Satisfaction with Life Scale with five 7-point Likert items measuring life satisfaction, two questions adapted from the National Health and Nutrition Examination Survey (NHANES) asking the time (in minutes) spent on PA per week, and one 5-point Likert item adapted from NHANES measuring the perceived health. According to a widely used procedure to test mediation, three multiple regression models were performed. First, the perceived health (mediator) was regressed on the PA (independent variable). Second, happiness and life satisfaction (dependent variables) were respectively regressed on the PA (independent variable). Finally, happiness and life satisfaction (dependent variables) were respectively regressed on both the PA (independent variable) and perceived health (mediator). Age, gender, and weight status were obtained by self-report and added to all models as covariates.
RESULTS: The first model revealed that PA was a significant predictor of perceived health (t = 5.30, p < 0.01). In the second model, PA significantly contributed to the happiness (t = 3.43, p < 0.01) and life satisfaction (t = 3.62, p < 0.01), respectively. However, after including the perceived health to the second model, the coefficient of PA was no longer significant for both happiness and life satisfaction (p's > 0.05). Our result showed that the independent variable had no effect when the mediator was controlled, suggesting a mediating effect of the perceived health on the relationship between PA and SWB.
CONCLUSIONS: The increased time spent on PA is associated with a higher level of SWB among college students. Moreover, this positive association is mediated by the individual level of perceived health.

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Testing The Effects Of Message Framing On Physical Activity Motivation: Does Stage Of Change Matter?

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(No relevant relationships reported)

PURPOSE: Understanding how to best "sell" physical activity (PA) is a critical goal. This study investigated the effects of message framing on motivation to participate in a PA program, and tested whether the effectiveness of messages framed to promote either affective benefits, physical health benefits, or a combination benefits varied based on one's current PA status. **METHODS**: Adult participants (*N*=188) from a Midwestern university, who were recruited via email, completed an online survey assessing demographic information and current stage of change. They then viewed one of four randomly assigned promotional flyers for a PA program offered on campus. The flyers mentioned either the: (a) affective benefits of program participation (e.g., improved mood), (b) physical health benefits (e.g., improved fitness), (c) a combination of affective and physical health benefits, or (d) a control message noting some generic aspects of the program (e.g., clean facilities). After viewing the flyer, participants responded to a series of questions about the content of the flyers (manipulation checks) and their perceived behavioral control for participating in the program, followed by their interest in the program, intention to participate, the likelihood of participating, and whether they wanted to sign-up. **RESULTS**: A series of 2 (PA status: active, non-active) x 4 (message: affective, physical health, combination, control) ANOVAs found that, after accounting for perceived control, the effectiveness of the different promotional messages on intention and likelihood of participating varied based on the respondents' PA status. The major finding was the message promoting affective benefits led to significantly greater intention and likelihood of participation than the other messages for those who were active, but the opposite occurred for non-active participants. No group or message differences were found with regard to interest in the program. Further, a chi-square analysis found no differences in participants' yes or no response to wanting to schedule a session in the program at that time. **CONCLUSIONS**: Using message framing to sell PA may help increase intention to participate. However, the type of message that effectively promotes PA appears to vary depending on the message receiver's current physical activity.

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Race and Types of Motivation in Indoor Group Cycling

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(No relevant relationships reported)

As racial health disparities persist in the U.S. for conditions that can be mitigated by regular exercise (e.g. cardiovascular disease, type II diabetes), identifying the types of motivation that drive various racial groups to participate in exercise may be a strategy to help inform intervention efforts and reduce these health disparities. **PURPOSE:** To identify racial differences in the type of motivation (autonomous, controlled, or amotivation) that influence regular participation in indoor group cycling classes. **METHODS:** Twenty-one indoor group cyclists currently participating in classes $\geq$ 1 day/week for $\geq$ 3 consecutive months (non-Hispanic Whites (NHW) = 14, non-Hispanic Black (NHB) = 4, mixed-race = 3; age: 43.6 $\pm$ 14.5 yrs.; body mass index: 26 $\pm$ 3.8 kg/m^2) were recruited for this study. Participants completed the Treatment Self-Regulation Questionnaire (TSRQ) using a 7-point Likert scale to indicate why they continue to utilize indoor group cycling classes as an exercise modality. Average TSRQ scores of autonomous and controlled motivation, and amotivation were examined by race. One-way ANOVA was used to examine between-group differences. Significance was accepted at p < 0.05. **RESULTS:** There were no racial differences in autonomous (p = 0.44) or controlled motivation (p = 0.84) by race, but there was a significant difference in amotivation (p = 0.02). Tukey post hoc analyses showed that NHB had higher amotivation (3.5 $\pm$ 1.0) compared to NHW (2.0 $\pm$ 1.1) and mixed-race (1.3 $\pm$ 0.4) participants. **CONCLUSION**: Compared to the other race groups in this sample, NHB had higher amotivation despite continued participation in indoor group cycling. This suggests that other factors (e.g. group dynamics, environment) may be driving NHB to continue participation. Further research using racially diverse samples is needed to identify possible factors related to motivation in NHB and other race groups, as they may be valuable in the development of culturally relevant exercise programs.

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Cardiorespiratory Fitness, Physical Activity, and Psychological Effects of an Acute Bout Of Cycling Exercise in People with Epilepsy

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(No relevant relationships reported)

PURPOSE: The primary purpose of this study was to test if an acute bout of cycling exercise in a sample of young adults with epilepsy would improve feelings of energy and enhance executive function. Secondary aims included evaluating cardiorespiratory fitness and physical activity level. **METHODS:** A within-participants crossover design was used to compare seated rest to 20 minutes of moderate-intensity cycling. Ten people diagnosed with epilepsy completed the Profile of Mood States (POMS) and the Wisconsin Card Sorting Task (WCST) before and twice after the treatments. Cardiorespiratory fitness was assessed with a standardized, graded maximal cycling exercise test. Physical activity level was assessed with a hip-worn accelerometer (ActiGraph GT3X+) and a self-reported past-year physical activity questionnaire (CARDIA Physical Activity History). **RESULTS:** Within-participants repeated measures ANCOVAs controlling for initial values and order of treatments showed a significant interaction for POMS Vigor, $F(2,32)=4.21$, $p=.024$. Immediately after exercise, vigor scores were higher than after seated rest. WCST performance was not influenced by acute exercise. Independent t-tests revealed that this sample of people with epilepsy was similarly fit and similarly active compared to reference groups of young adults without epilepsy. **CONCLUSION:** Acute cycling transiently increases feelings of energy without altering executive functioning in normally active and fit people with epilepsy.

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Machines versus Free Weights: Does Exercise Mode Influence Affect and Perceived Exertion?

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(No relevant relationships reported)

Resistance exercise reduces the risk of chronic disease and promotes numerous health benefits. Due to the low rates of participation in resistance exercise, research is needed to create a more positive affective response from exercise. This has been shown to increase rates of adherence in aerobic exercise. **PURPOSE:** To compare the affective responses of performing resistance exercise on machines (MA) and free weights (FW). **METHODS:** Novice participants (4 Males: 20.8±0.5yrs; 75.2±17kg; 180±2.4cm; 14 Females: 25.7±9.8yrs; 67.9±19kg; 163±5.6cm) completed a MA workout consisting of the leg press, row, chest press, and leg curl and a FW workout consisting of a goblet squat, row, bench press, and stiff leg deadlift. Each exercise was performed at 80% 10RM for 3 sets of 9-11 repetitions with 90 secs of rest between each set. Feeling Scale (FS) and Felt Arousal Scale (FAS) were assessed before exercise, after the completion of the 7th repetition of the 2nd set of each exercise, after the 3rd set of each exercise, immediately after, 30 min after, and 60 min after. **RESULTS:** Repeated measures ANOVA from before to after exercise revealed a condition x time interaction for FS where FS in the MA condition increased immediately and 60 minutes following exercise, there was no change across time for FW, and FS for MA was significantly higher at 60 minutes following exercise than FW, $F(3, 51) = 3.26$, $p = 0.040$. For FAS before and after exercise, FAS significantly increased immediately following exercise and then decreased to below exercise levels at 30 and 60 min regardless of condition, $F(3, 51) = 11.91$, $p < 0.001$. Repeated measures ANOVA for RPE during the exercise revealed a condition x time interaction where RPE was higher in FW for all exercises except those of the chest where RPE was higher for MA, $F(7, 119) = 3.285$, $p = 0.015$. **CONCLUSION:** The more positive affective response from the MA workout immediately and 60 minutes after exercise suggests that MA exercises may be better for novice lifters when beginning a resistance training regimen.

C-40   Free Communication/Poster - Correlates and Behavioral Aspects of Physical Activity in College Students

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1327   Board #135   May 31 9:00 AM - 10:30 AM

The Impact of Body Fat Percentage on Appearance and Weight Management Related Motivations to Exercise in College Age Men

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(No relevant relationships reported)

Physical activity and exercise levels have been shown to decline throughout childhood and adolescence with a noticeable decrease occurring during the transition to college. The Exercise Motivation Inventory-2 (EMI-2) has been used to identify factors that potentially affect exercise levels in adults. There is little known research regarding the motivation to exercise in college students at a rural, commuter-based, two-year University campus. **PURPOSE:** The purpose of this study was to determine whether differences existed in enjoyment, appearance, and weight management related motivations and MVPA based on body fat percentage levels in male college students. **METHODS:** Thirty-nine, traditional-age (18-25 y), full-time (>12 credit hours) male college students were recruited for this study. The participants completed the EMI-2 instrument and then anthropometric measures (height, weight, and BF%; dual energy x-ray absorptiometry) were collected. All participants were then asked to wear an accelerometer for 7 consecutive days to measure MVPA. Participants were then divided into two groups, a healthy body fat group, (HBF; ≤ 22 BF%, n = 16) and an overfat group (OBF; > 22 BF%, n = 23). A one-way MANOVA was used to determine differences in exercise motivations and physical activity levels based on body fat percentage. **RESULTS:** A significant main effect was determined for body fat category, Wilks' lambda=.533, F(4, 34) = 7.439, p <0.001, η_p^2 = .467. Pairwise comparisons of EMI-2 scores determined that OBF men had greater motivation scores based on appearance (3.565 vs. 2.703, p = .026) and weight management (3.685 vs 1.781, p < .001) compared to their healthy-fat counterparts. There were no significant differences in enjoyment scores (3.533, OBF vs. 3.203, HBF, p = .465) or time spent in MVPA (OBF, 289 min/week vs. HBF, 371 min/week, p = .064). **CONCLUSION:** Body fat percentage can impact the motivations to exercise in college age men. OBF reported stronger motivations to exercise based on appearance or weight management compared to the HBF. Despite these stronger motivations, this did not translate into greater time spent in MVPA compared to their HBF counterparts. More research is necessary to determine motivation and barriers to exercise in this population, while considering the impact of body composition.

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Self-Reported Wellness Benefits of Recreational Sports Use in College Freshmen

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(No relevant relationships reported)

Previous research has shown a positive relationship between academic success and recreational sports participation. Few studies have investigated the relationships between recreational sports participation and psychosocial/physical health indicators. **PURPOSE:** To investigate the impact of recreational sports on psychosocial and physical health indicators in college freshmen, and determine differences in impact between high and low users. **METHODS:** Participants included freshmen students who participated in an online survey and consented to recreational sports usage tracking. Usage was collected via ID card swipe each time the student utilized the University fitness centers, group fitness classes, and participated in intramural sports games. Users were categorized as high or low (median split) based on total usage during their 1st year. The survey was administered during the 2nd semester of participants' 1st year. Participants reported the impact (1=very negatively to 5=very positively) of their usage on psychosocial and physical health variables. Responses were categorized into negative/no impact (1-3) and positive impact (4,5). Frequencies were calculated for variables of interest. Logistic regression was utilized to investigate the impact of recreational sports use on psychosocial and physical health variables. **RESULTS:** The sample (N=131) was 51.1 percent male and primarily Caucasian (82.4%). On average, high users had 48.1±39.2 ID card swipes per year; low users had 6.1±3.3. Most participants reported that recreational sports participation had a positive impact on psychosocial and physical health: overall well-being (86.3%); sense of belonging (83.2%); stress management (77.9%); self-confidence (77.9%); time

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management (68.7%); overall health (90.8%); fitness level (89.3%); weight control (64.9%); balance and coordination (74.8%); and sleep (61.8%). High users were more likely than low users to report positive impacts on overall well-being (OR: 3.2; 95%CI: 1.1-9.5), fitness level (OR: 4.4; 95%CI: 1.2-16.7), and self-confidence (OR: 3.0; 95%CI: 1.2-7.1). **CONCLUSIONS**: Recreational sports participation had a positive impact on self-reported psychosocial and physical health in college freshmen, and frequency of participation played a role in some of these relationships.

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Academic and Non-Academic Stress of College Students Enrolled in Physical Activity Classes

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(No relevant relationships reported)

College students often see a decline in their physical activity, in pair with an increase in psychological stress. Many universities aim to increase physical activity and spark new interest by offering a wide variety of health and physical activity classes for all students.
PURPOSE: To explore demographic differences among students in the physical activity classes and to examine how stress relates to how students self-select into different types of physical activity classes.
METHODS: Potential participants were students who self-enrolled in physical activity classes at the University. Participants (n=155) completed consent forms, a demographics questionnaire, and two surveys were sent out electronically through Qualtrics during the first, ninth, and fifteenth week of the semester. The surveys assessed psychological stress, both academically related (Academic Stress Scale) and non-academically related (Perceived Stress PSS-10). Between group differences were analyzed using One-Way ANOVA's to find using SPSS.
RESULTS: Results of the One-Way ANOVA on Academic Stress showed female students (mean = 9.61) to have statistically significant higher academic stress levels compared to male students (mean = 7.82) (p < .001). While not significant, the students on the spectrum of gender identity reported higher academic stress levels than both male and female students (mean = 9.82). Females also reported higher overall (non-academic) stress (mean = 17.53) than males (mean = 15.42) (p = .030). Female students reported more academic stress (mean = 9.67) than males (mean = 7.63). Students in the College of Education reporting the highest overall stress (mean = 20.33) on the Perceived Stress Scale. Time point three will be analyzed to assess changes in stress through the semester.
CONCLUSIONS: This study explored the descriptive statistics of students self-enroll in physical activity classes and examine differences in their stress levels through the semester. The results of this study can be used to reach students who's major may not require physical activity classes. Results can also be used to try to get more students involved in physical activity classes, or which courses certain colleges should consider requiring students to take.

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Gender Differences In College Student Physical Activity Based On The Use Of Wearables, Apps, And Social Media

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(No relevant relationships reported)

College students Physical Activity (PA) continues to remain low and decline, whilst the utilization and availability/accessibility of wearables, apps and social media continues to increase. Understanding the relationship between the use of such technologies and PA may provide insight valuable to college student PA promotion.
PURPOSE: To investigate gender differences in PA between users and non-users of wearables, physical activity and weightless apps, as well as those who shared their PA on social media and those who did not. **METHODS:** This cross-sectional study collected data using an online survey from a volunteer sample of students enrolled in a PA class. The survey examined a range of variables, including demographic information, self-reported PA levels and height, weight, as well as the use of wearables, PA apps, weightloss apps, and social media to share about PA. Basic descriptives were computed, and differences in technologies usage were assessed using independent sample *t*-tests **RESULTS:** The final sample included 2341 participants, 56% women; 78.7% Non-Hispanic White, with an average age of 21.1±1.5y. Among students, 85.9% met or exceeded PA recommendations, 27.1% reported using a wearable, 30.1% a PA app, and 16.7% a weightloss app, and 12.7% reported sharing their PA on social media. Wearable users reported greater MPA ($p<.001$, $\eta^2=.009$), PA app users reported greater VPA ($p=.001$, $\eta^2=.004$), and weightloss app users reported higher BMIs ($p=.001$, $\eta^2=.004$) compared to non-users of such technologies respectively. Those who shared their PA on social media reported greater MPA ($p=.033$, $\eta^2=.002$), and VPA ($p<.001$, $\eta^2=.011$). Among males, wearable users reported greater MPA ($p<.001$, $\eta^2=.015$),

whereas female users reported greater MPA ($p=.005$, $\eta^2=.006$), and VPA ($p<.001$, $\eta^2=.013$). Male PA app users had higher BMIs, ($p=.018$, $\eta^2=.006$) and reported more VPA ($p=.012$, $\eta^2=.007$), whereas female PA app users reported significantly higher MPA ($p=.050$, $\eta^2=.003$), and VPA ($p<.001$, $\eta^2=.012$). Males who shared about PA on social media reported higher MPA ($p=.004$, $\eta^2=.009$), and VPA ($p<.001$, $\eta^2=.013$), whereas females reported only higher VPA ($p<.001$, $\eta^2=.016$). **CONCLUSION**: Technologies had positive associations with PA, indicating that they have the potential to increase and/or sustain PA in certain individuals.

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Cellular Telephone Use Predicts the Likelihood of Being an "Active Couch Potato" in College Students

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(No relevant relationships reported)

The term "active couch potato" was developed to describe individuals who participate in regular, planned physical activity yet are also highly sedentary. These individuals are of interest as participation in excessive amounts of sedentary behavior, even in individuals which are regularly physically active, increases the risk for cardio-metabolic disease. Our group has demonstrated that cellular telephone (cell phone) use is positively associated with sedentary behavior, but not related to physical activity. Therefore, it is possible that individuals who use their cell phone heavily may participate in large amounts of sedentary behavior while also regularly participating in physical activity. In other words, cell phone use may predict the likelihood of being an "active couch potato." **PURPOSE:** To assess the relationship between cell phone use and the likelihood of being an "active couch potato."
METHODS: A sample of 228 college students completed validated survey items to assess their daily cell phone use, physical activity, and sedentary behavior. Tertile splits were performed and participants were categorized into *low, moderate* or *high* groups for each of these three variables. Participants were then categorized as "active couch potatoes" if they were a) in the *high* physical activity group and also in a *high* or *moderate* sitting group, or b) in the *moderate* physical activity group and also in the *high* sitting group. Mann-Whitney U tests compared the number of "active couch potatoes" across the three cell phone use groups and binary logistic regression was used to test if cell phone use group predicted being an "active couch potato."
RESULTS: There were a greater ($Z \geq 1.9$, $p \leq 0.05$) number of "active couch potatoes" in the *moderate* ($n = 21$) and *high* ($n = 28$) cell phone use groups versus the *low* ($n = 11$) use group. The likelihood of being an "active couch potato" was significantly ($\chi2 = 11.0$, $p = 0.01$) associated with cell phone use. Specifically, individuals in the *moderate* and *high* cell phone use groups were 2.3 and 3.5 times more likely (Wald ≥ 3.9, $p < 0.05$), respectively, to be an active couch potato than *low* users.
CONCLUSION: Among a sample of college students, *moderate* and *high* cell phone users were significantly more likely to being categorized as "active couch potatoes" than their *low* use peers.

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Motivations for Moving: An Analysis of Physical Activity in Residential College Students

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(No relevant relationships reported)

Physical activity (PA) habits developed in college can have health effects that extend well into adulthood. **PURPOSE**: To examine the relationship between social and ecological determinants of PA in residential college students. **METHODS**: A random sample of 162 students from a liberal arts college was surveyed. A 35-question web survey was used to collect data about on-campus residence, demographics, access to walking resources pre-college, knowledge and use of the college PA resources, and PA patterns. A hot spot analysis was conducted to determine geographic patterns of PA level or use of PA resources. The Wilcoxon signed-rank test was used to compare median energy expenditure (METs) per week between demographic groups. Multiple linear regression was used to find predictors of log METs per week based on demographic groups that were found to have significantly different median METs per week; a log transformation was used to correct for a skewed distribution. Logistic regression was used to find predictors of respondents having used the cardiovascular exercise room (CR). **RESULTS**: Residence halls and apartments closest to the CR were more likely to have residents who had used the CR. Having used the CR was significantly positively related to log METs (p<.05). There was a trend for a positive relationship (p=.055) between having used the racquetball courts and log METs and a trend for a negative relationship (p=.054) for having access to walking resources before attending the college and log METs. Holding other variables constant, the odds of having used the CR were 15% higher among respondents who lived in apartments (beta=.16, odds=1.17) vs. those who lived in residence halls, 50% higher among respondents who had used the weight room (beta=.41, odds=1.50), 58% higher among only white respondents (beta=.46, odds=1.58) vs. non-white respondents, 67% higher

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among multiracial white respondents (beta=.51, odds=1.67) vs. non-white respondents, and 15% higher among respondents who had not used exercise equipment in the residence halls (=.14, odds=1.15). **CONCLUSIONS**: Colleges may be able to enhance participation in PA by providing well-distributed resources throughout campuses. Colleges should be aware that social and ecological factors may also influence PA and associated health benefits.

1333   Board #141   May 31 9:00 AM - 10:30 AM

An Examination of Obligatory Exercise, Eating Attitudes, and Perceived Body Image Among Collegiate Males and Females

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(No relevant relationships reported)

Eating and exercise behaviors among college students remains an area of interest as habits formed during these years may affect future behavior. Additionally, individuals who engage in extreme eating and exercise behaviors may be at risk for compromised health and well-being. **PURPOSE:** To investigate the relationship between obligatory exercise, eating attitudes, and perceived body image among collegiate males and females. **METHODS:** 222 females aged 20.1 ± 1.9 yrs, and 136 males aged 20.1 ± 2.2 yrs voluntarily completed a demographic questionnaire, the Obligatory Exercise Questionnaire (OEQ), Compulsive Exercise Teat (CET), Social Physique Anxiety Scale (SPAS), and the Eating Attitudes Test (EAT). Variables were analyzed with one-way ANOVA and Pearson product coefficient correlations. **RESULTS:** Overall 15% of women and 6% of men scored higher than 20 on the EAT indicating a high level of concern about dieting, body weight or eating behaviors where counseling is recommended. One-way ANOVA revealed that men were more obligated to exercise than women (47.7 ± 8.4 vs. 44.7 ± 9.3, p = 0.004), men had lower SPAS scores compared to women (28.7 ± 10.9 vs. 36.5 ± 11.3, p < 0.001), and men had lower scores on the EAT (7.2 ± 6.3 vs. 10.5 ± 9.3, p < 0.001). Correlations by sex revealed that men had a significant correlation for OEQ and CET (r = 0.618, p < 0.001), CET and EAT (r = 0.313, p < 0.001), and SPAS and EAT (r = 0.234, p = 0.007). Women had a significant correlation for OEQ and CET (r = 0.685, p < 0.001), OEQ and EAT (r = 0.261, p < 0.001), SPAS and CET (r = 0.328, p < 0.001), SPAS and EAT (r = 0.490, p < 0.001), and CET and EAT (r = 0.446, p < 0.001). **CONCLUSION:** While it may appear that a low percentage of participants had concerning scores on the EAT, this sample indicated that approximately 1 in 10 college students may need proper counseling in this area. Although women were more likely to have higher scores on EAT and SPAS, both males and females demonstrated relationships between OEQ, CET, SPAS, and EAT. Further investigation is warranted to determine the extent of these relationships and to possibly use these data to direct health and wellness initiatives on campuses to best serve young adults.

C-41   Free Communication/Poster - Correlates and Behavioral Aspects of Physical Activity in Youth and Teens

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1334   Board #142   May 31 9:00 AM - 10:30 AM

Understanding the Relation Between Physical Fitness and Executive Function among Adolescents: An Expectancy-value Approach

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(No relevant relationships reported)

Research indicated that maintaining adequate physical fitness may benefit cognitive health among adolescents. It was noticed that psychosocial process may be the underlying mechanism to understand cognitive health (Lubans et al., 2016). Current literature has no sufficient evidence to conclude the responsible mechanism to cognitive health.
PURPOSE: Guided by expectancy-value theory (Eccles et al., 1983), this study was to explore how psychosocial process (i.e., expectancy-value beliefs) interact with fitness components (i.e., cardiovascular fitness, muscular fitness, flexibility, and body mass index [BMI]) to affect cognitive health (i.e., executive function) among adolescents. The direct and indirect effects of expectancy-value beliefs on executive function through fitness were tested.
METHODS: Participants were adolescents ($N = 424$; 58% female; $M_{age} = 12.7$, $SD = .93$) recruited from Southwest region of the U.S. to complete this cross-sectional study.

FITNESSGRAM® test battery was utilized to measure fitness components. Participants self-reported their expectancy-value beliefs (Xiang et al., 2003). The Behavior Rating Inventory of Executive Function–Self-Report Form (BRIEF-SR®, Guy et al., 2004) was used to assess executive function. Higher scores of BRIEF-SR® indicate lower executive function.
RESULTS: Correlation analysis demonstrated that expectancy-value beliefs were significantly related to each component of physical fitness. Cardiovascular fitness and muscular fitness were negatively associated with executive function, while BMI was positively correlated with executive function. The structural equation modelling (AMOS 22.0) supported the significant indirect effect of expectancy-value beliefs on executive function ($\beta = -.11$) through physical fitness ($\chi^2/df = 284.16/113$, p < .001; NFI = .85; IFI = .90; CFI = .90; RMSEA = .06; 90% CI [.05, .07]). The variance explained by the model was 12% for physical fitness and 9% for executive function.
CONCLUSION: The findings support the psychosocial mechanism towards adolescents' cognitive function proposed by Lubans et al.'s conceptual model (2016). School-based interventions focused on building perceived confidence and values may directly augment physical fitness and may serve to enhance executive function during adolescence.

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School'S Physical Environment And Children'S Physical Activity Self-efficacy

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(No relevant relationships reported)

Physical activity self-efficacy (PASE) and the school's physical environment (SPE) can influence children's moderate-to-vigorous physical activity (MVPA) participation. However, the association between PASE and the SPE has not been clearly established in this population. **PURPOSE**: To evaluate the relationship between PASE and SPE among elementary school children in Puerto Rico. **METHODS**: Sixty-eight girls and 63 boys (age= 7.8 ± 0.7 years) completed a questionnaire to assess PASE by interview. SPE was evaluated taking into consideration the physical education class, recess time, and use of facilities that promoted PA. Time in physical education and recess was provided by the school's administration. To determine the use of facilities, a score was generated based on self-reported activities and time spent in each. Children wore a GT3X+ accelerometer during 5 consecutive school days to determine MVPA and sedentary time (ST) during school time. MVPA and ST data was included if participants wore accelerometers ≥ 3 school days for ≥ 3 hr/day. Correlation analysis was conducted to test the relationship between the use of facilities and PASE. Mann-Whitney U-test was conducted to test the difference in PASE by recess time and Kruskal-Wallis test was used to evaluate difference in PASE by physical education time. Secondary correlation analyses were conducted to test the relationship between 1) PASE and MVPA (min/wk); and 2) PASE and ST (hr/wk). **RESULTS**: Participants accumulated 110.94 ± 21.81 min/wk in MVPA, and 3.48 ± 0.48 hr/wk in ST. No significant correlations were observed between: 1) use of facilities and PASE ($r_s = 0.122$, p = 0.22); 2) PASE and MVPA ($r_s = 0.010$, p = 0.91); and 3) PASE and ST ($r_s = 0.068$, p = 0.45). No significant differences were found in PASE by recess time (U = 1815.00, p = 0.86) and by physical education time (H(2) = 0.830, p = 0.66). **CONCLUSIONS**: School time allowed participants to comply with one fourth of the PA recommendation (60 min/day ≈ 420 min/wk). Lack of relationship between SPE and PASE could be explained by an overall high PA self-efficacy score, which requires further investigation. Funded by University of PR -FIPI Institutional Grant.

1336   Board #144   May 31 9:00 AM - 10:30 AM

Childhood Experiences in Physical Education May Have Long-term Implications

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(No relevant relationships reported)

PURPOSE: The transition from childhood to adolescence is marked by a dramatic decrease in physical activity (PA). While many mediating factors have been suggested to explain this drop, one of the most influential may be the experiences children derive from physical education (PE). Scholars have been voicing concerns about the potential long-term implications of early PE experiences for nearly 100 years. However, there has been surprisingly little empirical investigation into this subject. Using a retrospective survey, we examined whether memories of enjoyment or non-enjoyment of PE relate to present-day attitudes and intentions for PA, and PA participation, among adults. **METHODS**: An online questionnaire was completed by 1,028 adult respondents (18-45 years), representing 47 of the 48 contiguous United States. The participants rated their retrospective enjoyment of PE and their present attitudes and intentions for PA, as well as their present PA and sedentary behavior. In addition, participants recorded their best and worst PE memories in an open-ended fashion. **RESULTS**: Retrospective enjoyment of PE as a child was significantly and positively associated with present-day attitude (r = .37) and intention (r = .23) for PA, days per

week engaging in vigorous-intensity PA ($r = .11$) and moderate-intensity PA ($r = .13$), as well as negatively associated with sedentary time both on the weekdays ($r = -.13$) and on the weekend ($r = -.14$). Of the worst memories, 34% related to embarrassment during PE, 18% to lack of enjoyment, 17% to bullying, 14% to social-physique anxiety, 16% to injury, and 2% to being punished by the PE teacher. "Worst" memories increased sharply between 6th and 10th grades. Notably, participants reported being ridiculed by teachers or peers and feeling that they lacked physical competence for the sport or fitness tests. **CONCLUSIONS**: An important relationship may exist between childhood memories of PE and present-day PA attitude and behavior as an adult. As also demonstrated in other domains of development, negative PE experiences during childhood may be influential throughout the lifetime. Intensified research efforts should be directed toward understanding the factors and processes that lead to the formation of negative memories of PE.

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Weight Dependent Disparities in Adolescent Girls: The Impact of Brief Interventions on Exercise and Healthy Eater Identity

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(No relevant relationships reported)

Adolescents girls report low efficacy in healthy behavior engagement, and are disproportionately affected by obesity. Short-term interventions, such as behavior change summer camps, may positively influence psychological correlates of healthy behavior, particularly Exercise Identity (EI) and Healthy Eater Identity (HEI). However, previous studies lack family involvement, and do not take into consideration potential disparities in EI and HEI based upon weight status (healthy vs. obese). **PURPOSE:** To determine if the combination of a 1-week intervention and an 8-week family-oriented eHealth program will increase EI, HEI, and subsequent healthy behaviors in adolescent girls. Additionally, we sought to determine if EI and HEI scores differ between normal-weight and obese groups.
METHODS: Twenty-one participants (age=11.3±1.0 years, BMI=20.2±6.4 kg/m^2) were recruited from a prevention camp (no BMI inclusion criteria), and twenty participants (age=12.4±1.5 years, BMI=31.6±6.6 kg/m^2) were from a treatment camp (elevated BMI inclusion criteria). Both camps ran 1-week in duration, and had similar intervention components. Participants self-reported EI, HEI, physical activity, screen-time, and dietary behavior at baseline and post-intervention. All families were given access to an 8-week eHealth program, and measures were repeated three months following camp.
RESULTS: EI and HEI role-identities significantly differed between the prevention and treatment groups at baseline (ΔEI=4.0, p=0.007; ΔHEI=4.5, p=0.001). Positive trends in increasing EI and HEI scores were seen in both groups following the 1-week intervention; however, mean role-identity disparities remained between groups. Participation in the eHealth program was low-moderate. At follow-up, the treatment group had increased EI and HEI role-identities in such that the groups no longer significantly differed (ΔEI=3.2 p=0.161; ΔHEI=1.5, p=0.464). Minimal changes in health behaviors were experienced in each group.
CONCLUSION: Findings indicate that EI and HEI role-identities may differ in adolescent girls based upon weight status; 1-week interventions may positively influence EI and HEI, mitigating these differences. Further investigation is warranted to address eHealth compliance, and subsequent changes in health behavior.

1338   **Board #146**   May 31 9:00 AM - 10:30 AM

Positive Body Image And Compliance With Physical Activity Recommendations Across Physical Activity Contexts In Adolescents

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(No relevant relationships reported)

Introduction: Being physically active is associated with a positive body image (PBI). Gyms offer a popular physical activity (PA) context for adolescents, and such contexts may motivate adolescents to meet PA recommendations. However, it has been suggested that exercising at gyms has been associated with a negative body image, i.e. unhealthy appearance and body composition focus. It is however, unknown whether gyms as opposed to a context of organized sports or a non-member context is differently associated with body image and PA recommendations for adolescents. **Purpose:** To investigate 1) the degree of PBI in different PA contexts and 2) if the criteria for PA recommendations are met in the different PA context groups. **Methods:** Baseline data was used from an ongoing RCT aiming to promote

PBI and prevent disordered eating among high-school students in Norway. Students aged 16-17 years (630 boys and 1073 girls) with BMI values within normal range completed the Experience of Embodiment Scale (EES) measuring PBI (score range 34-170). PA context (gym, organized sports, mixed and non-members) and meeting PA recommendations (PA ≥7 hours/week) or not (PA<7 hours/week) were assessed. ANOVA was used to investigate group differences in EES score.
Results:
Table 1: Mean PBI scores (SD) between PA contexts and compliance with PA recommendations.

Context	PBI (SD)	Meeting criteria	PBI (SD)	Meeting criteria
	BOYS		GIRLS	
Non-member	117.00 (18.4)*	No	112.00 (18.4)	No
Organized sport	125.00 (16.1)	Yes	117.93 (17.1)*	Yes
Gym	124.33 (16.2)	Yes	112.74 (19.2)	No
Mixed	126.04 (15.6)	Yes	112.30 (18.8)	Yes

* Differed significantly ($p < .001$) from other groups.
"Non-member" boys had a significantly lower PBI score than boys in other PA contexts. Girls in organized sports had a significantly higher PBI score than girls in other PA contexts.
Conclusion: For boys and girls, being a non-member, and for girls, being a gym member, are associated with not meeting PA recommendations. Further research is needed to validate these findings. The fact that non-members in agencies that offer organized PA display a low degree of PBI and not meeting PA recommendations is a matter of societal concern in the pursuit of promoting physical and mental health as well as PBI.

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Exploring Predictors of Concussion Concerns in Youth Sport Parents

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(No relevant relationships reported)

PURPOSE: To explore predictors of parental concerns about sport-related concussion (SRC) and chronic traumatic encephalopathy (CTE). **METHODS:** A 22-item online survey was emailed to 5,366 youth sport parents, assessing parents' perceptions of the long-term effects of SRC and CTE. A series of chi-squares, odds ratios (ORs), and logistic regressions (LRs) were used to analyze the data. **RESULTS:** Total response rate was 14% (739/5,366). Parents that were ≥ 18 years, had a child aged 5-12 years, and did not have a child that currently played football were included, resulting in 434 (8%) respondents. The parents were 42 ± 4.82 years, 64% (277/432) female, and the majority did not report SRC history (83%, 358/434). Their children were 9 ± 2.13 years and the majority did not have a SRC history (78%, 335/431). Key findings include: 60% (257/431) of the respondents perceive SRC as a problem in youth sports. 39% (163/416) have attended a SRC talk, 72% (297/415) have talked with their child about SRC, 77% (320/418) are concerned that their child will get a SRC, 96% (403/418) believe there are long-term effects from SRC, 45% (186/418) claim to know about CTE, and 41% (172/418) have considered not allowing their child to play youth sports due to concerns about long-term effects of SRC or CTE. Respondents were more likely to consider not allowing their child to play youth sports if their child had a SRC history (OR=1.93, p=.005), thought SRC was a problem (OR=1.54, p=.03), and were concerned their child might have a SRC (OR=1.92, p=.008). Respondents' gender, SRC history, attendance at a concussion talk, and knowledge about CTE were not significant predictors of not allowing their child to play youth sports. Results of the LR (X^2 (3, *N*= 414) = 12.829, p<.001) for predictors of not allowing their child to play youth sports were significant, with child SRC history as the only significant predictor in the model (adjusted OR=1.72, p=.04). **CONCLUSION:** A majority of parents perceive long-term effects from SRC to be a problem and are concerned about CTE. A child's SRC history and parental concerns about SRC influence decisions to allow youth sport participation. There is a need for accurate information on the benefits/risks of youth sports, factors that influence parents' concerns about SRC and CTE, and decisions to allow their children to play youth sports.

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Understanding Mothers And Daughters Physical And Emotional Health

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Compared to boys, adolescent girls have a higher prevalence of obesity, are more sedentary, and suffer more from psychosocial distress. It has been theorized that girls imitate their mothers' body image concerns and physical activity habits. **PURPOSE:** The aim of this study was to explore the relationship between adolescent girls' and mothers' perceived physical and emotional health. **METHODS:** Adolescent girls (N = 44) and their mothers (N = 19) participated in seven and four focus groups, respectively. Each focus group lasted 30-45 minutes and included an average of six and five participants for girls and mothers, respectively. Questions focused on physical activity behaviors of mothers and daughters as well as their perceptions of body image and self-esteem. The focus groups were analyzed using "Framework Analysis". Intercoder reliability was addressed through an iterative coding process (initial coding, code modification, recoding) whereby three of the authors developed and agreed upon the codes and subsequent collapsed themes. **RESULTS:** The thematic analysis resulted in four major themes and five subthemes: 1) Health related conversations are complex and result in a) daughters feeling frustrated and b) mothers feeling confused, 2) Social expectations influence body image through a) social networks and b) women's changing bodies, 3) Social comparison is common in women and girls in a) their comparison of one another which b)influences the daughter's perception of herself, and 4) Mothers' health behaviors are noticed by daughters who report very little physical activity participation with mothers. **CONCLUSION:** Results from this study highlight the type of health communication that mothers and daughters perceive as most challenging; daughters struggled with indirect conversations with their moms about health, whereas their mothers struggled with direct communication about health. Potential implications of this research include the support for targeting mothers, in addition to adolescent girls, in interventions aimed at improving mother-daughter communication as well as adolescent girls' health. Other possible implications include targeting psychosocial health (e.g., body image) and including a mothers' educational component for programs aimed at improving adolescent girls' health.

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Physical Activity and Play Behaviors during Indoor and Outdoor Free Play in Toddlers

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(No relevant relationships reported)

Young children should be provided with physical activity (PA) opportunities that promote both skill and cognitive development. Unstructured free play, both indoors and outdoors, allows young children to accumulate PA while engaging in diverse types of play behaviors, which include social and cognitive components. Cognitive play behaviors focus on the purpose of the children's activity and are classified as constructive, dramatic, exploratory, functional, and game play. **PURPOSE:** To determine PA levels and cognitive play behaviors in toddlers during indoor and outdoor free play time. **METHODS:** Participants were 25 toddlers (2.9±0.6y) enrolled in a university laboratory school, who were observed for four 20-min free play segments (2 indoor and 2 outdoor). PA was assessed using the ActiGraph GT3X+ accelerometer worn on the right hip. Each free play assessment was video recorded for analysis using the Noldus Observer XT system. The Play Observation Scale was used to classify cognitive play behaviors (constructive, dramatic, exploratory, functional, and game). The percentage of time spent in each play behavior was averaged for indoor and outdoor segments. Paired samples t-tests were used to determine differences in mean vector magnitude (VM; counts/15sec) between environments (indoors and outdoors). A 2X5 repeated measures ANOVA was used to determine the main effects of environment (indoor, outdoor) and play behavior (constructive, dramatic, exploratory, functional, game) and the interaction between these variables. **RESULTS:** There were no differences in VM counts between indoors and outdoors (541±173 vs. 657±327 counts/15sec, $p>0.05$). A significant interaction ($p<0.05$) was found between the environment and play behavior. Compared to outdoors, the participants engaged in 8.5% and 8.9%, more time in constructive and dramatic play, respectively, indoors ($p<0.05$). The children engaged in 1.4% more time in exploratory play ($p<0.05$) outdoors compared to indoors. There were no differences in percent time spent in functional (6.3%) and game (2.3%) play between environments ($p>0.05$). **CONCLUSIONS:** While there were no differences in VM counts, it appears that environment has an impact on the type of play behaviors children engage in. Indoor and outdoor play opportunities may encourage a variety of play behaviors.

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Activity Type, Play Context, and Group Composition during Indoor and Outdoor Free Play in Toddlers

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(No relevant relationships reported)

PURPOSE: To determine the type of physical activity (PA), play context, and group composition in toddlers during indoor and outdoor free play time. **METHODS:** Twenty-five toddlers (2.9±0.6y; 12 male) were video-recorded during four 20-minute free play segments (2 indoor and 2 outdoor). Each free play assessment was coded for type of PA, play context, and group composition using the Noldus Observer XT system and the percentage of time spent in each variable was averaged for indoor and outdoor segments. The Observational System for Recording Physical Activity in Children – Preschool (OSRAC-P) was used to classify the type of PA and play context. The three most common PA types (sit/squat, stand, and walk), indoor (transition, manipulatives, and sociodramatic), and outdoor (open space, portable equipment, and fixed equipment) contexts were included in the analyses. Group composition (solitary, parallel, or group) was assessed using the Play Observation Scale. Multiple repeated measures ANOVAs with post hoc analysis (LSD) were used to determine the effects of environment (indoors vs. outdoors) and PA type, environment and context, and environment and group composition as well as any interactions among these variables. **RESULTS:** The children spent 5.6% more time walking outdoors and 15.5% more time sitting/squatting indoors ($p<0.05$). The children spent less time on fixed equipment and in sociodramatic play compared to using manipulatives/portable equipment (13.7%) and transitioning or being in an open space (9.9%; $p<0.05$). Finally, the participants engaged in 13.5% more parallel and 11.1% more group play compared to solitary play ($p<0.05$). **CONCLUSION:** The type of PA varied by environment and consisted primarily of sitting/squatting, standing, and walking. The contexts were similar despite differing environments. The children spent most of their time transitioning and in open spaces and playing with manipulatives or portable equipment and playing with or in close proximity to other children. These results provide insight into children's play and PA choices during indoor and outdoor free time.

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Youth Sport Coaches Perceptions and Prioritization of Sport Safety

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(No relevant relationships reported)

Youth sport coaches set the stage for athletes' and parents' future sport involvement, experiences, and perceptions as well as attitudes toward playing safely. If youth level coaches do not see safety as a priority, athletes and parents may not either. **PURPOSE:** To determine youth sport coaches' safety perceptions and prioritization. **METHODS:** Youth sport coaches (males: n=28; females: n=2; age=46.2±12.1yrs; yrs coached=12.1±10.6) from 10 sports completed a validated survey and participated in a qualitative focus group (FG) examining prioritization, challenges, and barriers related to implementing safety policies. Coaches reported their agreement level (1-strongly disagree to 5-strongly agree) with statements about their perceptions of sport culture, education, and preparation. Descriptive statistics described each factor's agreement. Data were analyzed separately then triangulated. **RESULTS:** 97% of youth sport coaches agreed/strongly agreed that sport safety is important (n=29, 4.3±0.5), although only 77% actually make safety a priority within their sport (n=23, 3.9±0.9). Less mean agreement existed in league mandates including: coach safety education (3.8±0.9), emergency action plans (EAP) (3.2±1.1), coaches' EAP awareness (2.7±1.0, range=1-5), concussion management policies (CMP) (3.4±1.0), coaches' CMP awareness (3.1±1.0), and being encouraged to share safety information (3.8±0.9). Challenges to implementing sport safety include: parental involvement, education, sport culture and tradition, win-at-all-costs mentality, athlete physical development, lacking medical personnel, and time. These findings are reinforced qualitatively by three main FG themes affecting youth sport safety and culture including education and athlete development, others' influence and expectations, and sport safety overall. **CONCLUSION:** These data suggest a gap among youth sport coaches who think sport safety is important at the youth level versus those who actually make it a priority. Some challenges they experience with implementation may provide future targets for sport safety initiatives at the youth level. By targeting these challenges, we can minimize the gap between importance and prioritization. Supported in part by a UNC-Chapel Hill Junior Faculty Development Award

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Relationships among Weight Perception, Exercise Behaviors and Physical Fitness in Korean Elementary School Children

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(No relevant relationships reported)

PURPOSE: This study evaluated whether young children perceive their body weight correctly, and to investigate relationships among weight perception, exercise behavior and physical fitness in elementary school children.
METHODS: We recruited 200 boys (9±1 yrs, 138±6 cm, 37±10 kg, 19±4 kg/m^2) and 197 girls (9±1 yrs, 138±6 cm, 36±9 kg, 19±3 kg/m^2). Their physical fitness such as endurance shuttle run (63±26 vs. 51±20 laps), sit-and-reach (5.8±6.5 vs. 8.8±5.6 cm), grip strength (15±3 vs. 14±3 kg), and standing long jump (137±21 vs. 123±21 cm for boys vs. girls) were measured. They responded to a questionnaire reporting weight perception, exercise participation, physical activity time, physical activity preference. Their relative weight status (BMI percentile) was categorized as; underweight (<5%, UW), normal weight (5-85%, NW), and overweight/obese (85%<, OW). Data analyses were performed using Chi-square test, Fisher's exact test, Independent t-test and One-way ANOVA.
RESULTS: More than one third (36.8%) of children misperceived their body weight compared with the actual weight. In particular, body weight misperception rate was higher in NW than UW and OW. Girls considered themselves more to be overweight while boys did more to be underweight. Physical activity time and physical activity preference were not related to weight perception. Exercise participation showed differences according to gender. Physical fitness level was related to exercise behaviors. Physical fitness was higher for children who liked to exercise or were being active than those who were not. Endurance run and standing long jump were more strongly associated with physical activity preference than physical activity time, and a dose-response relationship was observed.
CONCLUSIONS: Overall, weight perception of the children was not quite accurate when compared with their actual body weight. However, there was no difference in exercise behaviors according to weight perception. Physical fitness level was associated with exercise behaviors. Endurance run and standing long jump were more strongly associated with physical activity preference than physical activity time(NRF-2013M3C8A2A02078508).

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The Effect Of Goal Structure On Vo$_2$ And Motivation In 6-10 Year Old Children During Exergame Play.

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(No relevant relationships reported)

Previous research has examined contexts which may promote playing physically interactive video games (exergames) in place of traditional, sedentary video games in children. In one such study the presence of a friend did not increase children's motivation to play an exergame versus a sedentary alternative. This lack of an effect may have been due to the competitive goal structure of the exergame studied. Children may prefer a cooperative game structure when playing with a friend. **PURPOSE:** To examine physiologic response and relative reinforcing value (RRV, i.e., motivation) for playing an exergame with a friend under two different goal structures: competitive and cooperative. **METHODS:** Participants (N = 7, 7.9 ± 1.5 years old) and a same-sex friend each completed three, 10-minute conditions: supine rest, competitive, and cooperative game play. During competitive game play, participants played Nintendo Wii Tennis against their friend. During the cooperative condition, subjects and their friend played together against a computer avatar. During each 10 minute session oxygen consumption (VO$_2$ ml·kg^{-1}·min^{-1}) was recorded and children reported their liking, via visual analog scale, for that condition. After completing all three conditions, children completed an RRV computer task to assess their motivation to play the competitive versus cooperative goal structures. During the task children performed work (button presses) to gain access to competitive play, cooperative play or a combination of the two. The output maximum (O$_{max}$) or maximum amount of work (presses) for each goal structure was used as the measure of RRV.**RESULTS:** VO$_2$ was significantly ($p \leq 0.009$) greater for cooperative (8.88 ± 3.29 ml·kg^{-1}·min^{-1}) and competitive (10.24 ± 3.24 ml·kg^{-1}·min^{-1}) game play than the resting condition (5.75 ± 1.59ml·kg^{-1}·min^{-1}). Liking was also significantly ($p \leq 0.004$) greater for cooperative (8.92 ± 2.03 cm) and competitive (8.59 ± 2.39 cm) game play than rest (3.07 ± 2.59 cm). There were no differences ($p > 0.05$) between cooperative and competitive game play for: VO$_2$, liking, or O$_{max}$. **CONCLUSION:** In children, VO$_2$ and liking were both greater during exergame play versus the resting condition. However, motivation to play the competitive and cooperative game structures was not significantly different.

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Using Self-determination Health Behavior Model To Examine Adolescents' Need Support, Need Satisfaction, And Health-related Outcomes

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(No relevant relationships reported)

Given the fact that adolescence is a critical period for establishing independent healthy lifestyle, the prevalence of physical inactivity and mental health problems should be addressed (Cai et al., 2017). Research has indicated that health-related behaviors can be promoted by satisfying individuals' basic psychological needs if we create a need-supportive social environment (Ryan & Deci, 2017). Thus, it is essential to investigate the relations among need support, need satisfaction, physical activity, and health outcomes among adolescents. **PURPOSE:** Guided by self-determination health behavior model (Ryan et al., 2008), the aim of this study was to examine the relations between perceived need support, need satisfaction, and health-related outcomes (i.e., physical activity and well-being) among middle school adolescents in China. **METHODS:** Participants were adolescents (N = 300; 50.3% female; M_{age} = 14.48) recruited from five middle schools in Shanghai, China. In this cross-sectional study, participants completed previously validated questionnaires assessing their perceived need support from PE teachers (i.e., autonomy support, competence support, and relatedness support), need satisfaction (i.e., autonomy, competence, and relatedness), physical activity, and well-being. **RESULTS:** Correlation analysis revealed significant positive associations among need support, need satisfaction, physical activity, and well-being (rs ranged from .15 to .82). The structural equation modelling (AMOS 22.0) supported the hypothesized model with a good fit to the data (χ^2/df =58.08/18, p < .001; NFI = .95; IFI = .97; CFI = .97; RMSEA = .09; 90% CI [.06, .11]). The need support had a large influence on need satisfaction (β = .80), and need satisfaction also had a significant contribution on health-related outcomes including physical activity and well-being (β = .89). **CONCLUSION:** The findings highlighted the importance of need-supportive environments, and supported the theoretical tenets of self-determination health behavior model and its generalizability among Chinese adolescents. To maintain adolescent's healthy lifestyle, school teachers and health professionals need to create a need-supportive environment to enhance adolescents' need satisfaction and health-related outcomes during adolescence.

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Physical Literacy, Anxiety, And Depression In Sixth-grade Physical Education Students

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(No relevant relationships reported)

In the past decade, physical literacy has been given increased research attention among educational organizations and researchers (Edwards et al., 2017). Physically literate individuals are said to have the ability, confidence, and desire to be physically active for life (SHAPE America, 2014). Though relationships among physical activity, anxiety, and depression are well-established, relationships among physical literacy, anxiety, and depression have yet been explored. **PURPOSE**: To investigate the relationships among physical literacy, anxiety, and depression in early adolescents. **METHODS**: Participants were 419 sixth-grade physical education students (58% female; M_{age} = 11.51 ± 0.5 years) from two public middle schools located in Southwestern United States. To assess physical literacy, anxiety, and depression, participants completed the PE Metrics® Overhand Throwing (SHAPE America, 2010), FITNESSGRAM® (The Cooper Institute, 2013), and Plank (NHANES, 2012) assessments, as well as three brief surveys assessing self-efficacy (Gao, Newton, & Carson, 2008), intrinsic motivation (Ryan & Connell, 1989), self-esteem (Harter, 2012), knowledge and understanding (Healthy Active Living and Obesity Research Group, 2013), and anxiety and depression (Lovibond & Lovibond, 1995). Structural Equation Modeling was used to investigate the fit of the measurement and structural models of the factors and the proposed relationships. **RESULTS**: Analyses revealed good model fit for the physical literacy, $\chi^2(167)$ = 343.38, $p < .01$, RMSEA = .05, CFI = .96, SRMR = .07, and the anxiety and depression measurement models, $\chi^2(34)$ = 73.72, $p < .01$, RMSEA = .05, CFI = .95, SRMR = .05. Physical literacy was variant between sexes; thus, boys' and girls' data were analyzed separately. Analyses indicated physical literacy was negatively related to anxiety (γ = -.41, $p < .01$) and depression (γ = -.38, $p < .01$) with female and male data (γ = -.20, $p < .01$; γ = -.22, $p < .01$, respectively). **CONCLUSION**: In both female and male six-grade physical education students, higher physical literacy related to lower levels of anxiety and depressive symptomologies. These results were consistent with previous research that suggests increasing physical literacy in children may improve psychological well-being (Olive, Telford, Telford, & Byrne, 2015).

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Learning Through Play: Positive Effects Of Active Playing On Cognition In Children

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(No relevant relationships reported)

The utility of physical activity, fitness to improve cognition and academic achievement is important to make pleasant learning disturbs and difficulties. **PURPOSE**: To verify the effects of three months of interdisciplinary physical education program on academic achievement and selective attention in children. **METHODS**: 60 boys and girls from 4th grade of public elementary brazilian school, underwent a Education by Movement group (EduMove) (n=39, 9.7±yr; 31.6 ± 6.2 kg; 1.4 ± 0.1 m; 17.9 ± 7.2 %body fat) with math, written and reading classes through physical education activities during a school journey (172.8±16.31bpm) (60min each class, twice a week), and a control group (Con) (n=21, 9.9±0.8yr; 30.0 ± 5.1 kg; 1.4 ± 0.1 m; 17.1 ± 8.6 %body fat) which participated at traditional classes (92.4±8.9bpm). Children performed an academic achievement standardized test (reading, writing and math), selective attention test (Stroop Go/NoGo) and anthropometric measures before and after three months. **RESULTS**: ANOVA revealed tricipital skinfold reduction for EduMove in comparison with CON at post test (11.8 ± 5.6 *vs* 12.7 ± 5.3; p=0.008), it was observed higher physical activity level for EduMovi *vs* CON (Δ 23.3 *vs* 2.9 METs; p=0.09). Children showed better results at reading capacity for EduMovi *vs* CON (65.2 ± 4.9 *vs* 64.7 ± 3.0; p=0.038). Regarding selective attention EduMovi was faster and committed less mistakes in comparison with pre test (236.1 ± 39.9 *vs* 327.9 ± 45.88 ms/%, Δ -90ms e -2% of mistakes p=0.09). **CONCLUSIONS**: A short term interdisciplinary physical education program can improve reading capacity, and selective attention in children. These results may suggest that activity breaks during a school journey could contributing to learning.

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High School Adolescents' Physical Activity and Physical Fitness: A 3 × 2 Achievement Goal Approach

Liang Shen[1], JoonYoung Lee[2], Xiaoxia Zhang[2], Xiangli Gu[2], Tao Zhang[2]. [1]Shanghai University, Shanghai, China. [2]University of North Texas, Denton, TX.

(No relevant relationships reported)

Previous research has showed the majority of high school adolescents are not physically active and fit (CDC, 2010). The literature indicates that individuals' goal orientations would influence their healthy behavior (Elliot et al., 1999). The 3 × 2 Achievement Goal Model aims to understand individuals' six goal orientations (i.e., task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance; Elliot et al., 2011). Therefore, it is important to identify high school adolescents' goal orientations toward their physical activity and fitness. **PURPOSE:** Guided by 3 × 2 achievement goal approach, this study attempted to examine the relations between six goal orientations, physical activity, and physical fitness among high school adolescents. **METHODS:** Participants were 792 adolescents (360 males, 432 females; M_{age} = 16.9) recruited from four high schools in Shanghai, China. They completed previously validated survey to measure their 3 × 2 goal orientations (Elliot et al., 2011), physical activity (Kowalski et al., 1997), and physical fitness (i.e., 50-meter run and standing long jump). **RESULTS:** Correlation analysis demonstrated that task-, self-, and other-approach goals were significantly correlated to physical activity and fitness (rs ranged from -.10 to .27). While task-, self-, and other-avoidance goals were positively related to physical activity (rs ranged from .10 to .13), they were not significantly associated with physical fitness. The results of three multiple regressions revealed that other-approach goal (β = .19), self-approach goal (β = .18), and task-avoidance goal (β = -.09) were significant predictors of physical activity (R^2 = 9.0%). Other-approach goal (β = -.19) and self-avoidance goal (β = .10) significantly contributed to 50-meter run (R^2 = 2.5%). Only self-approach goal (β = .14) significantly predicted standing long jump (R^2= 1.9%). **CONCLUSION:** The findings supported the 3 × 2 achievement goal model can be utilized to understand physical activity and fitness among high school adolescents. Specifically, creating a self- and other-approach oriented environment and designing developmentally appropriate class contents based on adolescents' level could be effective strategies to augment high school adolescents' physical activity and fitness.

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Understanding High School Adolescents' Physical Activity and Depressive Symptoms from a Psychosocial Perspective

Tao Zhang[1], Xiangli Gu[1], Liang Shen[2], JoonYoung Lee[1], Xiaoxia Zhang[1]. [1]University of North Texas, Denton, TX. [2]Shanghai University, Shanghai, China.

(No relevant relationships reported)

Although regular physical activity (PA) produces significant health benefits, the majority of adolescents were physically inactive and adopting sedentary lifestyle (Zahl et al., 2017). Further, the mental health problems such as depressive symptoms were prevalent among adolescents (Schubert et al., 2017). The theory of planned behavior (TPB; Ajzen, 1991) suggests attitude, subjective norm, and perceived behavioral control can shape individuals' PA intention and PA, but there is limited empirical evidence of relationships among TPB variables, PA, and depressive symptoms among adolescents. **PURPOSE:** Guided by the TPB, this study attempted to fill the research gap and test a hypothesized model of TPB variables (i.e., attitude, subjective norm, perceived behavioral control, and intention) related to PA and depressive symptoms among high school adolescents. **METHODS:** 792 Chinese adolescents (432 females; 360 males; M_{age} = 16.9) who enrolled into four high schools in Shanghai completed previously validated questionnaires assessing their TPB variables, PA, and depressive symptoms. Correlations were used to examine the relationships among the variables, and the hypothesized model was tested using structural equation modeling (SEM; AMOS 22). **RESULTS:** Correlation analysis revealed significant positive associations among TPB variables and PA, while depression was negatively related to TPB variables and PA. The SEM analyses indicated that the hypothesized model produces a good fit to the data (χ^2/df =33.9/6, p < .01; NFI = .98; IFI = .98; CFI = .98; RMSEA = .08; 90% CI [.05, .10]). Specifically, the model accounted for 23.8% and 1.0 % of the variance in PA and depression, respectively. Path coefficients suggested that attitude (β = .33), subjective norm (β = .21), perceived behavioral control (β = .28) were positively associated with intention. Intention (β = .11) and perceived behavioral control (β = .42) significantly predicted PA. PA negatively predicted depression (β = -.09). **CONCLUSION:** The findings support the theoretical tenets of TPB and provide empirical evidence of the relationships among key TPB variables, PA, and depressive symptoms in Chinese adolescents. These findings have significant practical implications for PA intervention strategies aimed at promoting adolescents' PA and reducing depression.

C-42   Free Communication/Poster - **Correlates and Behavioral Aspects of Sport**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1351   Board #159   May 31 9:00 AM - 10:30 AM

Athletic Coping Skills of Female Ultrarunners

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(No relevant relationships reported)

A female ultrarunner's ability to cope with stressful situations during competition is crucial for optimal development. Therefore, the ability to cope under these circumstances is essential for creating a strong mental capacity that leads to competitive success. PURPOSE: To quantify the athletic coping skills of female ultra runners. METHODS: Following written informed consent, 76 female ultra runners (mean age 38.9 ± 9.4) completed the Athletic Coping Skills Inventory (ACSI; Smith et al., 1995): coping with adversity (COPE), peaking under pressure (PEAK), goal setting/mental preparation (GOAL), concentration (CONC), freedom from worry (FREE), confidence and achievement motivation (CONF), coachability (COAC), and personal coping resources (PCR). Data were grouped by distance (<50 miles, 50-99 miles, 100+ miles), experience in years (novice-3, 4-9,10+), age (20-39 years, 40+ yrs), number of ultra races completed (1-2, 3-4, 5+), ethnicity (Caucasian, other), and competitive injuries (0, 1-2, 3+). RESULTS: MANOVAs (Wilks' λ) indicated significant main coping affects by distance (F 14,134 = 1.912; P = 0.030), experience (F 14,134 = 2.123; P = 0.014), and age (F 7,68 = 2.329; P = 0.034); but not by ultra competitions completed (F 14,134 = 1.239; P = 0.255), ethnicity (F 7,68 = 1.183, P = 0.324), and number of competitive injuries (F 14,134 = .899, P = 0.562). Post hoc analyses (T scores; T = 50, SD = 10) indicated 100+ ultra milers responded significantly higher in FREE (44 vs 34 vs 41; p = 0.011) and COAC (34 vs 30 vs 30; p = 0.019) than middle and low distance class runners, respectively. Runners with 10+ years of experience responded significantly higher than less experienced (4-9 and Novice-3) in GOAL (58 vs 54 vs 51; p = 0.013), CONC (53 vs 48 vs 44; p = 0.012) and CONF (50 vs 46 vs 41; p = 0.022), respectively. Runners 40+ yrs responded higher in COPE (51 vs 47;

p= 0.025), CONC (53 vs 44; p = 0.001), and lower in FREE (37 vs 45; p = 0.013) than younger runners, respectively. **CONCLUSION:** Coping skills among this group reflected subnormal responses when compared to normative values across other athletic populations. It is recommended that ultra athletes incorporate time within their workout routines to conduct coping skills training involving sport psychologists familiar with ultra running.

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Learning Effect of Anchoring Bias in Combination with Action-Perception Coupling in Novice Golf Putting

Andrew Nixon, Matthew Miltenberger, Shala Davis, FACSM, Gavin Moir. *East Stroudsburg University, East Stroudsburg, PA.*

(No relevant relationships reported)

Quality of instruction significantly influences skill acquisition and performance in sport related tasks, such as golf putting. Instruction for novice individuals should promote external focus, and constantly emphasize the relationship between motor action and task outcome. **PURPOSE:** To analyze the influence of an anchoring bias, while also examining the learning benefits of integrating action-perception external foci. **METHODS:** The putting protocol consisted of three trials: pre-test, acquisition, and post-test. Each trial was performed from a distance of eight feet on artificial turf. Subjects (6 males, 6 females) did not receive instructions or cues for any of the ten putts during the pre- or post-tests. Two counter balanced groups were made upon the completion of the pre-test. Immediately before the start of the acquisition trial subjects were provided an anchor number and asked to estimate whether their average putt would stop closer or further than the number. Group one (High) was given an anchor of 12 inches and group two (Low) was given an anchor of 3 inches. External cues were positioned in front of and behind the starting point of the ball to facilitate club and ball path for the acquisition trials. The subjects were not made aware of the cues or instructed to use them in any way. The acquisition trial contained five blocks of twenty putts with a three-minute break between each block. Twenty-four hours after the completion of the acquisition trial subjects returned to complete the post-test. Distance from the target was measured as the average sum of horizontal and vertical distance. **RESULTS:** The high anchor group responded with an average of 5.55 inches (9.3±1.96 vs 3.75±1.78, p<0.05) more than the low anchor group. This difference was found to be significant, demonstrating that anchor values may have an influence on estimation. Error was reduced in both the High (50.1±18.07 to 40.84±9.71, p<0.05) and Low (58.72± 18.59 to 35.71±7.99, p<0.05) groups from pre-test to post-test. Differences between groups were not found to be statistically significant (p = 0.262). **CONCLUSION:** Individuals used the provided anchor values to adjust their estimate of predicted performance. Significant differences in putt performance from pre to post test showed improvement in both groups. Improvement between groups were not significant.

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Academic Confidence and Grit Predict Mindfulness in Collegiate Student-Athletes

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(No relevant relationships reported)

Mindfulness includes the ability to be attentive and aware of present events and experiences without making judgments based off prior beliefs. There is evidence that mindfulness is related to grit and academic performance but has not been well studied in the collegiate athletic population. **PURPOSE**: The purpose of this study was to determine if grit, academic confidence and demographic factors were predictive of mindfulness in collegiate student-athletes. **METHODS**: 349 (19.6+/-1.23yrs; 191 male, 158 female) varsity student-athletes completed the Mindfulness Attention Awareness Scale, Academic Confidence Scale, and short grit scale as part of the baseline concussion testing protocol. 177 were classified as contact and collision student-athletes (Football, Lacrosse, Soccer), 75 as contact student-athletes (Basketball, Baseball, Softball), and 96 as limited contact student-athletes (Cross-Country, Track and Field, Tennis, Golf, Volleyball). These classifications are used by the NCAA and may influence levels of mindfulness. A stepwise multiple regression was conducted to determine if gender (step 1), age (step 2), sport type (step 3), grit (step 4) and academic confidence (step 5) were predictive of mindfulness. **RESULTS**: Steps 1-3 displayed no significant change in R2(gender, age, and sport type, R2 =0.013, p>0.05) . Steps 4, grit, showed significant change in R2 (R2 change=0.159, p<0.001). In addition, step 5, academic confidence, showed a significant change in R2 (R2 change = 0.013, p<0.05). **CONCLUSION**: Demographic information including age, gender and sport classification do not significantly predict the variance of mindfulness (1.3%) but the addition of Grit and Academic Confidence accounted for 18.5% of the variance in mindfulness. This suggests that the relationship between mindfulness, grit, and academic confidence is important in collegiate student-athletes. Future research should consider how training in mindfulness impacts performance and confidence on and off the field of play.

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Psychophysiological And Pacing Strategy Responses To A Sprint Exercise Performed With Different Exercise Expectations.

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(No relevant relationships reported)

Deception is a psychological approach to manipulate the exercise expectation (EE) before or during self-paced exercise(SIE).
PURPOSE: Verify how negative expectations would alter pacing strategy, performance and psychophysiological responses to an all-out sprint interval exercise (SIE).
METHODS: Participated of the study, eleven cyclists (34 ± 6 years old, 173 ± 4.8 cm, 73 ± 5.8 kg, 52.9±8.1 ml/kg/min, 298.4±29.9 Wpeak). After characterize the cyclists with anthropometric measurements, maximal incremental test and familiarization, two all-out SIE were performed: (1) control (CON) composed by a ten all-out sprints, with 0.1 kp.kg^{-1} body mass workload, interspersed by a 60 s of passive recovery, without manipulating the EE; (2) more demanding exercise expectation (MDEE), with the same exercise configuration as in the CON, but the cyclists were informed that the SIE have a higher demand than in CON, based on the information of they would rest for 50 s between the sprints, however they actually rested for 60 s. Performance as a peak (PPO) and mean (MPO) power output and physiological measurements (heart rate (HR), VO2 and lactate (BLC)) were recorded continuously over the SIE and psychological measurements (RPE, felling scale (FS) and felt arousal scale (FAS)) were collected during each recovery period.
RESULTS: Main effect of EE was not found on performance, however the MDEE session show a higher PPO in the last sprint (p=0.019). EE main effect was also detected for FS (p < 0.001) but not for FAS (p = 0.26) responses. Although we did not detect an effect of EE on performance between experimental sessions (CON x MDEE), affect and pacing performance (MPO) were related. These correlations seems to indicate that either valence or the arousal have better associations either for the CON (r = 0.91, P <0.001; r = - 0.90, P <0.001) than for the MDEE (r = 0.69, P = 0.026; r = - 0.79, P = 0.006), respectively. Additionally, by means of *circumplex* model, the CON affect pre-exercise and sprint 1 values, were in the calmness quadrant, contrary to what is observed is MDEE. Main effect of exercise expectation was also found in HR (p=0.002) but not for VO2 (p=0.067) and BLC (p=0.38).
CONCLUSIONS: The manipulation of pre-EE, it seems to influence psychophysiological but not physiological responses, in two all-out SIE with the same exercise configuration.

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Impact Of Music On Athletes' Motivation And Flow State During Competitions

Michaela Cocca[1], Armando Cocca[1], Ney Augusto Da Silva[2], Luis Tomas Rodenas Cuenca[2]. *[1]Texas A&M University San Antonio, San Antonio, TX. [2]Autonomous University of Nuevo Leon, Monterrey, Mexico.*

(No relevant relationships reported)

Flow state (FL) and motivation (M) are among the most studied psychological conditions that may affect athletes' performance. Highly intrinsically motivated players who are fully synchronized and absorbed into their game have greater chances to perform well, to deal positively with stress and pressure associated with competitions, and to maintain a mental balance that allows them to be successful in their personal life as well. Among the strategies that athletes, or their coaches, adopt to prompt a positive mental condition before and after trainings and competition, listening to music has become a widespread trend.
PURPOSE: to determine motivational and flow profiles of athletes based on their use of music before and after trainings and competitions.
METHODS: A sample of 263 athletes participating in the 2017 University Olympics of Mexico filled a questionnaire on music habits and preferences, the Sports Motivation Scale, and the Flow State Scale. Two-step cluster analysis was performed to explore athletes' music-related profiles. RESULTS. The analysis highlighted the presence of two main groups: Music Enthusiasts (ME), athletes who listen to music often in

training and match situations, are characterized by high intrinsic (20.2), low extrinsic motivation (9.3), and null amotivation (7.5); also, they have high levels of flow state (FS > 18); and Music Hesitant (MH), athletes who listen to music seldom or never, have low intrinsic (5.1), high extrinsic motivation (20.4), as well as high amotivation (19.3); although MH's flow profile is similar as ME's in many dimensions, the formers show moderate balance between personal skills and task challenges (12.2), moderate focus on their tasks (13.1), and tend to have low self-awareness (9.9). CONCLUSIONS: Listening to music seems to trigger an optimal mental state before trainings and competitions, as well as it allows athletes to maintain a psychological balance after their performance.

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Evaluating The Effectiveness Of Applying Grief-Response Models To Sport Injury In Collegiate Student-Athletes

Sydney Brown, Eric E. Hall, FACSM. *Elon University, Elon, NC.* (Sponsor: Dr. Eric Hall, FACSM)

(No relevant relationships reported)

For an athlete whose identity is contingent upon their participation in sport, an injury that forces them to cease participation can represent a significant loss. As a result, grief models are often applied to the context of sport injury. However, most models may be outdated, and little empirical research has been done to test their applicability to sport injury. **PURPOSE**: The effectiveness of grief-response models in describing emotional responses to injury was evaluated in collegiate student-athletes. Additionally, the role of social support in determining emotional response was investigated. **METHODS**: 14 collegiate student-athletes (9 female, 5 male) across five Division I sports participated in this study by completing a semi-structured interview regarding the individual's injury experience. **RESULTS**: Athletes most frequently reported feeling upset during the injury diagnosis stage. For those athletes whose injury required surgical intervention, their top reported emotional response during that time was anxiety or fear. Frustration was the most commonly expressed emotion during the rehabilitation stage. Finally, in returning to play, the top emotional response reported among participants was nervousness/anxiety. Regarding social support, participants reported one or both of their parents as their greatest source of social support, while coaches were the primary source that the student-athletes wished they had received more support. **CONCLUSION**: Preliminary findings suggest that grief models should redirect focus from shock and depression and be reworked to account for the prevalence of anxiety and frustration in multiple stages of recovery. Additionally, results identified a need for increased availability of social support resources on campus, as well as, training for coaching staff on how to better meet the expectations and needs of injured athletes.

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Indicators Of Burnout In College Athletes: Proportion Comparisons By Sex And Sport Type

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(No relevant relationships reported)

PURPOSE: To describe the proportion of burnout levels in college athletes employing a psychological instrument and compare them by sport type and sex.
METHODS: 236 college athletes from a high performance program (122 from individual sports and 124 from team sports and; 76 women and 160 men) were evaluated. Trained psychologists applied the Sport Burnout Inventory-Reviewed (IBD-R, in Spanish), conformed by 19 items that evaluate 3 Burnout dimensions in athletes: Emotional Exhaustion (EE), Depersonalization (D) and Reduced Personal Realization (RPR); finally, it brings to a Total Burnout Qualification, which let the evaluator know the burnout level in the evaluated subject. The results were classified in four categories: "Low risk" (≤50), "Moderated risk" (≥51 <60), "High risk" (≥61 <70) and "With burnout" (>70). The frequencies and proportions were counted and compared by sport type and sex.
RESULTS: Team sports showed lower proportion of "Low risk" to suffer burnout in the RPR factor than individual sports (p=0.03). As well, a trend for higher proportion of "With burnout" in EE was observed for individual than team sports (p=0.06). Conversely, a trend for higher proportion of "Moderated risk" in RPR was observed for team than individual sports (p=0.06). On the other hand, statistically significant differences were found in three factors between females and males. Males showed higher prevalence of "Low risk" in EE compared to females (p=0.006), also females presented higher proportion of "Moderated risk" to suffer burnout in the EE indicator than males (p=0.02). In the D factor, males reported a higher proportion of "High risk" to suffer burnout than females (p=0.03) (Table 1).
CONCLUSIONS: The results showed that both individual sports and female athletes presented higher proportions of risk to suffer burnout than team sports and male athletes, respectively. However, a deeper evaluation is suggested to confirm the data and make a Burnout profile in college athletes.

Table 1. Proportion of burnout indicators by sport type and sex.

By sport type

	Team sports (n 124)				Individual sports (n 112)			
	EE	D	RPR	BURN-OUT	EE	D	RPR	BURN-OUT
Low risk	53.2% (n 66)	43.6% (n 54)	54.8% (n 68)[a]	44.4% (n 55)	46.4% (n 52)	48.2% (n 54)	68.8% (n 77)[a]	47.3% (n 53)
Moderate risk	33.9% (n 42)	34.7% (n 43)	31.5% (n 39)[b]	47.6% (n 59)	34.8% (n 39)	29.5% (n 33)	20.5% (n 23)[b]	44.6% (n 50)
High risk	11.3% (n 14)	13.7% (n 17)	8.9% (n 11)	7.3% (n 9)	12.5% (n 14)	14.3% (n 16)	8.9% (n 10)	8.0% (n 9)
With burnout	1.6% (n 2)[b]	8.1% (n 10)	4.8% (n 6)	0.8% (n 1)	6.3% (n 7)[b]	8.0% (n 9)	1.8% (n 2)	0% (n 0)

By sex

	Females (n76)				Males (n 160)			
Low risk	36.8% (n 28)[c]	48.7% (n 37)	65.8% (n 50)	44.7% (n 34)	56.3% (n 90)[c]	44.4% (n 71)	59.4% (n 95)	46.3% (n 74)
Moderate risk	44.7% (n 34)[c]	32.9% (n 25)	27.6% (n 21)	47.4% (n 36)	29.4% (n 47)[c]	31.9% (n 51)	25.6% (n 41)	45.6% (n 73)
High risk	11.8% (n 9)	6.6% (n 5)[c]	5.3% (n 4)	7.9% (n 6)	11.9% (n 19)	17.5% (n 28)[c]	10.6% (n 17)	7.5% (n 12)
With burnout	6.6% (n 5)	11.8% (n 9)	1.3% (n 1)	0% (n 0)	2.5% (n 4)	6.3% (n 10)	4.4% (n 7)	0.6% (n 1)

[a] Significant differences by sport type (p<0.05).
[b] Trend for differences by sport type (p<0.1)
[c] Significant differences by sex (p<0.05).

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Differences in Sport Motivation Types in NCAA Division II Athletes over Time

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(No relevant relationships reported)

Few studies have examined motivation types in collegiate athletes over time using the Self-Determination Theory (SDT) continuum. **PURPOSE:** To investigate differences in motivation types in NCAA Division II student-athletes (SAs) over three time points. **METHODS:** Overall, 530 SAs (n_{males} = 355, $n_{females}$ = 175) with an age range of 18 to 23 (M = 19.40, SD = 1.33) from 21 teams voluntarily completed a demographic questionnaire and the 18-item Sport Motivation Scale II used to measure six motivation types: intrinsic (IR), integrated (INTR), identified (IDR), introjected (INT), external (EXT), and amotivation (AMR) regulation. Six, one-way, repeated measures Analyses of Variance with Bonferroni post hoc tests were used to analyze SA motivation types over the pre-season (PS), in-season (IS), and off-season (OS). An alpha level of $p \leq .05$ was set for statistical significance. **RESULTS:** Analyses revealed statistically significant differences in IR, INTR, IDR, and AMR types over time. For IR, a difference was seen, $F(2, 710) = 3.66$, $p = .026$, between the PS and IS ($p = .028$) with lower scores in the IS (M = 16.11, SD = 4.21) versus the PS (M = 16.67, SD = 4.13). For INTR, differences were seen, $F(1.95, 691.39) = 15.75$, $p < .001$, between both the PS and IS ($p < .001$) and between the PS and OS ($p < .001$) with lower scores in the IS (M = 16.69, SD = 3.69) and OS (M = 16.53, SD = 4.05) versus in the PS (M = 17.58, SD = 3.29). For IDR, a difference was seen, $F(1.92, 680.470) = 5.89$, $p = .003$, between the PS and IS ($p = .004$) with lower scores in the IS (M = 16.43, SD = 4.09) versus in the PS (M = 17.12, SD = 3.62). For AMR, differences were seen over time, $F(1.97, 699.89) = 8.21$, $p < .001$, between both the PS and IS ($p < .001$) and between the PS and OS ($p < .001$) with higher scores in the IS (M = 7.82, SD = 4.31) and OS (M = 7.78, SD = 4.73) versus lower scores in the PS (M = 6.93, SD = 4.11). **CONCLUSIONS**: Findings demonstrated that more self-determined motivation (IR, INTR, IDR) was highest in the PS while increasing AMR scores predominated over time extending into the IS and OS. This is consistent with the athlete burnout/SDT literature where motivation extremely low in internalization (i.e., AMR) is positively associated with burnout and motivation extremely high in internalization (i.e., IR) is negatively associated with burnout (Cresswell, 2009; Cresswell & Eklund, 2005a, 2005b).

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Quantity Of Deliberate Play And Collegiate Sports: A Comparison Of Two Case Studies.

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(No relevant relationships reported)

The National Collegiate Athletic Association has over 250,000 students competing in Division I (DI) and Division III (DIII) programs. DI colleges comprise 32% of the association while DIII accounts for 40%. Previous studies of individuals within the same collegiate level have uncovered a positive correlation between the hours of deliberate play and athletic skill level. To date, there have been no studies on comparing the two aforementioned divisions. **PURPOSE**: To investigate the quantity of deliberate play that contributes to achieving the DI and DIII statuses. **METHODS**: Using an online interview as proposed by Côté, Ericcson, and Law (2005), all student-athletes from both Rice University (DI) and State University of New York (SUNY) in Plattsburgh (DIII), were recruited via email. Sixty-three participated from DI (track and field, basketball, and football) and 90 from DIII (track and field, basketball, hockey, soccer, softball, and tennis). The response rate was 17% and 29%, respectively. Descriptive statistics and parametric tests were used in the analysis. **RESULTS**: Differences with statistical significance (p<0.05) were found in: (a) height (when younger, 100% DI to 78% DIII were average or taller than peers), (b) participation in early activities of art (17 to 37%), organized games with rules (72 to 86%), and other sport-related activities (48 to 74%), (c) parents being top athletes (24 to 48%), and (d) the current activities of sleeping (25 to 52 hours per week), socializing (9 to 21 h.), school/career (8 to 21 h.), and studying (9 to 15 h.). **CONCLUSIONS**: In both divisions, we further attest to the suggestions of Côté et al. (2003) about participation of youth in multifarious activities. Our results also align with past work from Landers et al. (2011), which has underscored the competitive advantage of athletes with longer levers than their shorter peers. The comparison of current activities indicate that a DIII school may be promoting a more wellness lifestyle (including all its dimensions, such as social, physical, occupational, and mental). Possible limitations of this study are the use of convenience and unequal samples, self-reported data, and of retrospective methods. Future research, comparing more cases of different-division schools, is recommended.

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Athletic Coping Skills of Female Division I Volleyball Players

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Reported Relationships: M.P. Casanova: *Contracted Research - Including Principle Investigator; Partial support by FieldTurf USA.*

A female volleyball athlete's ability to cope within the competitive environment oftentimes determines the outcome of a match. Therefore, possessing a strong coping skill set necessary at this level of competition is essential for optimal performance potential. **PURPOSE:** To quantify the athletic coping skills of Division I female volleyball players. **METHODS:** Following written informed consent, 28 female volleyball players (mean age 19.7 ± 1.5) completed the Athletic Coping Skills Inventory (ACSI; Smith et al., 1995): coping with adversity (COPE), peaking under pressure (PEAK), goal setting/mental preparation (GOAL), concentration (CONC), freedom from worry (FREE), confidence and achievement motivation (CONF), coachability (COAC), and personal coping resources (PCR). Data were grouped by athletic rank (top, bottom), present injury status (yes, no), and by academic level (upper class, lower class). **RESULTS:** MANOVAs (Wilks' λ criterion) indicated significant main effects for athletic coping by athletic rank ($F_{13,16} = 5.046$; P = 0.002), but no significant main effects across present injury status ($F_{24,5} = 1.711$; P = 0.161) or academic level ($F_{14,15} = 0.545$; P = 0.791). Post hoc analyses (T score; T = 50, SD = 10) indicated that top-ranked athletes responded significantly higher in COPE (55 vs 42; p < 0.001), PEAK (53 vs 44; p = 0.001), GOAL (54 vs 44; p = 0.006), and CONC (53 vs 48; p = 0.025), CONF (54 vs 46; p = 0.001), COAC (52, 39; p = 0.001), and PCR (56 vs 41; p < 0.001) than bottom-ranked peers, respectively. There was also a trend for athletes experiencing trauma to respond more positively in COPE, PEAK, GOAL, CONC, FREE, CONF, and PCR than non-injured peers. Of concern, athletic coping skills among this group were below average when compared to normative values across other athletic populations. **CONCLUSION:** Although findings were influenced by limited sample size, results still support the recommendation that volleyball athletes incorporate psychological skills training into their workout routines that specifically target athletic coping skills. Further research is warranted to assess coping skills within a larger volleyball population, to assess coping skills in athletes recovering from injuries, as well as to quantify the efficacy of coping skills interventions on volleyball performance.

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Effects of Mental Strength and Mindfulness Training on Exercise Performance

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Internal self-talk has been shown to improve performance and reduce effort, but less is known about how short-term mental strength (MS) and mindfulness (MD) training affect performance and underlying physiological variables.
PURPOSE: To determine how MS (grit, resilience) or MD training affect cycling time trial to exhaustion and to determine the physiological mechanisms underlying these changes.
METHODS: 35 college-aged participants visited the lab on 4 separate days. A VO2max with ventilatory threshold (VT) was performed on day 1. The subsequent visits consisted of time trials to exhaustion (TTE) performed at 10% above VT. Between visit 3 and 4, MS (13 participants) and MD (10 participants) groups watched a video or listened to an audio recording for 15 minutes each day for one week while the control group (C) (12 participants) did no training. Heart rate (HR), rate of perceived exertion (RPE), VAS scores for pain and fatigue, and EMG were recorded during the time trials. CD-Risc, GRIT-S, and the 5-factor mindfulness surveys were also completed before study day 3 and 4. A RM-ANOVA was done to compare group and time differences.
RESULTS: TTE was significantly increased in MS ($8.6\pm13.6\%$, p<0.05) and MD ($4.3\pm5.8\%$, p<0.05) compared to C ($-4.9\pm11.6\%$). There were no changes between MS or MD and C for differences between trial 1 and trial 2 for maximum HR, average HR, maximum RPE, average RPE, or VAS scores for pain or fatigue (p>0.05). One week of MS or MD training also did not affect the GRIT-S, CD-Risc, or 5-factor mindfulness survey (p>0.05). There was a significant decrease in EMG for MS as compared to both MD (p<0.05) and C (p<0.01), but MD EMG did not change as compared to C (p>0.05).
Conclusions: One week of mental training, whether MS which included grit and resilience training or for MD, has the ability to improve TTE performance. However, current psychological surveys are not sensitive enough to detect changes in mental performance, perhaps because they are not sport/exercise specific. Further, MS may improve performance by reducing EMG input and shifting to a more external focus, allowing a decreased activation of muscle and subsequent reduced fatigue rate.

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Fitness Self-perception And Lifestyle In Rugby Players In Colombia

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(No relevant relationships reported)

Background: Self-perception and Lifestyle have a significant influence on athletes´ performance. Research in Rugby had been focused mainly on the assessment of physiological and anthropometrical player´s profiles as well as injuries incidence.
Purpose: The aim of this study was to evaluate the self-perception of Fitness and Lifestyle in Rugby players in Colombia **Methods:** A cross-sectional study was conducted with Rugby players from 37 cities in Colombia aged 18 years and older, with at least one year of sport practice. Fitness self-perception was assessed with the International Fitness Scale (IFIS) and Lifestyle was evaluated with the *FANTASTIC* Questionnaire. Statistical analysis was performed with central tendency measures, standard deviation, t- student and chi-square. **Results:** 479 players were surveyed. 68% were men, 53.7% played at Backs position and 46.3% as Forwards position. The age average was 24.6 (± 4.4) years old and a practice experience of 4.2 (± 3.8) years. Most of the participants classified their Fitness and Its components: Cardiorespiratory endurance, Strength and Speed /Agility as "*Good*" (58%, 47%, 53%, 44% respectively), while Flexibility was categorized between "*Acceptable*" 36% and "*Good*" 34% mainly. Significant differences were found by position on the field (Backs and Forwards) in the Self-perception of the Strength in players (p = 0.000). Regarding to Lifestyle, evaluated with the FANTASTIC Questionnaire, the average of overall score was 75.3 (± 10.2). According to this, the majority of the players, (54.7%, n = 262), reported their lifestyle in the category "*Good*". Significant differences were also found by position on the field in the total scores (p = 0.004). It highlight the difference between Forwards and Backs in the category "*Aggressiveness*" belonging to Personality Type domain (p = 0.04). **Conclusion:** Our results are consistent with the pilot study conducted previously on the same population. The players show a good self-perception of their Fitness and its components as well as a good Lifestyle. The differences found, might be explained according to the characteristics of the player's position on the field. Furthermore studies are necessary.

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Muscle Dysmorphic Disorders, Body Dissatisfaction and Eating Disorder in Male Bodybuilders

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(No relevant relationships reported)

Muscle dysmorphic disorders (MDD) have been described as a body image disorder, characterized by a perceived lack of muscularity, and largely affect males. **PURPOSE:** The study aimed to determine the rates and relationships among MDD, body image disturbance and eating disorders in both competitive/professional and non-competitive/recreational male bodybuilders. **METHODS:** The participants consist of 120 bodybuilders (competitive, n=62 (mean age 31.05 ± 10.60 yr) and non-competitive, n=58 (mean age 25.63 ± 6.67 yr) recruited from four bodybuilding gym centers in Ankara, Turkey. Weight, height and body fat percentage were measured with BIA (Tanita, TBF- 300). To assess symptoms of eating disorders, muscle dysmorphia, and body dissatisfaction, the participants were asked to answer four questionnaires, including Eating Attitude Test (EAT)-40, Muscle Dysmorphia Disorder Inventory (MDDI), and Bodybuilder Image Grid (BIG)-Original (BIG-O) and Scale (BIG-S), the instruments to measure the perceptual body images disturbance and perceived attractiveness. A multiple linear regression model was used to identify independent factors associating eating disorders. **RESULTS:** 81 bodybuilders (67.5%) had EAT-40 scores above its cut off point, indicating having eating disorders, and there was no significant difference between competitive and non-competitive bodybuilders (p>0.05). The average scores of BIG-O and BIG-S showed statistically significant differences (p<0.01) in current and ideal body fat and muscle mass scores, indicating the most bodybuilders desire to be leaner (less fat) and muscular than their current body sizes. According to MDDI, 70 bodybuilders (58.3%) had a risk of having MDD. Furthermore, there was a significant positive relationship between EAT-40 and MDDI total scores (r= 0.614, Φ= 0.713, p<0.001) in both competitive and non-competitive bodybuilders. A linear regression analysis predicts that the eating disorder was a relative risk factor for MDDI and muscle-related body dissatisfaction in male bodybuilders. **CONCLUSIONS:** Eating disorder psychopathology is positively related with body dissatisfaction and body dysmorphic disorders. The screening tools, EAT-40, MDDI, and BIG-O and BIG-S may provide early detections of body dissatisfaction and eating disorders in male bodybuilders.

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Training Mental Toughness In Sport: A Review And Meta-analysis

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(No relevant relationships reported)

In January 2017, after a week of strenuous, military-style, and anecdotally-based workouts designed to test the level of *mental toughness* (MT), three Pac-12 football players were diagnosed with rhabdomyolysis. In sporting environments, are there any safe and effective, empirically-based MT interventions? To date, there has been no attempt to collate all available empirical evidence in regards to development of MT in Sport.
PURPOSE: To summarize evidence relating to MT training programs in developing MT levels.
METHODS: Cross-sectional designs and pre- and post-test experiments were included. No publication date restriction was imposed. Participants of any age, gender, sport, or level were included. This search was applied to Embase, Scopus, PubMed, and SPORTDiscus. Two reviewers assessed the risk of bias using: (a) for RCTs, the PED*ro* scale, (b) for before-after studies with no control group, the 'Before-After (Pre-Post) Studies With No Control Group', and (c) for single-subject research study**,** the 'Quality Indicators'. The outcomes of primary interest were the scores of MT, which were translated into standardized variables (SMD). The meta-analysis was completed using a random-effects model.
RESULTS: Nine studies were included in the systematic analysis and seven in the meta-analysis. The methodological quality of those nine studies was not high. Common areas that increased the risk of bias include: (a) RCT's: allocation was not concealed, key outcomes were self-reported, no blinding of all subjects/assessors, and no random allocation of subjects; (b) Before-After Studies With No Control Group: No enrollment of all subjects who meet the inclusion/exclusion criteria, no blinding of assessors, and no reporting of relevant information; and (c) Single-subject design: fewer than three data points per phase without justification. MT scores increased by 0.88 standard deviations (95% CI). The values contained within the confidence interval were at least medium effect sizes and the variance of this estimate was 0.23.
CONCLUSIONS: A strong positive effect was observed. Therefore, the results are promising. Nevertheless, the authors believe that conclusions cannot be drawn due to limited number of reliable results, which creates a high level of uncertainty. However, this finding itself is of value.

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Relationships among Perceived Recovery, Vertical Jump And Change In Repeated Sprint Performance

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(No relevant relationships reported)

Recovery may be determined by using a counter movement vertical jump (CMJ). While a CMJ has been shown effective to evaluate recovery, there may be more efficient, less physically taxing alternatives such as the Perceived Recovery Status (PRS) Scale. The PRS is a non-invasive, and accurate psychophysiological tool designed to measure recovery and its correlation to performance. **PURPOSE:** To determine the efficacy of CMJ and PRS as methods for monitoring recovery between repeated sprint efforts. **METHODS:** Eight college-aged individuals (age=23±0.9 years; height=1.65±0.11 meters; weight=67.1±9.3.4 kg; percent body fat=17.5±8.4%) performed repeated sprints. The protocol consisted of three sets of eight 30 meter sprints on a non-motorized treadmill with 45 seconds of rest between each sprint. The sets were separated by 5 minutes of passive rest. Mean power output (MP) was measured during each sprint. RPE (overall) was recorded immediately following each sprint. Immediately before the next set of sprints PRS was recorded and a CMJ was performed on a force plate where maximal height was recorded. **RESULTS:** A 1-way repeated measures ANOVA showed a significant main effect of sprint set on RPE (p=0.04) and PRS (p<0.01). Subsequent pairwise comparisons revealed significant differences for RPE between sprint sets 1 and 2 (p=0.05), and in PRS between sprint sets 1 and 2 (p=0.001), and sprint sets 1 and 3 (p=0.02). Correlations showed the relationship between PRS and delta MP to be moderate, and significant at (R^2=0.32) while the relationship between CMJ and MP was weak (R^2=0.04). **CONCLUSION:** Current results suggest PRS may demonstrate a stronger relationship with change in repeated sprint performance within a session than CMJ. However, neither index of recovery was robust, and may indicate that these measures may be more appropriate for use between day-to-day training sessions (as previously established) and not necessarily to gauge recovery as in the current paradigm.

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Cross-cultural Invariance Of The Mental Toughness Inventory Among American And Greek Athletes

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(No relevant relationships reported)

The popularity of the term *mental toughness* (MT) in sporting environments, at least in the U.S., has been established. However, its worldwide cultural relevance remains to be fully uncovered. Recently, Gucciardi et al. (2016), using the Mental Toughness Index (MTI), reported intra-cultural invariance of MT in Australasia. To date, there has been no effort to uncover the extent of the universality of the term between Europe and USA via MTI.
Purpose: To examine the invariance of MT across two different cultural groups of athletes and to further validate MTI. **Method:** The MTI was completed by 99 Greek and 173 US athletes via Qualtrics. The MTI consisted of eight items with a seven-point response scale. Both samples consisted of roughly half male and half female athletes from a number of sports, including American football, basketball, baseball, softball, volleyball, golf, tennis, soccer, track and field, swimming. Judo was only reflected in Greek sample.
Invariance testing was conducted using multiple group confirmatory factor analysis with increasingly restrictive models. We first fitted a unidimensional model within each sample to ensure good model-data fit. Then we estimated configural (equal number of dimensions), metric (configural + equal loadings), and scalar invariance models (metric +equal intercepts). Scalar invariance is the minimum type of invariance to infer cross-cultural equality. To evaluate the model-data fit, we used the comparative fit index (CFI), root mean square error of approximation (RMSEA), and the differences between these indices for increasingly restrictive models.
Results: The model-data fit in both samples was very good (CFI Greek = .995, RMSEA Greek = .046; CFI US = .998, RMSEA US = .032). The scalar invariance model was selected as the best fitting (CFA scalar = .930, RMSEA scalar = .078) but with a slightly different item intercept for one item (Item 4; <.5).

Conclusion: The results of this analysis provide evidence for the partial scalar invariance of the MTI across cultural samples. This implies that the meaning of the MT construct and the levels of the underlying items are equal in both cultures. As a result, the two cultures can be directly compared on their scores in the latent variable.

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Athletic Identity does not Predict Reporting Intentions in Intercollegiate Athletes

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(No relevant relationships reported)

In recent years, there has been an increased emphasis on improving athlete recognition of signs and symptoms associated with concussion. Despite these empirical advances, approximately 50% of concussions at the collegiate level are believed to go unreported. In order to understand the motivational aspect of reporting concussions, it is crucial to identify factors contributing to an athletes' intentions to report. Athletes that more strongly identify with their role in their sport may be less likely to report a concussion because they fear losing their athletic identity. **PURPOSE**: To examine the relationship between athletic identity and concussion reporting intentions in student-athletes. **METHODS**: Student-athletes from 3 universities in the state of Georgia were invited to complete a survey via Qualtrics (n=298/498 response rate = 59.7%, male=41.8%). The previously validated survey included questions to assess indirect (8 items) and direct (3 items) concussion reporting intentions and the Athletic Identity Measurement Scale which includes 10 athletic identity (AI) items. All items were answered on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Two separate simple linear regressions were used to determine whether AI predicted intentions (alpha=0.05). A one-way ANOVA was used to compare reporting intentions between athletes with high and low AI. **RESULTS**: Athletic identity did not significantly predict indirect (R^2=.009; $F_{(1,265)}$=0.65; p=0.12,) or direct (R^2=0.002; $F_{(1,256)}$=2.54; p=0.42) concussion reporting intentions. There were no significant differences between groups for indirect (low AI mean= 5.1, high AI mean= 5.8, $F_{(1,256)}$= 3.14, p=0.07, low AI 95% CI [5.41, 6.02], high AI 95% CI [5.12,5.51]) or direct (low AI mean=6.05, high AI mean=6.30, $F_{(1,256)}$= 1.07, p=0.30, low AI 95% CI [5.53, 7.85], high AI 95% CI [5.89, 6.21]) intention to report a concussion.**CONCLUSIONS**: Although AI does play an important role in predicting outcomes following sport-related injuries, it does not seem to significantly predict concussion reporting intentions in the current study. Results of this study suggest the importance of considering the multiple factors that may explain athletes' intentions to report concussions beyond how highly they identify themselves with their sport.

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Perceived Behavioral Control is Key for Activity Tracker Usage

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(No relevant relationships reported)

Perceived Behavioral Control is Key for Activity Tracker Usage
Purpose: The Reasoned Action Approach (RAA) has not been previously used to examine activity tracker (AT) beliefs. The purpose of this study was to use the RAA to explore which global constructs (attitude toward the act (AA), perceived norm (PN), and perceived behavioral control (PBC)) would best predict trained-users' intentions to use their activity trackers for the next month. This descriptive study addresses a gap in the literature by examining the AT beliefs of 165 university faculty and staff.
Methods: A convenience sample was recruited from participants who previously took part in an on-campus physical activity program during 2014-2016. The participants were "trained-users", having been guided for 8 weeks by student coaches and provided with ATs during the program. An online survey was utilized to measure RAA constructs underlying the intention to wear, look at, and make physical activity decisions based on a wearable AT and its corresponding app's information. After data collection, four composite variables were created from 18 close-ended items. Internal consistency and regression analyses were performed for the constructs of intention, AA, PN, and PBC (a construct similar to self-efficacy).
Results: A standard regression analysis showed that 69.1% of the variance in the intention to use an AT was explained by attitude toward the act (Beta =.317), perceived norm (Beta = .153), and perceived behavioral control (Beta =.488); (R = .831, F [3, 159] = 116.37, $p < .0001$). PBC was found to be the strongest contributor towards the intention to use an AT.
Conclusion: This is the first study to examine AT usage using the RAA model. Results of this theory-based research suggest that focusing on perceived behavioral control (the perceived ease or difficulty of AT usage and a person's self-efficacy) may be the most efficacious route to helping individuals become long-term AT users.

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Anxiety And Depression Indicators In College Athletes: Proportion Comparisons By Sex And Type of Sport

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(No relevant relationships reported)

PURPOSE: To compare by sex and by type of sport the proportion of college athletes that show the probability of Anxiety and Depression Disorders employing a screening psychological instrument
METHODS: 237 college athletes from a high performance program were evaluated. They were cataloged into two sports modalities, Individual sports (Athletics, Boxing, Fencing, Aerobic Gymnastics, Weightlifting, Wrestling, Taekwondo, Table Tennis, Archery and Triathlon) and Team sports (Basketball, Baseball, Football, Soccer, Handball, Softball, Beach Volleyball and Indoor Volleyball). The instrument used was the Goldberg Anxiety and Depression Scale (a screening test, to evaluate two subscales of Anxiety and Depression). Subsequently, subjects were categorized with "No anxiety" (score <4), "Probable anxiety" (score ≥4 <7), and "Probable severe anxiety" (score ≥7), and with "No depression" (score <2), "Probable depression" (score ≥2 <6), and "Probable severe depression" (score ≥6). Then frequencies and proportions were counted and compared by sex and by type of sport.
RESULTS: We found most of the total sample showed "Probable depression", and in the area of anxiety, most of them showed "No anxiety". Statistically significant differences were found by sex, where women showed higher proportion of "Probable severe depression" than men (p = 0.01). In the area of anxiety, men showed higher "No anxiety" prorportion than women (P = 0.003), and women showed higher proportion of "Probable anxiety" than men (P=0.03). For the comparison between type of sport, no statistically significant differences were found (Table 1).
CONCLUSIONS: The results showed that women had a higher proportion of probable anxiety and depression compared to men. The type of sport was not a significant factor for differences in the presence of anxiety and depression. However, the evaluation was done by a screening instrument, so it is advisable to carry out a thorough assessment to obtain a better diagnosis.

Table 1. Proportion of probable depression and anxiety diagnosis by sex and sport					
	Total sample	By sex		By sport	
		Females	Males	Individual	Team
Depression					
No depression	41.4% (n 98)	31.6% (n 24)	46.0% (n 74)	43.8% (n 49)	39.2% (n 49)
Probable depression	50.6% (n 120)	54.0% (n 41)	49.1% (n 79)	50.9% (n 57)	50.4% (n 63)
Probable severe depression	8.0% (n 19)	14.5% (n 11) *	5.0% (n 8) *	5.4% (n 6)	10.4% (n 13)
Total	100% (n 237)	100% (n 76)	100% (n 161)	100% (n 112)	100% (n 125)
Anxiety					
No anxiety	52.3% (n 124)	38.2% (n 29) *	59.0% (n 95) *	56.3% (n 63)	48.8% (n 61)
Probable anxiety	33.8% (n 80)	43.4% (n 33) *	29.2% (n 47) *	30.4% (n 34)	36.8% (n 46)
Probable severe anxiety	13.9% (n 33)	18.4% (n 14)	11.8% (n 19)	13.4% (n 15)	14.4% (n 18)
Total	100% (n 237)	100% (n 76)	100% (n 161)	100% (n 112)	100% (n 125)
*Significant differences by sex (p<0.05)					

1370   Board #178   May 31 9:00 AM - 10:30 AM

Effect of Watching Professional Baseball on Health Outcomes in Elderly Japanese: A Randomized Controlled Trial

Ryoko Kawakami[1], Susumu S. Sawada, FACSM[2], Tomoko Ito[1], Yuko Gando[2], Tomohiro Fukushi[3], Ryosuke Fujie[3], Satoshi Kurita[1], Koichiro Oka[1], Shizuo Sakamoto[1], Mitsuru Higuchi, FACSM[1]. [1]*Waseda University, Tokorozawa, Japan.* [2]*National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan.* [3]*Seibu Lions Company Limited, Tokorozawa, Japan.*

Reported Relationships: R. Kawakami: *Contracted Research -*

Including Principle Investigator; Seibu Lions Company Limited.

PURPOSE: To investigate the effect that watching professional baseball at a ballpark has on the elderly's health-related outcome indicators.
METHODS: Fifty-eight elderly adults aged 65-85 years were randomized into a spectator group (n = 29) and a waiting-list control group (n = 29). The intervention period was approximately 2 months. During the intervention period, 21 professional baseball games were held. The spectator group was requested to watch professional baseball games at the ballpark freely. Before and after the intervention period, executive functioning (Stroop task), cognitive function (Cognitive Assessment for Dementia, iPad version 2), health-related quality of life (Medical Outcome Study 36-Item Short-Form Health Survey), depression symptoms (Center for Epidemiological Studies Depression Scale (CES-D)), subjective happiness (Subjective Happiness Scale), and physical activity (accelerometer method) were assessed.
RESULTS: The median number of days that the spectator group watched baseball games was 6 (interquartile range (IQR): 4-10 days, range: 1-21 days). Although there were no significant differences, the reverse-Stroop interference rate showed greater improvement in the spectator group (median (IQR): 17.0% (9.2-22.8) to 13.3% (3.1-24.9)) than in the waiting-list group (19.1% (7.4-30.1) to 18.0% (9.2-33.3)) (P = 0.063). The CES-D showed significantly greater improvement in the spectator group (5 (4-12) to 3 (2-7)) than in the waiting-list group (4 (1-8) to 5 (1-8)) (P = 0.016). There were no significant differences between the two groups regarding the other health-related outcome indicators.
CONCLUSIONS: These results suggest that regularly watching professional baseball at a ballpark may positively influence elderly adults' depression symptoms.

1371   Board #179   May 31 9:00 AM - 10:30 AM
Is Short-passing Ability Related To Anxiety And Self-confidence In Division Iii Collegiate Soccer Players?
Mohammed Bila, Angela Hillman, Alan M. Levine. *Marywood University, Scranton, PA.*
(No relevant relationships reported)

Competitive soccer players are required to perform various physiological movements including short passing under the stressful conditions of a match. Individual self-confidence and ability to perform under pressure may impact on a successful match outcome. **Purpose:** The purpose of this cross-sectional study was to examine the relationship between short-passing ability and anxiety and self-confidence among collegiate male and female soccer players. **Methods:** Participants included 17 Division III collegiate soccer players (19. ±1.1 years, 65% female, 35% male) who completed the following questionnaires on a computer to assess competitive anxiety and self-confidence: The Illinois Competitive State Anxiety Inventory-2 (CSAI-2R), Sport Competition Anxiety Test (SCAT), and Trait Sport-Confidence Inventory (TSCI). Soccer skills were then assessed indoors as measured by total time on Loughborough soccer passing test (LSPT), which consisted of 16 short passes completed as fast as possible. Data were analyzed using descriptive statistics and Spearman's *rho* correlations. **Results:** Mean short-pass total time was 55.7±12.03 seconds. We observed positive relationships between SCAT and LSPT total time (r_s =0.51, p = 0.04) and CSAI-2R and LSPT total time (r_s =0.52, p = 0.04): as anxiety increased, so did total time on the passing tests. Additionally a strong negative relationship was found between TSCI and LSPT total time (r_s =-0.68, p= 0.004): as self-confidence increased, total time on the passing test decreased. **Conclusions:** Increased anxiety and decreased confidence lead to poorer short-passing performance in collegiate soccer players. Coaches should consider interventions to decrease anxiety and improve self-confidence in preparation for soccer competition.

1372   Board #180   May 31 9:00 AM - 10:30 AM
Effects of Mental Fatigue Induced Using the Smartphone on Physical & Technical Performance of Footballers
Gianpiero Greco, Roberto Tambolini, Pasquale Ambruosi, Francesco Fischetti. *University of Bari, Bari, Italy.*
(No relevant relationships reported)

Mobile devices (i.e., smartphones and tablets) have acquired important functions in both interpersonal and individual spheres. For this reason, they can cause a true dependence for the young people. Moreover, prolonged periods of cognitive activity induce mental fatigue, a psychobiological state which influences the performances in team sports. **PURPOSE:** The purpose of this study was to assess the effects of prolonged use of smartphones on physical and technical performance of young footballers. **METHODS:** In total, 16 young male footballers (15.0 ± 1.1 years) were randomly assigned to two studies, Study 1 (S1, n=8) or Study 2 (S2, n=8), in which the Yo-Yo Intermittent Recovery Test level 1 and the Loughborough Soccer Passing Test were performed, respectively. The soccer-specific physical and technical performance was assessed for S1 and S2. In both studies, the participants underwent to mental fatigue through the use of smartphones (Brain It On App) for 30 minutes, and to control condition (normal activities) after at least 48 hours. A crossover study design

and a paired t-test (p<0.05) were used. **RESULTS:** S1 performed shorter running distances in the state of mental fatigue than under the control condition (1610 ± 135 vs. 1780 ± 249 m, Δ -10.56%, p = 0.046). In addition, mental fatigue significantly increased the performance time in S2 compared with the control condition (51 ± 6 vs. 43 ±2.2 s, Δ +15.7%; p = 0.003). **CONCLUSION:** Our findings suggest that prolonged use of smartphones, which causes mental fatigue, can reduce the physical and technical performance of young footballers. Therefore, it is necessary to educate to the conscientious use of technology.

1373   Board #181   May 31 9:00 AM - 10:30 AM
Effects Of Action Boundary Proximity On Perceptual-motor Judgements: Further Development Of The Pact
Caleb D. Johnson[1], Alice D. LaGoy[1], Gert-Jan Pepping[2], Shawn R. Eagle[1], Anne Beethe[1], Christopher Connaboy[1]. [1]*University of Pittsburgh, Pittsburgh, PA.* [2]*Australian Catholic University, Sydney, Australia.*
(No relevant relationships reported)

Designed as a more ecological measure of reaction times, the Perception-action Coupling Task (PACT) has shown good reliability and within-subject stability, however, a 5- to 10-minute testing period was required. Perceptual-motor judgements are known to be affected by proximity of the stimulus to the tasks action boundary. **PURPOSE:** To determine the effects of action boundary proximity on PACT performance, and whether redundant levels of stimuli, eliciting similar responses, can be eliminated to shorten the PACT while maintaining reliability, stability, and the intended behavioral responses. **METHODS:** 9 males and 7 females (Age(yrs) = 27.8 ± 3.6) completed 4 testing sessions, separated by at least 6 days. For each, participants performed 3 familiarization cycles and 6 testing cycles of the PACT. The PACT requires participants to make judgements on stimuli, in the form of whether a series of virtual balls presented on a tablet afford "posting" (can fit) through a series of virtual apertures. Eight ratios of aperture to ball size (AR) are presented, ranging from 0.2 to 1.8, with each ratio appearing 12 times per cycle. Response (time from stimulus presentation to first movement), Movement (time from first movement to initiation of ball movement), and Initiation (time from initiation to completion of ball movement) times were calculated. Accuracy was calculated as the percentage of correct judgements. All variables were averaged and plotted by AR. Based on visual inspection of plots, redundant stimuli were eliminated. ICCs (3,1) and coefficients of variation (CV) were calculated for each response variable in an iterative manner to determine the minimum number of testing cycles necessary. **RESULTS:** All variables followed an expected, quadratic trajectory, with performance the lowest near the action boundary (AR = .8 – 1.2). Ratios of .2 and 1.8 were found to elicit redundant responses to .4 and 1.6, and were eliminated. The shortened PACT showed good reliability with 1 (ICCs = .71 - .94) and 2 cycles (ICCs = .81 - .98) of testing. Further, CVs were consistent with the full PACT with 1 (CVs = .8 – 20.0 %) and 2 cycles (CVs = .6 – 14.7 %) of testing. **CONCLUSION:** The main findings support the use of the shortened PACT, limiting the testing period to 3.5 – 8.5 minutes depending on the desired level of reliability and within-subject stability.

C-43   Free Communication/Poster - **Altitude/Hypoxia**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1374   Board #182   May 31 8:00 AM - 9:30 AM
Separate and Combined Influences of Environmental Heat and Altitude on Self-Paced Aerobic Exercise Performance
Karleigh E. Bradbury, John H. Sellers, Charles S. Fulco, Adam J. Luippold, Katherine M. Mitchell, Robert W. Kenefick, FACSM. *United States Army Research Institute of Environmental Medicine, Natick, MA.* (Sponsor: Nisha Charkoudian, FACSM)
(No relevant relationships reported)

Aerobic exercise performance is degraded when performed in the heat or at altitude; however, it is unknown if the combination of the two environments will lead to a greater decrement in aerobic exercise performance. **PURPOSE:** To determine the impact of the combination of heat and altitude on self-paced aerobic exercise performance. **METHODS**: In order establish a coefficient of variation (CV), 7 subjects (2F, 5M, 27 ± 5 yrs, 174 ± 11 cm, 80 ± 19 kg; SL VO$_2$peak, 42 ± 5 ml·kg^{-1}·min^{-1}) performed 3 familiarization trials consisting of 30 min of steady state (SS) cycling (50% of sea level (SL) VO$_2$peak) followed by a 15 min self-paced cycling time trial (TT) while at sea level and under thermoneutral conditions (SLTN; 250m, 20°C, 30-50% rh). Following familiarization trials, subjects completed the SS and 15 min

self-paced TT under 4 environmental conditions at random: SLTN, SL hot (SLH; 250m, 35°C, 30% rh), altitude neutral (ATN; 3,000m, 20°C, 30-50% rh) and altitude hot (AH; 3,000m, 35°C, 30% rh). Performance was assessed by the total amount of work (kilojoules, kJ) completed during each TT. Heart rate (HR) and rate of perceived exertion (RPE) were recorded during the TTs. **RESULTS**: The CV was 2.6% for familiarization trials. Differences existed in total work completed during the 15 min TT between SLTN vs ATN (167 ± 32 vs 148 ± 28 kJ, P < 0.05), SLTN vs AH (167 ± 32 kJ vs 139 ± 29 kJ, P < 0.05), and SLH vs AH (159 ± 32 kJ vs 139 ± 29 kJ, P < 0.05). No differences existed in mean HR during the TT, or in RPE at the end of exercise (P > 0.05 for both) between any of the conditions. Pacing at 3 min increments was not different between environments (P > 0.05). **CONCLUSION:** Self-paced TT performance was negatively impacted by exposure to altitude, but not heat. The combination of heat and altitude did not lead to a further decrement in exercise performance than caused by either of the two environments alone.

Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

1375   Board #183   May 31 8:00 AM - 9:30 AM

Multi-Environmental Exposure does not Alter Plasma Cortisol or Perceived Stress Response to Steady-State Cycle Exercise

John H. Sellers, Michelle A. King, Roy M. Salgado, Karleigh E. Bradbury, Charles S. Fulco, Robert W. Kenefick, FACSM. *USARIEM, Natick, MA.*

(No relevant relationships reported)

Objective and subjective measures of the stress response have been shown to increase in response to exercise in sea-level thermoneutral (SLTN), hot, or altitude environments. However, responses to a combination of these stressors remain unclear. **PURPOSE**: To determine if the responses of objective (serum cortisol [CORT]) and subjective (perceived strain index [PeSI]) stress indices are further increased in a combined environment of heat and altitude. **METHODS**: Six participants (1 F, 5 M) completed 30 min of steady state (SS) exercise on a cycle ergometer at 50% of SL VO_{2peak} in four separate environmental conditions: 1) SLTN (250 m, 20°C, 30-50% RH); 2) Sea-level hot (250 m, 35°C, 30% RH); 3) Altitude thermoneutral (3,000 m, 20°C, 30-50% RH); and 4) Altitude hot (3,000 m, 35°C, 30% RH) in randomized order, separated by ~1 week. Blood samples were drawn via an indwelling venous catheter: upon arrival to the laboratory (baseline, BL); 1 hr upon reaching target environmental condition but before SS (PRE); and immediately following SS exercise (POST). A seated posture was maintained for at least 20 min prior to each draw. PeSI, a product of rating of perceived exertion (RPE) and perceived thermal stress (TS), [5*(TS/16)] + [5*(RPE-6)/14], was calculated PRE and POST SS exercise. **RESULTS**: CORT (ng/ml, mean ± SD) response to SS exercise did not differ among any of the four environmental conditions at any time point (p>0.05), however, there was a main effect of time for CORT levels as shown by an increase between both BL and POST (110 ± 64 vs. 120.32 ± 72 p<0.05) and PRE and POST (113 ± 66 vs 120 ± 72, p<0.05). Similarly, no differences in PeSI (mean ± SD) were observed among any of the environmental conditions (p>0.05), yet there was a main effect of time on PeSI (p<0.05) as demonstrated by an increase from PRE (1.36 ± 0.40) to POST (4.68 ± 1.65) SS exercise. **CONCLUSION**: During SS exercise, the combination of heat and altitude resulted in similar objective and subjective stress responses compared to any singular environmental stressor, suggesting that exercise, and not environmental condition, is responsible for any observed differences.

1376   Board #184   May 31 8:00 AM - 9:30 AM

Exhaled Nitric Oxide Levels during Acclimatization to High Altitude

Kirsten E. Coffman[1], Douglas T. Summerfield[1], Bryan J. Taylor[2], Amine N. Issa[1], Bruce D. Johnson[1]. *[1]Mayo Clinic, Rochester, MN. [2]University of Leeds, Leeds, United Kingdom.*

(No relevant relationships reported)

Introduction: During ascent to high altitude, inadequate pulmonary acclimatization may lead to high altitude pulmonary edema. One potential mechanism for acclimatization is pulmonary endothelial release of nitric oxide (NO) to reduce pulmonary pressures. **Purpose:** To characterize: 1) the change in exhaled NO concentration (eNO); and 2) the association between systolic pulmonary artery pressure (sPAP), arterial oxygen saturation (SaO_2), and eNO during acclimatization to high altitude. **Methods:** Seventeen healthy, non-smoking, adult lowlanders completed an 8- to 10-day trek to Mount Everest Base Camp (5,150m) in two groups. Group 1 arrived and stayed at base camp for ~30 days (acclimatized, 'ACC'; n=9 (7M/2F); age 38±9yr, ht 174±9cm, wt 69.7±10.1kg) prior to the arrival of group 2 (non-acclimatized, 'Non-ACC'; n=8 (8M/0F); age 36±11yr, ht 181±5cm, wt 85.9±7.8kg). Upon arrival of the Non-ACC group (*Day 1*), eNO (in triplicate via a handheld electrochemical detector), sPAP (via transthoracic echocardiography) and SaO_2 (via pulse-oximetry), were measured in each participant. In addition, eNO was measured in the Non-ACC

group after 5 and 9 days at base camp. **Results:** On Day 1, eNO was greater in the Non-ACC group vs. the ACC group (21.2 ± 8.6 vs. 9.6 ± 5.4 ppb; *P* = 0.004). In the Non-ACC group, eNO levels fell from Day 1 to Day 9 at high altitude (21.2 ± 8.6 vs. 14.5 ± 5.9 ppb; *P* = 0.032) such that eNO levels were not different compared to the ACC group by Day 9 (14.5 ± 5.9 vs. 9.6 ± 5.4 ppb; *P* = 0.095). On Day 1, lower eNO levels were associated with higher sPAP in all participants (*r* = -0.50, *P* = 0.042). There was no relationship between eNO and SaO_2. **Conclusion:** During acclimatization to high altitude, eNO levels decrease in healthy lowlanders. Moreover, there is a negative relationship between eNO and systolic pulmonary artery pressure during acclimatization to high altitude. These data suggest that eNO plays a role in pulmonary acclimatization.

1377   Board #185   May 31 8:00 AM - 9:30 AM

The Effects of Fluid Parameters on Performance in a Simulated Altitude Environment

Jessica L. Peacock, PhD.. *Merrimack College, North Andover, MA.* (Sponsor: Vincent Paolone, FACSM)

(No relevant relationships reported)

PURPOSE: The purpose of the current research was to clarify approaches to fluid parameters which may improve exercise performance at moderate simulated altitude. The researcher aimed to determine if consuming fluid equal to fluid loss has an impact on acute performance at simulated 3048-m. **METHODS:** Nine trained male cyclists (VO_{2peak} 51.68 ± 6.66 ml^{-1}·kg^{-1}·min) performed 30 min of cycling at 75-85% of HR attained at VO_{2peak} in four different conditions: control-normoxic (CON-NORM), control-hypoxic (CON-HYP), hypoxic-hydrated (HYP-HYD), and hypoxic-ad libitum (HYP-ADLB). In all conditions, subjects consumed 250 ml of water at baseline. In the HYP-HYD session, subjects consumed 250 ml of water at baseline in addition to the fluid volume equal to 50% of the total fluid lost during the CON-HYP session. After 15 min of cycling, subjects consumed the remaining 50%. In the HYP-ADLB condition subjects were permitted to consume water ad libitum. To simulate altitude (3048 m; 10,000 ft.), an E-Cylinder hypoxic inspirate containing 14.5% O_2 and 85.5% balance N_2 was used. **RESULTS:** As expected, S_aO_2 and average workload (Watts) were significantly reduced with exposure to simulated 3048-m (p < .05). Average workload was significantly (p <.05) lower in the CON-HYP, HYP-HYP and HYP-ADLB conditions ($M_{CON-HYP}$ = 155.00 ± 24.49, $M_{HYP-HYD}$ = 162.59 ± 28.84, $M_{HYP-ADLB}$ = 156.57 ± 22.77) compared to the CON-NORM condition ($M_{CON-NORM}$ = 194.72 ± 31.50). Mean fluid intake was significantly (p<.05) higher in the HYP-HYD condition compared to the HYP-ADLB condition ($M_{HYP-HYD}$ = 668.87 ± 261.23 ml, $M_{HYP-ADLB}$ = 197.00 ± 112.74 ml). **CONCLUSION:** Inadequate fluid replacement and ad libitum fluid consumption degrade exercise performance in an additive manner with that induced by hypoxia, despite maintaining hydration prior to acute performance. Additionally, consuming 50% of fluid loss prior to and during every 15 min appears to reduce the magnitude of performance decrements during an acute bout of high intensity cycling at 3048-m. Optimizing hydration strategies for performance at altitude may always remain indefinite, however, trained athletes that ascend to altitude must be as thorough about their hydration strategies as they are about other performance factors.

1378   Board #186   May 31 8:00 AM - 9:30 AM

Exercise At Simulated Altitude Increases Gastrointestinal Barrier Damage And Promotes Leukocyte Activation

Claire J. Lauterbach, Harrison R. Strag, Zach J. Schall, Ally M. Hamilton, Matthew R. Kuennen. *High Point University, High Point, NC.*

(No relevant relationships reported)

PURPOSE: This study tested whether altitude-associated ischemic stress damages the gastrointestinal barrier, activates leukocytes, and promotes inflammation. **METHODS**: Subjects (N = 5) completed two 60 min bouts of matched-workload treadmill exercise (65% VO_{2max}). One under control conditions (Normoxia, F_1O_2 = 20.9%) and the other at ~4000 m of simulated altitude (Hypoxia, F_1O_2 = 13.5%). Pulse oximetry was used to measure peripheral oxygen saturation (SpO_2) and near-infrared spectroscopy was used to measure absolute tissue saturation (StO_2) at 5 min intervals throughout exercise. Fatty acid-binding protein (I-FABP), markers of leukocyte activation (CD14, ICAM-1, IL-8, MCP-1, MPO), and cytokines (TNFα, IL-1β, IL-6, IL-10, IL-12) were measured in plasma samples that were collected Pre, Post, 1hr-Post, and 4hr-Post exercise. Data were analyzed with 2-Way (Condition x Time) RM ANOVAs with significance set at $p ≤ 0.05$. *Post hocs* (Newman-Keuls) were run where appropriate. **RESULTS**: Significant reductions in SpO_2 and StO_2 were shown during exercise at simulated altitude [(SpO_2: Hypoxia = 79 ± 1% *vs* Normoxia = 94 ± 0.5%, *p* = 0.03) (StO_2: Hypoxia = 61 ± 2 *vs* Normoxia = 69 ± 2, *p* < 0.01)]. A significant interaction effect was shown for I-FABP (*p* = 0.05), with *post hoc* analysis indicating I-FABP increased more from Pre to Post in Hypoxia (112%) than in Normoxia (30%). IL-8

increased more from Pre to Post (60%) and 1hr-Post (83%) in Hypoxia than in Normoxia (33% & 57%, respectively). Significant main effects were also shown for IL-6, ICAM-1, CD14, and MCP-1. All were higher in Hypoxia ($p \leq 0.05$). MPO increased at Post in Normoxia (121%, $p = 0.05$) but did not increase until 1hr-Post in Hypoxia (129%, $p = 0.02$).
CONCLUSIONS: Preliminary data suggest exercise at altitude may increase gastrointestinal barrier damage and leukocyte activation, as indicated by higher levels of I-FABP, IL-8, and MCP-1. Increased CD14 and ICAM-1 suggest TLR4-mediated inflammatory signaling may also be elevated, but the delayed increase in MPO following exercise at altitude warrants further investigation.

1379   Board #187   May 31 8:00 AM - 9:30 AM

Cerebral Blood Flow Velocity and EEG Response during Ergometer Exercise in Normoxia and Hypoxia

Ilgyu Jeong, Heehyuk Lee, Seongdae Kim. *Hannam University, Daejeon, Korea, Republic of.*
(No relevant relationships reported)

The cerebral blood flow velocity (CBFV) response to acute hypoxia has been known to increase. But, how CBFV might respond to exercise in hypoxic condition and be associated with EEG remains unclear. PURPOSE: To evaluate the effects of exercise in hypoxic condition corresponding to the altitudes of 4000m on cerebral blood flow velocity and EEG. METHODS: In a randomized, double-blind, balanced crossover study, ten healthy volunteers (19.8±0.4yrs) were asked to perform the incremental bicycle ergometer exercise twice in hypoxic and control(sea level) condition with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes to 125W. Acute normobaric hypoxic condition was maintained for 45 minutes using low oxygen gas mixture. CBFV in middle cerebral artery (MCA) and EEG were measured at rest 5 minutes, rest 15 minutes, immediately after exercise, and 15 minutes recovery using transcranial-Doppler sonography and EEG signal was recorded from 6 scalp sites leading to analysis of alpha and beta wave relative activities. All data were analyzed using two-way ANOVA with repeated measures and Pearson's correlation. RESULTS: CBFV in MCA in hypoxic condition was significantly higher than in control condition at rest 5 minutes (83±9 vs. 69±9 cm/s, p<.01), rest 15 minutes (87±8 vs. 67±7 cm/s, p<.001), immediately after exercise (112±9 vs. 97±9 cm/s, p<.01), and 15 minutes recovery (91±11 vs. 74±7 cm/s, p<.01). However, no significant correlation was found between the changes of CBFV and EEG wave activities. CONCLUSION: These results suggest that hypoxia might amply the changes of CBFV observed during exercise. But, the changes of CBFV might have no association with the changes of EEG wave activities in hypoxia.

1380   Board #188   May 31 8:00 AM - 9:30 AM

Effect of Hypoxia on EEG During and After Cycle Ergometer Exercise

Seongdae Kim, Heehyuk Lee, Ilgyu Jeong. *Hannam University, Daejeon, Korea, Republic of.*
(No relevant relationships reported)

How hypoxic condition influences the brain cortical activities observed by Electroencephalography (EEG) during exercise has been unknown. **PURPOSE:** To determine the effect of hypoxia on electroencephalographic activity during and after cycle ergometer exercise. **METHODS:** In a randomized, double-blind, crossover study, Eleven healthy volunteers (21.4±0.7yrs) were asked to perform the bicycle ergometer exercise twice in hypoxic condition and control(sea level) condition with a week interval, respectively. Exercise intensity was set initially at 50W and increased by 25W every 2 minutes until 125W, then maintained for 14 minutes. Acute normobaric hypoxic condition corresponding to the altitudes of 3150m was maintained using low oxygen gas mixture for the whole procedure of 60 minutes. EEG was measured prior to the onset of exercise, immediately after exercise and 20 minutes recovery. EEG signal was recorded from 6 scalp sites (frontal, temporal and occipital lobe of the international 10-20 system) leading to analysis of theta (4-7Hz), alpha (8-13Hz), beta (13-30Hz), and gamma(30-50Hz) relative activities. All data were analyzed using two-way ANOVA with repeated measures. **RESULTS:** Alpha wave activity of frontal lobe in hypoxia group was significantly lower than in control group immediately after exercise (0.24±0.13 vs. 0.41±0.15 µV, p<.05). Beta wave activity of occipital lobe in hypoxia group was significantly higher than in control group immediately after exercise (0.28±0.07 vs. 0.20±0.07 µV, p<.05). Gamma wave activity of frontal lobe in hypoxia group was significantly higher than in control group immediately after exercise (0.25±0.12 vs. 0.12±0.08 µV, p<.05). Theta wave activity of left frontal lobe in hypoxia group was significantly lower than in control group at 20 minutes recovery (0.08±0.05 vs. 0.15±0.05 µV, p<.05). **CONCLUSION:** These results suggest that acute exposure to mild hypoxic condition may amplify the change of EEG activities which has been commonly observed during exercise.

1381   Board #189   May 31 8:00 AM - 9:30 AM

Cardiovascular Adjustments During Steady-state Cycling: Effects Of Heat And Altitude.

Robert W. Kenefick, FACSM, Karleigh E. Bradbury, John H. Sellers, Adam J. Luippold, Katherine M. Mitchell, Charles S. Fulco. *U.S. Army Ressearch Institute of Environmental Medicine, Natick, MA.*
(No relevant relationships reported)

Compared to exercise in a thermo-neutral environment or at sea level (SL), heart rate is elevated to a greater extent during exercise in the heat or at altitude, to compensate for either increased skin blood flow or decreased arterial oxygen saturation (S_aO_2).
PURPOSE: To determine the compensatory heart rate response [% Δ heart rate (HR)] to steady-state cycling during *combined* heat and altitude exposure. **METHODS**: Seven subjects (2F, 5M, age: 27 ± 5 yrs; height: 175 ± 10 cm, weight: 80 ± 19 kg, SL VO_{2peak}: 42 ± 5 ml·kg⁻¹·min⁻¹) performed 30 min of steady-state cycling at an identical power output (50% of SL VO_2peak) in 4 randomly assigned environmental conditions in a hypobaric chamber: SL thermo-neutral (SLTN; 250m, 20°C, 30-50% rh), SL hot (SLH; 250m, 35°C, 30% rh), altitude thermo-neutral (ATN; 3000m, 20°C, 30-50% rh) and altitude and hot (AH; 3000m, 35°C, 30% rh). There was a minimum of 3-5 rest days between experimental trials. HR and S_aO_2 were measured throughout exercise. %Δ HR and %Δ S_aO_2 were calculated relative to SLTN (control) at the 24th min of exercise. **RESULTS**: %S_aO_2 was reduced (P<0.05) from SLTN for ATN (-12.1 ± 3.3%) and AH (-11.3 ± 2.0%) but not for SLH (-0.7 ± 0.5%). %Δ HR was increased (P<0.05) from SLTN for SLH (10.0 ± 5.2%), ATN (10.5 ± 2.0%), and AH (16.7 ± 5.5%). The %Δ HR for AH also was greater (P<0.05) compared to either SLH or ATN. **CONCLUSION:** Exposure to either heat or altitude resulted in a ~10% Δ HR compensatory response compared to exercise at SL in a thermo-neutral environment. The combination of both environments resulted in a potentiated compensatory %Δ HR of ~17% but was less than the summation of %Δ HR for both environments. These results suggest that the combination of heat and altitude evoked other compensatory adjustments (e.g., increased stroke volume or myocardial contractility; greater splanchnic vasoconstriction, etc.) in order to meet the combined demands of increased skin blood flow for thermoregulation and O_2 delivery during 30 min of moderate intensity, steady-state exercise. Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

1382   Board #190   May 31 8:00 AM - 9:30 AM

Between Individual Variability in Sleep and Awake Pulse Oximetry During Ascent Of Mt. Kilimanjaro

Stephen R. Muza, FACSM, Robert W. Kenefick, FACSM, Beth A. Beidleman, Charles S. Fulco, Scott W. Hamilton. *US Army Research Institute of Environmental Medicine, Natick, MA.*
(No relevant relationships reported)

Between individual variability in awake arterial pulse oximetry ($aSpO_2$) is well known and has been proposed for field assessment of altitude acclimatization. Sleep SpO_2 ($sSpO_2$) is known to be lower than $aSpO_2$ at high altitude, but the between individual variability in $sSpO_2$ is not as well known. **PURPOSE:** Compare between individual variability and relationship between $sSpO_2$ and $aSpO_2$ during a 6 day ascent of Mt. Kilimanjaro. **METHODS:** In 18 (12 men/6 women), age range 18-62 yr, low-altitude residents over 5 of 6 nights $sSpO_2$ was assessed using a finger sensor recording pulse oximeter and compared to a morning $aSpO_2$ measured for 1 minute while the subject was quietly seated. Each individual's mean SpO_2 was calculated for their sleep and awake measurements. Correlations (Pearson product-moment) between sleep and awake SpO_2 were evaluated. **RESULTS:**

	2280 m	2875 m	3200 m	3850 m	4830 m
$sSpO_2$ (mean±SD)	91 ± 2%	87 ± 3%	83 ± 4%	78 ± 5%	69 ± 4%
$sSpO_2$ (range)	88 – 95%	83 – 91%	78 - 88%	74 – 87%	57 – 76%
$sSpO_2$ (CV)	2.2	3.4	4.8	6.4	5.8
$aSpO_2$ (mean±SD)	94 ± 2%	90 ± 4%	88 ± 4%	83 ± 4%	72 ± 5%
$aSpO_2$ (range)	91 – 99%	86 – 99%	82 – 96%	76 – 91%	62 – 83%
$aSpO_2$ (CV)	2.1	4.4	4.5	4.8	9.7
$sSpO_2$ vs $aSpO_2$ (R)	0.78	0.77	0.71	0.75	0.69

As expected, both $sSpO_2$ and $aSpO_2$ decreased with increasing altitude. The Coefficient of Variation (CV), of both $sSpO_2$ and $aSpO_2$ increased with increasing altitude. Individual $sSpO_2$ and the next morning $aSpO_2$ were strongly correlated at all altitudes. **CONCLUSION:** In low altitude residents climbing to 4830 m over 6 days, sleep and awake SpO_2 have similar between subject variability (dispersion) that more than doubles with increasing altitude indicating a broadening of individual ventilation and pulmonary gas exchange responses to the hypoxic environment. Also, individual

$sSpO_2$ and $aSpO_2$ are highly correlated to each other. Funding: USAMRMC. The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

1383   Board #191   May 31 8:00 AM - 9:30 AM

Combined Effects of Heat and Altitude on Sweating Responses during Steady-State Cycling Exercise

Adam J. Luippold, Karleigh E. Bradbury, Katherine M. Mitchell, Beau R. Yurkevicius, John H. Sellers, Robert W. Kenefick, FACSM. *United States Army Research Institute of Environmental Medicine, Natick, MA.* (Sponsor: Robert W. Kenefick, FACSM)

(No relevant relationships reported)

Exposure to high altitude could increase sweating responses as a result of widening the air-to-skin water vapor pressure gradient. Previous laboratory studies have reported both lower and higher sweat losses at altitude. **PURPOSE:** To determine if exposure to altitude in a thermo-neutral environment, and exposure to altitude in the heat will alter the onset time of sweating (OTS) and sweat rate (SR) during 30 minutes of steady state (SS) exercise. **METHODS:** Seven healthy volunteers (2F, 5M, age: 27 ± 5 yrs, height: 175 ± 10 cm, weight: 79.7 ± 18.5 kg, sea level (SL) VO_{2peak}: 41.8 ± 4.6 ml·kg^{-1}·min^{-1}) completed 30 minutes of SS cycling exercise (50% SL VO_{2peak}) in four randomly assigned conditions: SL thermo-neutral (SLTN; 250m, 20°C, vapor pressure (VP): 5.3-8.8 mmhg), SL hot (SLH; 250m, 35°C, VP: 12.7 mmhg), altitude thermo-neutral (ATN; 3,000m, 20°C, VP: 5.3-8.8 mmhg), altitude hot (AH; 3,000m, 35°C, VP: 12.7 mmhg). Prior to exercise, a ventilated sweat capsule (surface area: 15.9 cm^2, air flow: 2 standard liters/min) was applied to the supinated forearm of the volunteer. Ambient temperature (°C) and relative humidity of the capsule interior were recorded throughout SS exercise. The time at which OTS occurred (minute) and SR (mg·cm^2·min^{-1}) were calculated. **RESULTS:** OTS and SR were not different (P > 0.05) between SLTN vs. ATN conditions (7.58 ± 2.90 vs. 7.43 ± 2.90 min; 0.70 ± 0.32 vs. 0.78 ± 0.33 mg·cm^2·min^{-1}, respectively). Furthermore, in the heat OTS and SR were not different (P > 0.05) between SLH vs. AH conditions (1.28 ± 1.64 vs. 0.83 ± 1.31 min; 1.55 ± 0.25 vs. 1.51 ± 0.20 mg·cm^2·min^{-1}, respectively). **CONCLUSION:** Both exposure to altitude in a thermo-neutral environment and exposure to altitude in the heat did not alter either OTS or SR. This suggests the water vapor pressure gradient at 3,000m was not great enough to have a marked effect on sweating responses. Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

1384   Board #192   May 31 8:00 AM - 9:30 AM

Heart Rate Variability And Body Composition As A Hypoxia Risk Factor In Military Pilots.

JUAN MIGUEL CASTRO HERRERA. *FUERZA AEREA COLOMBIANA, BOGOTA, Colombia.*

(No relevant relationships reported)

PURPOSE: To determine if heart rate variability, body composition and hypoxia exposure time could help to identify risk of hypoxia in a group of COLAF aircrew that train in hypobaric Chamber at the Aerospace Medical Center.
METHODS: Previous ethics committee approval and signing of the informed consent, 60 pilots between 20 and 40 years were selected. Body composition was obtained by impedance with a Tanita ® bascule TBA-300A (weight, height, BMI, muscle weight, fat percentage and water percentage). The volunteers attended to a hypoxia physiological training where they were exposed to profile IV-A COLAF (30 minutes denitrogenation with 100% oxygen (DNT), climb to 25,000 feet with exposure to hypoxia and descent to ground level). During this profile heart rate was monitored through the RR record with a Polar ® heart rate monitor RS800 and the minimum percentage of oxygen saturation in hypoxia exercise previous recovery was recorded. Hypoxia permanence time (TH) and power frequency response ANS Low Frequency (LF), High Frequency (HF) and LF / HF were analyzed. For LF and HF, modeling by Fast Fourier Transform (FFT) was implemented. Lilliefors test to verify normality was applied. For the relationship between variables with non-normal distribution Chi square test was applied. And for normal distribution direct correlation was applied.
RESULTS: Direct correlation (p-value <0.05) between TH (4.24 ± 1.74 min) and water percentage (44.46 ± 6.11) was observed. Additionally, a significant difference in LF / H was found among the three moments of the flight profile using the Wilcoxon test was observed in 21 pilots due to loss of signal in the other 39. While in HF there were only significant between moments: DNT - Hypoxia and Hypoxia - descent to ground level.
CONCLUSIONS: Pilots with highest percentage of water and muscular mass tolerated longer exposure to hypoxia at 25000 feet. Also, changes in oxygen partial pressure determine changes on autonomic nervous system, thus hypoxia exposure increase sympathetic modulation over parasympathetic that could be modify by body composition.

1385   Board #193   May 31 8:00 AM - 9:30 AM

Differences of Surface Electromyography during Incremental Cycling Exercise in Hypoxia and Normoxia Using Wavelet Transform Analysis

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(No relevant relationships reported)

Previous studies indicated that there was a difference between hypoxia and normoxia for amplitude parameters of surface electromyography (EMG). However, there are few reports on frequency parameters of EMG because of limitations of traditional analytical methods. **PURPOSE:** The purpose of this study was to investigate the differences of surface electromyography during incremental cycling exercise in hypoxia and normoxia using wavelet transform analysis. **METHODS:** Subjects were fourteen active and healthy men. (mean±SD; age: 21.08 ± 1.50 years; height: 1.69 ± 0.06 m; weight: 60.16 ± 7.77 kg; maximal oxygen consumption: 51.11. ±9.54 ml / min / kg). The subjects performed incremental cycling exercise test to exhaustion in hypoxia (F_IO_2: 13.4%) and normoxia conditions (F_IO_2: 20.9%). EMG activities of vastus lateralis (VL), vastus medialis (VM), rectus femoris (RF) and biceps femoris (BF) were recorded during cycling exercise test at a sampling rate of 2000 Hz. Integrated electromyogram (iEMG) and mean power frequency (MPF) for each exercise intensity were calculated from the EMG data. Contentious wavelet analysis was used to calculate MPF, and mother wavelet was set at morlet wavelet. The differences between exercise intensities and F_IO_2 conditions were compared using a two-way analysis of variance. The significance level was set at $p < 0.05$. **RESULTS:** iEMG of each muscle significantly increased with increasing exercise intensities (all: p < 0.01). However, there were no significant differences between F_IO_2 conditions for each muscle (VL: p = 0.37; VM: p = 0.49; RF: p = 0.37; BF: p = 0.64). MPF of VL significantly decreased with increasing exercise intensities (p < 0.01), and MPF in hypoxia was higher than that in normoxia (p < 0.01). MPF of VM significantly decreased with increasing exercise intensities (p<0.01), but there were no significant differences between F_IO_2 conditions (p = 0.37). In addition, there were no significant differences between exercise intensities (RF: p = 0.49; BF: p = 0.57) and F_IO_2 conditions (RF: p = 0.49; BF: p = 0.19) for RF and BF. **CONCLUSION:** The current results demonstrated that the change in MPF was different for each muscle, and MPF of VL in hypoxia was only higher than that in normoxia, and suggested hypoxia exposure affects neuromuscular activity agonist muscle during exercise.

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The Effect of Endurance Exercise in Hypoxia on Hepcidin Response in Athletes

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(No relevant relationships reported)

Training in hypoxia has been widely utilized to improve endurance capacity. On the other hand, the influence of the endurance training in hypoxia on hepcidin (a liver-derived, iron regulating hormone) response remains unclear. This information would be a great help for preventing iron deficiency in endurance athletes. **PURPOSE**: The purpose of the present study was to determine the influence of endurance exercise under hypoxic condition on post-exercise hepcidin levels in endurance athletes. **METHODS**: Nine trained endurance athletes (19.7 ± 0.3 years, 169.8 ± 2.2cm, 57.1 ± 1.1kg, VO_2max 62.8 ± 1.6ml · kg · min) completed two different trials on different days, consisting of exercise in under moderate hypoxic (H, FiO_2:14.5%) and normoxic (N, FiO_2:20.9%) conditions. They performed interval type of endurance exercise (10×3-min running at 95% of VO_2max with 60s of active rest at 60% of VO_2max) followed by 30-min of continuous running at 85% of VO_2max under hypoxic or normoxic conditions. Venous blood samples were collected before the exercise and during 120-min of post-exercise period. **RESULTS**: Running velocities during interval and continuous exercise were significantly lower in the H trial than in the N trial ($P < 0.0001$). Exercise-induced blood lactate elevation was significantly greater in the H trial (5.1 ± 0.5mmol/L) than the N trial (3.2 ± 0.7mmol/L, $P < 0.05$). There were significant increases in plasma interleukin-6, serum iron, and blood glucose levels after exercise, but these responses were not significantly different between the two trials. Serum hepcidin levels increased significantly at 120-min after completing exercise (H: from 10.7 ± 9.4 ng/mL to 15.8 ± 11.2 ng/mL; N: from 7.9 ± 4.7 ng/mL to 13.2 ± 7.9 ng/mL. $P < 0.05$). However, there was no significant difference between the two trials. **CONCLUSIONS**: Endurance exercise under moderate hypoxic conditions resulted in similar exercise-induced serum hepcidin response compared with equivalent exercise under normoxic condition in endurance athletes.

1387   Board #195   May 31 8:00 AM - 9:30 AM

Blood Oxidative Stress Following Exercise Recovery in Normobaric and Hypobaric Hypoxic Environments

John C. Quindry, FACSM[1], Tiffany S. Quindry[1], Katheryn Tiemessen[1], Roksana Zak[2], Robert Shute[2], John Cuddy[1], Walter Hailes[1], Dustin Slivka, FACSM[2], Brent Ruby, FACSM[1]. [1]University of Montana, Missoula, MT. [2]University of Nebraska - Omaha, Omaha, NE.
(No relevant relationships reported)

PURPOSE: Hypobaria and hypoxia exert independent effects on exercise-induced oxidative stress in blood, while the hypobaric and hypoxic influences are not well defined. The current study was undertaken to quantify exercise-induced oxidative stress recovery during lab-simulated hypoxic and hypobaric conditions following a common bout of exercise.
METHODS: At a base elevation of 975m, physically active participants (n=16), ages 18-40, provided informed consent prior to performing 60 minutes of cycle ergometry at 70% watts max. Using a randomized counter-balanced crossover design participants recovered for 4 hours in 3 lab-simulated conditions; 1000m normobaric normoxia (NN, 675mmHg, 18.8%FiO2), 4400m normobaric hypoxia (NH, 675mmHg, 12% FiO2), or 4400m hypobaric hypoxia (HH, 440mmHg, 12% FiO2). O2 saturation was confirmed via pulse oximetry throughout the 3 exercise-recovery trials. Blood samples were collected in heparinized vacutainer tubes at time points Pre, Post, 2 Hours Post, and 4 Hours Post exercise. Blood plasma was analyzed for the quantification of oxidative stress to proteins (protein carbonyls, PC; 3-nitrotyrosines, 3NT), lipid (lipid hydroperoxides, LOOH; 8-isoprostanes, 8-ISO), and antioxidant capacity (ferric reducing ability of plasma, FRAP; trolox equivalent antioxidant capacity, TEAC).
RESULTS: Plasma TEAC, FRAP, 3NT and PC were unaltered by exercise and recovery environments (p>0.05). Exercise-induced increases in LOOH and 8-ISO were observed, although time-by-trial differences were not present.
CONCLUSIONS: These data indicate that exercise recovery in simulated conditions of NH and HH do not impact a common panel of blood oxidative stress measures.

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Cardiopulmonary Responses, Brain and Muscle Oxygenation during Exercise on Hypoxia as Acclimatization to Hypoxic Training

Jin Uchimaru, Yi-Zhen Yu, Fan Chen, Hidekazu Takemura, Hirohiko Takahashi, Shozo Suzuki. Sendai University, Shibata, Japan.
(No relevant relationships reported)

It is well known that altitude/hypoxic training enhance to exercise performance. But there are individual differences in physiological responses and training effects on hypoxic training. Thus, acclimatize to altitude/hypoxic environment would be also very important factor for successful training. **PURPOSE**: Our study focuses on changes in cardiopulmonary responses, brain and muscle oxygenation on incremental exercise at hypoxia as acclimatization to short periods hypoxic training. **METHODS**: Sixteen male healthy college-age students were divided into a hypoxic training (N, n=8) or a normoxic training group (H, n=8). They completed 5 days training session. All subjects underwent the incremental maximal cycling test at hypoxia on 1st and 5th day and 40-minutes submaximal exercise under 50-70%VO2max on 2nd, 3rd and 4th day at both each environment. We measured cardiopulmonary measurements (VE, VO2, VCO2, HR and SpO2) and blood lactate concentration on incremental exercise. Near-infrared spectroscopy (NIRS) was also used to monitor concentration (μM) changes of oxy- and deoxyhemoglobin (Δ[O2Hb], Δ[HHb]) in left frontal cortex region of the forehead and ipsilateral vastus lateralis muscle. Changes in total Hb and StO2 were calculated and used as index of change in regional blood volume. Paired T-test were performed across treatments. **RESULTS**: VO2max (41.8±4.6 ml/kg/min) and exercise time (911±40 sec) on 5th day of H group were significantly improved from that of 1st day (38.7±3.7 ml/kg/min, 847±62 sec)(p<0.05). VE, VO2 and VCO2 at submaximal exercise (180W) on 5th day of H group were significantly improved from that of 1st day (p<0.05). Also, in H group, SpO2 during submaximal and maximal exercise on 5th day were significantly higher than that of 1st day (p<0.05). There was no significant difference in brain and muscle oxygenation during exercise in both group. **CONCLUSIONS**: We suggest that short period hypoxic training would be improve cardiopulmonary and oxygen-carrying capacity during exercise and exercise capacity under moderate hypoxia. Further study is needed to clarify the mechanism of physiological acclimatization to hypoxia.

C-44   Free Communication/Poster - Cold/Dive/ Space Physiology

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1389   Board #197   May 31 8:00 AM - 9:30 AM

Precooling With An Ice Vest: Effect On Core Temperature And Heart Rate While Swimming

Brent Alumbaugh, Shelbi Peters, Leah Hendrick, Michael Reeder. Colorado Mesa University, Grand Junction, CO.
(No relevant relationships reported)

Precooling has been shown to improve athletic performance by decreasing core body temperature prior to exercise, thus delaying the onset of core heating and decreasing heart rate at given intensities during training and competition. Previous research has studied the effect of precooling on cyclists and runners, but very little research has observed core temperature (CT) and heart rate (HR) response to precooling in collegiate female swimmers. **PURPOSE:** To observe the effect of precooling on core temperature and heart rate prior to swimming 1600 yards. **METHODS:** Eleven female collegiate swimmers participated in randomized, crossover swimming trials with and without precooling. Trials were separated by one week with each subsequent trial performed at the same time of day. Precooling trials started 45 minutes prior to non-precooling trials and subjects precooled wearing an ice vest with a wet t-shirt prior to the exercise trial. All trials had a 15 minute warm up consisting of a 400yd swim, 200yd kick, and four sets of 50yd drill, followed by a 200yd cool down. Core temperature monitoring was performed during a main set of 1600 yards, swam at 75% of fastest mile pace, broken into eight, 200yd intervals. CT, heart rate (HR), and rating of perceived exertion (RPE) were measured before and after warm-up and at 200yd intervals for the remainder of the trial. **RESULTS:** Group precooling CTs were significantly (p=.02) lower. Group precooling HRs were not significantly different (p=.20), however seven of the subjects did present significantly (p<.05) lower HRs during the precooling trial. **CONCLUSION:** Precooling, using an ice vest 45 minutes prior to exercise, was shown to significantly reduce core temperature during swimming compared to non-precooling. Individual response in HR between subjects was observed, with the majority of subjects (n=7) responding with a significant decrease in HR in the precooling condition.
Keywords: Core Temperature, Precooling, Ice Vest, Core Temperature Pill, Swimming

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Effects Of Cycling In The Cold On Neuromuscular Activation And Fatigue

Brittany N. Followay, Jeremiah A. Vaughan, Savannah R. Hall, Eliott Arroyo, Cody S. Dulaney, Joseph A. Laudato, Ellen L. Glickman, Adam R. Jajtner. Kent State University, Kent, OH.
(Sponsor: Ellen Glickman, FACSM)
(No relevant relationships reported)

PURPOSE: To examine the effects of cold exposure on neuromuscular activation and fatigue during aerobic cycling exercise. **METHODS:** Five apparently healthy males (24.8 ± 2.9 years; 183.1 ± 2.2cm; 80.5 ± 4.4kg; 11.3 ± 2.8%BF; 3.97 ± 0.34 L·min^{-1}) visited the laboratory on three separate occasions. During the first visit, participants performed a VO2max test on a Velotron cycle ergometer. During the two remaining trials, participants performed two, five-second maximal isometric voluntary contractions (MVICs) of the right leg extensors prior to entering the environmental chamber. In the environmental chamber, volunteers cycled for 60 min at 60% of their VO2max in either a low- (5°C / 45%RH; LT), or moderate-temperature (22°C / 45%; MT), in counterbalanced fashion. Electromyography (EMG) of the vastus lateralis was recorded during the 60-minute exercise protocol during the first two minutes, and during the last two minutes of every 10-minute period (0-2min, 8-10min, 18-20min, 28-30min, 38-40min, 48-50min, 58-60min). Root mean square (RMS), mean power frequency (MPF) and median power frequency (MEDPF) were then normalized to the MVIC for each time point. Data were analyzed using a within subjects repeated measures ANOVA. **RESULTS:** No significant differences were observed between conditions (LT and MT) for RMS (F = 0.341; p = 0.591) MPF (F = 0.003; p = 0.959), or MEDPF (F = 1.438; p=0.297). A significant main effect of time was observed for RMS F = 8.187, p<0.001. Specifically, RMS at 8-10Min (26.369 ± 3.542%), 18-20Min (24.782 ± 3.572%), 38-40Min (25.722 ± 3.534%) and 48-50Min (26.070 ± 3.451%) were significantly lower than RMS at 58-60Min (27.091 ± 3.521%). There was also a significant effect of time for MPF (F = 3.049; p = .023), with a significantly higher MPF at 18-20min (85.694 ± 1.467%) and 38-40min (85.942 ± 1.408%) compared to 8-10min (83.165 ± 1.215%). **CONCLUSION:** The increase in RMS observed at the end of exercise suggests an increase in neural drive and motor unit activity, suggestive of an increase in motor unit recruitment and fatigue during aerobic

cycling exercise at 60% VO_2max. Furthermore, MPF significantly increased from the beginning of exercise, suggesting an increase in action potential conduction velocity. <!--EndFragment-->

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Habituation to the Cold Pressor Test

Alyssa Leger, David Bellar. *University of Louisiana at Lafayette, Lafayette, LA.*

(No relevant relationships reported)

During acute cold exposure, a stress response is induced. **PURPOSE**: The purpose of this study was to see if daily, cold water exposure to the dominant hand causes habituation to the stress responses that occur due to cold exposure. **METHODS**: Fourteen seemingly healthy men (age=22 ± 2 years, height=70 ± 3cm, body fat %= 17.5 ± 12.9%) participated in the study. Subjects performed the cold pressor test (CPT) a total of 20 times for 4 weeks (5 times per week). Data was collected during the first and final day of the 20-day habituation period. Blood glucose levels were measured before and immediately after the CPT. Subjects were asked to respond to both pain and thermal sensation scale every 30 seconds during the CPT testing. **RESULTS**: A repeated measures ANOVA showed a significant main effect for time for glucose, day 1 versus the final day (F=5.16; p=.04). A paired T-test also revealed a significant difference between the changes in glucose levels (pre-CPT-post-CPT), day 1 versus the final day (mean difference=11.79; t-ratio=2.27; p=.02). The mean change pre to post CPT in glucose on day one was 12 ± 13 mmol/L, and the mean change in glucose on the final day was $.5\pm 18$ mmol/L. Repeated measures ANOVA showed a significant main effect for time for pain scale, but there was no significant main effect for time for thermal sensations (pain scale: F=27.39; p=.01) (thermal sensation: F=.68; p=.72). Pain scale responses decreased significantly while thermal sensations remained unaltered. The average pain scale response on day one was 5 ± 5, and on the final day 1 ± 1. **CONCLUSION**: This study found a significantly decreased glucose response after 20 days of cold water exposure to the hand. This demonstrates habituation to the stress response. The perception of pain decreased significantly, but not thermal discomfort. More studies are needed to further the investigation on the physiological processes that habituated due to repeated cold exposure.

1392   Board #200   May 31 8:00 AM - 9:30 AM

Afterdrop Effect during Recovery after Aerobic Exercise in a Cold vs Moderate Temperature Environment

Jeremaih A. Vaughan, Brittany N. Followay, Savannah R. Hall, Joseph A. Laudato, Eliott Arroyo, Cody S. Dulaney, Adam R. Jajtner, Ellen L. Glickman, FACSM. *Kent State University, Kent, OH.* (Sponsor: Ellen L. Glickman, FACSM)

(No relevant relationships reported)

PURPOSE: To examine the effect of after drop following a bout of aerobic exercise and exposure to a cold compared to moderate temperature during recovery. **METHODS**: Five active men (24.8 ± 2.9 yrs; 183.1 ± 6.2 cm; 80.8 ± 4.5 kg; 11.3 ± 2.8 %; 3.97 ± 0.34 L/min^{-1}) were counterbalanced between a cold (5°C; CLD) and moderate (22°C with 45% RH; MOD) temperature trial. Exercise trials consisted of 60min of cycling at 60% of their previously determined VO_2max, 15min of rest, and a time to exhaustion at 90% VO_2max. Rectal temperatures (Tre) were recorded at baseline (BAS), end of 60 min exercise (EX60), 15 min rest (RST), Time Trial (TT), 3 min recovery (Rec3), 10 min recovery (Rec10), 30 min recovery (Rec30), and 60 min recovery (Rec60); while oxygen consumption (VO2) was recorded at 3 min of exercise (Ex3), Ex60, TT, Rec3, 15 min recovery (Rec15), Rec30, and Rec60. The data were analyzed via a two factor within-subjects repeated measures ANOVA. **RESULTS**: A trial x time interaction was observed for VO_2 (F = 6.838, p = 0.001), which was greater in CLD at Rec30 (0.50 0.60 L·min^{-1}) and Rec60 (0.57 ± 0.10 L·min^{-1}) compared to MOD at Rec30 (0.33 ± 0.03 L/min^{-1}; p = 0.008) and Rec60 (0.37 ± 0.03 L/min^{-1}; p = 0.012). A main effect of time was observed for VO_2 (F = 282.52, p < 0.001), where Ex3 (2.06 ± 0.10 L·min^{-1}) was lower than Ex60 (2.3 ± 0.09 L·min^{-1}; p = 0.027) and TT (3.36 ± 0.18 L·min^{-1}; p = 0.001) and higher than Rec3 (0.5 ± 0.02 L·min^{-1}; p < 0.001), Rec15 (0.43 ± 0.05 L·min^{-1}; p < 0.001), Rec30 (0.42 ± 0.02 L·min^{-1}; p < 0.001) and Rec60 (0.47 ± 0.03 L·min^{-1}; p < 0.001). Ex60 was significantly lower than TT (p = 0.007) and higher than Rec3, Rec15, Rec30 and Rec60 (p < 0.05). TT was higher from Rec3, Rec15, Rec30, and Rec60 (p < 0.05). A trial x time interaction was observed for the change in Tre (F = 7.28, p < 0.001), which changed less than in the CLD at Rec3 (0.37 ± 0.58 $^\circ$C;), Rec10 (0.16 ± 0.58 $^\circ$C), Rec30 (-0.29 $\pm$ 0.67 $^\circ$C) and Rec60 (-0.69 $\pm$ 0.94 $^\circ$C) compared to MOD at Rec3 (0.94 ± 0.35 $^\circ$C; p = 0.034), Rec10 (0.85 ± 0.48 $^\circ$C; p = 0.024), Rec30 (0.44 ± 0.55 $^\circ$C; p = 0.021), and Rec60 (0.002 ± 0.59 $^\circ$C; p = 0.045), respectively. There was a main effect of trial (F = 8.078, p = 0.047), where the change in MOD (0.707 ± 0.167 $^\circ$C) was greater than the change in CLD (0.275 ± 0.259 $^\circ$C; p = 0.047). **CONCLUSION**: Not surprisingly, Tre was significantly reduced in the CLD, with a concomitant increase in VO_2 to maintain homeostasis.

1393   Board #201   May 31 8:00 AM - 9:30 AM

Thermal Responses Associated with Prolonged Cycling in Cold Temperature Cody S. Dulaney, Adam R. Jajtner, Jeremiah A. Vaughan, Brittany N. Followay, Elliot Arroyo, Savannah R. Hall, Joseph A. Laudato, Ellen L. Glickman FASCM Exercise Physiology Department, Kent State University, Kent, OH

cody dulaney. *Kent state university, Kent, OH.* (Sponsor: Ellen G Glickman, FACSM)

(No relevant relationships reported)

PURPOSE: To assess thermal responses to exercise in cold versus moderate temperature. **METHODS:** Recreationally active men (n=5, 23.4 ± 2.2 yrs; 183.1 ± 6.1 cm; 86.9 ± 11.9 kg; 4.44 ± 0.75 L·min^{-1}) completed a cycling protocol in 5°C (LT) and 22°C (MOD). The protocol consisted of 60-min cycling at 60% VO_2max (CT_{60}), 15-min rest, and a time to exhaustion at 90% VO_2max (TTE). Mean skin (T_{sk}), and core temperature (T_{re}) were evaluated before CT_{60} (BL) and at 3, 20, 40, and 60 min. Metabolic heat production (M) was assessed at BL, 3, 15, 30, 45, and 60 min. Tissue insulation (I) was assessed at 3, 30, and 60 min T_{sk}, T_{re} and I were measured before (PRE) and after (POST) TTE. M was measured at PRE, at the mid-point (MID), and POST TTE. Changes were analyzed using within-subjects repeated measures ANOVA. **RESULTS:** An interaction was observed for T_{sk} during CT_{60} (F = 64.00 p < 0.001, η_p^2 = 0.941). T_{sk} was lower in LT versus MT ($p \leq 0.001$) at 3 min (25.5 ± 0.7°C, 30.7 ± 0.6°C, respectively), 20 min (23.0 ± 0.7°C, 30.4 ± 0.8°C, respectively), 40 min (22.4 ± 0.6°C, 30.4 ± 0.8°C, respectively) and 60 min (21.9 ± 1.0°C, 29.9 ± 1.3°C, respectively). No interaction (F = 5.97; p = 0.071; η_p^2 = 0.599) was observed for T_{re}. A time effect was observed for M during the TC_{60} (F = 25.8, p < 0.001, η_p^2 = 0.866). M increased from 3 min (348.2 $\pm$ 36.9 W·m^{-2}) at 15 min (375.8 $\pm$ 35.6 W·m^{-2}; p = 0.006), 30 min (383.6 $\pm$ 37.6 W·m^{-2}; p < 0.001), 45 min (384.6 $\pm$ 35.28 W·m^{-2}; p < 0.001) and 60 min (391.2 $\pm$ 34.0 W·m^{-2}; p = 0.004). An interaction was observed for M during TTE (F= 29.08 p < 0.001, η_p^2 = 0.879), with M lower during LT versus MT at PRE (113.9 $\pm$ 28.7 W·m^{-2}; 305.2 $\pm$ 100.7 W·m^{-2}, respectively; p = 0.016), MID (154.3 $\pm$ 54.3; 529.8 $\pm$ 65.3 W·m^{-2}, respectively; p < 0.001), and POST (176.3 $\pm$ 26.6; 577.5 $\pm$ 59.6 W·m^{-2}, respectively; p < 0.001). An interaction was observed for I during TC_{60} (F= 18.52; p = 0.001; η_p^2 = 0.822). I was greater in LT compared to MT at 3 min (0.034 $\pm$ 0.005°C·m^{-2}·W^{-1}, 0.019 $\pm$ 0.028°C·m^{-2}·W^{-1}, respectively; p = 0.001), 30 min (0.045 $\pm$ 0.006°C·m^{-2}·W^{-1}, 0.019 $\pm$ 0.017°C·m^{-2}·W^{-1}, respectively; p = 0.001), and 60 min (0.48 $\pm$ 0.008°C·m^{-2}·W^{-1}, 0.022 $\pm$ 0.001°C·m^{-2}·W^{-1}, respectively; p = 0.003). **CONCLUSION:** As expected, I increased in 5°C compared to 23°C, while M increase during submaximal exercise. However, M decreased during exhaustive exercise perhaps due to fatigue.

1394   Board #202   May 31 8:00 AM - 9:30 AM

The Impact Of Long Duration Spaceflight On The Function Of Plasma Cells

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(No relevant relationships reported)

Long duration spaceflights have been associated with profound dysregulation of the immune system, which could jeopardize crew safety and mission success. Recent studies have examined the impact of long-duration spaceflight on specific markers of adaptive and innate immunity, but no study to date has characterized humoral immunity and serological markers of B-cell function. **Purpose**: The aim of this study was to characterize acute and chronic changes in polyclonal Free Light Chains (FLC) and in Immunoglobulin class switching, indicative of overall B-cell function, by retrospectively analyzing archived plasma samples collected during long-duration spaceflight studies. **Methods:** Plasma samples were collected before flight, during ("Early flight", "Mid-flight" and "Late flight"), immediately upon return and during a recovery period (R+18, R+33 and R+66) from 23 astronauts and 6 age/gender-matched healthy ground-based controls. Plasma Kappa and Lambda Free Light Chains were measured using commercially available ELISA kits (Abingdon Health, Oxford, UK), and changes in renal function were identified by calculating Cystatin C-derived estimates of Glomerular Filtration Rate (eGFR). Finally, Immunoglobulin isotype switching was assessed by measuring changes in total plasma IgA, IgG and IgM throughout the mission using ELISA kits (eBioscience, San Diego, CA, USA). Maximum likelihood linear mixed models (LMM) were used to determine main effects of time on the concentration of serum FLC, Immunoglobulins and Cystatin C. **Results:** There was no difference in serum Kappa and Lambda FLC between pre-flight samples and either in-flight or recovery samples (p>0.05). Furthermore, serum levels of IgA, IgG and IgM remained unchanged during and after spaceflight, when compared to pre-flight values (p>0.05). Finally, there was no difference in eGFR (p>0.05) between before, during and after flight, suggesting that kidney function was not affected by spaceflight. **Conclusion:** These preliminary findings indicate that free light chains

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and whole immunoglobulin output from plasma cells are unaffected by long-duration spaceflight, indicating that plasma cell immune competency is maintained in microgravity and risk of infection does not appear to be magnified.

1395   Board #203   May 31 8:00 AM - 9:30 AM
Power But Not Fatigue Is Influenced By Hot And Cold Immersion Prior To Vigorous Cycling

Donald L. Hoover[1], Samuel K. Knott[2], Christopher A. Bidwell[2], Carrie A. Revlett[3], Sarah E. Parks[2], Daren T. Webb[1], Lawrence W. Judge[4], Elizabeth Norris[2], Scott W. Arnett[2]. *[1]Western Michigan University, Kalamazoo, MI. [2]Western Kentucky University, Bowling Green, KY. [3]Western Kentucky University, Bowling Green, IN. [4]Ball State University, Muncie, IN.*
(No relevant relationships reported)

PURPOSE: The impact of hot and cold immersion upon vigorous physical activity is not fully understood. Increased body temperature has been linked to improved performance during vigorous activities, whereas lower body temperature has been noted as detrimental during maximal exercise. A deeper understanding of the effect of hot and cold immersion on fatigue characteristics during the Wingate Anaerobic Test (WAnT) may lead to better understanding on how to best construct training and rehabilitation programs. The purpose of this study was to explore the effects of hot and cold immersion on measures of power and fatigue while completing a maximal bout of anaerobic cycling.
METHODS: Thirty apparently healthy and physically active women (23.00 ± 2.67 yr, 165.77 ± 5.95 cm, 61.97 ± 10.56 kg) completed this study. Participants visited the laboratory on three occasions. Using a counterbalanced design, each completed the WAnT following three immersion protocols: HOT, COLD, and no immersion (CON). Each then rode an electronically-braked cycle ergometer at maximal intensity for 30 seconds. Conditions were controlled and measured by computer. Indices of peak power (PP), mean power (MP), and fatigue index (FI) were calculated using 5-second time periods. Repeated measures ANOVA were used for statistical analysis. Statistical significance was set at the $p \le .05$ level.
RESULTS: Significant differences were found between conditions for PP [$F(2,28)=3.918, p\le 0.032$] and MP [$F(2,28)=101.71, p\le 0.000$], respectively. Pairwise comparisons using the Bonferroni correction indicated that PP ($p\le 0.024$) was significantly different between HOT and COLD conditions, and MP ($p \le 0.001$) was significantly different between HOT, COLD, and CON conditions. Non-significant differences were found between the warm-up conditions for FI [$F(2,28)=.032, p\le 0.968$].
CONCLUSIONS: The measures for PP and MP were improved following heat immersion. These findings suggest heat immersion had a stimulatory effect upon performance in this study. Conversely, no differences were found between conditions regarding FI. This element suggests that the types of immersion therapy used in this study were essentially neutral in affecting staying power during maximal cycling.

1396   Board #204   May 31 8:00 AM - 9:30 AM
Central Chemosensitivity is Augmented during Thermoneutral Head Out Water Immersion in Healthy Adults

James R. Sackett, Zachary J. Schlader, Christopher L. Chapman, Blair D. Johnson. *University at Buffalo, Buffalo, NY.* (Sponsor: Dave Hostler, FACSM)
(No relevant relationships reported)

Carbon dioxide (CO_2) retention occurs during water immersion and increases the risk of CO_2 toxicity. The central chemoreceptors primarily mediate the rise in ventilation during hypercapnia. However, it is unknown if central chemosensitivity is altered throughout two hours of head out water immersion (HOWI) in healthy adults. **Purpose:** We tested the hypothesis that central chemosensitivity is blunted throughout two hours of HOWI in healthy adults. **Methods:** We assessed central chemosensitivity in 17 subjects (age: 22 ± 1 y, BMI: 25 ± 2 kg/m^2, 7 women) during a thermoneutral ($35\pm0°C$) HOWI trial and a time-control dry trial at baseline, 10 min, 60 min, 90 min, 120 min, and post. The partial pressure of end tidal CO_2 ($PETCO_2$; capnograph) and minute ventilation (pneumotachometer) were recorded continuously. Central chemosensitivity was evaluated via a rebreathing test. Subjects rebreathed 7% CO_2 and 93% O_2 from a 10 L bag for 3.5 min. Central chemosensitivity was calculated as the slope of the linear regression line of minute ventilation vs. $PETCO_2$ every 30 s throughout the test. Data are reported as a change from baseline (mean $\pm$ SD). **Results:** $PETCO_2$ increased from baseline during HOWI at 10 min ($+1\pm2$ mmHg), 60 min ($+2\pm2$ mmHg), 90 min ($+2\pm2$ mmHg), and 120 min ($+2\pm2$ mmHg) (all p<0.01). The change in $PETCO_2$ was greater during HOWI vs. control at 10 min, 60 min, 90 min, and 120 min (all p<0.01). The change in minute ventilation did not differ over time (p=0.50) or between conditions (p=0.09). Central chemosensitivity increased from baseline during HOWI at 10 min ($+0.68\pm0.51$ L/min/mmHg), 60 min ($+0.70\pm0.69$ L/min/mmHg), 90 min ($+0.73\pm0.92$ L/min/mmHg), 120 min ($+0.85\pm1.09$ L/min/mmHg), and post ($+0.39\pm0.72$ L/min/mmHg) (all p<0.01). Central chemosensitivity also

increased from baseline during control at 120 min ($+0.36\pm0.52$ L/min/mmHg, p=0.04). The change in central chemosensitivity was greater during HOWI vs. control at 10 min, 60 min, 90 min, and 120 min (all p<0.01). **Conclusion:** These findings indicate that central chemosensitivity is augmented during two hours of thermoneutral HOWI. Thus, it is unlikely that changes in central chemosensitivity contribute to CO_2 retention during water immersion.

1397   Board #205   May 31 8:00 AM - 9:30 AM
The Role of Diver Hydration Status on Performance Following Head Out Water Immersion

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(No relevant relationships reported)

Water immersion results in a diuresis, which could potentially limit exercise performance after egress to land. **PURPOSE**: We examined the effect of three rehydration strategies on an endurance run to exhaustion, cardiovascular stability, and overnight recovery following a four-hour head out water immersion (HOWI) in thermoneutral water.
METHODS: Twelve male subjects (22.7 ± 1.8 y) completed a crossover design consisting of three rehydration strategies: no rehydration (NH), hourly replacement of fluid loss during immersion (RD), and replacement of fluid after the immersion period (RA). Following immersion, subjects ran to exhaustion at ~80% maximum heart rate. After completing the run, each subject submitted to a head up tilt test (HUTT). Vital signs and ECG were monitored overnight.
RESULTS: HOWI resulted in a transient diuresis in NH and RA protocols, while it was sustained throughout immersion in the RD protocol resulting in greater total urine volume (l) output (1.27 ± 0.48 (NH), 2.32 ± 0.77 (RD), and 1.18 ± 0.43 (RA); p < 0.001). Body mass change (%) from fluid loss was greater in NH than RD, but not RA (-1.58 ± 0.56 (NH), $- 0.66 \pm 0.47$ (RD), and $- 0.92 \pm 0.76$ (RA)). Run time was 17% and 13% shorter in NH than RD and RA, respectively, but were not statistically different. Time to orthostasis, heart rate, and blood pressure during the HUTT did not differ by condition. Overnight heart rate variability and mean arterial pressure were not different between rehydration strategies.
CONCLUSIONS: Loss of body water during thermoneutral HOWI was modest and rehydration strategies minimally affected aerobic performance, cardiovascular stability, and overnight recovery in young, healthy males. Rehydration during water immersion resulted in a large, sustained diuresis without improving performance or recovery after exiting the water.

1398   Board #206   May 31 8:00 AM - 9:30 AM
Effects Of Concurrent Exercise During Simulated Microgravity On Soleus Muscle Fiber Myonuclear Content

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(No relevant relationships reported)

Introduction: Exercise countermeasures administered on the International Space Station are time-consuming and use large/expensive equipment. Aerobic exercise has shown to maintain oxidative capacity of muscle fibers, while resistance exercise preserves muscle mass in Astronauts. Recently, Cotter et al. (2015) determined that concurrent exercise (combining aerobic and resistance exercises; CE) was effective at mitigating de-conditioning during ULLS (unilateral lower limb suspension, simulated microgravity) but resulted in differences in fiber-type responses (i.e., fast-twitch *vs* slow-twitch). This current study provides additional analyses of muscle samples used in Cotter et al. (2015), investigating soleus muscle (mostly slow-twitch) myonuclei. Modulations in fiber size and myonuclear domain (MND; the area each myonuclei controls) may provide mechanisms for preventing unloading decrements. **Purpose:** Our aim was to determine 1) if simulated microgravity affects soleus muscle fiber size and MND size and 2) if CE training mitigates these changes. Sixteen subjects were separated into two groups, 10-day ULLS and 10-day ULLS + CE. **Methods:** Muscle biopsies were taken pre- and post- intervention, which were isolated into individual fibers (muscle cells), stained for myonuclei, three-dimensionally imaged, and analyzed for fiber size and MND size. 2x2 ANOVAs determined potential differences in fiber size and MND size between groups, before and after ULLS. **Results**: No significant differences in fiber size or MND size after 10 days of ULLS were observed. These findings suggest that, while 10 days of ULLS may cause a decline in muscle function (as seen in Cotter et al., 2015), it may not significantly affect soleus muscle fiber size or MND size. However, individual variability occurred, suggesting that some people may be responders (or non-responders) to ULLS and ULLS+CE. **Conclusion:**

The results of this study suggest a need for additional analyses to help develop "personalized" exercise countermeasures for those undergoing significant periods of unloading (e.g., people in bed rest or Astronauts). <!--EndFragment-->

1399   Board #207   May 31 8:00 AM - 9:30 AM

Reliability of the Portable Metabolic Gas Analysis System used on the International Space Station

Alan D. Moore, FACSM[1], Meghan E. Downs[2], Shannon L. Jordan[1], Alan H. Feiveson[3], Jamie R. Guined[4], Stuart MC Lee[2]. [1]Lamar University, Beaumont, TX. [2]KBRwyle, Houston, TX. [3]NASA-Johnson Space Center, Houston, TX. [4]University of Houston, Houston, TX.
(No relevant relationships reported)

Metabolic gas analysis is utilized for both research and medical operations purposes on the International Space Station (ISS). Data regarding reliability of metabolic gas analysis system used on board the ISS, the Portable Pulmonary Function System (PPFS – Danish Aerospace Corporation, Odense, DK), has not been reported. **PURPOSE:** To determine the reliability and intra-subject repeatability of metabolic gas analysis data collected by the PPFS. **METHODS:** Subjects (n=8: 5M, 3F) performed 3 peak cycle tests, consisting of three 5-min stages designed to elicit 25%, 50%, and 75% peak oxygen consumption (VO_{2peak}) followed by stepwise increases of 25 W/min until reaching volitional exhaustion. Metabolic gas analysis was performed using the PPFS during these tests. Intraclass correlation coefficients (ICC), within-subject standard deviations (WS SD), and coefficients of variation (CV %) were calculated. **RESULTS**: The ICC, WS SD and CV % for peak exercise are contained in the table below. Across all exercise stages, the ICC values for oxygen consumption (VO_2), carbon dioxide production (VCO_2), and ventilation (V_E) ranged from 0.79 to 0.99; however, the ICC for respiratory exchange ratio (RER) indicated poorer agreement between trials (ICC=0.11 to 0.51). The CV values for all dependent variables ranged from 2.6% to 6.6%, which are consistent with reported values obtained using other metabolic gas analysis devices.

Variable	ICC	WS SD	CV (%)
VO_{2peak} (L/min)	0.98	0.11	3.6
VO_{2peak} (ml/kg/min)	0.92	1.91	4.6
VCO_{2peak} (L/min)	0.94	0.18	5.4
RER_{peak}	0.51	0.05	4.0
V_{Epeak} (L/min)	0.94	6.34	5.6
Peak Watts	0.96	10.32	3.7

CONCLUSIONS: The PPFS appears to yield reliable metabolic gas analysis data. Lower reliability of RER measurements are reported in the literature using other devices and is not likely a function of the PPFS. The PPFS should provide accurate and reliable data for research and monitoring of human adaptation to spaceflight.

C-45   Free Communication/Poster - Heat/Hydration

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1400   Board #208   May 31 8:00 AM - 9:30 AM

Physiological Response in Time to Exhaustion Trial Across Varied Environmental Conditions

Savannah R. Hall, Ellen L. Glickman, FACSM, Jeremiah A. Vaughan, Brittany N. Followay, Elliott Arroyo, Cody S. Dulaney, Joseph A. Laudato, Adam R. Jajtner. *Kent State University, Kent, OH.*
(No relevant relationships reported)

Purpose: To examine different environmental conditions on the physiological response to aerobic exercise preformed to exhaustion. **Methods:** Recreationally active men (n=5, 24.2 ± 2.6yr., 183.6 ± 5.57cm, 79.95± 3.99 kg, 11.72 ± 2.48 %BF, VO_2 =3.89 ± 0.31 L·min⁻¹) completed four trials. VO₂max was tested on the first trial, and trials were counterbalanced into: 5°C (LT), 23°C (MT), 34°C (HT). Participants cycled 60 minutes at 60% of their previously determined VO₂max, prior to a time to exhaustion (TTE) trial at 90% of VO₂max. Duration, metabolic (VO_2, VCO_2, V_E, & HR), and electromyography (EMG) of the right leg (RMS, MPF, MEDPF) were collected during TTE. Metabolic and EMG variables were assessed over the initial (PRE), middle (MID) and last (POST) 30s periods. EMG data were normalized to a 2-min reference bout in a thermoneutral condition. Data were analyzed using a within subjects repeated measures ANOVA. **Results:** A condition effect (F =5.37; p=0.033; η_p^2 = 0.573) during TTE, indicated MT (326.4 ± 231.1s) was longer than HT (143.2 ± 52.6s; p=0.034), with no differences in LT(281.6± 259.5s; p >0.05). No interactions

were observed for metabolic or EMG analyses. A time effect (F=145.23, p <0.001, η_p^2 = 0.973) was observed for VO₂. VO₂ was lower (p<0.001) at PRE (1.78 ± 0.52 L·min⁻¹) than MID (2.97 ±0.48 L·min⁻¹) and POST (3.15 ± 0.53 L·min⁻¹). A time effect (F= 222.182, p<0.001, η_p^2=0.982) was observed for VCO₂. VCO₂ was lower (p<0.001) at PRE (1.40± 0.37 L·min⁻¹) than MID (2.97 ± 0.72 L·min⁻¹) and POST (3.49± 0.48 L·min⁻¹), while MID was lower than POST. A time effect on V_E (F= 87.523, p <0.001, η_p^2=0.956) indicated increases (p<0.05) from PRE (37.44±6.95 L·min⁻¹) to MID (67.70 ±21.72 L·min⁻¹) to POST (86.12 ± 18.23 L·min⁻¹). A time effect (F= 45.382, p = 0.002, η_p^2= 0.002) for HR indicated increases (p<0.05) from PRE (150.80 ± 29.0 bpm) to MID (180.3 ± 19.7 bpm) to POST (189.3 ± 15.8 bpm). A time effect (F= 4.503, p= 0.049, η_p^2=0.530) for RMS indicated decrease (p=0.043) from PRE (135.1±25.04%) to MID (124.6±28.2%). A time effect (F= 4.720, p=0.044, η_p^2=0.541) of MPF indicated no differences across time points. **Conclusions:** LT had no effects on TTE endurance. Endurance in MT may be better compared to HT, though metabolic and EMG variables are likely not responsible for this difference.

1401   Board #209   May 31 8:00 AM - 9:30 AM

Thermoregulatory Responses To Moderate-intensity And High-intensity Cycling In The Heat

Eliott Arroyo, Brittany N. Followay, Jeremiah A. Vaughan, Cody S. Dulaney, Joseph A. Laudato, Savannah R. Hall, Ellen L. Glickman, FACSM, Adam R. Jajtner. *Kent State University, Kent, OH.*
(No relevant relationships reported)

PURPOSE: To examine the thermoregulatory responses to moderate- and high-intensity cycling in the heat. **METHODS:** Recreationally active Caucasian men (n=5, 24.2 ± 2.9 yrs; 183.6 ± 6.2 cm; 83.6 ± 8.1 kg; 11.7 ± 2.8%BF; 48.9 ± 6.2 ml·kg⁻¹·min⁻¹) completed an exercise protocol under two conditions: high temperature (HT; 35ºC) and moderate temperature (MT; 22ºC). The protocol consisted of 60 minutes of cycling at 60% VO₂max (CT_{60}), a 15-minute rest period, and a time to exhaustion trial at 90% VO₂max (TTE). Mean skin temperature (T_{sk}; ºC), core temperature (T_{re}; ºC), and thermal sensation (TS) were evaluated before CT_{60} (BL) and at minutes 3, 20, 40, and 60. Metabolic heat production (M; W·m⁻²) was evaluated at BL and at minutes 3, 15, 30, 45, and 60. Tissue insulation (I; ºC·m²·W⁻¹) and physiological strain index (PSI) were evaluated at minutes 3, 30, and 60 of CT_{60}. T_{sk}, T_{re}, TS, PSI, and I were measured before (PRE_{TTE}) and after ($POST_{TTE}$) TTE. M was measured at PRE_{TTE}, during TTE (MID_{TTE}), and $POST_{TTE}$. Changes were analyzed using a two factor (time x trial) within-subjects repeated measures ANOVA. **RESULTS:** For HT, T_{sk} was lower at all timepoints relative to BL ($p's$ = 0.014–0.028). For HT, T_{sk} was higher at all timepoints relative to BL ($p's$ = 0.003–0.005). T_{sk} was significantly higher in HT compared to MT at minutes 3, 20, 40, and 60 ($p's$ = 0.001–0.033). T_{sk} decreased from PRE_{TTE}–$POST_{TTE}$ (p = 0.002) and was significantly higher during HT compared to MT (p < 0.001). T_{re} was higher at all timepoints relative to BL (p < 0.001–0.001) during CT_{60}, and was significantly higher during HT compared to MT (p = 0.003). In HT, T_{re} decreased from PRE_{TTE}–$POST_{TTE}$ (p = 0.032). T_{re} was significantly higher during HT compared to MT at PRE_{TTE} (p = 0.009) and $POST_{TTE}$ (p = 0.033). M was higher at minutes 15, 30, 45, and 60 relative to 3 min ($p's$ = 0.001–0.047) and increased at MID_{TTE} and $POST_{TTE}$ ($p's$ < 0.001) relative to PRE_{TTE}. I was significantly lower during HT compared to MT at minutes 3, 30, and 60 ($p's$ < 0.001–0.001). I was lower at $POST_{TTE}$ relative to PRE_{TTE} (p = 0.001). TS was higher during HT compared to MT at minutes 20, 40, and 60 (p < 0.001–0.009). PSI was significantly higher during HT compared to MT at PRE_{TTE} (p = 0.047). **CONCLUSION:** As expected, tissue insulation is decreased, and physiological strain index is increased during exercise in the heat.

1402   Board #210   May 31 8:00 AM - 9:30 AM

Effects Of Wrist Cooling On Balance And Cognitive Performance In The Heat

Rachel K. Katch, Ryan Curtis, Andres Almeraya, Rebecca L. Stearns, Douglas J. Casa, FACSM. *University of Connecticut, Storrs, CT.* (Sponsor: Dr. Douglas J. Casa, FACSM)
(No relevant relationships reported)

Many cooling modalities exist in the literature claiming to improve performance in the heat; however, there's a paucity of literature regarding wrist cooling's effects on balance and cognitive performance after a bout of exercise in the heat. **PURPOSE:** To examine if wrist cooling influences balance and cognitive performance after a bout of cycling exercise in the heat. **METHODS:** Fourteen male participants (age, 22±4 years; height, 182±7 cm; body mass, 75.4±8.7 kg; body fat %, 10.7±3.4%) were analyzed. In an environmental heat chamber (39.5±0.9°C, 38.6±5.2% RH) participants underwent three randomized 135-minute cycling trials, which included: one wrist cooling device (W1), two wrist cooling devices (W2), and no wrist cooling device (W0) during exercise. Cognitive measures (Balance Error Scoring System [BESS], Letter Digit Substitution Test [LDST], Trail Making Test [TM]) were conducted immediately post-exercise, and delta scores were calculated from a baseline familiarization session. Rectal temperature (T_{REC}) was taken every 15 minutes during exercise. A group x time

repeated measures ANOVA was conducted to determine group differences, and paired samples *t*-tests were used to determine mean differences. **RESULTS:** No statistical difference between groups W1 and W2 occurred, therefore their data were pooled (W_P). No statistically significant difference was observed in T_{REC} between W0 and W_P (n=28; p=0.69). Additionally, no significant differences were observed in the LDST (n=27, p=0.21) and TM (n=26, p=0.64) delta scores between W0 and W_P. Significant differences were noted in BESS delta scores between W0 and W_P specifically for the single leg foam stance (0±2 vs. 1±2, respectively; p=0.002). **CONCLUSION:** Wrist cooling during exercise in the heat did not have an effect on T_{REC}, LDST, and TM scores; however, it did significantly improve single leg foam stance of the BESS testing post-exercise. Further research is warranted to investigate the potential link of body cooling and balance performance, as well as the effectiveness of wrist cooling on cognitive measures after exercising in the heat.

1403   Board #211   May 31 8:00 AM - 9:30 AM

Game-to-Game Increases in Core TemperatureDuring Rugby 7's World Series Tournaments

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(No relevant relationships reported)

PURPOSE: Characterize player core temperature (Tc) across two separate World Rugby 7's Series (WRSS) tournaments in temperate and warm environments. **METHODS:** Continuous Tc (ingestible e-Celsius™ capsule) was collected in seventeen separate playing members of one men's team (Singapore; n = 12, London; n = 11, with n = 6 competing in both tournaments) competing at the Singapore (warm) and London (temperate) WRSS tournaments. Symptoms of exertional heat illnesses (EHI), cooling strategy use, playing minutes and wet blub globe temperature (WBGT) were collected. Linear mixed models were used and a magnitude-based inference network was used to describe differences in delta Tc between all periods (baseline, pre-warm-up, warm-up, pre-game, game and post-game) within and between competitions. **RESULTS:** There were substantial game-to-game Tc increases relative to baseline, particularly within second and third games, on all match-days. Despite high peak Tc values (Singapore 39.9°C; London 39.6°C); (1) no signs and symptoms of EHI were reported by players; (2) voluntary post-game CWI usage was low; and (3) other pre-, during- and post-game cooling maneuverers were not implemented. Magnitude of Tc response was associated with playing minutes [excluding London Day 2 (Effect size; ES = 0.87–1.46)] and WBGT [excluding Singapore Day 1 (ES = 0.54–0.60)]. **CONCLUSION:** Tc demonstrated game-to-game increase with peak temperatures approaching thresholds associated with EHI (>40°C) and exceeding those demonstrated to decrement repeated sprint performance (>39°C), despite the short game duration. Practitioners may consider the use of acclimation/acclimatization programs (preferentially) and practice compatible cooling strategies to minimize Tc increase and maximize recovery and preparedness for games within and between match-days. Supported by Aspire Zone Foundation (AZF; Doha, Qatar) funding.

1404   Board #212   May 31 8:00 AM - 9:30 AM

Effect of Thermal Stress on Cycling and Plasma Volume Shifts, Body Weight and Water Intake

Joseph A. Laudato, Ellen L. Glickman, FACSM, Brittany N. Followay, Jeremiah A. Vaughan, Eliott Arroyo, Cody S. Dulaney, Savannah R. Hall, Adam R. Jajtner. Kent State University, Kent, OH. (Sponsor: Ellen Glickman, FACSM)

(No relevant relationships reported)

PURPOSE: To examine the effects of environmental stress while cycling, and its influence on hydration status. **METHODS:** Recreationally active men (n=5, 24.2 ± 2.6 years; 183.6 ± 5.6 cm; 80.0 ± 4.0 kg; 11.7 ± 2.5 %BF; 3.9 ± 0.3 L·min⁻¹) completed 4 trials, with the first consisting of a VO_2 max test, and the remaining 3 trials involving cycling at 5°C (LT), 23°C (MT), and 34°C (HT) in a counterbalanced manner. Each trial consisted of 60 min of cycling at 60% VO_2 max, 15-min rest, and a time to exhaustion (TTE) at 90% VO_2 max. Blood was drawn prior to (PRE), immediately following (60), after TTE and 1-hr post-trial (REC). An automated hematology analyzer examined whole blood, in which plasma volume shifts (PVS) were calculated using the formula established by Dill & Costill (1974). Body weight (BW) and water intake (WATER) was assessed at each time point, while urine specific gravity (USG) was assessed at PRE and REC. All data were analyzed using within-subjects repeated measures ANOVA. **RESULTS:** A trial x time interaction was observed for PVS (F= 5.71; p=0.041; η_p^2= 0.655). Post Hoc analysis indicated that at REC, PVS were greatest in LT (-14.75 ± 2.33%), compared to HT (-9.33 ± 1.77%; p=0.039), and MT (-3.5 ± 2.25%; p=0.015), while PVS at HT was significantly greater than MT (p=0.009). Furthermore, in MT, PVS were significantly greater at 60 (-18.06 ± 4.47%) and TTE (-16.34 ± 4.55%) than REC (-6.64 ± 7.29%; p=0.008, p=0.047 respectively). In HT,

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PVS was significantly greater at 60 (-17.63 ± 2.52%) and TTE (-19.45 ± 2.58%) than REC (-9.33 ± 1.77%; p=0.024, p=0.001 respectively). No change was observed in LT (p=0.090). There was no trial x time interaction (F= 0.515; p= 0.435; η_p^2=0.203), nor a main effect of time (F=0.655; p=0.595; η_p^2=0.141), or trial (F=0.515; p=0.616; η_p^2=0.114) in BW. A main effect of trial was observed in WATER (F= 29.156; p=<0.001; η_p^2=0.879). WATER was lower in LT (399.2 ± 186.9 ml) than MT (903.9 ± 302.6 ml; p=<0.001) and HT (1386.0 ± 216.8 ml; p=0.021), and greater in HT than MT (p=0.033). There was no trial x time interaction nor main effect of time or trial in USG. **CONCLUSIONS:** Cycling resulted in a greater PVS at REC for LT, compared to HT and MT. For MT and HT, PVS were reduced at REC when compared to 60 and TTE, revealing a resolution of plasma volume post-trial. As expected, water intake increased as trial temperature increased.

1405   Board #213   May 31 8:00 AM - 9:30 AM

World Championship Heat Stress Preparation: A Comparison Of IAAF And UCi Athletes

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(No relevant relationships reported)

PURPOSE: To compare exertional heat illness (EHI) history and preparedness to compete in the heat at the Beijing, China 2015 IAAF (athletics) and Doha, Qatar 2016 UCI (road cycling) World Championships. **METHODS:** Responses to a pre-competition questionnaire evaluating EHI history, heat countermeasure strategies and recovery approaches were compared in 307 IAAF and 69 UCI respondents (32% and 7% participation rate, respectively). The IAAF event was held in ~29°C and ~58% RH conditions, and the UCI event in ~37°C and ~25% RH. A *Chi-square* test of independence was employed to compare sports. **RESULTS:** Both the IAAF (48%) and UCI (57%) athletes had previously experienced EHI symptoms, with 9% and 17% having been diagnosed with EHI, respectively (P<0.001). Only 15% of IAAF athletes trained in the heat (5-30 days) before the championships, in contrast to 32% of the cyclists (P<0.001). Half of the IAAF athletes (52%) had a precooling strategy compared with 96% of the cyclists (P<0.001). Ice slurry ingestion was the most prevalent strategy in athletics and wearing an ice-vest during the warm-up was most common for cyclists. Almost all IAAF (96%) and all UCI athletes (100%) had a fluid consumption strategy (P<0.001), which differed based on event category (field, sprints and distance events; time trials and road race). The volume of fluids planned on being consumed also differed between event categories within each sport, although water was the fluid most commonly consumed. Most IAAF athletes (89%) planned on using at least one recovery strategy with the most frequently employed being massage, active recovery, stretching and cold-water immersion. The majority of cyclists (92%) planned on using one or more recovery strategies with massage, stretching and active recovery the most prevalent. **CONCLUSION:** Athletes competing at the 2015 IAAF and 2016 UCI World Championships reported a similar history of heat illness. Along with most athletes competing throughout the northern hemisphere summer months, 15% of IAAF athletes surveyed prepared specifically for the event by training in the heat, whereas 32% of the cyclists reported undertaking some form of heat training. Approximately half of the IAAF athletes and almost all the UCI athletes had a precooling strategy. Most athletes in each sport had a fluid consumption and recovery strategy.

1406   Board #214   May 31 8:00 AM - 9:30 AM

Gastrointestinal Telemetric Pills Used as Rectal Probes Provide Inaccurate Measurements of Absolute Rectal Temperatures

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(No relevant relationships reported)

Continuous measurement of rectal temperature (RT) using a wired rectal probe (WRP) comes with obvious technical difficulties and practical limitations. Measurement of RT using a telemetric pill (TP) inserted as a suppository to act as a rectal probe would circumvent some of those problems. **PURPOSE:** Validate the use of a commercially available gastrointestinal TP (HQ Inc.) for the continuous measurement of RT during slow and rapid increase and decrease in core temperature induced by periods of passive cooling, passive heating, active heating and active cooling. **METHODS:** Nine (8 men, 1 woman) physically active participants (30 ± 9 yrs; 175 ± 7 cm; 75 ± 9 kg) underwent a research protocol where they completed, while wearing a WRP (YSI 401) linked to a TP: 1) a 30 min sitting period (23°C) followed by 2) a 45 min sitting period inside a head-out environmental chamber (40-42 °C); 3) a 45 min sitting period (23°C) while ingesting, over the first 30 min, 7.5 g of shaved-ice (-1°C)/kg body weight; 4) a running exercise period (38 °C, 20-30% RH) at 68% VO_{2max} until a WRP temperature of 39.5°C and; 5) a cold-water (10°C) immersion period until a WRP decrease in temperature of 1.5°C. The WRP and each TP were calibrated before experiments. A

bias ± random error contained within ± 0.35°C (daily variation in RT of ± 0.25°C + sensors measurement error of ± 0.1°C) around the zero line was deemed acceptable between sensors. **RESULTS:** The rate of change in WRP and TP temperatures during phases 1, 2, 3, 4 and 5 was respectively of -0.008 ± 0.007°C/min and -0.006 ± 0.004°C/min, 0.003 ± 0.005°C/min and 0.002 ± 0.004°C/min, -0.011 ± 0.004°C/min and -0.011 ± 0.002°C/min, 0.057 ± 0.010°C/min and 0.054 ± 0.008°C/min and -0.141 ± 0.124°C/min and -0.091 ± 0.065°C/min. Mean biases (WRP - TP) and random errors during phases 1, 2, 3, 4 and 5 were of 0.12°C/± 0.30°C, 0.15°C/± 0.22°C, 0.12°C/± 0.26°C, 0.21°C/± 0.34°C and 0.24°C/± 0.66°C, respectively **CONCLUSION:** The use of TPs (HQ Inc.) as suppositories tracked slow and rapid increases in RT and slow decreases in RT as measured by WRP, but did not detect the rapid decrease in RT. In all instances, however, the absolute difference between WRP and TP exceeded +/- 0.35°C. Therefore, we conclude that a TP inserted as a suppository to act as a rectal probe does not provide acceptable absolute measure of RT.

1407   Board #215   May 31 8:00 AM - 9:30 AM

Gastrointestinal Heat Sink: Impact on Ingestible Telemetric Pill and Rectal Probe Temperature Measurements Following Exercise

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(No relevant relationships reported)

Measurement of core temperature at the gastrointestinal level with an ingestible telemetric pill (ITP) is increasingly used in research. But, unlike core temperature measured at the rectum *via* a rectal probe (RP), data contamination due to water or food ingestion remains a limitation of ITP. Rapid creation of a heat sink at the stomach and upper-intestinal level (duodenum to ileum), as can be obtained, for example, following shaved-ice ingestion, could potentially differently impact ITP and RP temperature measurements. In fact, the closer proximity of ITP to the heat sink than RP could result in a more important and faster rate of energy loss for ITP than RP. **PURPOSE:** To examine the impact of shaved-ice ingestion following exercise-induced increase in core body temperature on the degree of agreement between ITP and RP temperature measurements. **METHODS:** 8 healthy young men (33 ± 8 yrs, 75 ± 6 kg, 176 ± 5 cm) underwent a passive sitting period of 20 min at 20°C, after which they completed 2 exercise periods (cycling or running) at 75% of estimated maximal heart rate in a hot-dry environment (31.1 ± 1.1°C, 32% RH) with the goal of increasing rectal temperature by 1°C over baseline level. Following each exercise period, subjects passively seated in a 20°C ambient temperature for 45 min while ingesting, over the first 30 min, either 7.5 g of water provided at rectal temperature/kg body mass (after the first exercise) or 7.5 g of shaved-ice provided at -1°C/kg body mass (after the second exercise). Rectal (YSI 401) and gastrointestinal temperatures (HQ Inc.) were measured continuously during the experiments. ITPs were ingested 10 h prior to arrival time at the laboratory. **RESULTS:** The rate of decrease in RP and ITP temperatures during water ingestion was respectively of 0.017 ± 0.004°C/min and 0.018 ± 0.008°C/min, compared to 0.025 ± 0.006°C/min and 0.026 ± 0.006°C/min for shaved-ice ingestion. Mean biases (RP - ITP) and 95% limits of agreement during the passive sitting period, first exercise period, water ingestion period, second exercise period and shaved-ice ingestion period were respectively of 0.10°C/± 0.35°C, 0.09°C/± 0.31°C, 0.17°C/± 0.66°C, 0.12°C/± 0.38°C and 0.16°C/± 0.64°C. **CONCLUSION:** The present results indicate that the creation of a heat sink at the stomach and upper-intestinal level does not alter the degree of agreement between RP and ITP.

1408   Board #216   May 31 8:00 AM - 9:30 AM

Evidence for Seasonal Acclimatization of Behavioral Thermoregulation in Resting Humans

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(No relevant relationships reported)

Environmental temperatures perceived as comfortable in the summer season are often perceived as uncomfortably warm during the winter, and vice versa. During rest, behavioral thermoregulation is driven by thermal discomfort, which is largely mediated by changes in skin temperature. Thus, it is likely that seasonal acclimatization shifts the skin temperature thresholds that elicit behavioral thermoregulation. However, this is unknown.
Purpose: Test the hypothesis that skin temperatures upon the decision to behaviorally thermoregulate differ between the winter and summer.
Methods: Seven healthy adults (age: 26 ± 3 y, 2 females) wearing shorts and a t-shirt underwent a 90 min behavioral test while seated in which they passively moved between a warm (40 ± 0°C, RH: 20 ± 0%) and a cool (19 ± 1°C. RH: 37 ± 14%) room when they felt 'too warm' or 'too cool'. Testing was completed during both the summer (S; average high/low: 26 ± 4°C / 18 ± 3°C) and winter (W; 0 ± 8°C / -7 ± 5°C) months in Buffalo, NY. Weighted mean skin (6 sites) and intestinal temperatures were measured continually and are reported as a 30 s average immediately prior to moving from cool to warm (C-to-W) and warm to cool (W-to-C). Thermal sensation (7 point

scale: 1 = cold, 7 = hot) and thermal discomfort (4 point scale: 1 = comfortable, 4 = very uncomfortable) were measured at C-to-W and W-to-C. Data were averaged across behaviors for a given subject.
Results: The time prior to moving from C-to-W (S: 9.4 ± 3.4 min, W: 10.5 ± 3.9 min, P=0.46) and W-to-C (S: 15.1± 4.5 min, W: 14.1± 4.2 min, P=0.51) did not differ between seasons. Intestinal temperature at C-to-W (S: 36.8 ± 0.2°C, W: 37.1 ± 0.2°C, P<0.01) and W-to-C (S: 36.7 ± 0.2°C, W: 36.8 ± 0.3°C, P=0.05) was higher in the winter. However, mean skin temperature at C-to-W (S: 33.2 ± 0.4°C, W: 31.9 ± 0.8°C, P<0.01) and W-to-C (S: 35.9 ± 0.5°C, W: 34.4 ± 0.6°C, P<0.01) was lower in the winter. Thermal sensation at C-to-W (S: 2.5 ± 0.4, W: 2.7 ± 0.3, P=0.22) and W-to-C (S: 5.5 ± 0.6, W: 5.3 ± 0.4, P=0.49) did not differ between seasons. Thermal discomfort at C-to-W (S: 1.9 ± 0.4, W: 2.0 ± 0.1, P=0.58) and W-to-C (S: 1.9 ± 0.6, W: 2.0 ± 0.2, P=0.57) also did not differ between seasons.
Conclusion: Compared to the summer, skin temperatures upon the initiation of thermoregulatory behavior are shifted to lower temperatures in the winter.

1409   Board #217   May 31 8:00 AM - 9:30 AM

Thermoregulation And Perception Among Lean/obese And Fit/unfit Girls Cycling In The Heat

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(No relevant relationships reported)

Heat stress may be an extra concern to obese and unfit adolescents while exercising. Besides the higher rate of body temperature (T_{body}) increase, it is believed that heat stress aggravates perceived exertion (RPE), irritability and thermal sensations. However, no study has compared thermoregulatory and perceptual responses of obese and unfit girls in relation to their lean and fit peers under similar heat stress and metabolic heat production.**PURPOSE:** To verify thermoregulatory and perceptual responses of obese and lean girls, either fit or unfit, exercising in the heat at a similar metabolic heat production per unit of body mass (Hp).**METHODS:** 34 pubescent (Tanner 2 to 4) girls divided in four groups participated in the study. 21 were obese (12 fit and 9 unfit; 13.2±1.4yrs, 60.8±13.7kg, 158±0.1cm, 40.5±5.8% fat (DXA), VO_{2peak} 76.0±8.1 and 56.6±5.8 ml$\cdot$kg$^{\text{-musclemass-1}}\cdot$min^{-1}), and 13 lean (5 fit and 8 unfit; 13.1±1.6yrs, 44.1±6.5kg, 156±0.1cm, 24.0±4.8% fat, VO_{2peak} 74.5±2.9 and 56.2±5.0 ml$\cdot$kg$^{\text{-musclemass-1.}}$min^{-1}). They cycled 2×25 min bouts, with a 10-min rest, at ~5.4 W$\cdot$kg^{-1} (5.2±1.2 and 5.7±1.0 W$\cdot$kg^{-1} obese and lean) in the heat (36°C and 40% RH). Rectal (T_{re}) and skin (T_{sk}) temperatures and heart rate (HR) were measured every 5 min. Additionally, RPE, irritability, thermal sensation, and thermal comfort were collected throughout the exercise. Sweat losses were replenished with spring water during rest period.
RESULTS: Initial T_{re} and HR were similar between obese and lean girls (37.5±0.3 and 37.2±0.3°C and 101±13.6 and 98.8±11.9 bpm). No difference was observed among the 4 groups (obese fit, obese unfit, lean fit and lean unfit) throughout the exercise for T_{re}: 37.6±0.2, 37.5±0.3, 37.5±0.3 and 37.4±0.3 °C; T_{sk}: 34.8±0.8 ; 35.1±1.0 ; 34.4±0.9 e 35.2±0.9°C; T_{body}: 37.0±0.2, 37.0±0.4, 36.8±0.3 and 36.9±0.3 °C; HR: 128±18; 118±12, 130±16 and 119±16 bpm. Also, no differences were observed in the perceptual responses (RPE:11±2, 12±2, 11±2 and 11±2, irritability: 3±0.5, 2±0.3, 3±0.8 and 2±0.3, thermal sensation: 7±0.4, 7±0.5, 7±0.7, 6±0.7 and thermal comfort: 3±0.4, 3±0.5, 3±0,7 and 3±0.5).**CONCLUSION**: Regardless of the adiposity or aerobic fitness level, pubescent girls had similar thermoregulatory and perceptual responses while cycling under heat stress during 50 min at a mild (~5,4 W$\cdot$kg^{-1}) intensity level.

1410   Board #218   May 31 8:00 AM - 9:30 AM

Effect Of Dehydration On Cognitive Functions: A Meta-analysis

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(No relevant relationships reported)

Dehydration (DEH) is believed to impair cognitive functions but which processes (e.g., from executive control to simple reaction time) are affected and at what magnitude of body mass loss (BML) remains unclear. **PURPOSE:** To systematically review the literature and examine factors influencing the effect size (ES) of DEH on cognitive functions via meta-analysis. **METHODS**: Human studies were identified through databases (PubMed, Psych Info, Sport Discus, Scopus, ISI Web of Science, Medline, ProQuest Dissertation & Theses). Thirty-one studies were identified, providing 256 ES estimates from 388 subjects with the magnitude of DEH ranging from 1 to 6% BML. Outcome variables (accuracy, reaction time), cognitive domains, and methods to induce DEH (exercise and/or heat stress and/or fluid restriction) varied. ES were calculated using standardized mean differences and a meta-analysis completed using a random-effects model. **RESULTS**: Impairment on overall cognitive performance (all domains/outcomes) with DEH was small (ES = −0.24; 95% CI [−0.38, −0.10]) but significant (p = 0.002) and due primarily to outcomes based on accuracy (ES = −0.24; [−0.39, −0.10]) versus reaction time (ES = −0.16; [− 0.34, 0.02]), although these two ES were not different (p = 0.47). Indicators of heterogeneity (τ^2 = 0.19, I^2 = 69.9%) reflected moderate to large variation across studies. Cognitive impairment

following DEH was greater ($p = 0.02$) for executive functions (ES $= -0.38$; 95% CI: $[-0.60, -0.17]$) compared to simple/choice reaction times (ES $= -0.02$; $[-0.16, 0.11]$). Based on meta-regression, the magnitude of BML was not associated with impairment of executive functions (slope $= -0.03$, $r^2 = 0.002$, $p = 0.68$). Sub-group estimates of cognitive impairment when %BML was $\leq 2\%$ (ES $= -0.20$; $[-0.40, -0.002]$) versus $> 2\%$ (ES $= -0.30$; $[-0.50, -0.10]$) were not different ($p = 0.38$) based upon 134 and 122 outcomes, respectively. **CONCLUSIONS**: Despite variability among studies, the adverse effect of DEH on human cognition appears to be small to moderate. Tasks requiring executive functions appear more vulnerable to DEH compared to tasks utilizing lower-order cognitive domains, but lacking a dose-response relationship. A minimum threshold of DEH that impairs human cognition was also not evident.

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Dehydration is How You Define It: Comparison of 318 Blood and Urine Spot Checks

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(No relevant relationships reported)

Clinical medicine defines dehydration using blood markers which confirm hypertonicity (serum sodium concentration/[Na$^+$] >145mmol/L) and intracellular dehydration. Sports medicine equates dehydration with a concentrated urine as defined by any urine osmolality (UOsm) ≥ 700mOsmol/kgH$_2$O or urine specific gravity (USG) ≥ 1.020. **PURPOSE**: To compare blood versus urine indices of dehydration in a cohort of athletes undergoing routine screenings. **METHODS**: 318 collegiate athletes (193 female) provided blood and urine samples and asked to rate how thirsty they were on a 10-point visual analogue scale. Serum was analyzed for serum [Na$^+$] while urine osmolality was measured using an osmometer. USG was measured using a Chemstrip. Data were categorized into Dehydrated versus Hydrated groupings based upon the above-mentioned UOsm and USG thresholds. **RESULTS**: Athletes from seven sports teams were represented (combined: height 1.75±0.1m; weight 71.9±13.5kg; body mass index 23.2±2.5kg/m^2). Overall, female athletes had lower USG vs. male athletes (1.014±0.006 vs. 1.015±0.006; $p=0.03$). Using the UOsm ≥ 700mOsmol/kgH$_2$O threshold to define dehydration, 55% of athletes were classified as dehydrated. Using any USG ≥ 1.020 to define dehydration, 27% of these same athletes were classified as dehydrated. No athlete met the clinical definition for dehydration (hypertonicity; serum [Na$^+$] >145mmol/L). Normonatremia (serum [Na$^+$] between 135-145mmol/L) was maintained in 99.7% of athletes (mean serum [Na$^+$] 139.9±2.1; range 134-145mmol/L) despite wide variation in UOsm (mean 682.7±302; range 110-1298mOsmol/kgH$_2$O). A significant correlation was confirmed between serum [Na$^+$] versus UOsm ($r=0.18$; $p=0.001$). However, urine concentration at the extreme ranges of dehydration did not reflect clinical abnormalities in serum markers or thirst rating (mean rating 4.4±1.8; range 0-10). **CONCLUSION**: Urine concentration thresholds (commonly used by sports medicine) classified 27-55% of collegiate athletes as dehydrated, while no athlete was dehydrated according to serum [Na$^+$] measurement. Practitioners should caution against using urine indices, as isolated measurements, to diagnose or monitor dehydration because urinary output is largely a response rather than a reflection of physiologically regulated blood tonicity.

1412   Board #220   May 31 8:00 AM - 9:30 AM

Thirst Perception and Fluid Intake are not Affected by Knowledge of Water Losses During Exercise

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(Sponsor: Luis Fernando Aragon-Vargas, FACSM)
(No relevant relationships reported)

Thirst perception has been studied as an indicator of acute dehydration during exercise, however, as a perception, it could be affected by the information received about water (sweat) losses. **Purpose:** To identify if thirst perception (TP) can be affected by knowledge of water losses during exercise. **Methods:** 11 males exercised intermittently in the heat on two occasions (30 min bicycle-30 min treadmill, at 70-80%HRmax), to a dehydration of 3.9±0.4% and 3.8±0.4% body mass (BM). TP and heat sensation were measured every 30 minutes during exercise. During session one (S1) they received real information about their water losses; in session two (S2), they received false information about their water losses (60% of their real losses). Information was given every 30 minutes; the order of the sessions was randomly assigned. After finishing the exercise, they ingested water *ad libitum* for 30 minutes. Urine osmolality was measured preexercise, postexercise and at the end of each trial. Data were analyzed using Student's *t* and analysis of variance, as appropriate. **Results:** Preexercise conditions were not statistically different between sessions (Table).

Variable	Real Information (S1)	False Information (S2)	t	p
Body Mass (kg)	76.7±5.2	76.8±5.2	-0.389	0.706
USG (a.u)	1.019±0.07	1.018±0.07	0.135	0.895
Uosm	699.6±256.8	673.5±255.3	0.279	0.786
Thirst perception (mm)	15.09±9.6	22±15.7	-1.38	0.199
WBGT (°C)	28.8±0.1	28.9±0.3	-0.814	0.461

Exercise time was the same (115±22.3 and 110±24.4 min, t=-1.27; $p=0.232$). Thirst perception between sessions was also similar (48.26±2.11 and 51.2±3.81, for S1 and S2, respectively; $f=0.661$; $p=0.447$). Thirst percepton changed significantly over time in both sessions ($f=44.6$; $p= 0.001$), but no interaction ($f=0.382$; $p=0.559$). Power analysis for TP was 79%. Heat sensation showed no differences between sessions (8.14±2.18 and 6.00±0.23, for S1 and S2; $f=0.982$; $p=0.360$) or over time ($f=2.88$; $p=0.140$). Uosm was not different between sessions 659.94±80.59 and 636.09±79.76, for S1 and S2; $f=0.134$; $p=0.722$). Water ingestion was the same between sessions (1220.4±248.6 mL and 1228±421.8 mL; t=-0.66, $p=0.949$). **Conclusion**: these results suggest that thirst perception is not affected by knowledge of water losses during exercise.

1413   Board #221   May 31 8:00 AM - 9:30 AM

Fluid Intake Pattern, Dehydration, And Performance In Young Athletes During A Triathlon In Tropical Climate

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(No relevant relationships reported)

Mild dehydration is associated with increased core temperature and reduced performance during endurance events in adult athletes. Little is known about hydration practices, hyperthermia, and the effects of insufficient fluid replacement on performance in young athletes during real-life competitions. **PURPOSE:** Examine voluntary fluid intake, the relation between dehydration and performance, and core temperature in adolescents during a triathlon competition in tropical climate. **METHODS:** 15 junior (14-15 yr) and 21 senior (16-18 yr) athletes competed in a triathlon (750 m swim, 18 km cycle and 4 km run) in a hot and humid environment (WBGT=27.9°C; water temp=29.0°C), in July, between 7:30 to 9:30 am. Urine specific gravity (U$_{SG}$) was measured upon waking the day of competition. Water and sports drinks were carried in bottles on the bike, and available for each athlete in a fluid station during the run. Sweat loss was calculated from change in body weight [BW] (corrected for urine output) and fluid intake. Dehydration was calculated as % change in BW. Core temperature was measured in two athletes pre-competition, and at the end of the swim, cycle, and run portions, using ingestible sensors. **RESULTS:** Mean U$_{SG}$ (1.025 ± 0.001 g/mL) indicated that athletes were not in an adequate state of hydration upon waking. Fluid intake (juniors=471.8 ± 161.4 and seniors=551.3 ± 263.2 ml) replaced 46% of the sweat loss and was higher during run (juniors=10.2 ± 3.5 and seniors=12.3 ± 8.2 ml/min) compared to cycle (juniors=6.1 ± 2.5 and seniors=8.0 ± 3.4 ml/min), $P < 0.05$. At the end of the competition, 26% of juniors and 52% of seniors had dehydrated $\geq 1.5\%$. Dehydration was associated with finishing time in senior boys ($r= -0.70$; $P= 0.01$) who also showed the highest sweat rate (1.3 ± 0.8 L/h) and faster times. Core temperature rose to 40.1°C in the girl who placed 2nd, and to 39.6°C in the boy who placed 3rd. No athletes showed symptoms of heat illness. **CONCLUSIONS:** Young athletes participating in a triathlon in tropical climate show mild to moderate levels of dehydration. Higher dehydration in senior athletes may be due to higher sweat rates and faster racing. Competition organizers should be aware that young, dehydrated athletes may become hyperthermic during triathlons in tropical climate, and should be prepared for medical interventions if needed.

1414   Board #222   May 31 8:00 AM - 9:30 AM

Effects of Hypohydration on Markers of Catabolism in Females Following Resistance Exercise

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(No relevant relationships reported)

BACKGROUND: Cortisol is elevated in times of stress and works as an inhibitor of muscle protein synthesis through binding to its glucocorticoid receptor (GR). This GR is expressed throughout the body and regulates the expression of glucocorticoid responsive genes that are involved in catabolic pathways. **PURPOSE:** The purpose of this study was to determine the effects of previous night dehydration on markers of catabolism in resistance-trained females following resistance exercise. **METHODS:** Ten healthy, resistance trained females (age 22.0 ± 2.1 years; height 164.5 ± 5.0 cm; mass 61.9 ± 19.0 kg; body fat 26.7 ± 2.9%) completed two bouts of resistance exercise,

either dehydrated (~3% body weight) (DT) or heat exposed with fluid replacement (HT). Each exercise bout consisted of one rep maximum (1RM) followed by 5 sets to failure of 75% of 1RM for bench press and leg press. Muscle and blood samples were obtained prior to and 1hr following exercise. Blood samples were obtained to examine cortisol. From each muscle sample, glucocorticoid receptor-DNA (GR-DNA) binding and mRNA expression were determined. Data was analyzed with separate 2 (trial) x 2 (time) analysis of variance (ANOVA). Significant interactions were further analyzed with paired t-tests. **RESULTS:** There were no significant interactions between session and time for any markers of mRNA expression. There was no significant interaction or main effects for session and time for serum cortisol. There was a significant main effect for session for GR- DNA binding (p = .043). GR-DNA binding was significantly elevated post exercise for DT (p = .016). **CONCLUSION:** Hypohydration appears to have little effect on proteolytic gene expression even though GR-DNA binding was increased. It is possible that gene expression was suppressed due to participants being resistance-trained. Further research is needed to determine if hypohydration affects proteolytic gene expression in untrained individuals. Theoretically, if an individual were to be chronically hypohydrated, a reduction in resistance training volume and increase in GR-DNA binding could diminish the anabolic response to resistance exercise and potentially lead to muscle atrophy. This study was supported by a doctoral research grant from the National Strength and Conditioning Association.

1415   Board #223   May 31 8:00 AM - 9:30 AM

Factors Influencing Hydration Status during a NCAA Division 1 Soccer Preseason

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(No relevant relationships reported)

PURPOSE: To investigate the role that training and environmental conditions has on fluid balance during a collegiate men's soccer preseason. **METHODS:** Twenty-eight male collegiate soccer players (mean±SE; age, 20±0y; body mass (BM), 79.9±7.6kg; height, 180.9±7.0cm; VO_{2max}, 50.8±4.4ml·kg⁻¹·min⁻¹) participated in this study, which took place during the preseason period of the 2016 NCAA soccer season. Prior to each practice and game (PRE), BM and urine sample were collected to assess hydration status and then donned a heart rate and GPS enabled chest strap to measure training volume and intensity, including session time, total distance (TD), training load score, distance·session time⁻¹, average heart rate, and average speed. Players consumed 500mL of water prior to and following each practice with ad libitum access to water during practice as team customized hydration strategy. Participants provided a post-session (POST) BM to assess percent body mass loss (%BML). Average ambient temperature (T_{AMB}) and relative humidity (RH) were collected using an online environmental-based serve. Stepwise linear regression was used to identify which hydration, training, and environmental variables were predictive of %BML. Repeated measures ANOVA was used to assess changes in PRE-BM, POST-BM, and %BML across the 17-day preseason period. Significance was set a-priori p<0.05. **RESULTS:** TD predicted %BML during preseason training sessions (r²=0.252, p<0.001). When T_{AMB} and RH were added to the model these factors significantly predicted %BML (r²=0.301, p<0.001). PRE-BM, POST-BM, %BML were significantly different over the course of the study (p<0.05). However, %BML never exceeded 2% of BM during any one session and daily variations in BM were <1% from baseline measures. **CONCLUSION:** TD, T_{AMB} and RH were able to predict %BML during the preseason of a collegiate soccer season. The team customized hydration strategy utilized was successful at preventing fluid losses exceeding 2% of BM, which may adversely affect athletic performance. Future work is needed to assess 24-h fluid balance in this population to develop improved hydration strategies.

1416   Board #224   May 31 8:00 AM - 9:30 AM

Pregame Hydration Status of Collegiate Basketball Players on Consecutive Days of Play

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(No relevant relationships reported)

Collegiate basketball teams typically compete on non-consecutive days, allowing players ample time to recover from fluid loss incurred during a game and return to a euhydrated state before the next contest. However, some NCAA conferences, tournaments and invitationals require play on consecutive days, possibly leading to greater occurrences of hypohydration, which could impair performance and/or increase injury risk. **PURPOSE:** To evaluate pregame hydration status of collegiate basketball players on consecutive days of competition and determine if these measures are associated with game performance. **METHODS:** Twenty-five collegiate basketball players (14 men, 11 women) from a NCAA Division II university participated in this study. Players' urine specific gravity (USG) and body weight (BW) were assessed 1-2 hours prior to the start of 8 pairs of regular season conference games (16 games

total) played on consecutive days (Fri & Sat). Upon arrival to the locker room, each athlete was weighed on a digital scale, wearing similar clothing each time, and provided a urine sample. USG was assessed using a hand-held clinical refractometer. Box score data were used to calculate player efficiency (PE) ratings as measures of in-game statistical performance. **RESULTS:** On Sat, 61.8% of players had a BW deficit (-0.60 ± 0.42 kg) compared to Fri, with 20.2% presenting with a BW deficit ≥ 1%; however, Fri vs. Sat BW differences were not significant (P = 0.693). Overall, 25.2% of players had USG values 1.020-1.024 and 27.0% of players had USG values ≥ 1.025 before their games. Players had USG values ≥ 1.020 more often on Fri (56.2%) than Sat (48.2%), though this difference did not reach statistical significance (P = 0.834). Neither changes in BW (P = 0.659) nor USG (P = 0.854) from Fri to Sat were significantly associated with PE on Sat. **CONCLUSION:** Approximately 50% of players were mildly to severely hypohydrated before the start of each game; yet hypohydration rates were similar before games played on consecutive days. Still, the majority of players had modest BW deficits before games played on the second day, indicating insufficient rehydration from the prior game. Although collegiate basketball players were consistently hypohydrated before their games, hydration status was not associated with statistical performance in these contests.

1417   Board #225   May 31 8:00 AM - 9:30 AM

Bilateral Differences in Muscle Activation Associated with Cycling in Varying Environmental Conditions

Adam R. Jajtner, Brittany N. Followay, Jeremiah A. Vaughan, Eliott Arroyo, Savannah R. Hall, Cody S. Dulaney, Joseph A. Laudato, Ellen L. Glickman, FACSM. *Kent State University, Kent, OH.*

(No relevant relationships reported)

PURPOSE: To examine the influence of ambient temperature on bilateral differences (DIF) in muscle activation. **METHODS**: Five recreationally active men (24.2 ± 2.9 yrs; 1.84 ± 0.06m; 80.0 ± 4.47 kg; 11.7 ± 2.8 %BF, 3.89 ± 0.34 L·min⁻¹) completed four experimental visits: a VO_2max test, and cycling in 5°C (LT), 23°C (MT) and 34°C (HT) in a counterbalanced fashion. Cycling consisted of 60 minutes at 60% of their previously determined VO_2max (TC_{60}), and a time to exhaustion trial at 90% of their VO_2max (TTE). Electromyography (EMG) was monitored on the vastus lateralis of both legs from 0-2min, 8-10min, 18-20min, 28-30min, 38-40min, 48-50min, and 58-60min during TC_{60}, as well as at the initial (PRE), middle (MID) and last (POST) 30-second periods during the TTE. Rectified EMG (RMS) and power spectra analysis (MPF and MedPF) were normalized to a standard 2-min cycling bout at 60% of VO_2max in a thermoneutral condition. DIF between legs were calculated (dominant - non-dominant), and data analyzed via a within-subjects repeated measures ANOVA. **RESULTS**: During CT_{60} a main effect of trial (F = 5.34; $p = 0.034$; $\eta_p^2 = 0.572$) was observed with differences from LT (4.29 ± 6.28%) to MT (-3.79 ± 6.98%; $p = 0.033$) and HT (-7.36 ± 10.76%; $p = 0.033$). During CT_{60}, no interaction was observed for MPF (F = 1.755; $p = 0.227$; $\eta_p^2 = 0.305$). An interaction (F = 2.883; $p = 0.033$; $\eta_p^2 = 0.419$) was observed for MedPF during CT_{60}. No differences were observed across time in LT ($p = 0.597$) or MT ($p = 0.287$), though in HT 48-50min (10.17 ± 7.79%) was different ($p < 0.05$) from 8-10min (-1.91 ± 3.77%), 18-20min (2.40 ± 4.63%), and 28-30min (4.12 ± 2.97%). Additionally, at 8-10min, HT was different from MT (10.61 ± 5.14%; $p = 0.004$). During TTE, no interactions were observed for RMS (F = 0.660; $p = 0.629$; $\eta_p^2 = 0.142$) or MPF (F = 0.840; $p = 0.520$; $\eta_p^2 = 0.174$). An interaction was observed for MedPF (F = 3.808; $p = 0.023$; $\eta_p^2 = 0.488$) during TTE. Post hoc analysis indicated that during the LT trial, DIF was different at MID (-2.63 ± 8.34%) compared to PRE (3.12 ± 8.51%; $p = 0.004$) and POST (2.54 ± 7.77%; $p = 0.004$). **CONCLUSIONS**: During prolonged exercise in cold conditions, there appears to be a greater propensity to activate muscle from the dominant limb. Similarly, as an individual fatigues in a hot condition, it appears the rate of action potential depolarization may increase more in the dominant limb.

THURSDAY, MAY 31, 2018

1418 Board #226 May 31 8:00 AM - 9:30 AM

Hydration Biomarker and Plasma Copeptin Variability in Response to Partial Rehydration After Exercise-Induced Dehydration

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(No relevant relationships reported)

Changes in plasma osmolality (P_{osm}) and arginine vasopressin (AVP)-mediated signaling regulate thirst and drinking behavior. Copeptin is a peptide derivative of the AVP preprohormone and thought to be more stable and measureable than AVP as a biomarker of the hydration process. PURPOSE: This investigation aimed to evaluate hydration biomarkers, including copeptin, responses to exercise-induced dehydration and partial rehydration. METHODS: Fifty-two registrants (mean age: 52y, range: 21-72) in a 161km cycling event under warm and humid environmental conditions (mean = 26°C, 76%RH; maximum = 30°C, 93%RH) participated. P_{osm}, urine specific gravity (U_{sg}), urine color (U_{col}), thirst, and plasma copeptin were measured at 3 time points: before (PRE) and shortly after (POST) the ride, and one hour following a 650mL water bolus at ambient temperature consumed in 6 increments within 3min (POST$_{1h}$). Subjects consumed their typical diet during, but were not permitted to eat or drink between ride completion and the 1h post period. RESULTS: Subjects lost 2.2 ± 1.1% body mass at POST, and all variables significantly increased from PRE to POST (P_{osm} = 295.8 ± 3.9 to 299.1 ± 5.6 mOsm·kg^{-1}; U_{sg} = 1.017 ± 0.005 to 1.021 ± 0.006; U_{col} = 3 ± 1 to 5 ± 2; copeptin = 7.50 ± 4.9 to 42.23 ± 35.74 pmol·L^{-1}; thirst = 3 ± 1 to 5 ± 2; all p < 0.05). At POST$_{1h}$ (body mass = -2.0 ± 1.1%) P_{osm} returned to PRE (294.4 ± 5.7 mOsm·kg^{-1}), while U_{sg} (1.021 ± 0.006), U_{col} (5 ± 2), and thirst (5 ± 2) remained elevated compared to PRE (all p < 0.05). Copeptin remained elevated at POST$_{1h}$ vs. PRE (p < 0.0001) but decreased from POST to POST$_{1h}$ (POST$_{1h}$ = 27.87 ± 28.57 pmol·L^{-1}; p < 0.0001). CONCLUSION: Well-studied hydration biomarkers and the more recent biomarker copeptin tracked exercise-induced dehydration (PRE vs. POST), but differed in response to partial rehydration with a 650mL bolus (POST$_{1h}$): copeptin tracked with partial rehydration, while P_{osm} would indicate adequate and urine markers inadequate fluid replacement occurred. Ongoing work includes analyses of the relationship between food intake during the ride and hydration biomarkers to determine factors that may contribute to change magnitude at POST and differences in biomarker responses at POST$_{1h}$. Grant Funding: University of Hartford faculty grant; University of Connecticut ONSF, faculty start-up funds, and OUR

1419 Board #227 May 31 8:00 AM - 9:30 AM

Fast Rehydration Rate Helps To Keep Positive Body Fluid Balance Longer Time: A Pilot Study

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(No relevant relationships reported)

PURPOSE: To compare the effects of three different post exercise rehydration rates after exercise derived dehydration on body fluid balance and subjective feelings of thirstiness and bloating.
METHODS: We evaluated five male college soccer players. They were weighted before performing a treadmill run to induce a ≈2% body weight loss by sweating. After the dehydration, subjects were rehydrated with 150% of their body weight loss with a carbohydrate electrolyte solution (5% CHO, 30 Na mEq/L). Subjects were assigned to one of three postexercise rehydration rates in a randomized, counterbalanced and crossover design. The postexercise rehydration rates consisted on drinking the whole fluid volume the first 30 minutes in 3 equal doses (H30), or the first 60 minutes in 5 equal doses (H60), or the first 120 minutes in 9 equal doses (H120) after dehydration. Subjects were weighted without clothes (after voiding their bladders and drying the skin with towels) each 30 minutes during a 240 minutes lapse. At the same time they answered a visual analogue scale to answer how thirsty and how bloated they felt at that moment. Results are presented as mean. A two-way repeated measures ANOVA was performed.
RESULTS: Positive fluid balance in H30 was significantly higher than H60 and H120 at minute 30. H30 and H60 were higher than H120 at minute 60. H60 was higher than H120 at minute 90, but H30 was not different vs H60 nor H120. H30 kept a positive

fluid balance for 2 hours, H60 for 1 hour, and H120 for 0.5 hours. Thirstiness was significantly lower in H30 than H120, but not to H60 at minute 30, no other difference was found. Bloating was significantly higher in H30 than H120, but not to H60 at minute 30, no other significant difference was found (Table 1).
CONCLUSIONS: The H30 rehydration rate was effective to keep positive fluid balance for a longer period and to rapidly achieve positive fluid balance and decrease thirstiness acutely, however bloating may be a concern employing this rehydration rate.

Table 1. Body fluid balance and subjective feelings of thirstiness and bloating by rehydration rate									
Minute	0	30	60	90	120	150	180	210	240
Body fluid balance (%)									
H30	-1.90[a]	0.79[a]	0.77[a]	0.58[ab]	0.30[a]	0.17[a]	-0.17[a]	-0.24[a]	-0.51[a]
H60	-1.80[a]	-0.25[b]	0.76[a]	0.71[a]	0.23[a]	-0.06[a]	-0.15[a]	-0.21[a]	-0.57[a]
H120	-1.86[a]	-0.99[c]	-0.41[b]	0.12[b]	0.43[a]	0.00[a]	-0.22[a]	-0.45[a]	-0.75[a]
Thirstiness (mm)									
H30	65.4[a]	9.7[a]	17.3[a]	22.5[a]	23.5[a]	27.5[a]	38.3[a]	46.3[a]	51.5[a]
H60	62.1[a]	37.1[ab]	23.7[a]	25.9[a]	28.0[a]	30.6[a]	23.3[a]	26.6[a]	24.6[a]
H120	67.6[a]	50.7[b]	43.1[a]	39.2[a]	31.8[a]	37.6[a]	42.7[a]	46.4[a]	51.3[a]
Bloating (mm)									
H30	20.0[a]	76.3[a]	58.2[a]	47.8[a]	41.1[a]	33.7[a]	21.6[a]	14.6[a]	6.6[a]
H60	11.3[a]	53.0[ab]	64.7[a]	53.3[a]	43.5[a]	29.9[a]	18.4[a]	11.8[a]	6.8[a]
H120	29.1[a]	31.3[b]	37.8[a]	39.6[a]	45.1[a]	36.0[a]	27.7[a]	17.1[a]	8.1[a]
Different lowercase letters denotes significant differences (p<0.05) between rehydration rates at the same minute									

1420 Board #228 May 31 8:00 AM - 9:30 AM

Error Analysis of a Commercial Water Planning Tool for Road Race Event Organizers

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Reported Relationships: K.J. Sollanek: *Intellectual Property; Dr. Cheuvront is owner of the intellectual property and copyright related to the Road Race Water Planner app.. Ownership Interest (Stocks, Bonds); Dr. Cheuvront is owner of Sports Science Synergy, LLC and has commercial interests related to sale of RRWP on the AppStore.*

Water planning is an important logistical and risk management concern for event organizers of road races. Until now event organizers have relied upon experience to estimate water needs on race day.
PURPOSE: To compare estimated water needs using a commercial water planning tool against both 1) empirical group water losses of runners and 2) documented event water usage.
METHODS: Group sweating rates (L/h) from 14 published studies were compared to a weighted composite average using the Road Race Water Planner© app (RRWP). Estimated water (gallons) and cup (#) needs were compared to documented usage at a large marathon event. RRWP inputs were air temperature (ºC), race distance (km), numbers of runners and numbers of water stations; outputs were gallons of water, numbers of cups, and both gallons and cups per fluid station. An *a priori* constant error (y-intercept) of less than ± 0.250 L/h per runner was used as an acceptance threshold and evaluated using Deming Regression.
RESULTS: Published studies provided 14 group mean sweating rates from 321 runners for comparison to composite RRWP estimates. Air temperatures ranged from 13.4 to 28.5ºC and running distance from 11.7 to 42.2 km. Constant error was 0.203 L/h with one outlier and 0.053 L/h with outlier removed. The 2017 Boston marathon hosted 27,222 runners on a day averaging 21.5ºC. Water and cup usage was 31,740 gallons and 1,036,003 cups (51.8 cases), respectively. RRWP estimates were 33,505 gallons and 1,072,160 cups (53.6 cases), respectively. The difference in gallons expressed as liters was 0.246 L per person. For a ~4 h marathon, the difference as a rate was 0.062 L/h. The difference in cups was 1.8 cases (3.5% error).
CONCLUSIONS: The results of the RRWP analysis indicate acceptably small error, thus RRWP provides event organizers with a quantitative way to narrow the uncertainties of water planning related to changes in weather, participant numbers, and race distance.
Travel support for Dr. Sollanek provided by Sports Science Synergy, LLC.

1421   Board #229   May 31 8:00 AM - 9:30 AM

A Comparison of Environmental Heat Stress Response in Professional and Amateur Sports Car Racing Drivers

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(No relevant relationships reported)

It is hypothesized that heat stress in a race car can impair driving performance. Yet there is little published research on the physiological demands of driving a racing car. **PURPOSE**: The purpose of this investigation was to compare the physiological responses to racing in veteran professional drivers and amateur drivers. **METHODS**: Four male sports car drivers, two professionals (PRO) and two amateurs (AM) participated in seven nationally sanctioned sports car races in the IMSA series. Rate of perceived exertion (RPE) was collected on the Borg scale (scale of 6-20) after their driving stint. Blood lactate was measured both before and after their driving stint. Pre and post nude body weights were collected as a measure of flood loss. **RESULTS**: Over the course of the seven races, there was no significant difference in RPE between the professionals and amateurs. However, there was a significant difference in blood lactate following a driving stint (PRO 4.82mmol/dl ±0.95; AM 5.2 ±0.98 mmol·dl-1 ; P<0.05). There was also significant difference (P=0.03) in fluid loss with the PRO losing 3.05 ±.78 lbs of sweat while the AM lost 4.09 ±0.78 lbs. **CONCLUSIONS**:These findings suggest that the level of racing experience plays a critical role for a driver in the amount of work done in a race car and the associated fluid loss. These factors indicate that AM could become fatigued faster and result in a decrease in driving performance.

1422   Board #230   May 31 8:00 AM - 9:30 AM

Effect of Fatigue and Active Hyperthermia on Proprioception

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(No relevant relationships reported)

PURPOSE: Proprioception is of paramount importance for motor control, with any alterations likely to alter sport performance and injury risk. Passive hyperthermia impairs proprioceptive acuity, but the effect of exercise-induced fatigue and active hyperthermia remain unclear. This study sought to determine the effect of a 30-min running time-trial in temperate and hot environments on proprioception. **METHODS:** Post familiarization, 11 trained runners (maximal aerobic velocity range 18 - 21.3 km.h⁻¹) completed two 30-min running time-trials (TT) in temperate (CON, 22ºC) and hot (HOT, 39ºC) conditions on separate days in a counterbalanced manner. Proprioception was evaluated immediately pre- and post-TT by Active Movement Extent Discrimination Apparatus (AMEDA). Thermoregulatory [rectal (Tr) and skin temperature (Tsk)], physiological [heart rate (HR)] and perceptual [thermal comfort (TC)] responses were recorded. Data were compared via a two-way ANOVA for repeated measures. **RESULTS:** Tr, Tsk, HR and TC increased with exercise but reached higher values in HOT compared to CON (see Table 1, p<0.05). The average error for active movement discrimination displayed an interaction effect (p=0.029) with post-hoc analyses revealing that proprioception was impaired by running in HOT (p=0.028) but not in CON (p=0.547). **CONCLUSION:** Exercise-induced fatigue in HOT (but not CON) impaired proprioception and thus active hyperthermia may influence performance and injury risk during dynamic tasks requiring proprioceptive acuity.

Table 1. Thermoregulatory, physiological and perceptual responses				
	COOL	HOT		
	Pre	Post	Pre	Post
Rectal temperature (°C)	37.3 (±0.4)	39.3*(±0.4)	37.4 (±0.3)	39.9*(±0.3)
Skin temperature (°C)	32.2 (±1.1)	33.1*(±1.1)	34.3 (±0.5)	36.1*(±1.0)
HR (bpm)	62.0 (±9.3)	136.2*(±13.7)	64.2 (±13.1)	150.1*(±17.7)
Thermal comfort (/7)	2.6 (±0.9)	4.0*(±0.9)	3.9 (±1.2)	5.6*(±0.8)
Average error (degrees)	0.63 (±0.2)	0.60 (±0.2)	0.57 (±0.1)	0.64*(±0.2)

1423   Board #231   May 31 8:00 AM - 9:30 AM

Whole-body Sweating Rate And Percentage Of Weight Lost By Dehydration In Two Different Volleyball Trainings

Sergio Alejandro Copado-Aguila, Sayra Nataly Muñoz-Rodriguez, Alejandro Gaytan-Gonzalez, Roberto Gabriel Gonzalez-Mendoza, Ix Chel Andalon-Gonzalez, Cesar Alonso Rodarte-Salinas, Angelica Janette Ramirez-Gonzalez, Juan R. Lopez-Taylor. *Universidad de Guadalajara, Guadalajara, Mexico.*

(No relevant relationships reported)

PURPOSE: To compare the whole-body sweating rate and percentage of weight lost by dehydration in two different types of indoor training in male college volleyball players. **METHODS**: 8 male college volleyball players were evaluated from February to March 2017. We calculated the whole-body sweating rate and the percentage of weight lost by dehydration in two different training session [Volleyball training (VO) and Volleyball training plus resistance training (VR)]. To evaluate the whole-body sweating rate, body and sport bottle were weighted before and after training to calculate changes in body mass and fluid intake (subjects were allowed to drink ad libitum during trainings). Subjects had to wear minimal clothing, to dry their skin with towels and to void their bladders before being weighed. Active time of each training was evaluated employing a stopwatch. Results are shown in median, minimum and maximum. **RESULTS**: The active time for VO were 117 min (72 - 135); on the other hand, for VR were 107 min (97 - 126) (p= 0.96). A higher whole-body sweating rate was found from VO (11.8 ml/min, 5.7 - 13.3) than VR (10.1 ml/min, 7.0 - 12.3) but were not significantly different (p= 0.42). Conversely, a lower percentage of weight lost by dehydration was found from VO (0.7, 0.3 - 1.4 %) than VR (0.8, 0.2 - 1.3 %), but again were not significantly different (p=0.69). **CONCLUSIONS**: In this study we found the sweating rate and body weight loss by dehydration were similar despite the training sessions were different. Maybe this happened because the active time was the same. However, it is known that intensity also plays a role in sweating rate, but it wasn't measured here, and therefore, the differences in training intensity may soft the differences in sweating rate and body weight loss despite there were the same active time.

1424   Board #232   May 31 8:00 AM - 9:30 AM

Effects of Aerobic Cycling Exercise in the Heat on Neuromuscular Activation and Fatigue

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(No relevant relationships reported)

Purpose: To examine the effects of heat on neuromuscular activation and fatigue during aerobic cycling exercise. **Methods:** Five recreationally active men (24.8 ± 2.9 years; 183.1 ± 2.2cm; 80.5 ± 4.4kg; 11.3 ± 2.8%BF; 3.97 ± 0.34 L·min⁻¹) visited the laboratory on three separate occasions. Participants completed a VO₂max test on a Velotron cycle ergometer and underwent skinfold assessment. The remaining two visits consisted of cycling for 60 min at 60% of their previously determined VO₂max in either a high-temperature (35°C / 45%RH) (HT), or a moderate-temperature (22°C / 45%) (MT) in a counterbalanced fashion. Electromyography (EMG) of the vastus lateralis of the right leg was recorded during the 60-min exercise protocol during the first two min, and during the last two min of every 10-min period (0-2 min, 8-10 min, 18-20 min, 28-30 min, 38-40 min, 48-50 min, 58-60 min). Raw EMG recordings were normalized to maximal voluntary isometric contractions (MVICs), and analyzed for root mean square (RMS), mean power frequency (MPF) and median power frequency (MEDPF). Data were analyzed using a within-subjects repeated measures ANOVA. **Results:** No significant interaction (F = 0.519; $p = 0.788$) or main effects (Time: F = 2.069; $p = 0.095$; Condition: F = 2.742; $p = 0.173$) were observed for RMS. Additionally, no interaction was observed for MPF (F = 1.310; $p = 0.291$), however, a significant main effect of condition was observed for MPF (F = 15.325; p = 0.017), with a significantly higher MPF in HT (91.27 ± 3.03%) compared to MT ($p = 0.017$; 85.00 ± 3.07%). A significant main effect of time was also observed for MPF (F = 3.282; $p = 0.017$), with a significantly higher MPF at 58-60 min (89.30 ± 2.86%) compared to 8-10 min ($p = 0.039$; 86.34 ± 2.34%). No significant interaction was observed for MEDPF (F = 1.214; $p = 0.333$), though a significant main effect of time was observed (F = 2.841; $p = 0.031$). Pairwise comparisons indicate this difference occurred between 0-2min (82.469 ± 3.098%) and 28-30min ($p = 0.023$; 85.834 ± 2.638%). **Conclusion:** Exercise in the heat resulted in a significantly higher MPF, with an increased MPF towards the end of exercise. These data suggest that heat exposure, as well as continuous aerobic exercise, may elicit an increase in action potential conduction velocity over the vastus lateralis. <!--EndFragment-->

1425   Board #233   May 31 8:00 AM - 9:30 AM

Predicting The Onset Of Sweat During Cycling In Simulated Environments

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(No relevant relationships reported)

E-bikes have become a growing alternative to traditional bikes. E-bikes are often used for transportation to and from the workplace, thus, in the initiative to promote adoption, advanced features such as appropriate assistance to eliminate the onset of sweat would be appealing to most users. **PURPOSE:** To provide a starting point for the development of a regression equation that can predict sweat onset. **METHODS:** Ten participants volunteered for this study. Participants committed to 5 experimental cycling sessions that varied by workload and climate. Participants cycled on an indoor bike trainer at 2 power outputs (25W and 75W) and 2 climatic conditions (25ºC @ 60% RH and 30ºC @ 60% RH) until sweating commenced. Physiological measures included: electromyography, heart rate, skin temperature, core temperature, galvanic skin response, and VO_2. **RESULTS:** The average subjective sweat onset time for the 75W condition was less effected by the climatic condition than the 25W condition. The subjective sweat onset times for the 75W condition was 8.53 ± 2.19 minutes and 5.83 ± 1.44 minutes for the low and high temperatures, respectively. The subjective sweat onset times for the 25W condition was 23.52 ± 7.40 minutes and 12.49 ± 7.08 minutes for the low and high temperatures, respectively. A regression equation was developed and is able to predict subjective sweat onset with 61.5% of the variance explained with two measured variables. Workload alone explained 41.5% of the variance for sweat onset determination. When the regression was designed with workload as the outcome instead of sweat onset time, subjective sweat onset time was able to predict wattage with 40.1% of the variance explained. **CONCLUSION:** For the conditions simulated in this study, external temperature had less of an influence on sweat onset times than cycling workload. Sweat onset can be predicted with 61.5% of the variance explained using only two input variables. Heart rate was a poor indicator of sweat onset and simply using power output would be a better starting point. Overall, workload proved to be the most influential variable for predicting sweat onset.

1426   Board #234   May 31 8:00 AM - 9:30 AM

Folic Acid Improves Vascular Function, But Not Skin Blood Flow, In Heart Failure Patients

Bryce N. Balmain[1], Ollie Jay, FACSM[2], Norman R. Morris[1], Amelia J. McFarland[1], Kenji Shiino[1], Glenn M. Stewart[3], Rohan Jayasinghe[4], Jonathan Chan[4], Surendran Sabapathy[1]. [1]*Griffith University, Gold Coast, Australia.* [2]*University of Sydney, Sydney, Australia.* [3]*Mayo Clinic, Rochester, MN.* [4]*Gold Coast University Hospital, Gold Coast, Australia.*

(No relevant relationships reported)

PURPOSE: Heart failure (HF) patients' are limited in their ability to manage a thermal load during exercise secondary to impaired skin blood flow (SkBF). Folic acid has been shown to improve vascular function and accompanying changes in SkBF in healthy older individuals and in those with metabolic and cardiovascular disease. Therefore, we examined the effect of folic acid on vascular function, and SkBF responses during exercise in 10 HF patients and 10 age-matched healthy controls (CON) similar in body size during exercise at a fixed rate of metabolic heat production (Hprod) in a 30°C environment. **METHODS**: Rectal temperature (T_{rec}) and cutaneous vascular conductance (CVC) were measured during 60min of cycle ergometry before (pre) and after (post) a 6 week intervention period where participants ingested 5mg of folic acid, once daily. At these time points (pre- and post-folic acid), vascular function was assessed using flow-mediated dilation (FMD). **RESULTS**: H_{prod} was maintained at the same level for HF (pre: 332 ± 46; post: $337\pm51W$, p=0.84) and CON (pre: 323 ± 31; post: $317\pm40W$, p=0.72), and no differences were observed between groups in both exercise trials (p>0.05). T_{rec} increased to a similar extent for HF (pre: $0.76\pm0.22°C$; post: $0.70\pm0.11°C$, p=0.63) and CON (pre: 0.55 ± 0.27; post: $0.45\pm0.25°C$, p=0.84); however, the rise in T_{rec} was consistently higher in HF during both exercise trials (p<0.05). Similarly, CVC increased to a similar extent for HF (pre: 0.89 ± 0.43; post: $0.83\pm0.45au/mmHg$, p=0.80) and CON (pre: 2.01 ± 0.79; post: $2.03\pm0.72au/mmHg$, p=0.73), but the rise in CVC was consistently lower in HF during both exercise trials (p<0.05). Furthermore, folic acid improved FMD in HF (pre: 3.72 ± 1.16; post: 5.88 ± 1.29, p<0.01); however, no difference was observed in CON (pre-: 5.47 ± 1.98; post: $6.50\pm2.49\%$, p=0.20). **CONCLUSIONS**: Collectively, these findings demonstrate that folic acid supplementation does not serve to enhance SkBF responses and attenuate the rise in core temperature during exercise at a fixed H_{prod} in HF patients. However, folic acid improved vascular function to a greater extent in HF than CON.

1427   Board #235   May 31 8:00 AM - 9:30 AM

Combined Heat Treatment and Exercise Prevents Skeletal Muscle Insulin Resistance in Wistar Rats Fed a High-Fat Diet

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(No relevant relationships reported)

PURPOSE: Insulin resistance (IR) is associated with many related health complications. Previous studies demonstrate that heat and exercise independently reduce IR. The purpose of this study was to test the hypothesis that combined exercise and heating is even more favorable in reducing IR.
METHODS: Male Wistar rats were randomly divided into five groups: exercise (NE; n=10), heated (HC; n=10), exercise and heated (HE; n=10), sedentary (NC; n=10), and normal diet plus sedentary (CC; n=10). All but the latter group was fed a high-fat diet (60% calories from fat) for 10 weeks while receiving heat and/or exercise exposure for latter 8 weeks. Following this regimen, protein expression from the soleus and extensor digitorum longus muscles, serum, and brown fat were analyzed using Western blotting.
RESULTS: Exercise combined with heating shifted the metabolic characteristics of rats on a high-fat diet toward that observed in the rats on a standard diet. Specifically, eight weeks of combined heat and endurance exercise increased PGC-1α, CnA, CaMKIV and p38 MAPK protein expression in the soleus (P < 0.05), insulin protein expression in the serum (P < 0.05), and UCP1 protein expression in the brown fat (P < 0.05), when compared to the high fat fed sedentary group. There were some significant differences in responses (i.e., body weight and Leptin & Adiponectin concentrations) between the combined exercise and heat group relative to the exercise alone group.
CONCLUSIONS: Exercise combined with heat exposure mitigates the development of IR, presumably from the Irisin pathway. The study provides potential non-pharmaceutical methods for therapeutic treatment of IR.
KEY WORDS: Insulin resistance (IR); Exercise; Heat; Irisin

1428   Board #236   May 31 8:00 AM - 9:30 AM

The Effect of Mild Hypohydration on Performance and Thermoregulation in Male Cyclists: A Blinded Study

J.D. Adams[1], Dylan Scott[2], Natasha Brand[2], Hyun-Gyu Suh[2], Adam D. Seal[2], Brendon P. McDermott, FACSM[2], Matthew S. Ganio, FACSM[2], Stavros A. Kavouras, FACSM[2]. [1]*Mayo Clinic, Rochester, MN.* [2]*University of Arkansas, Fayetteville, AR.* (Sponsor: Stavros A. Kavouras, FACSM)

(No relevant relationships reported)

PURPOSE: The aim of the present study was to examine the effect of mild dehydration on thermoregulation and exercise performance with subjects blinded to their hydration status via intravenous infusion (I.V.).
METHODS: Eleven male cyclists (weight 75.8 ± 6.4 kg, VO_{2peak}: 64.9 ± 5.6 mL·kg·min⁻¹, body fat: $12.0\pm5.8\%$, $Power_{max}$: 409 ± 40 W) performed three sets of criterium-like cycling, consisting of 20 min of steady state cycling at 50% peak power output, each followed by a 5-km time-trial at 3% grade. Subjects completed the protocol, in counter-balanced fashion, on two separate occasions in dry heat (30 °C, 30% rh) either hypohydrated (HYP) or euhydrated (EUH). In both trials, subjects ingested 25 mL every 5 min during the steady-state and 25 mL every 1-km during the 5-km time-trials. In the EUH trial, sweat losses were fully replaced via intravenous infusion of isotonic saline, while in the HYP trial, a sham I.V. was instrumented.
RESULTS: Following the exercise protocol, the subjects dehydrated by $-0.1\pm0.1\%$ and $-1.8\pm0.2\%$ of their body weight for the EUH and HYP trial, respectively. During the second and third time-trials, subjects displayed faster cycling speed in the EUH trial (27.5 ± 3.0 and 27.2 ± 3.1 km·h⁻¹) compared to the HYP trial (26.2 ± 2.9 and 25.5 ± 3.3 km·h⁻¹; both $P<0.05$). Core temperature (T_{re}) was higher in the HYP trial throughout the third steady-state ($P<0.05$) and continued to be higher throughout the third 5-km time-trial ($P<0.05$). Final T_{re} of the third time-trial for HYP and EUH was 39.1 ± 0.3 vs. 38.6 ± 0.6 °C ($P<0.05$).
CONCLUSIONS: These data suggest that full fluid replacement, even in a blinded manner, provided a performance advantage of faster cycling speeds. This benefit seems to be associated with concomitant decreased thermoregulatory strain.

1429   Board #237   May 31 8:00 AM - 9:30 AM
Thermal Behavior During Recovery From Exercise

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(No relevant relationships reported)

During exercise recovery, autonomic thermoeffectors return to pre-exercise levels despite elevations in core temperature. It is unknown if thermal behavior follows a similar trajectory or compensates for elevated core temperature in lieu of autonomic thermoeffector withdrawal. **PURPOSE**: To test the hypothesis that thermal behavior during recovery remains engaged despite autonomic thermoeffector withdrawal. **METHODS**: In a $24 \pm 1°C$, $45 \pm 10\%$ RH environment, 10 subjects (6 females, 22 ± 1 y) cycled for 60 min (225 ± 46 W metabolic heat production), followed by 60 min passive recovery. Weighted mean skin (10 site) and intestinal temperatures, skin blood flow (forearm; laser Doppler), average local sweat rate (upper arm, trunk; ventilated capsule), and weighted mean skin wetness (4 site) were measured continually. Subjects controlled the temperature of their dorsal neck to their perceived thermal comfort using a custom-made fluid filled tubing device. Device temperature provided an index of thermal behavior. Mean body temperature, calculated as the unweighted average of mean skin and intestinal temperatures, provided an index of the stimulus for thermal behavior. To directly determine the effect of prior exercise, post-exercise data were analyzed the minute mean body temperature recovered to pre-exercise levels within a subject. **RESULTS**: Mean body temperature returned to pre-exercise levels 28 ± 20 min into recovery (Pre: 33.5 ± 0.2, Post: $33.5 \pm 0.2°C$, P=0.20). At this point, mean skin temperature had recovered (Pre: 29.6 ± 0.4, Post: $29.5 \pm 0.5°C$, P=0.20), yet intestinal temperature (Pre: 37.3 ± 0.2, Post: $37.5 \pm 0.3°C$, P=0.01) and skin wetness (Pre: 0.2 ± 0.1, Post: 0.3 ± 0.0 a.u., P=0.02) were elevated. Post-exercise, skin blood flow (Pre: 59 ± 78, Post: 26 ± 25 PU, P=0.10) and local sweat rate (Pre: 0.05 ± 0.25, Post: 0.13 ± 0.14 mg/cm^2·min^{-1}, P=0.09) returned to pre-exercise levels, while neck device temperature was depressed (Pre: 27.4 ± 1.1, Post: $21.6 \pm 7.4°C$, P=0.03). **CONCLUSIONS**: Mean body temperature and autonomic thermoeffectors returned to pre-exercise levels, yet thermal behavior was active during recovery. Thermal behavior may compensate for autonomic thermoeffector withdrawal in the presence of elevated intestinal temperature and mean skin wetness post-exercise.
Supported by lululemon athletica inc.

C-46   Free Communication/Poster - **Exercise Immunology**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1430   Board #238   May 31 8:00 AM - 9:30 AM
Erk1/2 And Ccr2 Expression In Fit And Unfit Males

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(No relevant relationships reported)

C-C chemokine receptor 2 (CCR2) is required for monocyte chemotaxis to inflamed areas. Monocytes undergo diapedesis and differentiate into inflammatory M1 or anti-inflammatory M2 macrophages. Skewing of M1/M2 balance toward M1 may lead to sustained inflammation and disease development, including cardiovascular disease (CVD). CCR2 activation increases phosphorylation of extra-cellular regulated kinase 1 and 2 (pERK) which is necessary for M2 polarization but not M1. **PURPOSE:** To evaluate the differences and time course of CCR2 and pERK in fit (FIT) and unfit (UF) males following acute exercise. **METHODS:** 5 FIT (VO2$_{peak}$ $\geq$45ml O$_2$/kg/min) and 5 UF (VO2$_{peak}$ <40ml O$_2$/kg/min) males performed 30 minutes of cycling. Intensity was adjusted to maintain an average blood lactate concentration of 8mM/L. Blood samples were taken pre-exercise, immediately (POST), 1 hour (1H), and 2 hours (2H) post. Cells were fixed and stained using antibodies against CD14, CD16, CCR2, and pERK. Monocytes were defined by CD14 and CD16 using flow cytometry. **RESULTS:** A main effect for pERK (p=0.017) suggested a difference between groups. pERK increased POST in FIT (3113 [PRE] vs. 4116 [POST], p = 0.031). CCR2 was not significantly altered within groups. However, CCR2 was significantly different between groups at POST (12316 [FIT] vs. 3253 [UNFIT], p=0.001) and CCR2 was positively correlated with pERK at POST (R=0.77, p<0.02) and at 1H (R=0.94, p<0.001) with all subjects. **CONCLUSION:** Higher pERK in FIT males may increase monocyte recruitment and differentiation to the M2 macrophage phenotype. This likely helps maintain M1/M2 macrophage balance which may decrease the incidence of CVD.

1431   Board #239   May 31 8:00 AM - 9:30 AM
Alleles Associated with Voluntary Physical Activity are Predicted to be Older Than Anatomically Modern Humans

Ayland C. Letsinger, Alexandra R. Thompson, J Timothy Lightfoot, FACSM. *Texas A&M University, College Station, TX.* (Sponsor: J Timothy Lightfoot, FACSM)
(No relevant relationships reported)

Voluntary physical activity (VPA) has repeatedly been shown to be partially driven by genetics. Understanding the genetic age of the specific genetic mutations associated with VPA control can help facilitate understanding of potential mechanisms underlying genetic control of physical activity level. **PURPOSE:** To determine the estimated allelic age of SNPs associated with VPA in humans. **METHODS:** All human registered SNPs (rs#) found to be associated with VPA to date were cross-referenced with the NHLBI GO ESP's Exome Variant Server to find estimated African-American (AA) and European-American (EA) allelic origin. Allelic origin predictions were published by Fu et al. (Nature, 2012) with estimates based on the Out-of-African model that characterized a bottleneck of non-African populations approximately 51 Kyrs ago and a second bottleneck for European populations 23 Kyrs ago, with accelerated population growth 5.1 Kyrs ago. The VPA-associated SNPs were located in the Fu database and the estimated age of allelic variation represented by that SNP was calculated. **RESULTS:** Only 4 of the 64 SNPs associated with various measurements of physical activity were exonnally-located missense variants. The exon-located SNPs were in the IFNAR2, PPARGC1A, PML, and APOE genes. APOE age was not estimated in the initial allelic origin predictions and thus could not be determined. For the remaining SNPs, average AA estimated allelic age was 584.7 ± 355.1 kyrs and average EA estimated allelic age was 607.6 ± 397.2 kyrs. **CONCLUSIONS:** Exon-located VPA candidate SNPs are older than the hypothesized emergence of anatomically modern humans. The predicted allelic age of these particular SNPs suggests the control of VPA in humans has been conserved throughout modern human evolution.

1432   Board #240   May 31 8:00 AM - 9:30 AM
Aerobic Training Status and Fatty Acid-Induced hTERT mRNA Expression Following Maximal Exercise

Tiffany M. Zuniga, Aaron L. Slusher, Edmund O. Acevedo, FACSM. *Virginia Commonwealth University, Richmond, VA.*
(No relevant relationships reported)

PURPOSE: Telomeres protect the ends of cellular chromosomes from degradation. Although telomere length within immune cells shorten naturally with age, increasing risk of disease and all-cause mortality, physical activity preserves telomere length by increasing mRNA expression of the telomerase component, telomerase reverse transcriptase (hTERT). Therefore, this study examined the influence of aerobic training status on the capacity of peripheral blood mononuclear cells (PBMCs) to express hTERT mRNA following palmitate stimulation.
METHODS: PBMCs were isolated from 12 trained (T) and 11 untrained (UT) subjects pre- and post-maximal exercise, and stimulated with or without palmitate (4 hours) to examine changes in hTERT mRNA expression.
RESULTS: hTERT mRNA expression remained unaltered following palmitate stimulation in T subjects at rest and in response to maximal exercise. To the contrary, palmitate-induced hTERT mRNA expression was elevated at rest relative to unstimulated PBMCs in UT subjects and following maximal exercise was suppressed relative to unstimulated PBMCs and pre-exercise expression levels ($F_{[1, 81]} = 7.874$, $p = 0.006$). In addition, cardiorespiratory fitness (VO2$_{max}$) was negatively associated with the percent change in hTERT mRNA expression in unstimulated PBMCs (r = -0.496, $p = 0.022$) and positively associated with the percent change in hTERT mRNA expression following palmitate stimulation (r = 0.468, $p = 0.032$).
CONCLUSION: This data suggests that aerobic training may preserve the capacity of immune cells to protect against inflammatory-induced telomere shortening following acute physiological stress.

THURSDAY, MAY 31, 2018

1433 Board #241 May 31 8:00 AM - 9:30 AM

Association Between Actn3 R577x Polymorphism And Weight-lifting Performance In Japanese And Italian Atheltes.

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(No relevant relationships reported)

α-actinin-3 (ACTN3) R577X polymorphism is associated with various aspects of muscular strength and power. **PURPOSE**: To investigate the association between ACTN3 R577X polymorphisms and athletic performance in Japanese and Italian weight-lifting athletes.
METHODS: 128 weight-lifting atheletes (n=114 Japanese; n=14 Italians) and 1323 controls (n=1227 Japanese; n=96 Italians) were included in the analysis. The data were the best crean & jerk and snatch performances obtained by athletes during official competitions. Genotyping results were analyzed using the TaqMan approach for the *ACTN3* (rs1815739) polymorphism.
RESULTS: The genotype frequencies in Japanese and Italian controls were 21%, 48%, 31% and 30%, 58%, 12% for RR, RX, and XX, respectively. There were no significant differences in the ACTN3 R577X genotype frequency distribution between athletes and controls in either Japanese and Italian cohorts. Athletes with RR genotype showed higher records of snatch and crean & jerk than athletes with XX genotype in both Japanese and Italian groups.
CONCLUSIONS: In conclusion, our data indicates an association between that *ACTN3* R577X polymorphism and weight-lifting performance, with carriers of the RR and RX genotypesthat showed higher records in crean & jerk and snatch performance than athletes with XX genotypes in both Japanese and Italian cohorts. Further studies in large cohort are required to confirm the association between genetics and weight-lifting performance

1434 Board #242 May 31 8:00 AM - 9:30 AM

The Interplay between Genes and Psychosocial Home Environment on Leisure-time Physical Activity: a Twin Study

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(No relevant relationships reported)

PURPOSE Both genetic and environmental factors contribute to individual differences in physical activity. However, it remains uncertain whether the home environment can modify the effects of genetic factors on physical activity. We examined to what extent the psychosocial home environment in childhood and adolescence modifies the genetic influences on leisure-time physical activity in young adulthood by using Finnish twin data. **METHODS** Families with twins born between 1983 and 1987 took part in the population-based FinnTwin12 study. The psychosocial home environment was assessed by twins at ages 12, 14 and 17, as well as by their parents when the twins were age 12 using an 8-item questionnaire. At age 24, twins assessed their leisure-time physical activity based on a series of structured questions, which were used to calculate leisure-time MET hours per day. Data of 3,305 twins were analyzed using a gene-environment interaction model with OpenMx software. **RESULTS** Parental ratings of positive home atmosphere as well as the twins' ratings of both positive home atmosphere at age 14 and lower relational tensions at ages 12 and 14 predicted higher leisure-time physical activity levels in young adulthood (regression coefficients 0.33-0.64). Parental perceptions as well as the twins' perceptions of positive home atmosphere at ages 14 and 17 increased the additive genetic variation (moderation effects 0.60, 95% CI 0.26-1.05; 0.55, 95% CI 0.29-0.80 and 0.52, 95% CI 0.19-0.87, respectively). The twins' ratings of positive home atmosphere at age 12 and lower relational tensions at ages 12 and 14 increased the unique environmental variation of their subsequent physical activity (moderation effects 0.46, 95% CI 0.19-0.60; 0.48, 95% CI 0.29-0.64 and 0.85, 95% CI 0.12-0.95, respectively). **CONCLUSION** A warm and supportive psychosocial home environment in childhood and adolescence not only increases the level of leisure-time physical activity in young adulthood, but also modifies the variation of genetic and environmental influences on leisure-time physical activity. In terms of clinical implications, it would be important to find ways to help parents create a home environment that is both warm and supportive for their children because it can go a long way toward developing their offspring's interest in physical activity.

1435 Board #243 May 31 8:00 AM - 9:30 AM

The Effect Of Exercise Mode On The Hypothalamic Expression Of Kiss-1and Gpr54 Genes Mrna In Dietinduced Obesity Rats

Yi Yan, Chunyu Liang, Rui XU. *Beijing Sport University, Beijing, China.*

(No relevant relationships reported)

Kisspeptin, a hypothalamic peptide coded by the KiSS1 gene, is a neuromodulator that controls GnRH secretion and is now recognized as a crucial regulator of the onset of puberty.**PURPOSE**: To explore the difference roles of moderate-intensity treadmill training (MIT) and high intensity interval treadmill training (HIIT) in modulating the hypothalamic expression of KiSS-1and the G-protein coupled receptor (GPR) 54 mRNA in the diet induced obesity male rats.
METHODS: After 8 weeks high fat feeding, 24 obesity 11-weeks SD rats were randomly assigned to sedentary (FS, n=8), MIT (n=8) , and HIIT (n=8) groups, 8 normal diet 11-weeks SD rats were assigned as sedentary (SS, n=8) groups. During the following 8 weeks, obesity rats were continued expose to high-fat-diet. MITgroup did the 60%-70%V(•)O$_2$max treadmill training (5 days/week, 1 hour/day). HIIT group did the HIIT training (5 days/week, 1 hour/day),which included 7 minutes warmup (70% V(•)O$_2$max), 6groups formal training(90% V(•)O$_2$max*3min+ 50% V(•)O$_2$max*3min) and 7 minutes recobery (70% V(•)O$_2$max) The V(•)O$_2$ max of exercise groups were remeasured every two weeks. The hypothalamic expression of KiSS-1 and GPR54 mRNA were tested in each group. **RESULTS**: After the first 8-weeks high fat feeding, the obesity rats were heavier than normal diet group (491.74±26.19g vs. 410.05±45.77g, p<0.01). After 8-weeks training, FS group was still heavier than SS group (681±52.56g vs. 574.27±52.43g, p<0.01), and had more hypothalamic expression of KiSS-1 mRNA(1.51±0.66 vs 0.75±0.27, p<0.05) and GPR54 mRNA (2.45±0.38 vs 0.61±0.15, p<0.01). Both MIT and HIIT groups weighted less than FS group, HIIT group had the lightest bodyweight (590.23±35.74g, 558.1±29.57g vs 681±52.56g). Compared with FS group, although both MIT and HIIT groups had lower hypothalamic expression of KiSS-1 mRNA and GPR54 mRNA, HIIT group had the lowest hypothalamic expression of KiSS-1 mRNA (0.47±0.13 vs 0.69±0.13, p<0.01) and GPR54 mRNA(0.58±0.10 vs 0.23±0.06, p<0.01).
CONCLUSIONS: Both MIT and HIIT could reduce the stimulating effect of high-fat diet induced obesity on bodywight and hypothalamic expression of KiSS-1and GPR54 mRNA, and HIIT could play a better role.

C-47 Free Communication/Poster - Musculoskeletal

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1436 Board #244 May 31 8:00 AM - 9:30 AM

Retrocalcaneal Approach Of Ultrasound Guided Tibial Nerve Block: A Preliminary Study

Hongjae Lee. *Ilsanpaik Hosp., Inje Univ, Goyang, Korea, Republic of.*

(No relevant relationships reported)

PURPOSE: Ultrasound guided tibial nerve block has emerged as a valuable tool for various situations related to chronic heel pain. With conventional method the needle is advanced oblique angle from antero-medial side to the Achilles tendon into tarsal tunnel. However, the entire shaft of the needle is difficult to visualize. Besides, as the needle is inserted from the proximal side of posterior tibial artery, extraordinary precaution is required to avoid damage to the artery. In order to complement such shortcomings, a new tibial nerve block method was designed. The purpose of this study was to introduce, and assess the effectiveness and safety of this new approach.
METHODS: The study subjects were patients with chronic plantar heel pain. The needle was inserted from the lateral side of retrocalcaneal space, advancing medially toward tarsal tunnel space beneath the Achilles tendon. This method allowed the transducer to be nearly parallel to the needle axis, making the entire needle to be visualized. After the needle tip was positioned in the tarsal tunnel adjacent to the tibial nerve, anesthetic was injected. Revised Foot Function Index (FFI-R) was used to assess the effectiveness of the nerve block. The FFI-R questionnaire was conducted two times; before and 2 weeks after the procedure. Higher score indicated greater impairment. The safety was assessed by the presence or absence of bleeding, swelling, and inflammation after the procedure. **RESULTS**: Two patients suffering from prolonged plantar fasciitis underwent the retrocalcaneal posterior tibial nerve block. The first patient who had plantar fasciitis showed some improvement after the nerve block; FFI-R score changed from 36 to 27. The second patient who had excessively severe foot pain and activity limitation initially with FFI-R score of 55 showed dramatic improvement after the nerve block; the FFI-R score declined to 36. There were no complications such as bleeding, swelling, or inflammation in both subjects.

CONCLUSIONS: This study has introduced retrocalcaneal approach of ultrasound guided posterior tibial nerve block. It can be as effective as, and even safer than the conventional method because visualization of the entire needle is possible and the needle is advanced from the opposite direction to the posterior tibial artery.

1437   Board #245   May 31 8:00 AM - 9:30 AM

Dynamic Quadriceps Strength are Associated with Self-Reported Disability Following ACL Reconstruction

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(No relevant relationships reported)

PURPOSE: Quadriceps dysfunction following ACL reconstruction contributes to the development of knee osteoarthritis. Individuals with ACLR express long-term disability that is attributed to quadriceps weakness. The purpose of this study was to (1) compare quadriceps function between individuals with and without ACLR, and (2) determine the relationship between indices of quadriceps function and self-reported disability. **METHODS**: Isometric peak torque (PT; Nm/kg) and rate of torque development (RTD; Nm/kg/s) and isokinetic (180°/sec) quadriceps PT (Nm/kg) were assessed in 46 individuals with ACLR (74% female; age=22.1±2.8 years; height=1.70±0.09m; mass=71.6±15.7kg) and 38 control participants (74% female; age=21.9±1.2 years; height=1.69±0.09m; mass=66.2±11.7kg). Self-reported disability was assessed using the International Knee Documentation Committee (IKDC) instrument. Dependent variables were compared between the involved and uninvolved limbs using paired t-tests, and involved and uninvolved limbs were compared to control limbs using independent t-tests (adjusted α=0.017). Pearson correlation was used to determine the relationship between indices of quadriceps function and IKDC (*a priori* α =0.05). **RESULTS**: Involved limbs had lower isometric PT (2.27±0.55 vs. 2.57±0.73 Nm/kg, p=0.016), RTD (11.7±5.9 vs. 15.3±6.9 Nm/kg/sec, p<0.01) and PT at 180°/s (1.72±0.48 vs. 1.91±0.47 Nm/kg, p<0.01) compared to control limbs. Uninvolved limbs had lower PT (2.29±0.53 vs. 2.57±0.73 Nm/kg, p=0.02), RTD (10.7±5.1 vs. 15.3±6.9 Nm/kg/sec, p<0.001) and PT at 180°/s (1.66±0.41 vs. 1.91±0.47 Nm/kg, p<0.01) compared to control limbs. No differences were found between involved and uninvolved limbs in PT (p=0.43), RTD (p=0.07), or PT at 180°/sec (p=0.16). Greater PT at 180°/sec (r=0.33, p=0.02), and greater RTD100 (r=0.28, p=0.03) were associated with higher IKDC score. Isometric PT was not associated with IKDC (r=0.15, p=0.31). **CONCLUSION**: Bilateral quadriceps weakness was found compared to control participants. Greater isokinetic PT and RTD were associated with higher levels of self-perceived knee joint function while maximal isometric strength was not. Assessment of maximal isometric strength following ACLR may not comprehensively evaluate quadriceps impairment after ACLR.

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Response Of Muscle Damage Markers After Acute Heavy Exercise In Different Ovarian Hormone Secretion

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(No relevant relationships reported)

PURPOSE To evaluate the response of muscle damage markers to acute heavy resistance exercise in female athletes with different ovarian hormone levels.
METHODS Eleven female college athletes were enrolled. They were divided into 2 groups according to the variations in their ovarian hormone levels: the ovarian-suppression group (OVS) and the cyclic menstruation group (CYC). Measurements were taken under 2 conditions (rest and exercise) over a 3-week period. Measurements in CYC were started after the start of menstruation (week 1). The exercise involved 6 sets of 5 squats at 90% 1-RM with a 3-min rest between each set. During rest, the athletes remained quiet and sat for 30 min. Blood chemicals including serum creatine kinase (CK) and lactate dehydrogenase (LD), Profile of Mood State 2 (POMS2) TMD scores, and muscle soreness evaluated using the 100-mm Visual Analog Scale were measured before, immediately after, 30 min after, 60 min after, and 24 h after each condition.
RESULTS In CYC, week-2 estradiol (E2) levels during exercise were significantly higher than those of weeks 1 and 3 (336.7±104.6 vs 69.5±44.2 and 109.8±28.7 pg/mL). During rest, week-1 E2 levels were significantly lower than those of weeks 2 and 3 (63.2±36.9 vs 116.2±18.1 and 198.8±19.7 pg/mL). In OVS, E2 levels did not differ significantly at any point in the study (weeks 1, 2, and 3: 45±12.1, 66.2±8.8, 59.8±14.2 pg/mL during exercise and 52.2±23.2, 52.0±18.1, 43.0±20.1 pg/mL during rest). CK was significantly higher in week 2 in OVS than in CYC before both conditions (163±12.1 vs 196.1±11.0, 158.4±10.4 vs 201.3±11.4 U/L). LD and TMD scores were significantly higher in OVS than in CYC during rest and before exercise. CK in CYC increased significantly immediately after exercise when compared with its level before

exercise in week 1 (178.3±12.8 vs 218.2±39.7 U/L) and 3 (189.7±8.1 vs 207.0±7.6 U/L). CK in OVS significantly increased immediately and 30 min after exercise when compared with its level before exercise in every week (week 1: before exercise 191.1±114.0 vs immediately after 256.4±11.2 vs 30 min after 239.4±11.5; week 2: 196.3±11.0 vs 244.0±8.1 vs 239.4±13.1; week 3: 199.9±8.8 vs 240.6±5.4 vs 234.0±4.9 U/L).
CONCLUSION Ovarian suppression in athletes may lead to severer muscle damage because of lack of muscle protection by estradiol.

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Within-Day Intra- And Interrater Reliability Of Ultrasonographic Measurements Of Acromion-Greater Tuberosity Distance Performed By Novice Testers

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(No relevant relationships reported)

Introduction: The use of musculoskeletal ultrasonographic (US) measurements in Physical Therapy (PT) has recently increased and been reported to assist in the diagnosis of supraspinatus impingement syndrome (SIS). It has been proposed that the acromion-greater tuberosity distance (AGT) measurements with US may be used to determine the efficacy of PT interventions aimed at increasing AGT in patients with SIS. Limited data has been reported on the intrarater and interrater reliability of AGT measurements when performed by novice (limited US training) individuals. **Purpose:** The purpose of this study is to establish the intrarater and interrater reliability of ultrasonographic measurements of the AGT in healthy individuals when performed by novice testers. **Methods:** Participants were 7 males and 13 females (26 years; 21-38 years) with an average BMI of 24.4 (18.9-32). Two PT students took measurements with a portable ultrasound device in brightness mode (B-mode) with an 8-13 MHz linear transducer. Ultrasound images (3) were taken with participants placed in standardized position with transducer placed on lateral surface of the right shoulder aligned with long axis of humerus. AGT was measured using on-screen calipers from the inferolateral edge of the acromion to the nearest margin of the superior aspect of the greater tuberosity. Each participant was then instructed to move out of the standardized position and 3 more images were taken. A second rater repeated the process. The average of the 3 measurements were used for data analysis. Intra- and interrater reliability of measuring AGT was determined by calculating intraclass correlation coefficients (ICC$_{2,3}$) with 95% confidence intervals. **Results:** Intrarater reliability for Rater A: .872 (CI: .683-.949) with AGT distance of 2.17 cm (1.68-2.59 cm). Intrarater reliability for Rater B: .804 (CI: .503-.923) with AGT distance of 2.27 cm (1.94-2.91 cm). Interrater reliability for both raters was .741 (CI: .349-.897). **Conclusions:** This study demonstrates that intrarater and interrater measurements of AGT are very reliable in healthy individuals when performed by novice testers.

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Effect Of Cryotherapy To A Muscle Versus A Joint On Functional Performance

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(No relevant relationships reported)

Cryotherapy is a common intervention used to treat acute and chronic injuries, and it can be used to facilitate rehabilitation exercises. A common practice in athletic training is allowing a patient to return to activity after the application of some type of cryotherapy. However, the effect of applying cryotherapy to a muscle or a joint on functional performance is unclear. **PURPOSE:** To investigate if cooling a muscle compared to cooling a joint affects functional performance in healthy, active individuals. **Methods:** Forty-five healthy, college student volunteers (21 males; 24 females) with ages ranging from 18 to 23 years ($M = 20.67$; $SD = 1.09$) were randomly assigned to muscle (low leg) cryotherapy, joint (ankle) cryotherapy, or control (no cryotherapy) intervention for 20 minutes. After a 10 minute warm-up, subjects performed practice trials of a shuttle run and single leg vertical jump (SLVJ). Subjects performed three trials of a shuttle run (4 – 6.1 m sprints) for time, and performed three trials of a SLVJ for height measured prior to and immediately following the intervention. A mixed model ANOVA with a Bonferroni Correction was used to determine significant interactions between intervention groups and times with an alpha level of .05 for statistical significance. **RESULTS:** For the SLVJ, there was a significant interaction between the intervention groups and time; $F(2,42)=3.349$, p=0.045; however, group differences were unable to be determined. The muscle intervention group had a significant decrease in jump height between pre- (M=12.24, SD=3.61) and post-test (M=10.89, SD=3.21); p=0.01. For the shuttle run test, there were no significant interactions between group and time; $F(2,42)=0.747$, p=0.480. The joint (pre-M=7.43, SD=0.77; post-M=7.56, SD=0.70); p=0.036, and muscle (pre-M=7.63, SD=0.71; post-M=7.79, SD=0.78); p=0.013 intervention groups had a significant increase in run times between pre- and post-test. **CONCLUSIONS:** Cryotherapy application for 20 minutes to a muscle significantly decreased SLVJ

height and increased shuttle run time, while, cryotherapy application for 20 minutes to a joint significantly increased shuttle run time pre-to post-test. If cryotherapy application is utilized prior to performance, a warm-up should be initiated to prevent a decrease in functional performance.

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VO$_2$max Differs Between Those with Chronic Ankle Instability and Healthy Matched Controls

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(No relevant relationships reported)

Previous research has reported decreased physical activity levels in those with Chronic Ankle Instability (CAI). The impact of this decrease in physical activity is known in CAI subjects. **PURPOSE**: To measure VO$_2$max in those with CAI compared to healthy matched controls. **METHODS**: Sixteen subjects participated in the study. Eight subjects with CAI were matched by age (22.4±2.8 yr and 22.3±3.0 yr, respectively), height (165.3±8.5 cm and 167.8±8.2 cm), weight (68.5±8.2 kg and 65.5±8.2 cm) and gender (five females and 3 males / group), to subjects with no history of ankle injury. All subjects reported to the Health Risk Assessment lab for one session. Subjects completed the foot and ankle disability measure (FAAM and FAAM sport) and the NASA physical activity questionnaire. After the preliminary measurements, the subjects performed a treadmill maximal exercise test. Heart rate was monitored by ECG, while oxygen consumption and carbon dioxide production were monitored using standard techniques. Every minute of the test the subjects rated their effort of exertion using the Borg RPE scale (a 6 to 20 scale). For the treadmill test we used a two-minute progressive test until volitional exertion was attained. **RESULTS**: No differences were observed between groups for age (p=0.93), height (p=0.56), and weight (p=0.48). VO$_2$max (ml/kg.min) was significantly different between Injured and Control groups (p=0.0005; 32.5±5.1 and 50.5±10.0, respectively). Time to maximal exercise test completion (p=0.26), maximal RER (p=0.57), and VEmax (p=0.44) were not different between groups. Although maximal HR (p=0.30) and peak RPE (p=0.13) were not different between groups, resting HR was observed to be different between the Injured and Control groups (p=0.0078; 75.2±11.7bpm and 58.9±7.5bpm, respectively). FAAM (p<0.0001), FAAM Sport (p<0.0001) and NASA (p<0.0001) were all observed to indicate differing activity levels between the groups. **CONCLUSIONS**: These findings suggest one's physical fitness level, as assessed by VO$_2$max, and resting HR differs in college-aged subjects with CAI, suggesting the reoccurrence of this musculoskeletal injury at a young age is serious enough to reduce physical activity levels and result in decreased fitness levels.

1442   Board #250   May 31 8:00 AM - 9:30 AM

Reliability of a Smartphone Compass App and Goniometer for Assessing Tibial Rotation Range of Motion

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(No relevant relationships reported)

Rotational motion at the tibia is important for both knee and ankle function. Normative values for tibial rotation vary greatly and the ability to accurately assess this motion lacks reliability and clinical applicability. Increasingly, clinicians are using smartphone apps for assessing ROM. **PURPOSE**: To assess the reliability of a smartphone compass app and goniometer for measuring tibial rotation ROM. Secondarily, to compare average values for the two devices. **METHODS**: Two evaluators used a test-retest study design. Seventeen (11 male, 6 female), healthy subjects (21.0±1.3yrs, 177.2±10.8cm, 82.0±23.3kg) volunteered with a total sample of 31 qualifying limbs. Maximum internal (IR) and external rotation (ER) ROM was assessed in a seated position simultaneously using a smartphone compass app secured to the shank using an armband and with a goniometer secured to the floor. Participants sat on an adjustable stool with the limb in neutral and knee flexed to 90°. Evaluators separately recorded 3 trials of IR and ER from the goniometer and compass app. The average of 3 trials was used for analysis. Interclass correlation coefficients (ICC) were used to assess reliability. Two MANOVAs (2 devices x 2 raters x 2 times) were used to compare IR and ER ROM. **RESULTS**: ICC values from the app ranged from 0.78-0.84 and 0.78-0.88 for the goniometer. No significant differences for rater or time were found for either IR or ER. Significant differences in both IR (p=0.001) and ER (p=0.001) ROM were found between devices. Tibial IR and ER were significantly lower for the smartphone (IR=12.7±5.4°, ER=25.1±8.2°) than the goniometer (IR=39.7±8.4°, ER=43.6±7.7°). **CONCLUSIONS**: While both devices demonstrated excellent reliability, some of the differences in normative values may be attributed to the device used and/or measurement techniques. Reliability values for the smartphone app compared similarly to a previously published study using the Myrin Goniometer®, an expensive, needle-based goniometer that is no longer manufactured or sold. Assessing tibial motion using a compass app is a reliable and efficient way to assess a patient's tibial rotation,

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although values will vary compared to traditional goniometers. Clinicians must ensure they utilize the same measurement technique and device to accurately track this motion.

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Breast Injuries In Female Collegiate Athletes: Prevalence, Type, And Impact On Sport Participation

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(No relevant relationships reported)

In 2015-2016, over 214,000 female athletes competed at the collegiate level in the U.S. The NCAA collects injury data; however, breast related injuries do not have a specific reporting category. The exact sequelae of breast injury is unknown; however, a relationship between breast injury and fat necrosis, which mimics breast carcinoma, is documented outside of sport participation. Breast injuries related to motor vehicle collisions, seatbelt trauma, and blunt trauma have been reported. For these reasons, it is important to investigate female breast injuries in collegiate sports. **PURPOSE:** The objectives of this study are to report the prevalence of self-reported breast injuries in female collegiate athletes, explore injury type and treatment, and investigate breast injury reporting and impact on sports participation. **METHODS:** A cross-sectional study of female collegiate athletes at four U.S. Universities participating in basketball, soccer, softball, or volleyball. The main outcome measure was a questionnaire regarding breast injuries during sport participation. **RESULTS:** Almost half of the 194 participants (47.9%) reported a breast injury during their collegiate career, less than 10% reported their injury to health personnel with 2.1% receiving treatment. Breast injuries reported by sport include softball (59.5%), basketball (48.8%), soccer (46.7%), and volleyball (34.6%). **CONCLUSION:** The long-term effects and sequelae of breast injuries reported by female collegiate athletes during sport play is unknown. Nearly 50% of participants had a breast injury during sport. Although 18.2% indicated that breast injury affected sport participation, only 9.6% of the injuries were reported to medical personnel with 2.1% receiving treatment. From a clinical perspective, this information can be used to heighten the awareness related to female breast injuries and encourage health professionals to create an environment that encourages disclosure of injures that may be perceived as personal or embarrassing to discuss.

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Medical Utilisationat a Major Sporting Event- A Descriptive and Epidemiological Analysis.

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(No relevant relationships reported)

Objectives
We aimed to measure resource utilisation at the largest international aquatic sporting event in the hemisphere. We also aimed to measure epidemiological data including the type, location, sporting discipline and outcomes of medical contacts during the event.
Methods
This was a prospective observational study conducted under the auspices of the organising committee of the XXX Confederation Centroamericana y del Caribe de Natacion (CCCAN) championships held in Trinidad & Tobago. Anonymised data was collected from event medical contact records, screening and voluntarily reported contacts by team medical staff (for individuals who did not visit event medical staff). We excluded contacts by spectators. Data was collected over a 12 day competition period. Injury incidence rate (IR; number of injuries per 1000 athlete-days) and injury incidence proportion (IP; injuries per 100 athletes) were calculated.
Conclusions
There were 110 medical contacts for the event, with 80 occurring in athletes (72.7%). A significant number of non-sport related contacts was observed (60%) with a high number of complaints related to exhaustion and inadequate hydration. This was independent of country of origin. Acute gastroenteritis, ear and sinus infections were within expected frequencies. No EMS usage was necessary, and hospital transfers were for diagnostics in all cases. There were a total of 54 sport related contacts in 3956 athlete days (IR 13.65 injuries per 1000 athlete-days with an injury incidence

proportion, IP; of 6.5 per 100 athletes). Planning for aquatic events must take into consideration non-sport as well as competition related complaints. This study gives important information on medical utilisation for future event planning.

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Injury Reporting in Collegiate Runners

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(No relevant relationships reported)

PURPOSE: It is well-known that runners are commonly injured, yet rates of running injuries reported in the literature vary widely, ranging from 19% to 92%. This discrepancy in reported injury rates may be due to several factors, including injury definition, the timeline used when reporting injuries, and whether the reporting method is self-report or reported by medical professionals. Therefore, the purpose of this study was to compare self-reported injury rates to medically-reported injury rates in a group of Division-I cross country runners. **METHODS**: Questionnaires regarding pain, injury, and training status were completed at the beginning and end of the 2015 and 2016 seasons. Additionally, injury reports were obtained from the team's certified athletic trainer (ATC). Data were coded as 1) self-reported only; 2) ATC-reported only; 3) self-reported and ATC-reported. Only injuries that occurred within the past year were considered in the analysis. **RESULTS**: In 2015, 12 athletes participated, with 38 reported injuries. Of those, 26 were self-reported (68.4%), 6 were ATC-reported (15.8%), and 6 were both self-reported and ATC-reported (15.8%). In 2016, 9 athletes participated, with 22 reported injuries. Of those, 13 were self-reported (59.1%), 8 were ATC-reported (36.4%), and 1 was both self-reported and ATC-reported (4.5%). Additionally, about half of the reported injuries (47% in 2015; 55% in 2016) led to missed or modified training. Of those injuries that led to missed or modified training, the majority (88% in 2015 and 91% in 2016) were self-reported only. **CONCLUSIONS**: The results indicate a marked difference in self-reported injury rates compared with medically-reported injury rates. This demonstrates that the method of reporting injuries may be a contributing factor to the wide range of reported injuries in the literature. Thus, caution should be taken when considering injury rates reported in the literature, as the method of reporting injuries may be influential.

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Determining Orthopedic Knee Surgeons' Preference in using Hamstring or Patellar Tendon ACL Grafts

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(No relevant relationships reported)

The decision of which graft to choose for anterior cruciate ligament (ACL) injuries is a current a topic for debate. **PURPOSE:** To determine if athlete status or patient gender influence orthopedic surgeons' graft preference to perform ACL reconstruction (ACLR) surgery. **METHODS:** Human resource representatives of orthopedic hospitals and centers from various locations in the United States were contacted via faxes and emails to distribute access to an electronic survey. Approximately 500 orthopedic knee surgeons were invited to participate in this study through their human resource representative. A total of 31 surgeons completed the survey. Surveys were administered through Qualtircs. The survey included questions regarding preference of graft choice (i.e., Hamstring, Patellar Tendon, Other) for different demographics of patients (i.e., athlete/non-athlete, age, gender) **RESULTS:** Analysis were conducted using IBM SPSS V.23 statistical software. When combining survey responses regarding ACLR graft preference for all age groups (N=614), a one way chi-squared test determined a significant association between the type of group (i.e., Athlete (n=309) and Non-athlete (n=305)) and preference of the graft choice (Hamstring (n=408), Patellar Tendon (n=114), Other (n=92)) for orthopedic surgeons $\chi^2(2) = 261.7, p < .001$. For all age groups combined, orthopedic surgeons strongly preferred Hamstring ACLR for non-athletes (97%, Yes=297). Orthopedic preference of ACLR for athletes was similar between Patellar Tendon (37%, Yes=114) and Hamstring (36%, Yes=111). Another chi-squared analysis concluded no significant association in orthopedic surgeons' preference with type of graft choice for ACLR and patient gender $\chi^2(2) = .013, p= .993$. **CONCLUSION:** Orthopedic Surgeons appear to strongly prefer Hamstring graft ACLR for non-athletes while graft preference for athletes is similar between Patellar Tendon and Hamstring ACLR. Also, patient gender does not appear to play a role when deciding graft preference for ACLR. Future research may identify why these preferences exist between athletes and non-athletes and if surgeon demographics play a role.

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Percent Body Fat Differs between those with Chronic Ankle Instability and Healthy Matched Controls

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(No relevant relationships reported)

Ankle sprains remain one of the most common orthopedic injuries, with a significant percentage of patients developing chronic ankle instability (CAI). The impact CAI has on overall health is unknown. **PURPOSE:** To measure body composition in those with CAI compared to healthy matched controls. **METHODS:** Sixteen subjects participated in the study. Eight subjects with CAI were matched by age (22.4±2.8 yr and 22.3±3.0 yr, respectively), height (165.3±8.5 cm and 167.8±8.2 cm), weight (68.5±8.2 kg and 65.5±8.2 cm) and gender (five females and 3 males / group), to subjects with no history of ankle injury. All subjects reported to the Health Risk Assessment lab for one session. Subjects completed the foot and ankle disability measure (FAAM and FAAM sport) and the NASA physical activity questionnaire. Body composition was measures with DEXA. Subjects laid on the DEXA table supine, arms placed down by their side and fully clothed for approximately 15 minutes while the machine conducted a whole body scan. The following measurements were obtained: lean tissue mass (muscle), total/regional body fat, and bone mineral density. Bone mineral density in the form of AP Spine (5th lumbar vertebrae) and Dual Femoral (left and right pelvic joints). **RESULTS:** No differences were observed between groups for age (p=0.93), height (p=0.56), weight (p=0.48). Percent fat was different between Injured and Control groups (p=0.016; 35.5±6.1% and 25.5±8.3%, respectively). Fat mass was significantly different (p=0.024) while lean mass was found to be similar (p=0.89) between groups. Android:Gynoid was not different (p=0.58), suggestive of no differences in regional fat deposition between groups in college-aged subjects. Total BMD was not significantly different between the Injured and Control groups (p=0.055; 1.23±0.08 and 1.32±0.10, respectively). FAAM (p<0.0001), FAAM Sport (p<0.0001) and NASA (p<0.0001) were all observed to indicate differing activity/functional levels between the groups. **CONCULSIONS:** These findings suggest CAI results in decreased physical activity levels in college-aged subjects that appears to be resulting in increased adiposity, a trend towards altered total bone mineral density, and no changes in lean body mass.

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Effects of Instrument Assisted Soft Tissue Mobilization on Biceps Femoris Muscle Architecture

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(No relevant relationships reported)

Instrument assisted soft tissue mobilization (IASTM) is a popular therapeutic modality that is often used to treat skeletal muscle restriction and injury. The efficacy and mechanism by which IASTM elicits a therapeutic effect is not fully understood. This study was designed to explore if any reported benefits of IASTM stem from changes in skeletal muscle architecture. **PURPOSE:** Examine the effects of IASTM on biceps femoris (BF) ultrasonography (US) baseline measurements of cross sectional area (CSA) and echo intensity (EI) as well as pennation angle (PA) at three different joint positions. Joint positions included 90°, mid- (Mid_{ROM}), and end-range of motion (ROM) (End_{ROM}). **METHODS:** Seventeen female participants (mean±SD: age=21.12±0.78 years) participated in this study. Participants were placed in a prone position for the IASTM treatment and for CSA and EI measures of the BF. Participants were also placed in a supine position, with the right hip and knee joints at 90° of flexion against a horizontal support for PA measurements. PA measurements were recorded at 90°, $Mid_{ROM,}$ and the End_{ROM} joint positions. US settings were enhanced to improve image quality, including gain (50dB), depth (8cm), and frequency (12MHz). For the IASTM protocol, the BF received 3 sets of 7 strokes in both proximal and distal directions at a treatment angle of 45°. Paired samples t-tests [Time (Pre vs Post)] were used to analyze CSA and EI US data. A two-way repeated measures ANOVA [Joint position (90° vs Mid_{ROM} vs End_{ROM}) × Time (Pre vs Post)] was used to analyze PA data. An alpha value of $P \leq 0.05$ was considered statistically significant for all comparisons. **RESULTS:** No significant difference was observed across time for CSA (p=0.220) or EI (p=0.515). Additionally, there was no significant joint position × time interaction (p=0.851) for PA. However, a significant main effect (p=0.001) for joint position was observed. Pairwise comparison revealed significant decreases in PA between 90° and Mid_{ROM} (p=0.038), 90° and End_{ROM} (p=0.001) and Mid_{ROM} and End_{ROM} (p=0.001). **CONCLUSION:** Although PA was altered with the corresponding changes in joint position, this was not a result of IASTM. These results indicate that a single bout of IASTM may not evoke architectural change in the hamstrings as measured by ultrasonography.

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Analysis ofUSAWR Wheelmill VO₂ Max Testing Between Classes

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(No relevant relationships reported)

PURPOSE: Little is known about how elite level training can affect the Maximum Aerobic Capacity (Max VO₂) testing for all functional classifications of national wheelchair rugby athletes. The primary purpose of this study was to review existing Max VO₂ data between Higher Classification (HC) and Lower Classification (LC) players on the USA Wheelchair Rugby Team (USAWR). **METHODS:** Data was collected during the April training camp (camp1) and August training camp (camp2) at Lakeshore Foundation during the 2017 season. All athletes followed an individualized high intensity workout plan between camp1 and camp2. Athletes (n = 12) had to perform a graded VO₂ max test on a unique Wheelmill ergometer during both camps to be included. Variables tested for significance included absolute VO₂ (aVO₂), relative VO₂ (rVO₂), Respiratory Exchange Ratio (RER), Heart Rate (HR), Ventilatory Equivalent (VE), and Rate of Perceived Exertion (RPE). International Wheelchair Rugby Federation classifications are set by functional ability starting at 0.5 and progress up in 0.5 increments to a max level of 3.5. For this study, classifications were grouped into those whose roles were primarily as a blocker (Class 0.5 – 1.5) and those whose roles were primarily ball handlers (class 2.0 – 3.5). **RESULTS:** Means for the whole team were tested for significant change between camp1 and camp2, and then between HC and LC using 2-tailed T-test (95% confidence interval). Despite whole team mean aVO₂ and mean rVO₂ was not significantly changed, whole team mean VE significantly increased from camp1 to camp2 (64.92 L/min $\pm$ 9.5601, p=0.0146), as did RER (1.0750 $\pm$ 0.0636, p=0.0387). Significant rVO₂ Max changes occurred among LC athletes (17.9300 mL/kg/min $\pm$ 1.1172, p=0.0246) and with aVO₂ Max (1.5000 L/min + 0.0990, p=0.0346), but no significant changes occurred among HC group. **CONCLUSION:** Analysis results showed significant improvements in maximum achieved VE and RER variables between camp1 and camp2 in elite wheelchair rugby athletes. When separated into LC and HC groups, only LC showed significant improvements in rVO₂ and aVO₂. This could indicate that elite USAWR training methods are more effectively improving performance in athletes with lower classifications than in their higher classification counterparts.

C-48   Free Communication/Poster - **Cardiac and Pulmonary Rehabilitation**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1450   Board #258   May 31 9:00 AM - 10:30 AM

Predictors of Health-Related Quality of Life in Patients with Symptomatic Peripheral Arterial Disease

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(No relevant relationships reported)

Purpose: To identify predictors of baseline measures of health-related quality of life (HRQoL) in symptomatic patients with peripheral artery disease (PAD) from objective markers of severity of PAD, clinical and demographic characteristics, comorbid conditions, cardiovascular risk factors, objectively measured physical activity, and patient-based measures of physical function. **Methods:** HRQoL measurements of 216 symptomatic men and women with PAD were assessed with the Medical Outcomes Study Short-Form 36 survey. Patients were further characterized on demographic variables, comorbid conditions, cardiovascular risk factors, ankle/brachial index, peak walking time (PWT) during a maximal treadmill test, 6-minute walk distance (6MWD), gait speed, ambulatory activity monitored during one week, activities of daily living (ADL), mini-mental state examination questionnaire, and walking impairment questionnaire (WIQ). **Results:** For the physical function HRQoL subscale, the significant predictors included WIQ speed score (p < 0.001), a history of stumbling (p < 0.001), WIQ stair climbing score (p < 0.001), the ADL associated with bathing (p = 0.001), 6MWD (p = 0.004), and daily walking cadence (p = 0.043). For the role emotional function HRQoL subscale, the significant predictors included a history of stumbling (p < 0.001), the ADL associated with transferring from a bed to a chair (p < 0.001), and the WIQ distance score (p = 0.022). **Conclusions:** Physical and mental subscales of HRQoL in symptomatic patients with PAD are primarily predicted by patient-based physical function, rather than by more specific markers of PAD severity and comorbid conditions. The clinical significance is that interventions designed to improve HRQoL should focus on improving the quality of executing functional tasks

such as walking more steadily without stumbling, completing ADL's that are not specific to walking, such as bathing and transferring, and improving patient-based ability to walk various distances, speeds, and to climb stairs.

1451   Board #259   May 31 9:00 AM - 10:30 AM

Impact of Cardiovascular Disease Diagnosis on All-Cause Mortality Reductions after Cardiac Rehabilitation.

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(No relevant relationships reported)

Cardiac rehabilitation (CR) is known to reduce the risk for all-cause mortality. However, little is known whether the health benefits of CR differ across different types of cardiac patients.
PURPOSE. To compare the impact of CR participation on all-cause mortality between cardiac patients that were diagnosed with ST elevated MI (STEMI), non-STEMI, unstable angina pectoris (AP), stable AP, chronic heart failure (CHF), and among patients that underwent revascularisations.
METHODS. A Dutch population-based cohort study was performed using insurance claim data from 4 million individuals. Cardiac patients eligible for the study were those with STEMI (*n* 9,071), non-STEMI (*n* 11,611), unstable AP (*n* 12,182), stable AP (*n* 20,594), CHF (*n* 5824), and revascularisation (*n* 1569). Adjusted proportional hazards models (hazard ratio, HR [95%-CI]) were used to assess the efficacy of CR against all-cause mortality. All HR were adjusted for confounding factors, such as age, sex, medication use, and cardio-thoracic surgical intervention.
RESULTS. Among the 60,581 (67±12 yrs; 61.6% males) included patients, 16,598 (64±10 yrs; 71.9 %males) participated in CR. After an average follow-up time of 4 years, 533 CR participants (3.2%) and 4728 non-CR patients (10.8%) died (P<.05). CR patients had a 42% lower all-cause mortality risk compared to non-CR patients (HR$_{adjusted}$ [95%-CI]: 0.52 [0.47-0.57]). We observed similar findings for each type of diagnosis (STEMI, HR: 0.55 [0.44-0.68]; non STEMI, HR: 0.52 [0.44-0.62]; unstable AP, HR: 0.60 [0.47-0.75]; stable AP, HR: 0.63 [0.49-0.80]; CHF, HR: 0.40 [0.26-0.60]; and revascularisation, HR: 0.62 [0.41-0.94]).
CONCLUSION. Participation in cardiac rehabilitation programs lowers the risk of all-cause mortality irrespectively of the initial cardiovascular diagnosis. These findings support the need for improved referral and participation rates of cardiac patients in CR programs.

1452   Board #260   May 31 9:00 AM - 10:30 AM

Mobile phone-based Cardiac Rehabilitation Program Improves Exercise Capacity and Clinical Outcomes in Chinese Revascularized Patients

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(No relevant relationships reported)

Previous studies have documented a favorable effect of cardiac rehabilitation (CR) on patients undergoing percutaneous coronary intervention (PCI). However, participation in CR is sub-optimal, especially in China. Innovative models of CR are needed to improve participation. **Purpose:** The present study assessed the effect of a mobile phone-based CR (MBCR)program on exercise capacity and clinical outcomes in patients undergoing PCI. **Methods:** Totally 212 patients following PCI referred to the CR clinic of Chinese PLA General Hospital, between Jul, 2015 and Apr, 2016, were divided into 2 groups, to participate in MBCR (n=107) or usual care program (control, n=105). Individualized exercise prescription and educational materials were sent to the participants in the MBCR group by the App named "Heartguard" regularly. Cardiopulmonary exercise testing and questionnarires were measured in 12 months. **Results:** Compared with those in the control group, participants in the MBCR group showed a greater increase in peak exercise capacity (+0.74 vs +0.08 METs,+16.4% vs +4.5%, p=0.000), VO₂ at anaerobic threshold , and dVO₂/dWR, with a greater decrease in VE/VCO₂ slope in 12 months. Range of blood pressure lowering, angina symptoms and life quality in both groups were similar, but the proportion of smoking participants in the MBCR group was lower (1.0% vs 6.3%, p=0.048). More significant lowering of low density lipoprotein, uric acid, as well as homocysteine was also showed in the MBCR group. During a median follow-up of 18 months, a lower incidence of unscheduled target vessel revascularizations , rehospitalizations , worsening angina, and combined endpoint (9/107 vs 23/105, p=0.005), was also found in the MBCR group. Multivariable Cox regression analysis of correlation showed participation in MBCR was associated with a toward decreased clinical events (HR=0.32, p=0.0064) after adjustment for many factors. Subgroup analysis demonstrated that patients with a history of smoking are more likely to benefit from the MBCR program. **Conclusions:**

The MBCR program we studied is associated with better exercise capacity, better control of risk factors, and less adverse cardiovascular events. These findings add support to the application of mobile phone-based CR programs in patients following PCI.

1453   Board #261   May 31 9:00 AM - 10:30 AM

Relationships Between Short Physical performance Battery And Clinical and Laboratory Factors For Cardiovascular Disease Inpatients

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(No relevant relationships reported)

A progression of muscle atrophy (secondary sarcopenia, etc.) in lower extremity function in cardiovascular disease (CVD) inpatients leads to a high need for medical and nursing care. Previous study reported that the Short Physical Performance Battery (SPPB) may be an effective assessment tool for strength and lower extremity morphological evaluation for CVD patients (mixed inpatients and outpatients). However, it is unclear the SPPB can be used to evaluate mobility capability for only CVD inpatients, although which require special attention to nutrition status and body composition. **PURPOSE**: The purpose of this study was to examine if the SPPB can validated assessment tool for strength and lower extremity morphological evaluation and the relationships between the SPPB and clinical and laboratory factors for CVD inpatients. **METHODS**: CVD male (n=318) and female (n=172) inpatients were recruited. A stepwise multiple-regression analysis was performed to predict total SPPB scores and assess variable factors (physical characteristics, functional and morphological assessments, etc.). **RESULTS**: There were significant correlations between knee extensor strength and total SPPB scores for CVD male and female inpatients (both p<0.001). There were significant correlations between mid-thigh MTH and total SPPB scores for CVD male and female inpatients (both p<0.001). To predict total SPPB scores, the predicted handgrip, Controlling Nutritional Status score, % body fat, anterior mid-thigh muscle thickness (MTH), standing height and systolic blood pressure were calculated for males and anterior mid-thigh MTH, BMI, knee extension and fat mass were calculated for females. **CONCLUSIONS**: Total SPPB scores are an effective assessment tool for the functional and morphological evaluation for CVD male and female inpatients. Notably, quadriceps femoris MTH may play an important role in high SPPB scores in CVD in patients regardless of gender.

1454   Board #262   May 31 9:00 AM - 10:30 AM

Knowledge and Perceived Physician Encouragement Toward Exercise in Congenital Heart Disease Patients and Their Sphere

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(No relevant relationships reported)

Background: Congenital heart disease (CHD) affects approximately 1 in 100 babies. Patients with CHD may be dissuaded or discouraged from activities, for reasons including fear of sudden cardiac arrest. **Purpose:** The primary purpose of this study was to examine exercise-related knowledge among patients and the patient's perception of physician encouragement toward exercise. A secondary purpose was to gauge these same variables among the sphere of influence (family and friends). **Methods:** Eligibility was limited to CHD patients and their sphere. Exercise-related knowledge and disease-specific knowledge (Leuven Knowledge Questionnaire) were assessed by questionnaire. **Results:** There were 71 volunteers (age 18-66, 38.7±12.0 yrs). **Patient Focus:** Of the sample, 42 identified as CHD patients (females=36; males=6). For treatment, surgery (n=37) and medication (n=26) were common, but only 10 patients had ever been prescribed a physical intervention. Overall, 38 patients believed that regular aerobic activity would improve heart health and 35 viewed regular weight training as a means to maintain or increase muscular strength. Also, 37 patients believed that regular activity provides a great sense of accomplishment. When asked about physician influence on exercise habits, only 23 patients "agreed" they had been positively influenced, while 12 disagreed. **Sphere Focus:** Of the sample, 29 identified as sphere (female=28; male=1). All 29 believed that regular aerobic activity would improve heart health and 24 viewed regular weight training as a means to maintain or increase muscular strength. Also, 26 of the sphere believed that regular activity provides a great sense of accomplishment. When asked about physician influence on exercise habits, only 16 of the sphere "agreed" that they had been positively influenced, while 1 disagreed. **Discussion:** Certainly, cardiovascular and musculoskeletal health are necessary for all individuals. In particular, support for safe exercise is critical for CHD patients. From our findings, patients and their sphere seem to have a favorable view of exercise and physician encouragement could be improved. **Conclusions:** It would be prudent for educational efforts to become an intentional focus for physicians who are in an authoritative position in patient-care interactions.

1455   Board #263   May 31 9:00 AM - 10:30 AM

Submaximal Oxygen Uptake Efficiency Slope as a Predictor of VO$_2$max in Men with Cardiovascular Disease

Clare M. McDermott, Ciara M. McCormack, Sarah M. Kelly, Andrew McCarren, Kieran M. Moran, Niall M. Moyna. *Dublin City University, Dublin, Ireland.*
(No relevant relationships reported)

Title: Submaximal Oxygen Uptake Efficiency Slope as a Predictor of VO$_2$max in Men with Cardiovascular Disease
Purpose: Although VO$_2$max is considered the gold standard measure of cardiorespiratory fitness, it can be difficult to attain in patients with cardiovascular disease (CVD). The submaximal oxygen uptake efficiency slope (OUES) integrates cardiovascular, musculoskeletal and respiratory function during incremental exercise into a single index and has been proposed as an alternative and effort independent measure of cardiopulmonary reserve (Baba et al., 1996). The purpose of this study was to examine the relation between VO$_2$ peak and both submaximal absolute OUES and relative OUES (OUES/kg).
Methods: A total of 42 men ((mean ± SD) age, 59.9 ± 8.7 yr; VO$_2$peak, 1.9 ± 0.5 L/min and 22.3 ± 6.1 mL/kg/min) were recruited during induction to a community based exercise referral program following completion of a phase 2 cardiac rehabilitation. Participants performed a graded exercise test on a cycle ergometer with breath-by-breath open circuit spirometry and a 12- lead ECG. Absolute OUES and OUES/kg were calculated by plotting VO$_2$ in mL/min on the x-axis, and the log transformed VE on the y-axis (VO$_2$ = a log$_{10}$ VE + b). Exercise data up to the ventilatory anaerobic threshold (VAT) was included in the analysis.
Results: The %VO$_2$ max corresponding to the VAT was 56.0 ± 10.3. Absolute OUES and OUES/kg were 2114 ± 515 and 24.5 ± 5.48, respectively. There was a significant positive correlation between VO$_2$max (L/min) and OUES (r= 0.78; p<0.001) and between VO$_2$max (mL/kg/min) and OUES/kg (r= 0.80; p<0.001).
Conclusion: Determination of VO$_2$max is not often feasible in individuals with CVD where maximal exercise testing is contraindicated or when performance may be impaired by pain, dyspnea or angina. The findings from the present study indicate that the OUES and OUES/kg are significantly related to absolute and relative VO$_2$max, respectively and may be used as a valid submaximal effort independent measure of CRF.
Baba, R. (1996). Oxygen Uptake Efficiency Slope : A New Index of Cardiorespiratory ., Functional Reserve Derived From the Relation Between Oxygen Uptake and Minute Ventilation During Incremental Exercise. *Measurement*, (6).

1456   Board #264   May 31 9:00 AM - 10:30 AM

Unstable Surface Training Is More Effective For Improving Stability Than Walking Training In Stroke Survivors

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(No relevant relationships reported)

BACKGROUND: Falls are of great concern in the post-stroke population. Balance and gait deficits are major risk factors but may be improved through rehabilitation. However, little research has been done comparing the efficacy of different types of rehabilitation training programs. **PURPOSE:** The purpose of this study was to determine if unstable surface training is more effective than conventional walking training for improving stability among stroke survivors. **METHODS:** Twenty male chronic stroke patients were randomly assigned into two groups, the unstable surface training group (UST; n=10, 53.9 ± 8.3 yrs) and conventional walking training group (CON; n=10, 58.3 ± 12.1 yrs). Participants trained 3 d/wk for 60 min/d for 12 weeks with BOSU half ball (UST) or treadmill (CON). Stability was evaluated using the Biodex balance system. Anterior/Posterior (Sagittal Plane), Medial/Lateral (frontal plane), and overall scores were analyses using ANCOVA. Zones and quadrants were reported with individual data. **RESULTS:** The UST group showed a significant improvement in Anterior/Posterior (1.63 ± 0.42 vs 1.15 ± 0.56, F(1, 17) = 12.62, p=.002), Medial/Lateral (1.3 ± 0.80 vs 0.64 ± 0.30, F(1, 17) = 31.38, p<.001), and overall (2.26 ± 0.81 vs 1.41 ± 0.66, F(1, 17) = 21.25, p<.001) scores whereas the CON group showed no significant improvements. **CONCLUSION:** The unstable surface training of 12-week was effective in significantly improving stability in chronic stroke survivors.

1457   Board #265   May 31 9:00 AM - 10:30 AM

The Role of Ethnicity in Developing Cardiovascular Disease in At-Risk Populations

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(No relevant relationships reported)

In the U.S., cardiovascular disease (CVD) is responsible for 1 in 4 deaths. There are known predictors (e.g., obesity, hypertension, and dyslipidemia) that increase the odds of developing CVD; however, risk is not proportionate among all ethnicities. While Hispanic Americans often display markers of elevated risk, they have longer life expectancies than their non-Hispanic counterparts. Further exploration of this phenomenon is necessary to elucidate how risk engenders disease in different ethnic groups. **PURPOSE:** To evaluate CVD risk factors and the incidence of adverse cardiovascular events among at-risk Hispanic and non-Hispanic adults. **METHODS:** We enrolled 10 Hispanic and 41 non-Hispanic men and women with Type 2 diabetes in a 10-week exercise program. Prior to initiating exercise, we documented demographic data, collected a health history, conducted 7 tests of physical functioning, and measured cardiometabolic variables, including body mass index (BMI), body fat percent (BF%), blood pressure, heart rate, and HBA1C. We repeated all assessments following the intervention. Differences between ethnic groups in baseline values and exercise responses were evaluated with independent-samples t-tests and chi-squared tests. **RESULTS:** Hispanic subjects had fewer diagnoses of hypertension (p=0.002) and no history of heart attack, compared to 25% incidence among non-Hispanics (p=0.077). Hispanic subjects were 8.1 years younger (p=0.032), 40% of them smoked (compared to 0%; p<0.001), and they had better body compositions as measured by BMI (p=0.038), BF% (p=0.021), and categorical obesity (p=0.030). Physical functioning was slightly better among Hispanic subjects as measured by the 6-minute walk (p=0.010) and functional reach (p=0.029). Participants who completed the exercise program experienced improvement in all assessments but grip strength; there were no differences in improvement between ethnic groups. **CONCLUSION:** We found Hispanic and non-Hispanic subjects similarly. Hispanic adults with diabetes had a lower incidence of heart attacks. This may be attributable to observed anthropometric differences; however, if nutritional or behavior customs confer cardio-protective effects in this population, it is important for future researchers to identify those variables.

1458   Board #266   May 31 9:00 AM - 10:30 AM

Sex Influences Changes Over Time In Exercise Ventilatory Dynamics In Patients With Cystic Fibrosis

Matthew A. Tucker, Nichole Siegler, Jacob Looney, Paula Rodriguez-Miguelez, Kathleen T. McKie, Caralee Forseen, Reva H. Crandall, Ryan A. Harris, FACSM. Augusta University, Augusta, GA. (Sponsor: Ryan Harris, FACSM)
(No relevant relationships reported)

Exercise capacity (VO$_2$ peak), an independent predictor of mortality, declines at a substantial rate in patients with cystic fibrosis (CF). Despite a similar rate of decline in VO$_2$ peak between sexes, female patients with CF experience greater mortality compared with their male counterparts. Ventilatory dynamics (VD) during exercise provide important prognostic information in several clinical populations; however, changes over time in exercise VD in CF are not well understood. Moreover, little is known about the influence that sex may have on changes over time in exercise VD in patients with CF. **PURPOSE**: This study sought to test the hypothesis that females with CF have more pronounced decrements in VD over time compared with male patients. **METHODS**: 20 patients with CF (10 female, 10 male) were tested on two visits (V1 and V2) which were separated by a minimum of six months. On each visit, lung function (FEV$_1$, % predicted), exercise capacity (VO$_2$ peak), and VD during exercise (V$_E$/VO$_2$ max, V$_E$/VCO$_2$ max, and V$_E$/VCO$_2$ slope) were determined in all patients. Repeated-measures ANOVA were used to test the influence of sex while controlling for the time between visits and lung function as an index of disease severity. **RESULTS**: Age (15 ± 7 vs. 20 ± 11 y), FEV$_1$ (85.4 ± 16.2 vs. 96.1 ± 20.8 % predicted), VO$_2$ peak (9.4 ± 6.0 vs. 34.1 ± 6.2 ml/min/kg), and the mean time between visits (43 ± 10 vs. 35 ± 20 months) were all similar between female and male patients (all p>0.05), respectively. Significant sex by time interactions were observed such that at V2, female patients exhibited greater increases from V1 in V$_E$/VO$_2$ max (15.4 ± 2.8 vs. 4.5 ± 8.1, p=0.005), V$_E$/VCO$_2$ max (7.6 ± 3.1 vs. 2.1 ± 3.7, p=0.014), and V$_E$/VCO$_2$ slope (4.0 ± 3.4 vs. -0.2 ± 4.1, p=0.036) versus males, respectively. Changes in both VO$_2$ peak (-1.9 ± 3.8 vs. -1.9 ± 5.6 ml/min/kg, p=0.973) and FEV$_1$ (-7.8 ± 8.3 vs. -10.5 ± 9.1 % predicted, p=0.208) between visits were similar between females and males. **CONCLUSIONS**: These data suggest that females with CF have a greater decline in exercise VD over time compared with male patients, albeit similar changes in VO$_2$ peak or lung function over time. Future studies are warranted to examine the potential utility of exercise VD as a prognostic marker in CF.

1459   Board #267   May 31 9:00 AM - 10:30 AM

Antioxidant Supplementation Improves Skeletal Muscle Metabolism During Maximal Exercise In Patients With Cystis Fibrosis

Paula Rodriguez Miguelez, Jacob Looney, Nichole Seigler, Matthew Tucker, Kathleen McKie, Caralee Forseen, Ryan Harris, FACSM. Augusta University, Augusta, GA. (Sponsor: Ryan A. Harris, FACSM)
(No relevant relationships reported)

INTRODUCTION: Patients with cystic fibrosis (CF) exhibit high levels of oxidative stress that contribute to multiple systemic dysfunctions, including exercise intolerance. Antioxidant supplementation has been shown to mitigate oxidative stress and improve exercise intolerance in other populations. Recently, our group has described that patients with CF exhibit impairments in skeletal muscle metabolism that may contribute to exercise intolerance. Whether or not antioxidants can impact muscle metabolism during exercise in patients with CF, however, has yet to be elucidated. **PURPOSE**: This study sought to test the hypothesis that 4 weeks of oral antioxidant supplementation will improve skeletal muscle metabolism during maximal exercise in patients with CF. **METHODS**: Eight patients with CF (25 ± 11 yrs.) completed an incremental exercise test on a cycle ergometer before (Pre) and after 4 weeks of oral supplementation with an antioxidant cocktail (AOC: vitamin C, vitamin E and α- lipoic). Skeletal muscle metabolism was evaluated at rest and during maximal exercise (max) through: (I) O$_2$ extraction (O$_2$Ex) calculated using a derivation of the Fick equation, (II) muscle O$_2$ utilization (HHb), using near-infrared spectroscopy and (III) exercise factor (EF), as the relative contribution of O$_2$ supply to O$_2$ consumption. **RESULTS**: A significant (p=0.039) increase in O$_2$EXmax was observed after 4 weeks of AOC when compared to baseline (Pre: 57 ± 8%, AOC: 64 ± 7%). In addition, HHbmax was significantly (p=0.046) greater (Pre: 0.97 ± 3.4 μM, AOC: 5.9 ± 2.9 μM) and EFmax was significantly (p=0.048) reduced (Pre: 7.1 ± 1.4 AU; AOC: 6.3 ± 1.3 AU) after completing the AOC treatment. No changes in resting skeletal muscle metabolism (p≥0.446) were observed following 4 weeks of supplementation. **CONCLUSIONS**:
For the first time, we have documented that four weeks of AOC supplementation improves skeletal muscle metabolism during maximal exercise in patients with CF. These findings suggest that oxidative stress may be partially involved in the reduced O$_2$ extraction and muscle O$_2$ utilization during exercise observed in patients with CF. Future studies are warranted to investigate the long term effects of antioxidants on muscle metabolism and exercise tolerance in CF. Supported in part by CFFT HARRIS14A0 (RAH).

1460   Board #268   May 31 9:00 AM - 10:30 AM

Qigong exercise for Chronic Obstructive Pulmonary Disease Rehabilitation A Randomized Controlled Trial

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(No relevant relationships reported)

Purpose: To compare the effects for chronic obstructive pulmonary disease (COPD) between Qigong exercise and the aerobics exercise using cycle ergometer. **Methods**: Twenty-six participants (21 males and 5 females) with COPD were recruited and randomly assigned to either the Qigong group (N=13) or the cycle ergometer group (N=13). Both interventions lasted 12 weeks and comprised of 24 supervised training sessions with 30 min for each session and twice a week. All outcome measures were recorded at baseline and at the end of the study period. The primary outcome was the endurance capacity measured by six minute walk test. The secondary outcome was the St. George's Hospital Respiratory Questionnaire (SGRQ). Paired t-tests were utilized to analyze for within-group comparisons between baseline and after three months. **Results**: The data of ten participants in each group were analyzed due to 3 participants of losing follow up in each group. The six minute walk distance (6MWD) in Qigong group was 530±75.4m at baseline, and 560.9±60.9m after intervention. The 6MWD in cycle ergometer group was 520.6±35.6 and 549.6±26.9 after intervention. The result showed that there were significant differences between before and after intervention in each group (Qigong group t= -2.520, p <0.05, cycle ergometer group t= -3.747 , p <0.05), and was no significant difference between two groups after interventions. The SGRQ score in Qigong group was 27.8±11.8 at baseline and 22.5±8.9 after intervention. The SGRQ score in cycle ergometer group was 34.4±13 at baseline and 23.4±10.4 after intervention. The cycle ergometer group has significant difference between before and after intervention in (t = 2.601, p <0.05), but no significant

difference between two groups after interventions. **Conclusions**: Both Qigong and cycle ergometer should improve the endurance capacity and quality of life of COPD patients through a 12 weeks training.

C-49 Free Communication/Poster - **Cardiorespiratory Fitness**

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1461   Board #269   May 31 9:00 AM - 10:30 AM
The Association of Combined Peak Oxygen Consumption and Ventilatory Efficiency with Survival in Hypertrophic Obstructive Cardiomyopathy

Jose R. Medina-Inojosa, Joshua Smith, Veronica Layrisee, Thomas P. Olson, FACSM. *Mayo Clinic Rochester, Rochester, MN.* (Sponsor: Thomas Olson PHD, FACSM)
(No relevant relationships reported)

Introduction: Hypertrophic obstructive cardiomyopathy (HOCM) patients have impaired left ventricular outflow compromising peak oxygen uptake (VO_2). HOCM patients also exhibit reduced ventilatory efficiency (i.e. greater ventilation to carbon dioxide production (V_E/VCO_2) slope). Reduced peak VO_2 and elevated V_E/VCO_2 slope have independently been associated with mortality in these patients; however, it unknown if combining these prognostic indicators will their prognostic value. **Purpose:** To determine if peak VO_2 combined with V_E/VCO_2 slope was associated with survival in HOCM patients. **Methods:** We included all consecutive patients with the diagnosis of HOCM who underwent CPET between the years 1995 to 2016. We created Cox regression models to test the association between VO_2 and V_E/VCO_2 slope with survival and the prognostic value of exercise capacity (EC) defined by the median [peak (VO_2) in mL/Kg/min] to define high and low EC. The V_E/VCO_2 slope cutpoint was defined as ≥ 34. Models were adjusted for factors known to affect both peak VO_2 and survival. **Results:** We included 926 patients (age: 53.4 ±14.1 years, 41% women) over a median follow-up of 5.1 years with 107 patient deaths. Peak VO_2 and V_E/VCO_2 slope predicted survival in HOCM patients (AUC: 0.63, p<0.001 and AUC: 0.66, p<0.001, respectively). Combining peak VO_2 and V_E/VCO_2 improved the prognostic value for survival (AUC: 0.69, p<0.001) beyond that of peak VO_2 and V_E/VCO_2 separately. HOCM patients with a low peak VO_2 and high V_E/VCO_2 slope had a greater risk of death than those with a higher VO_2 and low V_E/VCO_2 slope (HR: 5.51, 95%CI: 2.51-13.93, p<0.001). This relationship remained consistently strong after adjusting for age, sex, body mass index, New York Heart Association Functional Class, hypertension, diabetes, coronary artery disease, and smoking (adjusted HR: 3.73, 95%CI: 1.52-10.18, p=0.007). **Conclusion:** These findings demonstrate that combining peak VO_2 and ventilatory efficiency accurately predicts survival in HOCM patients even after adjustment for traditional risk factors. These results highlight the importance of CPET in HOCM patients.

1462   Board #270   May 31 9:00 AM - 10:30 AM
Does Estimated Cardiorespiratory Fitness Accurately Predict Directly Measured Vo$_{2peak}$ In Breast Cancer Survivors?

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(No relevant relationships reported)

The ACSM walking equation used to estimate maximal aerobic capacity (VO_{2peak}) was developed nearly 4 decades ago and based on relatively few (<100), young (19 to 26 years old) participants. The validity of estimated VO_{2peak} in clinical populations remains uncertain. **PURPOSE:** To compare estimated VO_{2peak} with actual VO_{2peak} derived from maximal treadmill testing in breast cancer survivors. **METHODS:** In the context of a randomized controlled trial, 115 survivors (mean age, 59 ± 7 yr) performed an incremental walking treadmill test to volitional fatigue with gas exchange to determine VO_{2peak}. Estimated VO_{2peak} was calculated using the ACSM walking equation and compared with actual VO_{2peak} by examining the constant error (CE) and correlation coefficient (r). . **RESULTS:** The ACSM equation significantly overestimated VO_{2peak} (CE: 6.3 ± 5.0 ml/kg/min, p<0.001; r: 0.65, p<0.001) . **CONCLUSION:** Alternative estimated VO_{2peak} models should be considered given that low VO2$_{peak}$ is associated with a higher prevalence of acute and chronic treatment-related toxicities, higher symptom burden, and increased risk of all-cause and cancer-specific mortality.

1463   Board #271   May 31 9:00 AM - 10:30 AM
Abnormal Submaximal Cardiopulmonary Exercise Parameters Predicts Impaired Peak Exercise Performance In Sickle Cell Anemia Patients

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(No relevant relationships reported)

Purpose: We recently demonstrated that impaired functional capacity is associated with diastolic dysfunction in sickle cell anemia (SCA) patients. While impaired functional capacity on maximal effort testing is well described in SCA patients, less is known regarding submaximal exercise parameters. Additionally there have been no published studies investigating associations between submaximal exercise parameters and diastolic dysfunction.
Methods: A prospective longitudinal pilot study was performed in SCA patients. All patients had a resting cardiac MRI (cMRI), cardiopulmonary exercise test (CPET) with cycle ergometry using a ramp protocol and an exercise echocardiogram. Exercise data were compared to age, gender and size-matched normal controls.
Results: Compared to normal controls, the SCA group (n=19) had lower peak oxygen consumption (VO2; 1378±412 ml/min vs 2266±638.9, p<0.01), predicted peak oxygen pulse (67±15.9% vs 97±5.3%, p<0.01) and worse ventilatory efficiency (VE/VCO2 slope; 31.7±7 vs 27±4.3, p=0.03). When evaluating the submaximal exercise parameters, there was lower VO2 at the anaerobic threshold (AT; 950±311.7 vs 1497±526.8, p<0.01), oxygen uptake efficiency slope (OUES) at AT (1512±426.2 vs 2140±402.7, p<0.01) and higher VE/VCO2 slope at AT (24±6.6 vs 21±2.8, p=0.04). With the VO2 at respiratory exchange ratio 1.0, 12/19 patients were < -2 standard deviations below the mean with all 12 having a peak VO2 less than 70%. The VO2 at AT correlated with hematocrit (r=0.77, p<0.05). The OUES positively correlated with left ventricular ejection fraction (r=0.55, p=0.01) and left ventricle cardiac output by cMRI (r=0.51, p=0.02), hematocrit (r=0.52, p=0.02), and lateral E/e' (r=-0.54, p=0.01). The VO2 at respiratory exchange ratio 1.0 correlated with right ventricular (r=0.5, p=0.03) and left ventricular cardiac output by cMRI (r=0.47, p=0.04), and lateral E/e' (r=-0.51, p=0.02).
Conclusions: SCA patients have abnormal submaximal exercise measures compared to controls. The degree of submaximal abnormality correlates with the degree of diastolic dysfunction by echocardiography. These data further reinforce the scope of functional cardiovascular abnormalities in SCA.

1464   Board #272   May 31 9:00 AM - 10:30 AM
Considering Cardiorespiratory Fitness Relative to Lean Body Mass in HIV+ compared with HIV- Hispanic Women

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(No relevant relationships reported)

Cardiorespiratory fitness (CRF = VO_2max) is known to significantly influence the risk of morbidity and mortality from chronic diseases. Comparing CRF relative to body weight in different population groups is common. However, CRF relative to lean body mass (LBM) could be more informative due to its energy demanding characteristic; a relevant aspect in people living with debilitating chronic diseases associated with muscle wasting such as HIV infection. **PURPOSE:** To compare absolute VO_2max, and VO_2max relative to body weight and relative to LBM among community dwelling HIV+ and HIV- Hispanic women; and determine the percent VO_2max variance explained by body weight vs. LBM. **METHODS:** Measures of total mass, LBM, fat, and percent fat were conducted with DEXA scanning in a group of 32 HIV+ and 15 HIV- Hispanic women. VO_2max was measured on a cycle ergometer using increments of 25 W every 2-min until volitional fatigue. Independent t-tests were conducted to detect between group differences, and linear regressions to determine the percent variance in CRF explained by body weight and LBM. **RESULTS:** No between group differences were observed for the following variables, age (45.1±10.4 vs. 41.1±14.2 yrs), weight (73.6±15.2 vs. 72.0±12.3 kg), BMI (28.8±5.9 vs. 28.0±6.3 kg/m²), DEXA fat (41.1±7.2 vs. 43.3±4.8 %), DEXA LBM (41.6±5.7 vs. 39.6±6.7 kg), absolute VO_2max (1.40±0.34 vs. 1.53±0.34 L/min), VO_2max relative to body weight (19.3±3.6 vs. 21.4±4.2 ml·kg⁻¹·min⁻¹). However, a lower VO_2max relative to LBM was observed among HIV+ compared with HIV- women (33.4±5.3 vs. 38.6±6.3 ml·kg⁻¹·min⁻¹, P=0.006). Body weight explained 38%, and LBM explained 50% of the variance in CRF. **CONCLUSION:** These results suggest that VO_2max relative to LBM should be considered as the standard for VO_2max comparison, particularly among HIV+ women at risk of experiencing reduced muscle mass.

1465   Board #273   May 31 9:00 AM - 10:30 AM

Impact of Primary Disease Status on Six-Minute Walking Distance.

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(No relevant relationships reported)

PURPOSE: The 6-minute walk distance (6MWD) is one the most commonly used outcome assessments of physical function in exercise research. The 6MWD is predictive of health outcomes across many chronic health diseases, however, the impact of health conditions on 6MWD remains unclear; limiting its use as a clinical tool. The purpose of this study was to assess the differences in 6MWD across multiple chronic health conditions in older adults.
METHODS: We assessed the 6MWD in 337 community dwelling older adults (mean age 65 years, 225 males, 158 African American, BMI=29.4), following ATS guidelines. We separated groups by primary disease status [type 2 diabetes only (DM, n=117), moderate/severe chronic obstructive pulmonary disease (COPD, n=119), chronic kidney disease (CKD, n=40), peripheral artery disease (PAD, n=16), and moderate chronic heart failure (HF, n=45)].
RESULTS: The mean 6MWD across groups was 389 (103) meters. By disease, the mean 6MWD was 222 (78) m for HF, 364 (25) m for PAD, 425 (108) m for COPD, 458 (110) m for CKD, 477 (104) m for DM. Normative values of older adults are commonly considered to be 514 meters with the 10th percentile reported at approximately 334-361 meters. Our finding of a mean 6MWD of 389 m suggests low physical functioning status across older adults with chronic disease. Only the HF group met criteria for being in the 10th percentile although the PAD group also showed significant decline in physical function. A 6MWD of less than the 25 percentile (<470 m) is considered low functioning status. Our mean 6MWD was substantially lower than the 25th percentile in all groups except for the DM group.
CONCLUSIONS: We found that the mean 6MWD is lower in patients with HF and PAD, placing these patients at a high risk for loss of ability to conduct activities of daily living and eventually loss of independence, however all groups exhibited reduced physical function. This study highlights the importance of interpreting the 6MWD based on individual health conditions and that generalization based on 6MWD cannot be made without taking individual health conditions into account. Establishing a data register would capture data based on health conditions and enable the 6MWD to be used across disease states in a clinical setting and when prescribing exercise therapy for older adults with chronic disease.

1466   Board #274   May 31 9:00 AM - 10:30 AM

Cardiorespiratory Fitness Is Inversely Associated With Metabolic Syndrome And Clustering Of Metabolic Risk Factors: The Ball State University Adult Physical Fitness Study

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(No relevant relationships reported)

The metabolic syndrome (MetSyn) is a high-risk phenotype characterized by the clustering of cardio-metabolic risk factors (RF), including obesity, elevated triglycerides, high density lipoproteins, hypertension, and impaired fasting glucose. Cardiorespiratory fitness (CRF) has been associated with metabolic RF clustering and the presence of MetSyn. Most studies assessing this relationship have estimated CRF, which is associated with estimation error up to 40%, with only few studies using directly measured CRF assessed from cardiopulmonary exercise testing (CPX). However, these studies were small in size and predominately assessed men; therefore more information from studies using CPX derived CRF in both sexes may aid in the risk assessment for MetSyn and guide clinical decisions. **Purpose:** To assess the association between directly measured CRF and MetSyn RF clustering. **Methods**: A retrospective cross-sectional analysis was performed on 3,636 self-referred men and women who completed a health assessment including a CPX between 1969-2017. Inclusion criteria consisted of being ≥ 18 years of age, attainment of a respiratory exchange ratio ≥1.0 during CPX, and complete data on MetSyn RFs. Sequential regression models were run to assess the relationship between CRF and MetSyn and a univariate analysis of variance was performed to assess differences between number of MetSyn RF present and CRF. **Results**: Individuals with MetSyn (n=953) had a mean CRF 8.8 ml/kg/min lower than those without the syndrome (n=2683). Number of RFs was inversely related to CRF; CRF was significantly lower (p<0.05) with each additional RF. There was also a negative relationship (p<0.001) between CRF quartile and the likelihood of having MetSyn. Each quartile increment was associated with a 50% relative reduction in likelihood of MetSyn (p<0.001). **Conclusion**: These findings with CPX measured CRF suggest that higher levels may confer resistance to developing metabolic RFs, which could prevent MetSyn, and ultimately decrease cardiovascular disease risk. Further, the inverse, graded relationship between CRF and

number of MetSyn RFs has public health importance, as adoption of an endurance training program may increase CRF, and therefore should be promoted as an approach to improve health and decrease MetSyn risk.

1467   Board #275   May 31 9:00 AM - 10:30 AM

Physical Activity Patterns And Cardiorespiratory Fitness In Men With Cardiovascular Disease

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(No relevant relationships reported)

PURPOSE: Cardiorespiratory fitness (CRF) is generally regarded as an objective and reproducible measure of recent habitual physical activity (PA). Considering that the majority of daily PA is performed at light intensity, it is likely that CRF benefits will be detected at submaximal rather than maximal exercise. The purpose of this study was to evaluate daily minutes of light (LIPA), moderate (MIPA) and vigorous (VIPA) intensity physical activity among men with cardiovascular disease (CVD), and to determine the relation between PA and submaximal (oxygen uptake efficiency slope (OUES)) and maximal (VO_2 peak) indices of CRF.
METHODS: A total 32 male participants (mean (± SD): age of 60.0 ± 8.7 yr, VO_2 peak, 2.0 ± 0.45 L/min and 23.3 ± 5.7 mL/kg/min) were recruited during an induction to a community based exercise referral program following completion of phase 2 cardiac rehabilitation. Participants underwent a graded exercise test on a cycle ergometer with breath by breath open circuit spirometry after which they wore a wrist worn accelerometer (Actigraph) for 7 d. Absolute and relative submaximal OUES were calculated by plotting VO_2 in mL/min on the x axis, and the log transformed VE on the y axis ($VO_2 = a \log_{10} VE + b$). Exercise data up to the ventilatory anaerobic threshold was included in the analysis.
RESULTS: Participants performed 589.05 ± 69.41 min of daily LIPA, 161.38 ± 66.16 min of MIPA and no daily min of VIPA. There was no significant relation between peak VO_2 and either LIPA or MIPA. There was a significant correlation between submaximal OUES (r=0.44; p<0.01) and LIPA. The relation between submaximal OUES/kg and LIPA min almost reached statistical significance (r=0.33; p<0.07). There was no significant relation between MIPA and OUES or OUES/kg.
CONCLUSIONS: Men with CVD spend the majority (78%) of their day performing LIPA. OUES, a submaximal measure of CRF was related to LIPA whereas no relation was found between VO_2 peak and LIPA.

1468   Board #276   May 31 9:00 AM - 10:30 AM

Firefighters and Physical Function: Should There Be Annual Testing?

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(No relevant relationships reported)

There are more than a million actively employed firefighters in the United States. To qualify as a firefighter, one must pass the Candidate Physical Ability Test (CPAT), a vigorous assessment of strength and endurance. Following the CPAT, there is no national or state mandate to evaluate fitness or uphold a standard of minimum physical competency. Although strength, endurance, and mobility are critical to job performance, data concerning the preservation of function throughout a firefighter's career are scarce. **PURPOSE:** To evaluate the physical functioning of firefighters.
METHODS: We enrolled 35 firefighters in California, collected demographic data, and performed a battery of tests, which included anthropometric assessments, grip strength, sit-and-reach, shoulder flexibility, vertical jump, push-ups, curl-ups, and VO_2 max. We compared mean data to normative data and used multiple linear regression to test the effect of age on physical functioning, holding potential confounders constant.
RESULTS: On average, firefighters were 33.5 ± 11.8 years of age and performed 23.9 ± 3.1 curl-ups, 32.2 ± 12.3 push-ups, had a vertical jump of 59.6 ± 10.4 cm, mean L/R grip strength of 66.0 ± 12.9 kg, sit-and-reach of 5.2 ± 9.1 cm, shoulder flexibility of 20.2 ± 6.8 cm, and VO_2 max of 40.1 ± 10.8 ml/kg/min. Compared to normative data, the mean firefighter had excellent grip strength, excellent push-ups, above average vertical jump, average shoulder flexibility, below average curl-ups, poor sit-and-reach, and poor VO_2 max; 94.1% of firefighters were classified as poor in sit-and-reach and 58.1% were classified as poor or very poor in VO_2 max. Linear regression did not find age to be a significant predictor of sit-and-reach (p=0.167) or VO_2 max (p=0.319) holding other significant predictors constant. **CONCLUSION:** In general, firefighters performed competently in assessments of strength, but poorly in flexibility and aerobic capacity. Age was not a significant predictor of performance in either assessment; the implication is that duration spent as a firefighter is not related to functional decline. There may not be a need for firefighters to complete periodic CPAT assessments, but they should be encouraged to improve capacities of endurance and flexibility.

THURSDAY, MAY 31, 2018

1469   Board #277   May 31 9:00 AM - 10:30 AM

Comparison of Six-minute Walk Test VO$_{2peak}$ Prediction Equations in Cardiac Rehabilitation Patients

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(No relevant relationships reported)

The six-minute walk test (6MWT) is a popular submaximal exercise test used in cardiac rehabilitation (CR) programs. Patients in CR characteristically have several cardiovascular risk factors present; therefore, the selection of the 6MWT over maximal treadmill testing reduces the likelihood of adverse events. Several established prediction equations exist for predicting VO$_{2peak}$ from six-minute walk speed (6MWS) and/or distance (6MWD). **PURPOSE:** To compare the predicted VO$_{2peak}$ values, calculated from 6MWS, obtained from CR patients using established equations. **METHODS:** Seventeen volunteers (age = 64 ± 16 yr) completed a pre- and post-6MWT prior to a High-intensity Interval Training (n = 6) or moderate intensity continuous exercise (n = 11) program. The Burr et al. (2011), Cahalin et al. (1996), and Ross et al. (2010) VO$_{2peak}$ prediction equations were examined for validity and reliability. A repeated measures analysis of variance (ANOVA), with subsequent paired sample t-tests, was conducted to compare differences within and between 6MWT the VO$_{2peak}$ prediction equations. A 3 x 2 mixed-design ANOVA was performed to examine the effects across VO$_{2peak}$ and time (pre- and post-). **RESULTS:** The repeated measures ANOVA revealed statistical significance within pre- [$F(2,32) = 121.40, p \leq (0.001)$] and post-program VO$_{2peak}$ values [$F(2,32) = 78.24, p \leq (0.001)$]. Sequential paired sample t-tests showed a significant difference between the three equations for both pre- and post-program VO$_{2peak}$ values (df = 16, $p \leq 0.001$). The 3 x 2 mixed-design ANOVA observed no significant differences in VO$_{2peak}$ values across the two time points. **CONCLUSION:** The three prediction equations demonstrated reliability pre- and post-programming. However, insufficient literature exists comparing the validity and reliability of VO$_{2peak}$ prediction equations. Future research should increase the sample size and consider the use of criterion measurement system (i.e., wearable metabolic system which can measure gas exchange).

1470   Board #278   May 31 9:00 AM - 10:30 AM

Fat Mass, and Not Heart Rate Recovery is Associated With Cardiorespiratory Fitness in Young, Sedentary Adults

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(No relevant relationships reported)

Peak oxygen uptake resulting from maximal graded exercise testing is considered a measure of cardiorespiratory fitness. Post-exercise heart rate recovery (HRRec) measures have been used as a clinical indicator of health and mortality in older adults. However, the relationship between HRRec and cardiorespiratory fitness in young, sedentary adults has not been fully elucidated. **PURPOSE:** To examine the association between peak oxygen uptake (VO$_2$; ml·kg^{-1}·min^{-1}) and HRRec responses following a progressive maximal graded exercise test (MaxGXT; treadmill); and body composition measures in young, sedentary adults. **METHODS:** We examined peak VO$_2$ and absolute (AbsHRRec; beats·min^{-1}) and relative (RelHRRec; %) HRRec measures at 1, 3, and 5 mins post MaxGXT in 27 young (mean ± SD, age = 26.4 ± 5.7) adults (16 females). All subjects were sedentary (< 2hrs weekly structured exercise), non-smokers, free of known cardiovascular disease risk and medications. Body composition measures including fat mass (kg), fat-free mass (FFM; kg), mineral-free lean mass (MFLM; kg), and percentage body fat (%Fat; %) were determined by total body DXA scans. Pearson's correlation analysis was used to determine if significant (p < 0.05) correlations were observed between peak VO$_2$, AbsHRRec and RelHRRec, and body composition measures. **RESULTS:** No significant correlations were observed between peak VO$_2$ (36.4 ± 9.0) and AbsHRRec at 1 min (30.4 ± 7.8; r = 0.29), 3 mins (62.6 ± 8.6; r = -0.06) or 5 mins (71.1 ± 9.8; r = -0.07). Similarly, there were no significant correlations between peak VO2 and RelHRRec at 1 min (84.1 ± 4.3; r = -0.18), 3 min (67.3 ± 4.9; r = 0.20) or 5 min (62.9 ± 5.3; r = 0.21). Peak VO$_2$ was significantly correlated with %Fat (35.1 ± 9.3; r = -0.82; p<.001) and fat mass (27.8 ± 11.9; r = -0.66; p<.001), but not significantly correlated with FFM (49.7 ± 14.0; r = 0.22) or MFLM (47.0 ± 13.4; r = 0.22). **CONCLUSION:** Although heart rate recovery measures have been used as a clinical indicator of health and mortality in older adults, it may not be a valid measure of cardiorespiratory fitness in sedentary, young adults.

1471   Board #279   May 31 9:00 AM - 10:30 AM

Aerobic Exercise Capacity In Mild-to-moderate Chronic Kidney Disease Is Maintained Over A 5 Year-period

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(No relevant relationships reported)

PURPOSE: A reduced aerobic exercise capacity is a known feature of chronic kidney disease (CKD) and is associated with increased morbidity and mortality. Peak heart rate (peak HR) and hemoglobin level are known determinants of exercise capacity in CKD. Less is known about the change in exercise capacity over time. The purpose was to study the change in aerobic exercise capacity, peakHR and hemoglobin over a 5 year-period in mild-to moderate CKD (CKD 2-3).
METHODS: 34 patients (11 females and 23 males, 24-62 years at baseline) with CKD 2-3 and 34 age- and gender-matched healthy controls were examined at baseline and after 5 years. Peak workload, as a measure of aerobic exercise capacity, and heart rate response were measured during a maximal exercise test on a cycle ergometer. Hemoglobin was assessed in both groups and glomerular filtration rate (GFR) was measured by iohexol clearance in CKD only.
RESULTS: GFR in CKD 2-3 decreased from 60±5.2 to 47±15 mL/min/1.73 m^2 over 5 years, (p<0.001). Peak workload, peakHR and hemoglobin level were significantly reduced (p<0.05) in CKD 2-3 compared to controls at baseline and at 5 years-follow-up. The changes in these parameters over 5 years did not reach significance in either group. CKD at baseline vs 5 years-follow-up: peak workload 209±62 vs. 200±60 W; peakHR 161±22 vs. 158±21 beats per minute; hemoglobin 13.5±1.3 vs. 13.9±1.1 g/dL. Controls at baseline vs 5 years-follow-up: peak workload 247±65 vs. 244±73 W; peak HR 178±11 vs. 173±12 beats per minute; hemoglobin 14.2±1.0 vs. 14.7±1.0 g/dL. The change in peakHR was positively correlated (r=0.57, p<0.05) to the change in peak workload in CKD, but not in controls. No such correlation to the change in peak workload was found for the change in hemoglobin level or GFR.
CONCLUSION: Aerobic exercise capacity and its determinants peakHR and hemoglobin were maintained over a 5 year-period in mild-to-moderate CKD, despite a mean decline of 22 % in kidney function. Change in peak heart rate over a 5 year-period is an important determinant of the change in exercise capacity in CKD 2-3.

C-50   Exercise is Medicine®/Poster - EIM: Counseling and On-Campus

Thursday, May 31, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

1472   Board #280   May 31 9:00 AM - 10:30 AM

Bridging The Gap Between Campaigns And Programs. The Country-based Public Health Policy Issue: "Move It For Heath"

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(No relevant relationships reported)

Cardiovascular disease and risks factors are worldwide concerning problems leading to public health policies and strategies to avoid high costs and low outcomes to populations. Physical inactivity is a major risk factor and play an important role that should lead to global public health strategy for its cost-efficiency and cost-effectiveness. The main issues are the specific country-based public health policies, wich continuously leads to campaign to avoid sedentary behavior and physical inactivity, and not population-based exercise programs policies. **Purpose:** The purpose of our study was to share data from a community-based exercise program ("Move it") contextualized on the Brazilian public health policy (SUS) for the last 20 years. **Mehods and Results:** The program "Move it" is a multidisciplinary program that runs on primary care facilities of a inner state city of São Paulo (Botucatu), Brazil, that has been implemented 25 years ago. So far, 2% of the city population has been involved (2800 participants; 55±9 years, 74% females and 68,7% under 60 years of age), participating on protocols that runs on city's facilities (parks, public gyms and squares), involving diagnosis, fitness analysis and exercise program (80 minutes, 3 times a week). Metabolic Syndrome (ATP criteria) prevalence is 35%, with a succesfull response to the program of 20% after 10 weeks. VO$_2$ max (Balke

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protocol) improvement is 30% and muscular strength (25%). Blood Pressure (BP) normalization occurs after 20 weeks, returning to basal levels (High BP) when detrain occurs (Hollydays). Health Eating Index (HEI) and sedentary behavior (IPAQ and Baecke questionnaires) improves after 8 weeks. Figure 1. "Move-it": Flowchart and interactions with the national public health policy (SUS): **Conclusion:** Cardiorrespiratory fitness, healthy eating index, lipid profile, insulin sensitivity and body composition were improved. Since the primary care system in Brazil is based on active search ("Estratégia Saúde da Família - agentes comunitários"), the adhesion, acceptance and effectiveness of this model should be encourage for nation wide application. Strategies leading transition from campaigns to programs should be encourage world wide.

1473   Board #281   May 31 9:00 AM - 10:30 AM
Scientific Abstract

Victor Andrews. *Kansas State University, Manhattan, KS.*
(No relevant relationships reported)

PERCEIVED PHYSICAL LITERACY IN COLLEGE AGED STUDENTS
Victor Andrews, Kansas State University, Manhattan, Kansas
Individuals who fail to acquire adequate competencies in regards to physical activity may develop barriers that limit physical activity later in life. Physical literacy(PL) is a descriptive that is used to measure one's competence, confidence, and motivation in regards to physical activity. The goal of PL is to have all youth to be considered competent by 12 years of age in order to allow them to be physical active throughout their life-course. **PURPOSE:** To investigate the perceived physical literacy levels of college aged students. **METHODS:** The Physical Literacy Self-Assessment was distributed to college aged students to measure perceived PL through e-mail and social media. **RESULTS:** 94 college students responded (21 ± 3 years, 38 male, 56 female). SPSS vs 24 was used for frequency analysis and two independent samples t-test. Perceived PL scores were then divided into 4 graded categories: Very Low, Low, High, Very High. 49% of respondents were placed in the "Very High" category, 47% of respondents were categorized at "High", 3% of respondents were categorized as "Low", 1% of responded was categorized as "Very Low". The results indicate that there is no statistically significant difference between the PL score for male and females (t= 1.881, p= 0.63). **CONCLUSION:** The goal of PL is to have all individuals meet the criteria to be considered "Very High". Individuals graded into categories other than "Very High" are considered in need of further education and support until they are perceived to be competent in all elements of PL. PL is still a new concept within the USA. Further research is needed to better understand PL within the USA population and relationships with current physical education levels in college aged populations.

1474   Board #282   May 31 9:00 AM - 10:30 AM
Prenatal Healthcare Provider Physical Activity And Nutrition Discussions According To BMI

Kiersten M. Mead, Samantha J. Deere, Rebecca A. Schlaff, Meghan Baruth. *Saginaw Valley State University, Saginaw, MI.*
(No relevant relationships reported)

Research suggests healthcare providers (HCP) do not regularly discuss physical activity (PA) and nutrition during patient interactions, particularly when patients are considered overweight/obese by body mass index (BMI). It is unknown if this trend extends to obstetric HCPs. **PURPOSE:** To investigate the differences in 1) patient value of prenatal HCP advice, and 2) the likelihood of prenatal HCP discussion/recommendation of PA/nutrition behaviors according to BMI. **METHODS:** Participants (n=46) included pregnant women enrolled in a PA/nutrition behavioral intervention. A survey assessed 1) demographics, 2) pre-pregnancy height and weight, 3) the degree (1=do not value to 5=highly value) participants valued their prenatal HCP's opinions, and 4) whether the patient's prenatal HCP discussed PA behaviors, recommended PA participation, or gave nutritional advice. Means(SD) and percentages were calculated. Participants were categorized into BMI categories of normal weight (<25 kg/m^2) and overweight/obese (≥25 kg/m^2). An independent samples t-test and chi-square analyses were utilized to assess differences in the value of HCP's opinions, and whether or not the patient's HCP discussed PA behaviors, recommended PA participation, or gave nutritional advice according to BMI category. **RESULTS:** Most participants were Caucasian (82%), married (70%), and college graduates (59%). Participants were 28.3(4.4) years of age, had a pre-pregnancy BMI of 28.0(9.7)kg/m^2 and valued their HCP's opinions 4.6(0.6). Most participants discussed current PA habits (61%), received a PA recommendation (57%), and received nutritional advice (59%) from their prenatal HCP. Normal (45.6%) and overweight/obese (54.4%) participants valued their HCP's advice similarly: 4.6(0.60) and 4.6(0.64), respectively (p=0.71). Although not statistically significant, more normal weight participants discussed PA and received a PA and nutrition recommendation than overweight/obese participants (p=0.10-0.50). **CONCLUSION:** Our sample highly valued prenatal HCP opinions. HCPs discussed/recommended PA/nutrition behaviors to women across BMI categories, yet many participants received no PA/nutrition advice. Future research should explore ways to consistently incorporate PA/nutrition discussions in obstetric appointments.

1475   Board #283   May 31 9:00 AM - 10:30 AM
Physical Activity Counselling and Exercise Prescription Practices of Physiotherapists in Nova Scotia

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(No relevant relationships reported)

PURPOSE: Physiotherapists (PTs) have education and scope of practice to promote the benefits of physical activity (PA) and prescribe exercise in their clinical interactions with patients. As such, they provide an avenue to increase the reach of Exercise is Medicine, to improve the PA levels of the Canadian population. However, no study has assessed Canadian physiotherapists' perceptions and practices surrounding physical activity counselling and exercise prescription (PAE). **METHODS:** PTs working in Nova Scotia (n=146) completed an online self-reflection survey regarding their current practices, confidence, barriers, and facilitators in providing PAE to their patients. **RESULTS:** Overall confidence for PAE was high (most scores >80%) except for in helping patients maintain PA (72.8±25%) and in patients following through on PAE recommendations (66.3±22.5%). PTs include PAE in 85±23% of appointments and prescribe written exercise in 80±20% of appointments, but only refer to other exercise professionals or facilities in 27±27% of appointments. The most salient barriers to providing PAE were patient's interest in PA, and patients' preference for medication management over lifestyle intervention (2.36±0.68 and 2.11±0.66 respectively, out of 4), exceeding the typically cited barrier of lack of provider time. The most helpful facilitator was PTs' perceived patients' readiness to do PAE (3.5±0.7, out of 4). PTs are most comfortable providing PAE advice to those with arthritis and musculoskeletal issues (81%) and least comfortable to those with cancer (49%), insulin requiring diabetes (33%), respiratory disease (32%) and mental health concerns (28%). **CONCLUSION:** The primary barriers for PTs in providing PAE are patient-focused and PTs may benefit from avenues that allow greater referral access to other exercise professionals and a collaborative treatment approach to help patients maintain a physically active lifestyle, especially in those with other chronic disease beyond musculo-skeletal disorders. Exercise is Medicine networks should consider greater collaborations between allied health and exercise professionals to support multi-disciplinary approaches to patient exercise management across the continuum of health care.

1476   Board #284   May 31 9:00 AM - 10:30 AM
Participation in an Exercise Education Rotation affects Medical Students Opinions Towards a Physician's Role in Physical Activity Recommendations

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(No relevant relationships reported)

Physical activity is key for prevention of most chronic disease. In response, a global initiative called *Exercise is Medicine* was launched to encourage physicians to treat physical activity participation as a vital sign. However, medical students may not receive the necessary training which may inhibit the future physician's likeliness to assess or recommend physical activity participation. **Purpose**: To determine if a five day exercise education rotation affects medical student's opinion regarding a physician's role in recommending physical activity. **Methods:** Third year medical students (n=169) completed a mandatory exercise education rotation as part of general primary care clerkship. This rotation included included basic fitness assessment and consultation, one-hour observation of a clinical supervised exercise program, exercise prescription education for special populations, explanation of the *Exercise is Medicine* Initiative and mandatory attendance to five group exercise classes. All exercise activities were led by an ACSM certified exercise physiologist at a University based fitness facility. The medical students completed an 8-item Likert scale pre-post survey (1 to 4, strongly disagree, disagree, agree, strongly agree, respectively) to assess their level of agreement with statements about a physician's role in exercise prescription and personal fitness (Table 1). A paired t-test was used to compare the pre and post scores for each individual item. Significance was set at p < .05. Results: Table 1.

Item	Pre	Post	Mean Diff	p value
1. It is a physician's responsibility to discuss exercise with their patients.	3.67	3.76	.09	.059
2. Physicians are qualified to accurately prescribe exercise.	2.93	3.08	.15	.051
3. A physician's personal fitness affects the credibility of their advice.	3.28	3.30	.02	.805
4. Physicians should assess a patient's physical activity levels just like other vitals signs.	3.33	3.54	.21	.001*
5. A physician who can prescribe exercise is a better overall physician.	3.49	3.59	.10	.123
6. Exercise prescription coursework should be mandatory in medical school.	3.36	3.41	.04	.580
7. A physician should be judged based on their personal fitness.	2.36	2.58	.22	.007*
8. A physician should serve as a role model with regards to their nutrition/fitness.	3.28	3.37	.09	.201
Total Survey Score	25.66	26.57	.92	.009*

*p < .05

Conclusion: The findings demonstrate that a five-day exercise education rotation favorably impacts medical student's opinion regarding a physician's role in exercise consultation with patients. More importantly, the most significant increase in agreement was observed in the students' agreement that a physician should consider physical activity levels as a vital sign, consistent with the Exercise is Medicine initiative.

1477   Board #285   May 31 9:00 AM - 10:30 AM

Primary Care Students' Perceptions of Using Physical Activity Counseling as a Medical Intervention

Graceson C. Kerr, John E. Lowry, Samantha J. Deere. *Saginaw Valley State University, University Center, MI.*
(No relevant relationships reported)

Chronic diseases are among the most common and costly health problems in the U.S. Physical activity (PA) has been shown to be effective in treating and preventing many chronic diseases. The Exercise is Medicine initiative aims to promote PA counseling among healthcare providers. However, little is known about the education and perceptions of medical providers related to PA counseling. **PURPOSE:** To learn about the knowledge and perceptions that students in primary health care professions have related to using PA counseling. **METHODS:** Students currently enrolled in a DO or MD medical school, physician assistant, or nurse practitioner program were recruited to take an online survey. Incorporating two previously validated surveys, subjects were asked about their own PA counseling training they have received, the importance of various PA counseling tasks, and their competency to do each task. Data analyses were performed on each Likert scale question. Open ended questions were analyzed thematically. **RESULTS:** Of the participants who completed the survey (n=72), 6.8% were MD, 52.3% were DO, 21.6% were physician assistant, and 18.2% were nurse practitioner students. Primary care students rated many aspects of PA as being important (59.4-76.7% agreed/strongly agreed), but reported low confidence in their education and abilities to do them (19.7-51.3% agreed/strongly agreed). The most common barriers to PA counseling were patient motivation/compliance, lack of education, time, support system for patients, and cost/billing. The most common solutions they proposed to overcome these barriers were more education for primary care professionals, being able to refer patients to specialist, and help with psychological aspects of counseling. There was strong interest in taking an elective course, attending a CME/continuing education course, and having a certified fitness and/or nutrition professional in the office. **CONCLUSION:** There is a clear disconnect between what primary care students find important and what they feel competent to do in the field. There is a need for improving medical education related to PA counseling. There are many opportunities for PA professionals to work with primary care providers on PA counseling. Educating our healthcare professionals is essential in making them confident in PA counseling.

1478   Board #286   May 31 9:00 AM - 10:30 AM

Resistance Exercise Does Not Improve Habitual Physical Activity Despite Pain Relief: Implications for Patient Counseling

Kevin R. Vincent, FACSM, Heather K. Vincent, FACSM. *University of Florida, Gainesville, FL.*
(No relevant relationships reported)

Osteoarthritis (OA) of the knee leads to physical disability and avoidance of activity. Resistance exercise can reduce pain and increase leg strength, but it is not yet clear how resistance exercise (RX) impacts habitual physical activity levels. **PURPOSE:** To determine whether resistance-exercise induced changes in physical function and pain relief are related to increased walking related function and habitual physical activity in older adults with knee OA. **METHODS:** Older adults (N=60; 69.0 ± 6.9 yr; 64% women) were randomized to a 4-month total body RX program or not. Knee pain was estimated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain subscore. One repetition maximum of leg strength (knee extension and leg press) and walking performance measures (walking speed, walking endurance during progressive treadmill test, 6-minute walk test distance) were collected pre and post-training. Daily step count and intensity of ambulatory activity was determined by a 7-day tracking of ambulation using a StepWatch©. **RESULTS:** Knee pain severity decreased by 27% in the RX group and increased by 13% by month 4. Leg extension and leg press strength increased from 17% to 22% and decreased by 4% in the control group (p<.05). Walking speed did not differ between the two groups from pre to post-training. Walking endurance treadmill time increased from 12.5 to 13.3 min in control and from 10.1 to 11.2 min in the RX group but these changes were not different between groups. Six-minute walk distance increased by 1.0-4.2% in the RX and control groups (p=.08). Pre-training average daily step counts were 5002 ± 2125 and 3601 ± 1181 in the CON and RX groups, respectively, and decreased by 614 and 356 steps a day by month 4. **CONCLUSIONS:** Despite pain reduction and strength gains with RX, walking-related functional indices and habitual activity levels were not impacted. Patients should be counseled that RX does not replace daily physical activity, but should be added to ambulatory activity. The importance of combining ambulatory activity and strengthening exercise to maximize possible functional improvements should be discussed.

1479   Board #287   May 31 9:00 AM - 10:30 AM

"If We Knew That Exercise Could Be Our Medicine": Perceptions of Latinas in Low-Income Clinics

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(No relevant relationships reported)

PURPOSE: There is scarcity of research regarding the leveraging of the healthcare setting to promote PA among Latinas specifically, though they are one of the largest and most inactive ethnic minority groups in the US. This study aimed to conduct qualitative research to understand how low-income community clinics could be capitalized on as settings for the promotion of PA among Latina women.
METHODS: In-depth individual interviews were conducted with 24 Latina patients in two low-income community clinics in San Diego, California. Data were collected in English and Spanish, transcribed, translated to English, and analyzed using structural coding procedures, under a Thematic Analysis framework. Two investigators jointly coded each interview using a codebook. Codes were then compared and grouped into themes.
RESULTS: While other themes were identified, this presentation will mainly focus on participants' perceptions regarding the role of clinics and health professionals in the promotion of PA. The majority of participants reported receiving PA advice at their doctor's office, although only some of them found this advice facilitated their participation in PA. A few participants stressed the importance of personal responsibility, rather than physicians' responsibility, for their PA. Nevertheless, most participants had expectations regarding doctors' role in the promotion of PA. Specifically, participants wanted doctors to motivate people, for example by becoming role models and by providing more specific information of places and exercises they can do.
CONCLUSIONS: The results of this qualitative study support the need to leverage the role of healthcare professionals and clinics in the promotion of PA among Latinas, as participants expressed a desire for health professionals' involvement and provided suggestions regarding how they may motivate patients to be active. Future research might benefit from including some of these suggestions for the promotion of PA among Latina women in the healthcare setting. The results of this study also highlight the importance of initiatives like ACSM's Exercise is Medicine to better equip future healthcare professionals to address the PA promotion needs and expectations of their patients.

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Exercise Is Medicine On Campus 2017: Increasing Off-campus Outreach And Community Collaboration

Zack Papalia, Melissa Bopp, FACSM, Michele Duffey, Lori Gravish-Hurtack, Christopher M. Bopp, Nancy Williams, FACSM, Alexandra Telech, Britni De Castro. *Pennsylvania State University, University Park, PA.* (Sponsor: Melissa Bopp, FACSM)

(No relevant relationships reported)

PURPOSE: Exercise is Medicine on Campus (EIMOC) is an initiative promoting physical activity (PA) on college campuses. Pennsylvania State University, promoting EIMOC since 2010, has held an annual EIMOC Week since 2012. A focus of the EIMOC committee in 2017 was to expand its off-campus reach and community collaboration throughout the commonwealth of Pennsylvania and beyond. The purpose of this study is to analyze and describe the logistical challenges and lessons learned from expanding an EIMOC initiative to off-campus and out of town locations. **METHODS**: During fall 2017, EIMOC events were expanded from one, on-campus week, to a month of activities including a day of coordinated events with off-campus local businesses, travel to commonwealth campuses, and a week of collaboration with alumni-led organizations nationwide. The logistical challenges of coordinating remote events were documented and evaluated. Observational data from each event assessed popular activities and feedback from participating partners regarding the planning and execution of events was gathered. **RESULTS**: Analysis addressed three new initiatives. Partnership with local, off-campuses businesses, known as "EIM Off Campus Day," involved local fitness centers offering no-cost access to students, faculty, and staff for one day, promoted via social media and our website. Reach was assessed through social media analytics (i.e. likes, retweets), website visits and unique page views. Traveling events to commonwealth campuses occurred during "Mobile EIM Week" and were assessed based on the type of activities included, number of partners involved, and number of participants engaged, as well as feedback regarding the perceived success of each event and suggestions to improve future collaborations. Finally, a week-long initiative engaged alumni nationwide (EIM Everywhere Week) relying on email campaigns and social media to spread the word and gauge participation. **CONCLUSIONS**: The current study offered insights on the challenges and successes in leveraging an existing EIMOC program to spread the message into the community, including timing of advertising and better communication. Despite this, the new initiatives proved both popular and successful, and improving their execution will significantly benefit the future impact of EIMOC.

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Preliminary Results Of An In-depth Investigation Of Exercise Is Medicine On Campus

Oliver Wilson, Nishat Bhuiyan, Melissa Bopp, FACSM, Zack Papalia. *The Pennsylvania State University, State College, PA.* (Sponsor: Dr. Melissa Bopp, FACSM)

(No relevant relationships reported)

Widespread implementation of Exercise is Medicine on Campus (EIM-OC) has potential to address college student physical inactivity, however, limited research has comprehensively assessed how EIM-OC is operationalized at campuses. **PURPOSE:** To assess EIM-OC implementation, development, and outcomes at various academic institutions. **METHODS:** A survey was developed in consultation with key EIM-OC stakeholders and administered online among EIM-OC representatives. Data collected included: institutional information; promotion, education, and healthcare system integration; partnerships; challenges; and goals. **RESULTS:** Initial responses (n=24) were received from a diverse group of academic institutions ranging in size (<10,000 to >50,000 students) and type (public, private). Campus health and recreation were considered the most important EIM-OC partners, which was attributed to these partners providing the most opportunities for and having the most interactions with students. A lack of time and wanting to focus on existing relationships were cited as reasons for not yet establishing working relationships with other partners. Multiple respondents cited lack of time, awareness, funding, and/or resources as the biggest challenges faced by their program. Bureaucracy surrounding the collaboration between university departments was also a cited as a major challenge. Implementing the physical activity vital sign emerged as a common issue, with many institutions having no protocol in place for arranging a follow-up between students and physical fitness professionals after referral acceptances (n=5), and no protocol existing for referral declinations (n=9). Despite a stated desire for greater collaboration with other universities, particularly sharing of information and ideas (n=9), most respondents (83%) had not collaborated with other programs. Social media was under-utilized, with over a third (n=9) of respondents not utilizing any social media platforms. **CONCLUSION:** EIM-OC programs at various institutions experienced similar challenges. This research will serve to inform and improve upon the implementation, development, and outcomes of EIM-OC programs and ultimately contribute to helping academic institutions increase the physical activity of students and their local communities.

1482   Board #290   May 31 9:00 AM - 10:30 AM

Referred Students' Motivators And Barriers To Participate In An EIMOC Program

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(No relevant relationships reported)

PURPOSE: The purpose of this study is to describe referred students' motives and barriers to participating in an Exercise is Medicine on Campus (EIMOC) training program at Illinois State University.
METHODS: Referrals are initiated by Student Health or Counseling Services, and referred students complete an intake session with the School of Kinesiology and Recreation's (KNR) Exercise is Medicine on Campus staff. Student Health and Student Counseling services indicated a need for physical activity (PA) programming for students with certain conditions (e.g. social anxiety, body image concerns, obesity, depression, anxiety, and eating disorders) that would benefit from increased physical activity performed in a private setting. Students are referred to the School of KNR EIMOC program, which is informed and implemented by graduate students and Exercise Science faculty with expertise in the areas of exercise physiology, biomechanics, and exercise psychology. Specific diagnoses are not currently provided by Student Health or Counseling services to EIMOC staff.
RESULTS: Since the initiation of the referral system in 2016, 40 students (Women = 30, Men = 10) have been referred to the EIMOC program - 30 from Health Services and 10 from Counseling Services. Approximately half of these were already performing some activity, but were either not meeting recommended levels of PA or needed assistance with their exercise program. At the time of submission, ten of the 40 students had completed full intake questionnaires and consent forms. Descriptive statistics were calculated on data from these ten subjects to identify reasons for pursuing participation in the EIMOC program and clients' current motivations for and barriers to PA. All subjects cited "improving energy levels" as an important motivator for PA. The top three reported barriers for PA were Lack of Willpower (M±SD = 6.1±2.9), Lack of Energy (M±SD = 4.4±2.4) and Social Influence (M±SD = 4.0±1.8). Privacy of the exercise sessions (90%), expertise of the staff (90%), and physician referral (70%) were selected as strong motivators for pursuing the EIMOC program.
CONCLUSIONS: These preliminary data suggest that students referred to Illinois State University's EIMOC program pursue it due to an interest in increasing PA levels in a private, supervised setting.

D-07   Thematic Poster - **Aging and Training**

Thursday, May 31, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100C

1513   Chair: Loretta DiPietro, FACSM. *The George Washington University School of Public Health and Health Services, Washington, DC.*

(No relevant relationships reported)

1514   Board #1   May 31 1:00 PM - 3:00 PM

Aging, Maximal Aerobic Capacity, and Running Economy in Trained Distance Runners

Emma J. Lee, Christopher J. Lundstrom. *University of Minnesota, Minneapolis, MN.* (Sponsor: Eric M. Snyder, FACSM)

(No relevant relationships reported)

Aging, Maximal Aerobic Capacity, and Running Economy in Trained Distance Runners
Maximal aerobic capacity (VO_{2max}) tends to decline with age, even in trained long-distance runners. However, it is possible that running economy (RE), another predictor of performance, may be preserved. Furthermore, previous research has measured RE as the submaximal rate of oxygen consumption in ml O_2 *kg body mass $^{-1}$ * min $^{-1}$ (VO_2), whereas it is more valid to express RE using allometric scaling of body mass (alloVO_2) or as the energy cost of running (EC), in kcal * kg body mass $^{-1}$ * min $^{-1}$. The percent of VO_{2max} (%VO_{2max}) at which a submaximal run occurs is also related to performance. PURPOSE: To evaluate VO_{2max}, alloVO_2, EC, and %VO_{2max} in runners across a wide age range and determine whether aging is associated with these performance-related measures. METHODS: Runners aged 20-66 years completed two running tests. Study visits took place within four weeks of a goal race of 10-26.2 miles. Subjects ran for five minutes at 88% of their predicted age-based maximum heart rate, which approximates a marathon-intensity effort. Athletes then performed a VO_{2max} test. AlloVO_2 was calculated using body mass$^{0.66}$. Energy cost was determined using caloric equivalents based on mean respiratory exchange ratio, which takes substrate utilization into account. Pearson's correlations were used to determine relationships between age and running performance variables. RESULTS: Runners (n = 22, 11 females; body mass index 22.54 ± 2.9 kg * m^{-2}) had a mean VO_{2max} of 53.2 ± 10 ml O_2 * kg $^{-1}$ * min (range: 35.6-69.9). Age was not significantly correlated with VO_{2max}, alloVO_2, or %VO_{2max} (respectively: r = -0.281, p = 0.205; r =.0172, p = 0.470; r = -0.191, p = 0.42). Age was highly correlated with EC (r = 0.721, p = 0.001). CONCLUSIONS: In this population, age was not related to maximal or submaximal oxygen consumption. The strong positive relationship between age and EC suggests that substrate use during submaximal running may change with age in trained distance runners.

1515   Board #2   May 31 1:00 PM - 3:00 PM

HoppingExercise Training Improves Postural Control in Healthy Older Adults

Toshiaki Nakatani, Kazufumi Terada, Koji Kawakami, Kazuki Kino, Mika Imai, Shota Shinomiya. *Tenri University, Tenri, Japan.*

(No relevant relationships reported)

Older adults exhibit increased postural sway motion, increasing fall risk. Exercise programs can improve postural control and reduce fall risk in older adults. **PURPOSE**: This study aimed to investigate the effects of hopping exercise training on postural control during quiet standing in healthy older adults. **METHODS**: Thirty-one community-dwelling older adults were randomly assigned to either a hopping exercise group [HEG, n = 16 (men = 3), mean age = 71.5 ± 5.3 years] or a balance exercise group [BEG, n = 15 (men = 1), mean age = 71.1 ± 4.9 years]. Both groups performed a 12-week exercise training program. HEG performed two sets of two-legged hopping at a frequency of 90 bpm until reaching a score of 15 (hard) on the Borg Rating of Perceived Exertion scale twice a week. BEG performed balance exercise on a foam stability pad or soft balance beam. At a welfare center, all subjects participated in a 60-min supervised group exercise session once every 2 weeks. Outcome measures included the center of foot pressure (CoP) sway parameters during quiet standing with eyes open (EO) and eyes closed (EC) for 30 s. **RESULTS**: Repeated measures analysis of variance showed a significant interaction effect of path length in an enveloped area with EC ($P = 0.03$) and main effects of time of path length ($P = 0.027$), enveloped area ($P = 0.029$), and sway velocity ($P = 0.031$) with EO. After the training session, HEG demonstrated a significantly increased path length in an enveloped area with EC (21.5 ± 7.9 vs. 26.3 ± 13.0 cm², $P < 0.05$) and a significantly decreased path length (45.0 ± 17.4 vs. 37.6 ± 12.5 cm, $P < 0.05$), enveloped area (2.71 ± 1.40 vs. 2.09 ± 1.25 cm², $P < 0.05$), and sway velocity (2.25 ± 0.87 vs. 1.88 ± 0.63 cm/s, $P < 0.05$) with EO. BEG demonstrated no changes in CoP sway parameters with EO or EC. **CONCLUSION**:

Twelve-week hopping exercise training can improve postural control with EO and EC in older healthy adults. Hopping exercise is a safe, practical, and effective training approach in older people. Supported by JSPS Kakenhi Grant Number 26350767.

1516   Board #3   May 31 1:00 PM - 3:00 PM

The Effects Of Tempo-adjusted Music On Gait Speed And Functionality In Middle-aged And Older Adults

Jeffrey M. Janot, Saori Braun, Nicole Cisewski, Anna Stover, Samantha Noetzelman, Lauren Grover. *University of Wisconsin-Eau Claire, Eau Claire, WI.*

(No relevant relationships reported)

PURPOSE:Tempo-based music is capable of impacting gait patterns and functionality, however, there is little knowledge on how technological applications (apps) that match music tempo to self-selected gait speed can impact gait patterns. The purpose of this study was to determine if functionality and self-selected gait speed in community-dwelling middle aged and older adults can be improved both acutely (in one bout) and over a three-week period by utilizing an app that changes music tempo to match pace. **METHODS**: Twenty-six (14 females, 12 males) participants, aged 56-80 years old were recruited for this study. All participants were previously involved in a regular exercise program. Participants were randomly assigned to control (CTL) or training (TRN) group. The CTL group walked with the music app for one bout to measure acute effects then adhered to a 3-wk walking program (2x's/week) without music. The TRN group used the music app for the full 3-wk walking program. Main outcome measures included a 10-m walk test (10mWT), a 15-min walk test (15MWT), and the timed up-and-go test (TUG). **RESULTS**: There were significant (p < .05) improvements seen during the acute session (1.58±0.19 m/sec music app vs 1.49±0.18 m/sec no music) across all participants and improvements in TUG (CTL: 9.53±0.47 sec pre-study vs 8.83±0.52 sec post-study; TRN: 8.70±0.45 sec pre-study vs 7.92±0.50 sec post-study), regardless of group assignment. Also, there were no significant (p > .05) differences in the 10mWT (CTL: 1.48±0.09 sec pre-study vs 1.55±0.07 sec post-study; TRN: 1.66±0.09 sec pre-study vs 1.70±0.07 sec post-study) or 15MWT (CTL: 1.49±0.05 m/sec pre-study vs 1.55±0.07 m/sec post-study; TRN: 1.49±0.05 m/sec pre-study vs 1.56±0.07 m/sec post-study) tests times for both groups over the 3-wk period. **CONCLUSIONS**:These results demonstrated that a music app that matches walking tempo may be an effective means to acutely improve speed and functionality as measured by the TUG test in middle aged and older adults. Future studies should explore longer intervention programs to improve self-selected walking speeds or employ a similar program with individuals who were previously inactive.

1517   Board #4   May 31 1:00 PM - 3:00 PM

Ipsilateral and Contralateral Rapid Torque Adaptations To Unilateral Resistance Training In Young and Older Males

Alex A. Olmos[1], Garrett M. Hester[1], Zachary K. Pope[2], Mitchel A. Magrini[2], Ryan J. Colquhoun[2], Alejandra Barrera-Curiel[2], Carlos A. Estrada[2], Jason M. DeFreitas[4]. *[1]Kennesaw State University, Kennesaw, GA. [2]Oklahoma State University, Stillwater, OK. [3]Oklahoma State Univeristy, Stillwater, OK. [4]Oklahoma State University, Stilwater, OK.*

(No relevant relationships reported)

While the efficacy of unilateral resistance training (RT) to increase strength in the untrained limb (i.e., cross-education) is well established, it is less clear if cross-transfer of rapid torque characteristics occurs, and if age affects these adaptations. **PURPOSE:** To identify the effects of short-term, unilateral RT on rapid torque characteristics in the untrained limb of young and older males. **METHODS:** Twenty-two untrained, young (age = 21.43 ± 2.29 yrs, body mass = 81.03 ± 12.71 kg) and nineteen older (age = 65.78 ± 9.83 yrs, body mass = 87.23 ± 13.34 kg) males were randomly assigned to either a training (young trained group [YTG] and old trained group [OTG]) or young and old control groups. The YTG and OTG performed 3 sessions per week of isokinetic RT for 4 weeks. RT sessions consisted of maximal concentric knee extensions at 45°·s^{-1} with an emphasis on ballistic intent for 4 sets of 10 repetitions. Maximal voluntary isometric contractions of the trained and untrained knee extensors were performed before (PRE) and after week 4 (POST) of RT on a dynamometer. Peak torque (PT) in addition to rate of torque development and impulse from contraction onset to 30 ms (RTD_{0-30} and IMP_{0-30}, respectively) and 100-200 ms ($RTD_{100-200}$ and $IMP_{100-200}$, respectively) were recorded for analysis. Three-way (age [young vs. old] × group (training vs. control) × time (PRE vs. POST) repeated measures analyses of variance were used for each dependent variable. **RESULTS:** For the untrained leg, there was no effect of training on RTD_{0-30}, IMP_{0-30}, $RTD_{100-200}$, or $IMP_{100-200}$ (p > 0.05). However, a 2-way (group × time) interaction indicated that PT increased at POST similarly between the YTG and OTG (+11%; p = 0.003) compared to the control groups. For the trained leg, a 2-way (group × time) interaction indicated that PT (+21.1%; p < 0.001) and IMP_{0-30} (+7.0%; p = 0.038) increased at POST similarly between the YTG and OTG compared to the control groups. Similarly, RTD_{0-30} demonstrated a nearly significant increase that was similar between the YTG and OTG

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(+11.2%; p = 0.051). **CONCLUSION**: Cross-education of strength was unaffected by age, however, neither young nor older males demonstrated cross-education of rapid torque characteristics. Further, while rapid torque characteristics were improved in the trained leg, age was not influential on these adaptations.

1518   Board #5   May 31 1:00 PM - 3:00 PM

Copper - Zinc Serum Traces, Lipid Profile, Geriatric Depression, and Daily Living Activities in Older Adults

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(No relevant relationships reported)

This study aims to assess serum traces of copper (Cu) and zinc (Zn), lipid profiles, geriatric depression level and activities of daily living (ADL) scale index in older adults affiliated with two different programs of physical activity (PA) levels. In the first program, Exercise for Health, members perform regular PA (at least 60 minutes, 3 times per week) and the second one represents a Nursing Home (NH) without regular physical activity each week. **Methods:** Thirteen men and women in the PA group (age: 64.7±4.8 years) and 34 men and women in the NH (age: 77.9±5.3 years) with no previously documented cardiovascular disease participated in the study. Anthropometric measurements were performed and blood was drawn from left arm. Serum traces of Cu and Zn were determined by atomic absorption spectroscopy, lipid profiles by absorbance and colorimetric assays, levels of geriatric depressión with Yesavage's scale index, and activities of daily living with Katz's index of independency in ADL. **Results:** The results revealed similar serum trace of Cu (PA: 0.62±0.02; NH: 0.64±0.02 mg/L) and Zn (PA: 0.29±0.01; NH: 0.31±0.011 mg/L), and lipid profile (total cholesterol, PA: 163.92±47.24, NH: 160.06±36.16 mg/dL; HDL, PA: 38.62±9,8 mg/dl, NH: 37.79±7.53 mg/dl; LDL, PA: 102.85±33.75, NH: 109.24±29.19 mg/dl; VLDL, PA: 20.69±8.6, NH: 13.03±4.26 mg/dl; triglycerides, PA: 103.38±45.13, NH: 65.62±21.19 mg/dl) between both older adults groups. However, NH group showed higher level of geriatric depression (70.5% vs. 38.5%) and dependency when performing activities of daily living (ADL). **Conclusions:** Even though participants were involved in different levels of physical activity level, serum traces of Cu and Zn, and lipid profile were within a normal limits range, but institutionalized older adults showed higher tendency toward depression and difficulties with daily living activities.

1519   Board #6   May 31 1:00 PM - 3:00 PM

Heavier, Stronger for Better Bone Mineral Density of Middle Age and Older Adults

Xiong Qin, Weimo Zhu, FACSM. *University of Illinois at Urbana and Champaign, Urbana, IL.* (Sponsor: Weimo Zhu, FACSM)

(No relevant relationships reported)

PURPOSE: Lost of bone mineral density (BMD) could lead to a serious health consequence for middle age and older adults. It is well known that BMD declines as a person becomes aging. It is also observed that heavier individuals tended to have a better bone mineral density, which led an assumption that stronger persons should have a more dense bone. This hypothesis, however, has not been examined using the large population data. This study was to fill this gap.
METHODS: Data from the 2013-2014 National Health and Nutrition Examination Survey (NHANES) were used for the study, in which a sample of 3127 (representing a weighted national sample of 126541108 US adults), with age from 40 to 80 yr. old, were examined for their BMD, age, sex, height, weight and hand grip strength. The correlations between total femur BMD (tfBMD) and BMI (body mass index) and grip strength were examined by sex and by total.
RESULTS: Statistical findings of the study are summarized as in the table:

Correlation between total femur BMD and age, BMI and grip strength			
Correlation	Age	BMI	Grip Strength
Male	-0.171	0.434	0.285
Female	-0.449	0.496	0.414
Total	-0.291	0.411	0.475

CONCLUSIONS: As expected, age has a negative correlation with bone density and BMI and grip strength has a positive one and this is especially true for female adults and older adults. Since BMI is often associated with overweight or obesity, the best approach to improve body density is to engage in strength and conditional related exercises regularly. Future studies should focus more on dose-response issues of needed strength exercise for a better bone.

1520   Board #7   May 31 1:00 PM - 3:00 PM

Age-related Alterations In Functionality And Muscle Architecture Of The Lower Limbs In Women

Kevin C. Phillips, Byungjoo Noh, Michelle Burge, Matt Gage, Tejin Yoon. *Michigan Technological University, Houghton, MI.* (Sponsor: Sandra Hunter, FACSM)

(No relevant relationships reported)

The age-related declines in muscle mass and function are greater for women and the lower limb muscles, and these decrements accelerate during middle-age. However, it is less clear which lower limb muscles may be compromised more in middle-aged women. **PURPOSE**: To compare muscle function and architecture of the knee extensor and plantar flexor muscles in young and middle-aged women. **METHODS**: Twenty two middle-aged (years: 54 ± 6) and eight young women (years: 22 ± 2) volunteered to participate in this study. In vivo muscle architecture measurements such as muscle thickness and pennation angle of four muscles including vastus lateralis (VL), rectus femoris (RF), Gastrocnemius medialis (GM) and lateralis (GL) were measured using a B-mode real-time ultrasound scanner. Each participant performed maximal voluntary isometric contractions (MVIC) of knee extensor and plantar flexor muscles 3-4 times on the Biodex dynamometer. Interpolate twitch technique was used to assess voluntary activation (VA). Absolute and weight-normalized maximal strength and rate of torque development (RTD) were analyzed from MVIC torque data. Additionally 6 minute walk test and sit-to-stand task were performed. Age-related changes were tested using two-way ANOVA with repeated measures. **RESULTS**: Both absolute and normalized MVIC strength, RTD, and VA were similar (p > 0.05) between young and middle-aged women. There were no significant differences in muscular thickness between young and middle-aged women, however, VL thickness trended towards being larger in young women (2.31 ± 0.2 vs. 2.14 ± 0.22 cm, p = 0.067). GM pennation angle was significantly larger in young women (25.8 ± 2.5 vs. 23.6 ± 2.4 degrees, p = 0.038). Lastly, the young women performed significantly more repetitions during the sit to stand task (23.8 ± 5.7 vs. 18.3 ± 4.7, p = 0.013), whereas there were no differences in performance of the six minute walk test (p = 0.139). **CONCLUSION**: Isometric and explosive torque production was similar between young and middle-aged women. A greater decrease in GM pennation angle compared to other muscle groups suggest that the age-related alteration in muscle architecture may be more compromised for plantar flexor muscles than knee extensor muscles.

1521   Board #8   May 31 1:00 PM - 3:00 PM

Effects Of Linear Periodization Versus Concurrent Periodization Training On Adl's In An Elderly Population

Brian A. Zalma, Andrew Nl Buskard, Craig Dent, Catherine Armitage, Joseph Signorile. *University of Miami, Miami, FL.*

(No relevant relationships reported)

Aging is commonly associated with a decline in muscle size, strength and power. As a result, daily physical function also declines. Recent studies have noted that declines in muscle power are the most significant cause for decreased functional performance for older persons. No previous studies have assessed the magnitude of improvements in functional movements (activities of daily living) by implementing different methods of periodization during training. **PURPOSE:** To analyze the effects of two different periodization styles on functional strength, power, and activities of daily living (ADL) in an elderly population over a 14-week (3x weekly) training period. **METHODS:** Pretest and post-test measurements included chest and leg press 1RM and pneumatic isoinertial peak power, as well as functional performance on 5 ADL measures (gallon-jug test, 8-foot up-and-go, floor rise, 6m walk, laundry transfer, 5x repeated chair stand). After a 2-week familiarization period participants were randomly assigned to either a linear periodization group (n=16, age = 69.31 ± 4.59 y) or a concurrent periodization group (n = 14, age = 68.93 ± 6.72 y). Each protocol consisted of 12 total strength (3 x 8 reps @ 70% 1RM), power (3 x 8 @ 50% 1RM), and translational training sessions. Linear periodization consisted of 4 wk strength training, 2 wk translational training, 4 wk power training, 2 wk translational training while the concurrent periodization group completed 12 weeks of day 1: strength, day 2, power, and day 3: translational. **RESULTS:** Both groups experienced significant improvement on all strength (p<.0001), power (p<.0001), and ADL measures relative to baseline (p<.0001), with no significant between-groups differences observed on any outcome variable. **CONCLUSION:** Linear and concurrent periodization were found to be equally effective at increasing muscular strength, power, and ADL performance over the course of a 14 week training study.

D-08 Thematic Poster - **Exercise Training- Clinical Applications**

Thursday, May 31, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100E

1522   **Chair:** Cemal Ozemek. *University of Illinois Chicago, Chicago, IL.*

(No relevant relationships reported)

1523   Board #1   May 31 1:00 PM - 3:00 PM
Confirming Training-Related Aerobic Improvement Using Heart Rate Recovery in Older Adults with Chronic Disease

Ellie Rickman, Stacey Reading. *The University of Auckland, Auckland, New Zealand.*

(No relevant relationships reported)

PURPOSE: The efficacy of aerobic training in a rehabilitation setting is often determined by comparing changes in aerobic capacity (VO_2peak) using a cardiopulmonary maximal exercise test (CPX). In many studies, the reported pre- vs. post-training difference in VO_2peak is $\leq$ 3ml·kg^{-1}·min^{-1} and it is assumed that subjects put forth a maximal effort in both tests. A concern therefore arises that a difference in effort between tests could account for a significant portion of the reported improvement in VO_2peak; especially when those with chronic illness who are unaccustomed to maximal effort exercise are tested. In the present study we retrospectively examined data to test the hypothesis that only individuals with an improvement in VO_2peak have an improvement in steady state heart rate recovery (HRR) after completing a CPX test. METHODS: Thirty-seven chronically ill participants (57 ± 15yrs) completed a cycle CPX test to voluntary termination before and after a 12-week exercise rehabilitation program based on current guidelines for cardiac rehabilitation. VO_2peak was defined as the highest rate of O_2 uptake over 15s during the final stage of exercise. Participants were partitioned into a group of responders (RS) (n=18; VO_2peak increased > 0.2L·min^{-1}) and non-responders (NRS) (n=19; VO_2peak increased < 0.2L·min^{-1}). HRR was defined as the difference between peak HR and HR at each minute of cycling at 40% of the pre-training CPX test peak workload, which was compared between pre- and post-program tests.
RESULTS: VO_2peak significantly improved post program in RS (2.2 ± 0.6 vs. 2.6 ± 0.5 L·min^{-1}; p<.05) but not NRS (1.9 ± 0.7 vs. 1.9 ± 0.7 L·min^{-1}). The RS pre-program VO_2peak was 88% of age and gender predicted values vs. 107% in the NRS. Only RS had a greater HRR at 5 minutes (RS pre 39 ± 11 vs. post 46 ± 9bpm; p <.05 and NRS pre 37 ± 10 vs. post 39 ± 11 bpm; N.S.). Among RS, 14 of 18 improved their HRR by more than 3 bpm compared to 7 of 19 in the NRS group.
CONCLUSION: Including a fixed recovery workload following a CPX test may be useful for confirming post-program increases in VO_2peak. In the present study, participants that improved VO_2peak were more likely to have concurrent improvements in HRR after exercise-based rehabilitation.

1524   Board #2   May 31 1:00 PM - 3:00 PM
Using the Heart Rate Index Equation to Estimate Peak METs in Physically Active Adults

Roger Sacks, Barry Franklin, FACSM, Jenna Brinks, Judy Boura, Shelby Potkin, Rima Rida, Harold Friedman, Abhay Bilolikar, Justin Trivax, Diedre Brunk. *William Beaumont Hospital, Royal Oak, MI.* (Sponsor: Dr. Barry Franklin, FACSM)

(No relevant relationships reported)

PURPOSE: Cardiorespiratory fitness (CRF) provides an independent marker for endurance performance and all-cause and cardiovascular mortality. Oxygen consumption (VO_2) during treadmill testing can be reasonably estimated from the attained speed, grade, and duration in men, women, and patients with coronary disease. Using our Cardiovascular Performance database and the Wicks equation (MSSE, 2011) to estimate maximal oxygen consumption (VO_2 max), expressed as metabolic equivalents (METs), we examined directly measured VO_2 max data on clients who self-reported performing vigorous physical activity $\geq$2 days per week to establish a prediction equation for this escalating patient cohort. **METHODS**: Our study population (n = 177) was comprised of young, middle-aged and older adults (mean ± SD age = 53.7 ± 11.0 years), including 101 men and 76 women who had completed a standard Bruce treadmill protocol to volitional fatigue. Estimated VO_2 max, expressed as maximal METs, was derived using the formula: Maximal METs = 6 (heart rate [HR] index) –5, where the HR index was calculated as the ratio between the maximal attained during cardiopulmonary exercise testing and the standing resting HR. These values were compared to the directly measured VO_2 max values using age, body mass index (BMI), and gender to further modify the Wicks equation so that it more accurately estimated CRF for this active population. **RESULTS**: For the entire study population (n = 177), mean BMI was 25.6 ± 3.8 kg/m^2. During exercise testing, resting HR increased nearly 2.4-fold (2.37 ± 0.39); directly measured VO_2 max, expressed as mean ± SD METs, was 10.2 ± 2.8. Using a linear regression model and the original Wicks prediction equation, as well as gender, age, BMI, an r-squared value of 0.62 was obtained (P-value <0.001). Two separate equations were developed using this model: Maximal METs = 20.8 + (–.08 x age) - (0.29 x BMI) + 0.24 x ([6 x heart rate index]–5) for men; and Maximal METs = 18.8 + (–0.08 x age) - (0.29 x BMI) + 0.24 x ([6 x heart rate index]–5) for women. **CONCLUSION:** These newly developed equations may help to more accurately estimate peak METs in physically active, fit men and women of varied ages. Future research with a larger patient population and additional modulators should serve to increase the coefficient of determination.

1525   Board #3   May 31 1:00 PM - 3:00 PM
Effects of 12-weeks of Aerobic Exercise Training on Insulin Sensitivity Under Energy Balanced Conditions in Women

Christian E. Behrens, Jr. *The University of Alabama at Birmingham, Birmingham, AL.* (Sponsor: Dr. Gordon Fisher FACSM, FACSM)

(No relevant relationships reported)

Background: Exercise training is well known to improve insulin sensitivity (SI). However, the duration in which exercise –induced improvements in SI persists varies significantly between studies, ranging from 0- to 72-hrs following the last bout of exercise. One caveat that may explain the variability between studies is the magnitude of energy deficit following exercise. **Purpose:** To assess the chronic effects of 12-weeks of aerobic exercise training and the acute effects of exercise intensity for improving SI when measured under energy balanced (EB) conditions. **Methods:** Thirty three untrained premenopausal women were evaluated at baseline, after 12-weeks of training, 22 hrs after either an acute- bout of moderate-intensity continuous (MIC) aerobic exercise (50% peak VO_2) or high intensity interval (HII) exercise (84% peak VO_2). Participants stayed in a room calorimeter during and after the exercise sessions. Food intake was adjusted to obtain EB across 24-hrs. SI was measured 22hrs after all conditions using the hyperinsulinemia euglycemic clamp. Muscle biopsies were obtained in a subset of 15 participants to examine mitochondrial oxidative capacity using high resolution respirometry. **Results:** A significant increase in SI was observed only following the HII condition (P < 0.05). There were no significant improvements in SI following 12–weeks of training or the MIC session. A significant improvement in mitochondrial respiratory capacity occurred following all post-training conditions (P < 0.05). No significant differences between energy consumed and energy expended were found between all conditions. **Conclusions:** The primary finding from this study was that SI only improved following a bout of HII exercise when measured under EB, which suggests that energy deficit following exercise plays a role in exercise-induced improvements in SI. While we were unable to measure muscle glycogen, it is possible that glycogen deficit is important in determining the magnitude of these exercise-induced improvements in SI. Last, improvements in mitochondrial respiratory capacity occurred even when SI did not change, suggesting that these two responses are independent of one another.

1526   Board #4   May 31 1:00 PM - 3:00 PM
Effect of Exercise Amount and Intensity on Change in Adipose Tissue and Skeletal Muscle Distribution

Andrea M. Brennan, Theresa E. Cowan, Paula J. Stotz, Gregory J. Clarke, Robert Ross, FACSM. *Queen's University, Kingston, ON, Canada.*

(No relevant relationships reported)

PURPOSE: Habitual exercise is associated with marked reduction in both total and abdominal adipose tissue (AT); however, the optimal dose (amount and intensity) of exercise required to elicit the greatest reduction remains unclear. The purpose of this investigation is to determine the separate effects of increasing exercise amount and intensity on AT and skeletal muscle (SM) mass in sedentary, abdominally obese adults. METHODS: Participants in this ancillary study included 105 men (40%) and women (60%) who were randomly assigned to one of four conditions for 24 weeks: control (C; n=20); low amount low intensity (LALI; 180 and 300 kcal/session for women and men, respectively, at 50% of VO_{2peak}, n=24); high amount low intensity (HALI; 360 and 600 kcal/session for women and men respectively at 50% VO_{2peak}, n=31); high amount high intensity (HAHI; 360 and 600 kcal/session for women and men, respectively, at 75% of VO_{2peak}, n=30). AT and SM mass were measured by magnetic resonance imaging at baseline and 24 weeks. RESULTS: Reductions in total AT (%; C, -0.2; LALI, -7.9; HALI, -10.8; HAHI, -11.5), abdominal subcutaneous AT (%; C, -0.3; LALI, -6.7; HALI, -10.1; HAHI, -12.9), visceral AT (%; C, -0.2; LALI, -15.5; HALI, -18.4; HAHI, -17.1), weight (%; C, -0.8; LALI, -4.7; HALI, -6.8; HAHI, -6.4) and waist circumference (%; C, -1.2; LALI, -4.5; HALI, -6.1; HAHI, -5.6) were greater in all exercise groups compared to control (p<0.0001), independent of age and sex. Reductions in total AT and abdominal subcutaneous AT were greater in HAHI compared to LALI (p=0.003). SM mass did not change at 24 weeks in any exercise

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Abstracts were prepared by the authors and printed as submitted.

group compared to control (p>0.05). CONCLUSION: Substantial reduction in visceral AT with a preservation of SM mass is observed independent of exercise amount and intensity; however, higher intensity (HAHI) may be more effective than guideline-recommended (LALI) exercise for reducing total and subcutaneous adiposity.
Supported by Canadian Institutes of Health Research (grant OHN-63277)

1527   Board #5   May 31 1:00 PM - 3:00 PM

Interval Training In Cardiac Rehabilitation

Rochus Pokan, FACSM[1], Stefan Heber[1], Helmuth Ocenasek[2], Serge P. von Duvillard, FACSM[3]. *[1]University of Vienna, Vienna, Austria. [2]Cardiomed Ourpatient Cardiac Rehabilitation Center, Linz, Austria. [3]University of Salzburg, 5400 Hallein/Rif, Austria.*
(No relevant relationships reported)

Rochus Pokan, FACSM[1] , Stefan Heber[1] , Helmuth Ocenasek[2], Serge P. von Duvillard, FACSM[3]
[1]University of Vienna, Vienna, Austria, [2]Cardiomed Outpatient Cardiac Rehabilitation Center Linz, Linz, Austria, [3]University of Salzburg, Salzburg, Austria.
Exercise training is a standard treatment for patients with coronary artery disease (CAD). Improvements in endurance capacity are an important aim of cardiac rehabilitation.
PURPOSE: We assessed the use of high intensity interval training (HIT) on cardiorespiratory fitness (CRF) and body mass index (BMI) compared to the isocaloric conventional endurance exercise training. **METHODS:** After initial exercise test, 50 patients were randomized into HIT and a control groups (CG). In both groups, patients exercised for 12 wks, 4 x per wk. Between inclusion and week 6, patients exercised 4 x per wk and from wk 6 to 12, patients exercised 2 x per wk, both sessions were supervised in cardiac rehabilitation center and additionally 2 x per wk on individual basis at home. Patients in CG exercised continuously only, while patients in the HIT group completed 2 interval and 2 continuous exercise training sessions per wk, in alternate sequence. After 6 wks and at the end of the training phase, exercise tests were repeated. Exercise protocol consisted of 5min of warm-up followed by 30min of continuous cycling at 60% of P_{max}. HIT exercise protocol consisted of 5min of warm-up, followed by 30min of interval training at: P_{mean}=60% P_{max}; P_{peak}=100% P_{max}; P_{rec}=20% P_{max}; t_{peak}=60s; t_{rec}=60s where P_{mean} was the mean workload during the 30min of exercise, P_{peak} was the peak workload intensity, P_{rec} was the recovery workload, t_{peak} was the peak workload duration, and t_{rec} was the recovery duration. For weeks 7-12, power output for each training session was recalculated according to P_{max} achieved in the second exercise test. **RESULTS**: The type of exercise training had a significant effect on BMI but not on absolute VO_2max. The CG reduced the BMI (-0.95) compared to the HIT group after 6 weeks, and the BMI decreased even further (-1.2) after 12 wks. **CONCLUSION:** Our results suggest that despite equal energy expenditure, HIT may be more effective in increasing muscle mass than endurance capacity.

1528   Board #6   May 31 1:00 PM - 3:00 PM

Feasibility of Aerobic Interval Training in Non-Ambulant Persons after Stroke

Sarah R. Valkenborghs[1], Kirk I. Erickson[2], Michael Nilsson[1], Paulette van Vliet[1], Robin Callister[1]. *[1]University of Newcastle, Newcastle, Australia. [2]University of Pittsburgh, Pittsburgh, PA.*
(No relevant relationships reported)

PURPOSE: To investigate the feasibility of aerobic interval training in non-ambulant persons after stroke.
METHODS: Intervals of aerobic exercise were performed on a low entry upright (928G3, Monark) or semi-recumbent (RT2, Monark) cycle ergometer depending on individual ability and impairment. Participants were prescribed 4 × 4-minute intervals of exercise at 85%HRmax with a 3-minute active recovery at 70% HRmax between each interval per 30-minute session, 3 times per week for 10 weeks. Heart rate (T31, Polar), rating of perceived exertion (Borg 6–20), workload (W), cadence and duration of exercise achieved were recorded in the last 15 seconds of each interval. Workload was initially prescribed based on data from an incremental cycle ergometer test and, where tolerated, was progressively adjusted to maintain intensity.
RESULTS: 9 participants (aged 62±12; 5 male) unable to walk without assistance after stroke (2.9±3.9 years) were recruited. There were no adverse events and 1 drop out (due to Bronchitis). Attendance for the remaining 8 participants was 93±6%. The mean training %HRmax was 72±14% for the higher intensity interval and 57±21%HRmax for the recovery interval, with all participants bar one achieving ≥85%HRmax at least once and the mean number of times being 28±49 over the 120 intervals (30 sessions). The mean increase in training workload between weeks 1 and 10 was 11.2±11.6 W (26.9±27.7%) for the higher intensity interval and 4±7.7W (17.4±33.3%) for the recovery interval.
Mean VO2peak was 12.99±4.48mL/kg/min at baseline and 14.62±4.57 mL/kg/min after 10 weeks, showing a mean increase of 1.63±2.43 mL/kg/min (12.5±18.7%) over the 10 week intervention. The mean R-value was 1.09±0.17 at baseline and

1.19±0.19 at outcome while the mean peak HR was 79±16%HRmax at baseline and 79±15%HRmax at outcome. The mean workload was 59±23W at baseline and 78±35W at outcome, showing a mean increase of 17±23W (29±40%).
CONCLUSIONS: Aerobic interval training at a moderate-high intensity on an upright or recumbent cycle ergometer is feasible and safe for persons who are non-ambulant after stroke. It should be further researched to investigate its potential to improve cardiorespiratory fitness after stroke and risk-factors for recurrent stroke.
Funding body: National Stroke Foundation, Australia

1529   Board #7   May 31 1:00 PM - 3:00 PM

The Effects Of Hiit On Body Composition And Muscular Strength In Sedentary, Obese Women

Jamie DeRevere, Amy S. Clark, Annie B. De La Rosa, Todd A. Astorino. *California State University San Marcos, San Diego, CA.*
(No relevant relationships reported)

Introduction: Obesity rates are increasing, with the incidence of obese U.S. adults increasing from 30.5% in 2000 to 37.0% in 2014 (Ogden et al., 2015). Additionally, more women suffer from obesity or extreme obesity compared to men (Ogden and Carroll, 2010). A consequence of sedentary lifestyles is poor muscular strength, which is a risk factor for diabetes and cardiovascular disease (Shiroma et al., 2017), as well as all cause mortality (Rantanen et al., 2000). High intensity interval training (HIIT) is a time efficient and robust mode of exercise, which elicits similar adaptations versus moderate intensity continuous training (MICT) in obese adults (Kong et al., 2016). Previous data show that HIIT promotes weight and/or fat loss in overweight or obese populations (Gillen et al., 2013; Martins et al., 2016), yet in other studies, body composition was unchanged in response to HIIT (Nybo et al., 2010; Whyte et al., 2010; Astorino et al. 2013). A recent study (Farina et al., 2017) showed increased muscle strength in response to wk of HIIT in active men.
PURPOSE: To investigate the effects of different types of HIIT on body composition and muscular strength in sedentary, obese women.
METHODS: 17 obese sedentary women (age = 37.51±10.53 yr) participated in a six-week exercise intervention consisting of three training sessions per week. They were randomized into low volume HIIT (LO) (n=9, BMI=37.22±3.34 kg/m²) or periodized HIIT (PER) (n=8, BMI=41.00±5.33 kg/m²) which were performed on a cycle ergometer. Body composition and muscle strength were measured pre- and post-training. Fat mass and fat free mass were measured using air displacement plethysmography via a BodPod. Peak knee extension and flexion torque at 60 deg/s was assessed using an isokinetic dynamometer. Measures of dietary intake and physical activity were also obtained during the study.
RESULTS: FFM was increased in LO (52.07±5.09 kg vs. 53.93±4.69 kg) and PER (55.40±6.604 vs 56.10±6.57 kg), (p=0.03), yet there was no interaction (p=0.33). There was no significant change in body mass (p=0.075), fat mass (p=0.19), or peak extension (p=0.36) or flexion torque (p=0.75).
CONCLUSION: Regardless of protocol, HIIT elicits body composition improvements including an increase in fat free mass, but has no effect on muscular strength or body fat in sedentary, obese women.

1530   Board #8   May 31 1:00 PM - 3:00 PM

The Effects Of A High-volume And High-intensity Resistance Training Program On Arterial Stiffness

Tim Werner[1], Thomas K. Pellinger[1], Nabil E. Boutagy[2], Demetri Rosette[1], Austin T. Ortlip[1], Morgan M. Vance[1]. *[1]Salisbury University, Salisbury, MD. [2]Yale University, New Haven, CT.*
(No relevant relationships reported)

Arterial stiffness has long been regarded as an indicator of disease and is an independent predictor of cardiovascular events. Controversies exist amongst the impact of resistance training protocols on the stiffening process in the major elastic arteries. This study was designed to address some of the controversies.
PURPOSE: To determine the vascular impact of a high-volume (HV), moderate resistance training program and a high-intensity (HI), moderate repetition training program on arterial compliance. **METHODS**: 21 otherwise healthy, male university students with limited resistance training experience (< 6 months) were randomized into one of three groups: 7 control (CO) group (22±3 yrs), 6 HI resistance exercise group (23±3 yrs), and 8 HV resistance exercise group (21±3 yrs). All were subjected to a series of tests including anthropometry, ultrasonography of the carotid artery, applanation tonometry, blood pressure acquisition, and maximal strength assessment. Subjects were instructed to maintain normal dietary patterns throughout the study period. Food consumption was monitored. All subjects in the training groups performed the same 8-10 exercises on training days. Subjects in the HV group trained at 50-70% of 1-RM with 10-15 repetitions and 2-4 sets per exercise for 3-5 days a week for 12 weeks. Subjects in the HI group trained at 70-95% of 1-RM with 3-6 repetitions and 2-3 sets per exercise for 3-5 days a week for 12 weeks. Subjects randomized to the control group were instructed to refrain from both cardiovascular and resistance exercise during the study period. Arterial stiffness comparisons

were calculated with two-way ANOVA with repeated measures. **RESULTS:** 1-RM significantly increased for squat (52% vs. 25%, p<0.05), bench press (31% vs. 27%, p<0.05) and seated rows (22% vs. 13%, p<0.05) in the HV and HI groups respectively. Carotid femoral PWV did not change in the HI (7.6±2 vs. 8.1±2 m/s, p>0.05), HV (6.3±1 vs. 6.8±2 m/s, p>0.05), and CO (6.7±1 vs. 6.7±1 m/s, p>0.05) groups. Beta stiffness index did not change in the HI (5.9±3.5 vs. 5.7±2.6 U, p>0.05), HV (6.5±1.9 vs. 6.5±2.1 U, p>0.05), and CO (7.2±4.4 vs. 6.4±3.1 m/s, p>0.05) groups. **CONCLUSION:** 12 weeks of HI and HV training does not appear to augment indices for arterial stiffness in young, adult males.

D-09   Basic Science World Congress - Thematic Poster - Moderating Skeletal Muscle II

Thursday, May 31, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100C

1531   Chair: Christopher McGlory. *McMaster University, Hamilton, ON, Canada.*

(No relevant relationships reported)

1532   Board #1   May 31 1:00 PM - 3:00 PM

Interface Pressure Mechanics, Perceptual and Cardiovascular Responses To Different Cuffs In Blood Flow Restriction

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(No relevant relationships reported)

Blood flow restriction (BFR) is becoming more widely used with strength training in sports medicine and rehabilitation. It can be used passively and actively to combat muscle atrophy and strength loss observed during unloading in early post-traumatic and surgical contexts. Varied Cuff types and pressures have been used but quantification of interface pressures, safety and tolerance have not been widely investigated. **PURPOSE** : To investigate the interface pressure mechanics, perceptual and cardiovascular responses to different cuffs during acute bouts of passive blood flow restriction [BFR] and BFR exercise. **METHODS**: Eighteen participants attended three experimental sessions in a randomised, crossover, counterbalanced design. Participants underwent inflations at 40% and 80% limb occlusive pressure (LOP) at rest and completed 4 sets of unilateral leg press exercise at 30% of one repetition maximum with BFR at 80% LOP. Different cuffs were used for each session: a rapid-inflation, variable-contour and handheld cuff. Cuff-to-limb interface and Set pressure (IP, SP) were measured using a universal interface device with pressure sensors. Perceived exertion and pain were measured after each set, mean arterial pressure (MAP) was measured pre-, 1-min post- and 5-min post-exercise. **RESULTS**: IP was lower than the SP in all cuff trials at rest (p<0.05). IP was, on average, 10.24±8.01 and 47.65±35.95 mmHg higher than the SP for the rapid-inflation and handheld cuffs (p<0.01) and 2.17±6.70 mmHg lower than the SP for the variable-contour cuff (p>0.05) across all exercise sets. Pain and exertion were significantly greater in sets 3 and 4 in the rapid-inflation and handheld cuffs compared to the variable-contour cuff (p<0.05). MAP was significantly higher in the rapid-inflation and hand-held cuffs compared to the variable-contour cuff at 1-min and 5 min post-exercise (p<0.05). **CONCLUSION**: BFR cuffs that apply higher pressures than prescribed amplify CV and perceptual responses. A variable-contour cuff that regulates pressure is the most safe and effective for rehabilitative purposes in clinical populations.

1533   Board #2   May 31 1:00 PM - 3:00 PM

Importance of Autophagy in the Recovery of Muscle Function After Injury in an Ovariectomized Model

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(No relevant relationships reported)

The lack of ovarian hormones accentuates the loss of muscle contractility after muscle injury. Mitochondria are required to meet the energetic demands of muscle contractility, but whether mitochondrial function is affected by muscle injury and impacts repair is unclear in the context of ovarian hormone depletion. **PURPOSE:** To test mitochondrial dysfunction after muscle injury in the context of ovarian hormone depletion and to investigate autophagy, a cellular process for degrading damaged and dysfunctional mitochondria, as a mechanism of mitochondrial remodeling during regeneration. **METHODS:** We subjected sham surgery wildtype (WT) and ovariectomized (OVX) mice to traumatic muscle injury and assessed the recovery of in

vivo muscle strength (i.e. ankle dorsiflexion) and state 3 respiration from permeabilized muscle fibers at 7 and 14 days post-injury. To investigate autophagy, expression of autophagy-related proteins Beclin1 (Atg6) and LC3 were assessed. To determine if an interaction exists between ovarian hormones and autophagy, muscle strength and state 3 respiration were assessed 14 days post-injury following sham or OVX surgeries on Ulk1 deficient mice, a necessary protein for mitochondrial-specific autophagy, and littermate controls. **RESULTS:** OVX resulted in a 10% reduction in muscle strength (p=0.045) pre-injury compared to sham. This was exacerbated by muscle injury (14 days post-injury: OVX 25% vs. sham 35% of pre-injury, p=0.038). For state 3 respiration, there was a main effect of injury demonstrating a substantial reduction in mitochondrial function at 7 and 14 days post-injury (p<0.0001), independent of ovarian hormones. There was a large induction of autophagy as indicated by greater Beclin1 and LC3 expression at 7 and 14 days post-injury, independent of ovarian hormones (p=0.001, p=0.014 respectfully). Interestingly, OVX-Ulk1-deficient mice demonstrated less recovery of muscle strength at 14 days post-injury compared to OVX-LM (p= p=0.016). **CONCLUSIONS:** After muscle injury a robust autophagic response is required to recover muscle function in a timely manner and this occurs in the presence and absence of ovarian hormones. However, decreased strength recovery in OVX-Ulk deficient mice suggests an interaction between ovarian hormones and autophagy during muscle regeneration.

1534   Board #3   May 31 1:00 PM - 3:00 PM

Effect Of Diet And Exercise On Skeletal Muscle Morphology Following Radiation Therapy

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(No relevant relationships reported)

With an increase in long-term cancer survival, the late effects of radiation therapy, a common treatment option, is an area of clinical concern. Furthermore, while obesity and physical activity levels are known to be associated with the risk for cancer, little is known regarding the effect of these two physiological factors on health following radiation therapy. **PURPOSE**: The purpose of the current investigation was to evaluate the influence of obesity and physical activity on skeletal muscle morphology following a sub lethal dose of radiation (IR). **METHODS**: Four-week-old male CBA mice were divided into control (CON; n=20) and high fat groups (HF; 45% fat, n=20). At 9 weeks of age mice in each group were further divided into sedentary (SED, n=10) and exercise (EX, n=10) groups. EX mice completed 4 weeks of treadmill training. At 13 weeks of age all mice were administered a therapeutic IR dose (3 Gy), and subsequently continued their previous exercise and dietary protocol for an additional 4 weeks. **RESULTS**: At 10 weeks of age HF groups had a higher percentage of body fat and higher body weight compared to controls (*p<0.05, n=9-10). At 16 weeks of age HF groups had significantly higher lean body mass and gastrocnemius/soleus complex mass compared to controls (p<0.05, n=9-10). Myofibre cross-sectional area (MCSA) analysis revealed an increase in EX groups (p<0.05, n=6-8), with a trend for an increase in HF groups (p=0.062, n=6-8). Fibre distribution analysis identified a decrease in 500-999 μm fibres (p<0.05, n=6-8), and a greater proportion of large fibres (≥2000 μm, p<0.05, n=6-8) in EX groups. Myonuclei/fibre in HF-EX was 1.3-fold higher than CON-EX and HF-SED (p<0.05, n=6-8). **CONCLUSIONS**: Diet-induced obesity resulted in an increase in body weight, adiposity, lean mass, and muscle weight. However, exercise training, but not HF, increased MCSA, and the proportion of large fibres. The increase in myonuclei content in HF-EX mice may implicate a role for muscle stem cell populations in this adaptive response. Future evaluation of distinct muscle stem cell populations and muscle morphological characteristics will be completed to further characterize the effect of diet and physical activity on skeletal muscle morphology following radiation therapy.

1535   Board #4   May 31 1:00 PM - 3:00 PM

Plasticity Of Insulin Sensitivity And Muscle Mass In Healthy Older Adults Following Inactivity And Re-ambulation

Paul T. Reidy, Alec Mckenzie, Ziad Mahmassani, Nikol Yonemura, Vincent Morrow, Robin Marcus, Paul Hopkins, Yu K. Lin, Micah Drummond. *University of Utah, Salt Lake City, UT.*

(No relevant relationships reported)

Many older adults undergo repeated cycles of inactivity as they encounter sickness or injury. It is unknown how readily the insulin sensitivity and muscle mass of healthy older men and women are affected by modest physical inactivity (step reduction) and if these outcomes recover following a return to habitual physical activity. **PURPOSE**: To determine the changes in insulin sensitivity and leg muscle mass and function following inactivity and recovery.
METHODS: Healthy older adults (5F/7M, 70±2y, 26 kg/m² BMI, HbA1c 5.5±0.1%) were assessed before (PRE), after 2-weeks of step reduction (RA: <75% of normal

Abstracts were prepared by the authors and printed as submitted.

activity), and then following 2-weeks of baseline activity level (REC) for insulin sensitivity (euglycemic-hyperinsulinemic clamp), leg muscle mass (via DXA and pQCT) and isometric knee extension (KE) strength.
RESULTS: Participants decreased step counts during RA by ~70%. Glucose infusion rate (ml/kg FFM/min) during the clamp was 14.3±1.4 at PRE, decreased (p<0.05) to 12.5±1.7 at RA which then rebounded above PRE (p<0.05) to 16.6±1.9 at REC. This response was largely driven by the men. After removal of an outlier (+4.5% increase after RA), leg lean mass decreased after RA (p<0.05) 1.3±0.5% and then returned to PRE values at REC. Calf muscle area (pQCT) decreased (p<0.05) 2.4±0.9% from PRE to RA and then returned to PRE values at REC. KE strength decreased (p<0.05) 8.0±3.5% after RA and remained depressed 7.4±1.4% compared to PRE.
CONCLUSIONS: In healthy older men and women, insulin sensitivity as assessed via the gold standard (euglycemic hyperinsulinemic clamp) decreased (15±6%) following 2-weeks of modest physical inactivity, but unexpectedly, was able to rebound (39±8%) after re-ambulation such that it was 14±5% higher than baseline. This response may be limited to healthy older adults and therefore warrants further investigation. These older adults experienced modest muscle mass loss with step reduction that was restricted to the legs and especially the lower leg muscles. Knee extension strength was decreased after RA but did not recover following re-ambulation. Follow-up analysis may provide additional insight into the molecular mechanisms associated to the current metabolic and muscle alterations that occur with short-term physical inactivity and re-ambulation. Supported by NIH Grant R01 AG050781

1536 Board #5 May 31 1:00 PM - 3:00 PM

Effect Of Resistance Exercise Training On Anabolic Resistance To Amino Acids In Healthy Older Adults

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(No relevant relationships reported)

Aging attenuates the contraction-induced stimulation of muscle protein synthesis (MPS). This phenomenon is termed "anabolic resistance", and may contribute to the slow loss of muscle mass with advancing age (sarcopenia). Some studies also reported anabolic resistance to amino acid/protein intake with aging. However, this notion has not been firmly established. Acute bouts of exercise can improve the ability of amino acids to stimulate MPS by activating mechanistic target of rapamycin complex 1 (mTORC1) signaling and translation initiation, but it is not known whether chronic exercise training may improve muscle sensitivity to amino acid availability.
PURPOSE: The aim of this study was to determine if healthy older adults exhibit muscle anabolic resistance to essential amino acid intake (EAA), and whether resistance exercise training (RET) improves the muscle sensitivity to EAA.
METHODS: To test our hypothesis 19 healthy older adults (65-80 years old) underwent a 12-week progressive resistance exercise training program (RET). Before and after training we measured muscle mass and strength, and performed stable isotope infusion experiments with muscle biopsies to determine MPS and markers of amino acid sensing in the basal state and in response to EAA ingestion.
RESULTS: RET increased muscle strength (+15%), lean mass (+2%), and muscle cross sectional area (+17%) in healthy older adults (P<0.05). MPS and mTORC1 signaling (i.e., phosphorylation status of 4E-BP1, S6K1, and rpS6) increased following EAA ingestion (P<0.05). Basal MPS increased by 28% after RET (P<0.05). However, the amplitude of the response of MPS and mTORC1 signaling to EAA ingestion did not differ from pre-training values (P>0.05).
CONCLUSION: Aging does not inhibit the EAA-stimulation of muscle mTORC1 signaling and MPS. In addition, RET did not increase the sensitivity of muscle to amino acids. Our data indicate that anabolic resistance to amino acids is not a significant problem in healthy older adults. We suggest that future work in conditions associated with more pronounced muscle wasting is necessary to determine whether exercise training can improve muscle sensitivity to amino acids or protein. Supported by NIH/NIA R56 AG051267, P30 AG024832, NIH/NCATS UL1 TR001439.

1537 Board #6 May 31 1:00 PM - 3:00 PM

Impact of Short-term Sedentariness on Week-to-Week Myofibrillar Protein Synthesis Rates in Physically Active Young Men

Brandon J. Shad[1], Andrew M. Holwerda[2], Yasir S. Elhassan[1], Luc J.C. van Loon[2], Janice L. Thompson, FACSM[1], Gareth A. Wallis[1]. *[1]University of Birmingham, Birmingham, United Kingdom. [2]Maastricht University, Maastricht, Netherlands.*
(No relevant relationships reported)

Sedentary behaviour has been linked to the development of cardiometabolic disease and insulin resistance but little is known about its impact on the regulation of skeletal muscle mass. **PURPOSE**: To determine the impact of short-term sedentariness on week-to-week myofibrillar protein synthesis rates. **METHODS**: Utilising a within-subject design, eight physically active young men (22±1 y) completed 7 days of habitual physical activity (HPA) followed by 7 days of increased sedentariness (SED) using a step reduction model. Two days prior to the study, participants ingested 400 mL of deuterium oxide (^2H_2O) with 50 mL ^2H_2O doses ingested daily thereafter for the remainder of the study. Daily saliva samples were collected throughout to assess body water deuterium (^2H) enrichments. Muscle biopsies were collected at the beginning of the study (D1), after 7 days of HPA (D8) and after 7 days of SED (D15) for assessment of week-to-week myofibrillar protein synthesis rates. **RESULTS**: Currently, eight participants have completed the intervention. Preliminary data indicate that step count was reduced by approximately 92% during SED (14052±797 to 1185±134 steps·d^{-1}; P < .001) and this led to a substantial increase in the contribution of sedentary behaviour to daily activity (72±3 to 90±1 %; P < .001) and decrease in the contribution of standing (17±2 to 8±1 %; P < .001) and ambulation (10.0±0.4 to 1.0±0.2 %; P < .01) to daily activity. ^2H_2O ingestion resulted in mean body water ^2H enrichments of 0.64±0.04 % during HPA and 0.70±0.06 % during SED (P < .05). Week-to-week myofibrillar protein synthesis rates decreased by approximately 26% from 1.24±0.08 %·d^{-1} during HPA to 0.92±0.14 %·d^{-1} during SED (P = .096). **CONCLUSIONS**: Preliminary data show a trend for short-term sedentariness to reduce week-to-week myofibrillar protein synthesis rates in physically active young men.

1538 Board #7 May 31 1:00 PM - 3:00 PM

Utilizing Next Generation Sequencing to Describe Age-Related Skeletal Muscle Changes with Bed Rest

Ziad S. Mahmassani, Paul T. Reidy, Alec I. McKenzie, Chris Stubben, Robin Marcus, Paul LaStayo, Mark Supiano, Michael Howard, Micah J. Drummond. *University of Utah, Salt Lake City, UT.*
(No relevant relationships reported)

Short-term bed rest is used to simulate periods of disuse experienced during hospital visitation. In our previous reports, we found that 5d of bed rest induced a ~4% loss of skeletal muscle mass in OLD (60-79 y) but not YOUNG (18-28 y) subjects (Interaction: P < 0.001). Identifying muscle transcriptional events that underlie this consequence of bed rest will help identify therapeutic targets to offset muscle loss in vulnerable older adult populations. **Purpose**: To compare the gene transcriptome response between YOUNG and OLD skeletal muscle after bed rest and identify a transcriptional program that underlies rapid loss of muscle mass. **Methods:** RNA was isolated and sequenced (HiSeq, Illumina; DESeq, R) from muscle biopsies obtained from the vastus lateralis of YOUNG (N=9; 22.9 ± 1.1 y, 171.6 ± 2.0 cm, 65.6 ± 4.6 kg) and OLD (N=18; 67.6 ± 1.3 y, 173.7 ± 1.8 cm, 75.7 ± 2.2 kg) men and women before and after five days of bed rest (Tanner et al 2015; Reidy et al 2017). **Results:** After bed rest, 551 genes responded similarly and 61 genes were differentially regulated between YOUNG and OLD (P ≤ 0.05). Ingenuity Pathway Analysis identified the top commonly regulated pathways to be related to Actin Cytoskeleton Signaling, ILK Signaling, Calcium Signaling, and Mitochondrial Dysfunction. Out of the differentially regulated genes, 51 were altered in YOUNG (42 increased, 9 decreased) but were unresponsive in OLD after bed rest (P ≤ 0.05). On the other hand, 9 genes were altered only in OLD as a result of bed rest (P ≤ 0.05) of which 5 are protein coding (MRPL49, HIST1H2BC: increased; PXDNL, NEXN, MAGI2: decreased). These genes code for proteins related to mitochondrial function, DNA structure, oxidative stress, Z-disc stabilization, and activin signaling, respectively. **Conclusion:** Our preliminary results indicate that altered gene expression in YOUNG in response to bed rest may be indicative of a compensatory expression profile to combat muscle loss. Additional investigation of the differentially regulated gene responses in young and old adults are ongoing in efforts to further describe underlying molecular events that occur in response to bed rest. Supported by NIH Grant R01 AG050781.

D-10   Thematic Poster - **Movement Training**

Thursday, May 31, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100F

1539   **Chair:** Kevin R. Ford, FACSM. *High Point University, High Point, NC.*

(No relevant relationships reported)

1540   Board #1   May 31 1:00 PM - 3:00 PM

Neuromotor Training in Older Adults: A Pilot Study

Natalie Barron, Michelle Perri, Joshua Guggenheimer. *St. Catherine's University, St Paul, MN.* (Sponsor: Mark Blegen, FACSM)

(No relevant relationships reported)

PURPOSE: To discover if older women have improved gait speed and ROM after participating in a neuromotor training exercise program.
METHODS: Seven independently living women (79±9 yrs) participated in our study. Subjects underwent 16 sessions of neuromotor training over an 8-week period. The program consisted of two sets of 10 repetitions of eight exercises: squats, chair dips, lunges, band row, hip flexion and extension, bicep curls, ankle plantar flexion and dorsiflexion, and one legged balance. Hip flexion and ankle arc range of motion were measured pre- and post-intervention using an Acumar digital inclinometer. Gait speed, stride length, double stance time and timed-up-and-go (TUG), were measured using the BTS G-Walk device both pre- and post-intervention.
RESULTS: TUG times were significantly reduced from 14±6 sec to 10±4 sec, (p = 0.006). Interestingly, right hip ROM was significantly reduced post-intervention (94±13 vs. 88±13, p = 0.01). While not statistically significant, there was a 14% increase in gait speed and 8% and 10% increases in left and right leg stride lengths, respectively. Moreover, double limb stance time decreased by 12% and 19% with the left and right legs leading, respectively.
CONCLUSIONS:
The importance of improved gait and ROM variables is crucial for OA in order to reduce the risk of falls. The intervention used in this study produced a significant reduction in TUG times, which may imply enhanced functional independence, as TUG performance is contingent upon lower-body strength and gait speed. Even though statistically significant improvements in ROM and gait speed were not found, practical improvements were observed. Future neuromotor interventions should continue to find exercises that prioritize the improvement of gait and ROM variables, thereby enhancing functional independence.

1541   Board #2   May 31 1:00 PM - 3:00 PM

Dual-task Training Reduces Fall Frequency And Increases Physical Activity In Individuals With Parkinson's Disease

Amanda L. Penko[1], Jacob E. Barkley[2], Jay L. Alberts[1]. *[1]Cleveland Clinic, Cleveland, OH. [2]Kent State University, Kent, OH.*

(No relevant relationships reported)

Parkinson's disease (PD) is a neurodegenerative disease associated with motor and non-motor symptoms that increase individuals' risk of falling, which may contribute to lowered physical activity behavior. Dual-task constructs, or simultaneous performance of a motor-cognitive task, results in an increase in gait dysfunction in PD; however both single-task (separate training of gait and cognition), and dual-task training (i.e., simultaneous training of gait and cognition) have been shown to improve gait function in PD. A comparison of the effects single- and dual-task interventions on physical activity behavior, falls and motor symptoms in PD has yet to be assessed. **Purpose:** The aim of this study was to determine the effects of single- and dual-task training on physical activity, falls, and motor symptoms in PD patients with a history of falls. **Methods:** Twenty-one PD patients (age 63 ± 9 years) were randomized into single (*n* = 11) or dual-task (*n* = 10) training group. Both training groups exercised 40 minutes, three times/wk for eight weeks. Daily physical activity, 30-day fall frequency, and Unified Parkinson's Disease Rating Scale (UPDRS) were assessed during peak levodopa response (1-hr post antiparkinsonian medication administration) by a single-blinded rater at baseline and post intervention. **Results:** UPDRS scores significantly (*p* = 0.007) improved from baseline (34.90 ±11.24) to end of treatment (32.75 ±11.63) for both the single and dual-task groups. Physical activity significantly increased (*p* = 0.03) from baseline (4,942 ± 4,415 steps/day) to end of treatment (5,914 ± 5,425 steps/day) for both single and dual-task groups combined. Fall frequency decreased significantly (*p* = 0.02) in the dual-task group from baseline (2.30 ±3.02 falls) to end of treatment (0.80 ± 1.14 falls) with no change (*p* = 0.32) in falls in the single-task group (0.60 ± 0.84 falls at baseline, 0.80 ± 1.14 falls at end of treatment). **Conclusion:** Both single and dual-task training were successful in increasing physical activity.

The improvement in UPDRS scores exceeded the threshold for minimally clinically important difference. Fall frequency was reduced only in the dual-task group, which indicates dual-task training is superior than single-task training at reducing falls in PD.

1542   Board #3   May 31 1:00 PM - 3:00 PM

A Novel Movement Ability Training Program Enhances Performance in Female Soccer Athletes

Casey Myers[1], Mike Decker[1], Kevin Shelburne[1], Matt Shaw[1], Julie Graves[2], Eric McCarty[2], Michelle Wolcott[2]. *[1]University of Denver, Denver, CO. [2]University of Colorado, Boulder, CO.*

(No relevant relationships reported)

PURPOSE: The purpose of this study was to assess the effects of a novel training program on the field-based performance testing of speed, power and movement quality.
METHODS: Twenty-five, elite female soccer athletes (13.3 ± 0.6 y; 161.9 ± 5.3 cm; 50.9 ± 4.9 kg) participated in a 7-week, training program performed with a wearable neuromuscular device (WND). The training program was directed by an exercise specialist and consisted of a three-tier progression of exercise complexity and intensity to enhance the athlete's movement ability. All athletic exposures with and without the WND were recorded and analyzed descriptively. Field-based measurements of speed, power and movement quality were performed at the start (pre) and the end (post) of the training program. Speed was measured with a stop watch during a 20 yard sprint. Power was calculated from the flight times of three, single leg maximum vertical jumps captured with a wireless inertial measurement unit attached with double sided adhesive over the sacrum. Movement quality was determined by video analysis of three drop jump landings using the original and modified Landing Error Scoring System (LESS). A one-way repeated measures ANOVA contrasted pre and post sprint times and the average number of landing errors scored by the standardized methods of the LESS and the modified LESS. A two-way (time, leg) repeated measures ANOVA was used to measure the change in average and peak single leg jump heights (p=.005).
RESULTS: Twenty-two athletes completed pre and post testing. Each athlete had an average of 11.3 ± 2.9 hours of weekly athletic exposure of which 6.9 ± 1.7 hours were with the WND. Over the course of training, speed increased 4% (pre, 3.36 ± .06 s; post, 3.22 ± .04 s; F(1,21)=10.171, p=.004), average and peak power increased 40% (pre, .125 ± .003 m; post, .175 ± .006 m; F(1,21)=59.618, p<.001) and 37% (pre, .140 ± .004 m; post, .192 ± .007 m; F(1,21)=48.482, p<.001) and movement quality increased by 20% (LESS: pre, 6.7 ± .4 errors; post, 5.3 ± .5 errors; F(1,21)=15.032, p=.001; modified LESS: pre, 7.3 ± .4 errors; post, 5.8 ± .5 errors; F(1,21)=22.353, p<.001).
CONCLUSIONS: The novel training program enhanced the field-based measurements of speed, power and movement quality in elite female soccer athletes.

1543   Board #4   May 31 1:00 PM - 3:00 PM

Results from the Randomized Controlled Trial Cyclical Lower Extremity Exercise (CYCLE) Trial for Parkinson's disease

Jay L. Alberts, Amanda L. Penko, Anson Rosenfeldt, Nicole M. Zimmerman. *Cleveland Clinic, Cleveland, OH.*

(No relevant relationships reported)

Parkinson's disease (PD) is a neurodegenerative disease affecting approximately one million Americans. Our previous work suggested that forced exercise (FE), a mode of aerobic exercise in which voluntary exercise (VE) rate is augmented, results in global motor improvements. **Purpose:** The aim of this randomized clinical trial was to systematically evaluate the effects of voluntary and forced exercise on the motor symptoms of PD. **Methods:** A total of 100 individuals with PD (age 63 ± 8 years, *n* = 38 females) were randomized into one of three groups: VE (*n* = 40), FE (*n* = 40), or no-exercise control (*n* = 20). The VE and FE groups exercised 3x/week for 8 weeks on a stationary semi-recumbent cycle ergometer in a target heart rate range of 60-80% of heart rate reserve. The FE group exercised on a stationary cycle with the assistance of a motor that augmented pedaling rate by 35% compared to their preferred exercise rate. The MDS-Unified Parkinson's Disease Rating Scale (UPDRS) was used to characterize PD motor function. All clinical evaluations were completed while patients were 'off' antiparkinsonian medication (12 hr) at baseline, end of treatment (EOT), EOT+4 week and EOT+8 week. **Results:** UPDRS-III scores significantly decreased from baseline to the EOT for both the VE and FE groups. The VE and FE groups demonstrated significant improvements in clinical ratings following exercise. The magnitude of improvement was 5.4 and 4.5 points for the VE and FE groups (*p*<0.001) at EOT. The significant decrease in UPDRS-III was maintained for the VE (-3.5) and FE (-3.2) during the EOT+8 week follow up. The control group exhibited a slight worsening, 2.2 increase, at EOT in clinical ratings. There were no significant differences between the VE and FE groups. **Conclusion:** Improvements in global motor performance following VE and FE interventions indicate high intensity aerobic exercise is likely enhancing central nervous function (CNS) which ameliorates basal ganglia dysfunction associated to PD. The clinical rating improvement in the FE and

VE groups persisted eight weeks after ending treatment suggesting high intensity aerobic cycling may have potential in altering PD progression and efficacy as a complementary treatment to traditional approaches to PD.

1544   Board #5   May 31 1:00 PM - 3:00 PM

Long-term Tai Chi Exercise Lead to Enhanced Resistance Postural Perturbation Among Older Adults

Jiahao Pan[1], Cuixian Liu[2], Li Li, FACSM[3]. *[1]361° (CHINA) CO., LTD,, Xiamen, China. [2]Shanghai University of Sport, Shanghai, China. [3]Georgia Southern University, Statesboro, GA.*
(No relevant relationships reported)

PURPOSE: The purpose of this study was to examine the influences of performing precision fitting task on the dynamics of postural sway among older adults. **METHODS**: Three groups (12 each) participants aged 65 to 75 years recruited for the project: habitual Tai Chi practitioners (TC, body mass (M) = 64.4 ± 9.3 kg, height (H) = 162.5 ± 6.9 cm), long term brisk walkers (BW, M = 62. 8 ± 6.6 kg, H = 163.5 ± 6.5 cm), and sedentary (SE, M = 68.3 ± 7.0 kg, H = 163.9 ± 7.0 cm). Participants were asked to stand on a force plate (Kistler 9287C, Kistler Corporation, Switzerland) with their feet forming a 30° angle and their heels 8% body height apart. Participants were required to fit a 90 * 90 mm block into three different openings (small: 100 * 100, medium: 115 *115, and large: 130 * 130 mm) with two different distances (1 and 1.3 times arm's length). The task time and base of support were recorded by optical gate and reflective markers using Vicon system (Vicon Corporation, USA) synchronized with force plate data collection. The average time-to-contact (TTC) measures were used to examine the dynamic of posture sway during fitting task. Two two-way ANOVAs were used to assess the effects of group by size for average TTC at the two reaching distances. **RESULTS**: There was no group by size interaction observed for either distance ($p > .05$). Significant differences were detected for group (close: $F_{2,99} = 11.567$, $p < .00$; far: $F_{2,99} = 13.549$, $p < .00$) and size (close: $F_{2,99} = 49.228$, $p < .00$, far: $F_{2,99} = 36.296$, $p < .00$) for both distances. LSD Post Hoc revealed that TTC for TC was significantly less than that of the SE and BW at both close (2.30±0.56 vs. 2.81±0.71 vs. 2.61±0.71 s, $p < .05$) and far distance (1.82±0.31 vs. 2.30±0.61 vs. 2.11±0.58 s, $p < .05$). Additionally, TTC of small fitting size was significantly longer than that of the middle and lager fitting sizes, while TTC of middle size also was longer than that of the larger size at both close (3.25±0.75 vs. 2.46±0.43 vs. 2.14±0.28 s, $p < .05$) and far (2.52±0.57 vs. 1.98±0.42 vs. 1.74±0.30 s, $p < .05$) distances. **CONCLUSIONS**: Small fitting opening provided greater perturbation to postural control lead to longer TTC. However, postural control of the TC revealed having greater resistance to the perturbation lead to shorter TTC. Therefore, Tai Chi training have the potential for resist postural perturbation and prevent fall among older adults.

1545   Board #6   May 31 1:00 PM - 3:00 PM

Feasibility and Effectiveness of Augmented Feedback on Landing Mechanics in Female Basketball Players Compared to Controls

Erin H. Hartigan, Kelly Coleman, Jaclyn Brooks, Hailey Frisbee, Michael Lawrence, Katie Hawke, Gwenyth Breslen. *University of New England, Portland, ME.*
(No relevant relationships reported)

PURPOSE: Improper landing biomechanics (dynamic limb valgus,[1] hard landing,[2,3] and limb asymmetries[4]) influence risk of ACL injury in female athletes.[5] An intervention to train women to land properly using minimal time and resources appears warranted.[6] This study tested the feasibility and effectiveness of implementing video feedback and task cards (written and pictorial cues) into basketball practice. Effectiveness was defined as reducing dynamic limb valgus (greater hip abduction and external rotation angles), landing softer [lesser vertical ground reaction force (vGRF), greater hip and knee flexion angles], and decreasing limb differences. **METHODS**: 16 female high school basketball players were randomly assigned to a control (n=8) or intervention (n=8) group. The intervention (I) group utilized delayed video feedback and task cards at 6 practices while the control (C) group received typical coaching. Pre and post-season data collections included 5 double and 5 single limb drop jumps [dominant (D) and non-dominant (ND) limb] from a 31 cm box onto a force plate. Motion analysis equipment and software were used to calculate peak hip and knee angles and vGRF over the first 10% of landing.[2] A RM-ANOVA was used (P<.05). **RESULTS**: The feedback paradigm did not increase practice time and cost was minimal ($8 for BaM video delay app, iPad® was borrowed). Significance for double limb landing include: a group*time interaction for hip flexion angles (p=.04; C group decreased hip flexion angles over time: Pre=55°; post=46°); main effect of time for hip abduction (ABD) angle (p=.009; pre=1.7°; post=3.2°); and a main effect of group for hip ABD angles (p=.043; I=4.6°; C=.3°). Significance for single limb landing included a time*group interaction for vGRF (p=0.04, I group decreased over time); and a time*limb interaction for hip external rotation angles [p=.016; limb differences at pre (D=5.8°; ND=.77) and not at post (D=1.5°; ND=4.3°)]. **CONCLUSION:** This intervention provided varied feedback for different learning styles[7] and may improve landing mechanics in female athletes. High team compliance with the intervention may

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occur since it requires minimal time and resources. **References:** 1. Paterno AJSM 2010 2. Paterno CJSM 2007 3. Hewett AJSM 2005 4. Fox SM 2014 5. Munro PTS 2012 6. Sugimoto CPMRR 2015 7. Braakhuis JHSE 2015

1546   Board #7   May 31 1:00 PM - 3:00 PM

Effects of Gait Modification on Lower Extremity Sagittal Plane Biomechanics

Oladipo Eddo[1], Bryndan Lindsey[1], Shane Caswell[1], David Hollinger[1], Jessica Pope[1], Matt Prebble[1], Ana M. Azevedo[2], Nelson Cortes[1]. *[1]George Mason University, Manassas, VA. [2]University of Lisbon, Lisbon, Portugal.*
(No relevant relationships reported)

Gait modification (GM) via real-time biofeedback (RTB) is a conservative intervention that has shown positive outcomes in post stroke and diabetic patients. Results from a recent systematic review support the effectiveness of this approach for increasing peak internal knee extension moment (iPKEM). iPKEM is a resistive moment to peak external knee flexion moment (ePKFM), which is associated with altered joint loading. Scarce information exists on the comparative effectiveness of existing GM strategies. **PURPOSE:** To compare the effectiveness of trunk lean (TL), medial knee thrust (MKT), and foot progression (FP) on iPKEM. **METHODS:** 10 healthy individuals volunteered for this study (28.4±3.8 years, 1.73±0.1 m, 75.3±12.5 kg). Mean and standard deviation (SD) for iPKEM, trunk angle, knee angle (KA), and foot angle during stance were calculated from 10 baseline trials using a motion capture system (200Hz) and force plates (1000Hz). 10 trials completed for each strategy using RTB so that joint angles fell within a determined range (1-5 SD) relative to baseline. Visual 3D (V3D) was used to project visual RTB as a line graph displaying real-time joint angle during stance. V3D was used to calculate joint angles (°) and internal moments (Nm/kgm). Participants modified their gait based on strategy so the line fell within a highlighted bandwidth representing target ranges. Repeated measures ANOVA was used to assess differences in iPKEM between strategies. Dependent t-tests were conducted to compare joint angles between baseline and modification strategy (p<0.05). **RESULTS:** A significant difference between strategies was attained for iPKEM (p=0.001). MKT (.53±.24) had higher iPKEM than all other strategies (Baseline: .31±.2, FP: .34±.12, TL: .31±1.4). No other statistically significant difference was found (p>0.05). **CONCLUSION:** MKT gait increased iPKEM despite no significant differences in KA compared to baseline. The observed increase in iPKEM during MKT gait suggests that participants were successful at attenuating ePKFM during the absorption phase of stance. Lack of significant changes in joint angles across conditions suggests that overall gait kinematics were similar for all conditions. Future research employing greater values for kinematic change is needed to further understand the effect of GM on iPKEM.

1547   Board #8   May 31 1:00 PM - 3:00 PM

Can the Newly Learnt Gait Pattern after Running Retraining be Translated to Untrained Conditions?

Janet H. Zhang[1], Zoe Y.S. Chan[1], Ivan P.H. Au[1], Winko W. An[2], Roy T.H. Cheung[1]. *[1]The Hong Kong Polytechnic University, Kowloon, Hong Kong. [2]Boston University, Boston, MA.*
(No relevant relationships reported)

Running retraining is reported to be effective in impact loading control and injury prevention. During running retraining, biomechanics metrics, such as tibial shock, from one side of the body is usually provided while the participant is running at a controlled test speed. Whether participants are able to translate the newly learnt gait pattern to untrained conditions (e.g., untrained side of the limb and untrained speeds) remains unanswered. **PURPOSE**: To compare the tibial shock of the participants' untrained limb and at untrained running speeds before and after a course of running retraining. **METHODS**: Ten runners underwent a running retraining program as described by Crowell & Davis (2011). Before and after the program, their tibial shock from both limbs were measured using wireless accelerometers when they were running at the training speed (TS), 110% of TS and 90% of TS. The peak tibial shock during the last 20 footfalls in each 3-minute trial were extracted for analyses. **RESULTS**: The effect of gait retraining did not interact with test speeds (p=0.699) but it interacted with limb side (p<0.05). We found a reduction in the tibial shock on the trained limb at all test speeds (p=0.001-0.008; Figure 1). However, we only observed a trend of tibial shock reduction on the untrained side (p=0.074-0.098; Figure 1). **CONCLUSIONS**: The current running retraining protocol may not be fully optimized as the newly learnt gait pattern may not be completely translated to untrained conditions.
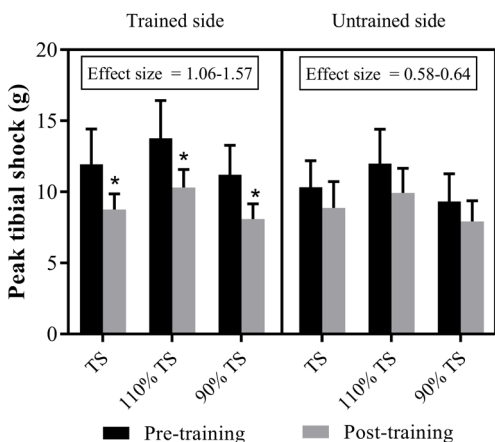
Figure 1. Peak tibial shock before and after running retraining at three speeds

TS: Training speed
* Significantly reduced compared to pre-training test

D-11   Thematic Poster - **Physical Activity and Health Promotion in Cancer Survivors**

Thursday, May 31, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100H

1548   Chair: Joachim Wiskemann. *Penn State College of Medicine, Hershey, PA.*

(No relevant relationships reported)

1549   Board #1   May 31 1:00 PM - 3:00 PM
Rural-Urban Differences in Meeting Physical Activity Recommendations in Cancer Survivors in Central Pennsylvania

Scherezade K. Mama[1], Wayne Foo[2], Renate Winkels[2], Joachim Wiskemann[2], Shirley M. Bluethmann[2], William Calo[2], Joel E. Segel[1], Eugene J. Lengerich[2], Kathryn H. Schmitz, FACSM[2].
[1]*The Pennsylvania State University, University Park, PA.* [2]*Penn State Cancer Institute, Hershey, PA.* (Sponsor: Kathryn H. Schmitz, PhD, MPH, FACSM, FTOS)

(No relevant relationships reported)

PURPOSE: To examine rural-urban differences in physical activity among cancer survivors in central Pennsylvania.
METHODS: Cancer survivors residing in central Pennsylvania were identified through the Pennsylvania Cancer Registry and mailed select questionnaires based on the Behavioral Risk Factor Surveillance Survey (BRFSS). The 2013 Rural/Urban Continuum Codes (RUCC) were used to classify cancer survivors as urban/metro (RUCC codes 1-3) or rural/nometro (RUCC codes 4-9). Cancer survivors self-reported frequency and duration of aerobic physical activity and frequency of muscle-strengthening physical activity. To maintain consistency with the ACSM exercise guidelines for cancer survivors and the 2008 Physical Activity Guidelines for Americans, respondents were classified as meeting aerobic guidelines (yes/no ≥150 minutes/week), muscle-strengthening guidelines (yes/no ≥2 times/week), both aerobic and muscle-strengthening guidelines, or neither aerobic nor muscle-strengthening guidelines. A composite variable was included in multivariate models to examine the association between rural-urban residence and meeting physical activity recommendations, adjusting for cancer site, age, BMI, education, and income.
RESULTS: Rural (*n*=64, 10.9%) and urban (*n*=521) cancer survivors from 27 counties in Pennsylvania completed mailed questionnaires. The prevalence of physical inactivity was higher in rural cancer survivors (rural 39.1%, urban 30.8%), but this difference was not statistically significant (χ^2=1.8, *p*=.180). Urban cancer survivors were 1.8 times more likely to meet aerobic physical activity guidelines compared to rural cancer survivors (95% CI: 1.015, 3.25; *p*=.040); however, this was only marginally significant after adjusting for covariates (OR=1.91; 95% CI: 0.98-3.76; *p*=.057). Adjusted analyses with the composite variable confirmed that urban cancer

survivors were 2.6 times more likely than rural cancer survivors to meet the aerobic physical activity guideline compared to meeting neither guideline (OR=2.62; 95% CI: 1.08-6.31, *p*=0.03).
CONCLUSIONS: Culturally and contextually adapted interventions are needed to improve adherence with physical activity recommendations and reduce cancer health disparities in rural cancer survivors in Pennsylvania.

1550   Board #2   May 31 1:00 PM - 3:00 PM
Breast Cancer Survivors' Psychosocial Beliefs, Physical Activity and Quality of Life

Zachary Pope[1], Nan Zeng[1], Jung E. Lee[2], Zan Gao, FACSM[1].
[1]*University of Minnesota-Twin Cities, Minneapolis, MN.*
[2]*University of Minnesota-Duluth, Duluth, MN.* (Sponsor: Zan Gao, FACSM)

(No relevant relationships reported)

PURPOSE: Physical activity (PA) among breast cancer survivors (BCS) has been associated with quicker physiological and psychological recovery following cancer treatment. Yet, little study has examined the predictive utility of psychological beliefs on BCS's quality of life (QoL) and objectively-assessed PA. Therefore, this study examined whether BCS's psychosocial beliefs predicted QoL and daily PA, energy expenditure (EE), and steps/day, with an additional examination of whether QoL differed based upon whether BCS met PA recommendations.
METHODS: Forty BCS (X_{age} = 51.2 ± 10.0 years; $X_{wt.}$ = 80.1 ± 19.7 kg) participated in baseline testing of two larger parent intervention trials. Participants completed validated surveys regarding social cognitive beliefs (i.e., self-efficacy, social support, enjoyment, outcome expectancy, and barriers) and QoL outcomes (i.e., anxiety, physical functioning limitations, fatigue, depression, sleep disturbances, pain interference/intensity, and ability to participate in social roles/activities). One-week daily sedentary behavior (SB), light PA (LPA), moderate-to-vigorous PA (MVPA), EE, and steps/day were assessed via ActiGraph GT3X+ accelerometers.
RESULTS: BCS participated in a daily average of 556.2 min, 119.9 min, and 31.3 min of SB, LPA, and MVPA, respectively, with respective daily EE and steps/day being 385.5 kcals and 4,808 steps. Stepwise multiple regression indicated self-efficacy was the only observed predictive of overall QoL—explaining 34.9% of the variance for this variable (F(1, 37) = 19.3, *p* < 0.01). Further, only outcome expectancy was found predictive daily LPA (F(1, 37) = 5.5, *p* = 0.03)—explaining 13.2% of the variance. Notably, however, independent t-tests showed no differences in any QoL outcome between BCS who met or did not meet PA recommendations.
CONCLUSIONS: Findings suggest health professionals concentrate first on increasing BCS PA self-efficacy and outcome expectancy to increase PA participation and improve QoL. Larger sample sizes might allow for broader investigations of the predictive utility of psychosocial beliefs on QoL and daily PA behavior.

1551   Board #3   May 31 1:00 PM - 3:00 PM
A Meta-analysis Of Tai Chi/qigong On Fatigue And Quality Of Life In Cancer Patients

Xiaoyue HU, Stanley Sai-chuen HUI, FACSM. *The Chinese University of Hong Kong, Hong Kong, China.* (Sponsor: Stanley Sai-chuen HUI, FACSM)

(No relevant relationships reported)

Due to the advances in cancer treatment, 64% of the person diagnosed with cancer can expected to be alive in 5 years. Long-term cancer-related health problems for these cancer survivors becoming a public health concern. Growing evidence suggests Tai chi or Qigong as a mind-body exercise become an option for cancer patients to improve QoL and reduce the cancer related fatigue symptom (CRF).**PURPOSE**: To investigate the effects of Tai Chi /Qigong versus non-Tai Chi/Qigong treatment on cancer patients' health related QoL and CRF.**METHODS**:Studies on randomized controlled trials (RCT) of Tai Chi /Qigong as an intervention were retrieved from Medline, CINAHL, SPORTDiscus, Cochrane Library, and PubMed. Meta-analyses were performed on changes in QoL and CRF. QoL was measured by SF-36 questionnaire and cancer-specific QoL was assessed by functional assessment of cancer treatment-general (FACT-G). CRF was assessed by brief fatigue inventory (BFI) or functional assessment of chronic illness therapy-fatigue (FACIT-F). Random effects model was used to calculate the pooled mean difference (MD) with 95% confidence interval (CI).
RESULTS: A total of 14 RCTs (1,001 subjects)were included in this review. Nine RCTs (567 subjects) provided sufficient data to estimates the effect size for QoL and CRF. For QoL assessed by SF-36 questionnaire, significant differences were found in two subscales, mental health and vitality. The MD of mental health and vitality were 2.33 (95% CI: 1.71, 2.96; Z score = 7.31; *p* <0.01), 1.50 (95% CI: 0.56, 2.44; Z score = 3.14; *p* =0.002). QoL assessed by five subscales (PWB, SWB, FWB, total) FACT-G change scores were in support of Tai Chi/Qigong interventions and indicated a statistically significant effect. Their MD were 2.36 (95% CI: 1.32, 3.40), 2.91 (95% CI: 1.49, 4.32), 1.24 (95% CI: 0.03, 2.44), 2.70 (95% CI: 1.73, 3.68), and 7.74 (95% CI: 4.58, 10.91), respectively. For CRF, the standardized mean difference (SMD) was−0.51 (95% CI: −0.98, -0.04; Z score = 2.14, *p* = 0.03) indicating that Tai Chi /Qigong had

Abstracts were prepared by the authors and printed as submitted.

significant positive effects on cancer patients' CRF.**CONCLUSIONS**: This study concluded that Tai Chi/Qigong had positive effects on QoL and cancer related fatigue symptoms on cancer patients. The findings need to be interpreted with caution due to limited studies and relatively small sample size.

1552   Board #4   May 31 1:00 PM - 3:00 PM

Does Low Volume High-Intensity Interval Training Elicit Superior Benefits to Continuous Low to Moderate-Intensity Training in Cancer Survivors?

Kellie L. Toohey, AEP. *University of Canberra, Bruce, Australia.*
(No relevant relationships reported)

PURPOSE: It is generally recommended that exercise form part of the standard of care for all cancer survivors, however, the optimal evidence-based clinical exercise guidelines for cancer survivors are currently not clear. The aim of this study was to determine the effectiveness of low volume high-intensity interval training (LVHIIT) and continuous low to moderate-intensity exercise training (CLMIT) on health outcomes in cancer survivors. **METHODS**: Sedentary cancer survivors (n = 75) within 24 months of diagnosis, aged 51 ± 12 y were randomised into three groups for 12 weeks of LVHIIT (n = 25), CLMIT (n = 25) or control group (n = 25). The LVHIIT group performed 7 x 30s intervals (≥ 85% predicted maximal heart rate), the CLMIT group performed continuous aerobic training for 20 min (≤ 55% predicted maximal heart rate) on a stationary cycle, three times per week. **RESULTS**: An interaction effect (p = 0.01) for waist circumference in the LVHIIT group was found. The LVHIIT group had larger improvements in emotional well-being compared to the other groups (p < 0.01). Participants in the CLMIT and LVHIIT group demonstrated improvements in physical and functional well-being (p < 0.01). **CONCLUSIONS**: LVHIIT elicited greater benefits in improving waist circumference and emotional well-being compared to the other groups in this study. Exercise positively impacted body composition, white blood cell count (WBC) and haemodynamic variables, without any adverse effects. Future research should explore the mechanisms involved in the changes reported in this study, so that clinicians can provide clinically relevant evidenced-based exercise prescription for cancer survivors.

1553   Board #5   May 31 1:00 PM - 3:00 PM

The Association Between Light Physical Activity and Physical Functioning Among Cancer Survivors

Elizabeth A. Fallon, Bennett McDonald, Tenbroeck Smith, Kassandra I. Alcaraz, J. Lee Westmaas, Alpa V. Patel. *American Cancer Soceity, Atlanta, GA.* (Sponsor: Melissa Bopp, FACSM)
(No relevant relationships reported)

Substantial research supports the positive effect of moderate-to-vigorous physical activity (MVPA) on physical functioning among cancer survivors. Less research has examined the association of light physical activity (LPA) and physical functioning, or the potential moderating effect of MVPA on this association.
PURPOSE: To explore the independent association between LPA and physical functioning and any moderating effect of MVPA on this association among cancer survivors.
METHODS: Self-report data from the American Cancer Society's Studies of Cancer Survivors I and II were merged. Using the Leisure Time Exercise Questionnaire, four LPA groups (0, 1-59, 60-119, and 120+ minutes/week) and three MVPA groups (0, 1-149, and 150+ minutes/week) were created. ANCOVAs assessed the independent associations of LPA and MVPA as well as the LPA by MVPA interaction on the SF-36 Physical Functioning scale. Covariates included age, time since diagnosis, race/ethnicity, cancer type by gender, cancer stage, and number of comorbidities.
RESULTS: The sample (N = 10,255) was primarily white/Caucasian (80.8%), female breast (29.5%) or male prostate cancer survivors (21.4%), with in situ/localized cancer (69.2%), 4.8 years (SD = 3.3) from diagnosis, had 1-2 comorbidities (49.9%), and mean age of 64.1 years (SD = 12.4). Almost 27% of the sample reported no leisure-time LPA or MVPA. Both LPA [F(3) = 19.93, p < 0.001] and MVPA [F(2) = 310.48, p < 0.001] were independently, positively associated with physical functioning. The LPA by MVPA interaction [F(6) = 31.34, p < 0.001] showed that among those reporting no MVPA, there is a significant difference in physical functioning between those reporting no LPA and those reporting ≥120 min/week of LPA [mean difference = 5.65 (SE = 0.3), t = 18.80, p < 0.001]. A linear trend with increasing levels of LPA was evident [t = 17.19, p < 0.001]. Among those reporting 1-149 and 150+ min/week of MVPA, there was no association of LPA and physical functioning (ps > .05).
CONCLUSIONS: Among cancer survivors reporting no leisure-time MVPA, LPA was positively associated with physical functioning. The effect was clinically meaningful at the highest level of LPA (≥120 min/week). Randomized control trials are needed to determine the impact of LPA on physical functioning among cancer survivors healthy enough to begin LPA.

1554   Board #6   May 31 1:00 PM - 3:00 PM

Diet and Eating Difficulties Affect Exercise Suitability in Head and Neck Cancer Patients Beginning Radiation

Josh N. Muhammad[1], P M. Anton, FACSM[2], K S. Courneya, FACSM[3], K A. Rao, FACSM[4], Laura Q. Rogers, FACSM[1]. [1]*The University of Alabama at Birmingham, Birmingham, AL.* [2]*Southern Illinois University, Carbondale, IL.* [3]*The University of Alberta, Edmonton, AB, Canada.* [4]*Southern Illinois University, Springfield, IL.* (Sponsor: Laura Rogers, FACSM)
(No relevant relationships reported)

PURPOSE: Determine if head and neck cancer (HNCa) patients are suitable candidates for exercise training based on macronutrient intake. Also, identify macronutrient associations with fatigue, lean mass, strength, physical functioning, and eating difficulties. **METHODS**: Cross-sectional 3-day food diary data from 23 HNCa patients initiating radiation therapy were analyzed. Self-administered survey assessed demographics. Functional Assessment of Cancer Therapy (FACT) measured eating difficulties (additional concerns subscale items) and fatigue (higher score indicated greater fatigue). Lean mass was measured by bioelectric impedance, strength by handgrip dynamometer, and physical functioning by a physical performance battery. Associations were analyzed with Spearman correlations. **RESULTS**: Participants were 60±10.8 years of age, 96% Caucasian, and 70% male with a mean body mass index of 28.75±6.5. The most frequent cancer stage was IV and site was oropharynx (61% and 70%, respectively). Difficulty swallowing, difficulty eating solid foods, and mouth pain was reported by 43%, 35%, and 48%, respectively. The mean macronutrient intake (g/day) was 249 ± 85 of carbohydrate (CHO), 81 ± 34 of fat, and 83 ± 39 of protein (PTN) with 33% reporting intake of less than 0.8 g/kg/day of PTN. Fatigue was associated with percent kilocalories from CHO (r=0.52, p=.02) and PTN (r=-0.48, p=0.03). Lean mass was positively correlated with total intake of CHO (r=0.46, p=.04), fats (r=0.54, p=.01), PTN (r=0.64, p,>.01) and kilocalories (r=0.56, p=.01). No significant correlations were observed between macronutrients and strength or physical functioning. Fat intake was positively correlated with greater ability to swallow (r=0.66, p<.01) and eat solid foods (r=0.60, p<.01) while CHO were negatively correlated with ability to swallow (r=-0.81, p<.01) and eat solid foods (r=-0.72, p<.01). PTN intake was positively correlated with ability to swallow (r=0.47, 0=.03). **CONCLUSIONS**: PTN intake sufficiency in HNCa patients beginning radiation may jeopardize exercise suitability. Macronutrient intake is associated with fatigue and lean mass. Ability to eat may serve as a marker for individuals warranting particular nutritional attention. Funding: AICR #10A048, NCI R25CA76023

1555   Board #7   May 31 1:00 PM - 3:00 PM

Complementary and Alternative Medicine Use in Cancer Survivors in a Structured Exercise Program

Peter Smoak[1], Matthew Christensen[1], Nicholas Harman[1], Daniel Shackelford[2], Reid Hayward[1], Katie Kage[1], Jessica Brown[2], Laura Stewart[1]. [1]*University of Northern Colorado, Greeley, CO.* [2]*Carroll University, Waukesha, WI.*
(No relevant relationships reported)

INTRODUCTION: Approximately 12.7 million people are diagnosed with cancer each year and many undergo conventional treatments including chemotherapy, radiation, and surgery. Complementary medicines supplement these conventional treatments while alternative medicine refers to practices intended to replace traditional cancer treatments. Complementary and alternative medicine (CAM) practices can include, but are not limited to dietary supplementation, Chinese herbal medicine, and physical manipulation. A yearlong 2012 survey found that cancer survivors spent $4 billion on vitamins and minerals, $1.2 billion on non-vitamin or mineral natural products, and $500 million on massage. **PURPOSE:** To examine the use of CAM in cancer survivors currently participating in a structured exercise program. **METHODS:** Participants from the University of Northern Colorado Cancer Rehabilitation Institute (N=29) were given a 28-question, traditional paper and pencil, CAM survey. **RESULTS:** All respondents indicated that they were happy with the conventional medical treatments that they received, and 70% of respondents reported CAM use after their cancer diagnosis. Half of the respondents started CAM use after physician recommendation, while the other half of respondents started using CAM on their own. Also, 45% of respondents used some form of CAM while undergoing cancer treatment. Almost half of respondents (48%) claimed that CAM was very effective, while the other 52% of respondents were unsure. Only 1 one participant reported experiencing a CAM-related negative side effect. Respondents reported using dietary supplements (75%), vitamins (75%), and minerals (30%) with the most commonly used forms including Vitamins D and B, calcium, fish oil, astragalus, and ginseng. Other therapies used were massage (60%), acupuncture (25%), and cannabis (15%). **CONCLUSION:** A high percentage of cancer survivors participating in a structured exercise program reported using CAM. Consequently, cancer rehabilitation programs may want to consider providing information related to the safety and effectiveness of these products and practices to cancer survivors.

1556   Board #8   May 31 1:00 PM - 3:00 PM

Exploring Racial/Ethnic Differences in Physical Activity and Behavioral Risk Factors among Cancer Survivors in Central Pennsylvania.

William A. Calo[1], Shirley Bluethmann[1], Wayne Foo[1], Eugene Lengerich[1], Scherezade Mama[2], Joel Segel[2], Renate Winkels[1], Joachim Wiskemann[1], Kathryn Schmitz, FACSM[1]. *[1]Penn State College of Medicine, Hershey, PA. [2]Penn State College of Health and Human Development, University Park, PA.*

(No relevant relationships reported)

PURPOSE: Racial/ethnic disparities in physical activity and behavioral risk factors are widely reported among the U.S. adult population. Little is known, however, about whether these racial/ethnic differences exist among cancer survivors. To address this gap, we examined the associations between race/ethnicity and meeting ACSM physical activity guidelines and behavioral risk factors among cancer survivors.
METHODS: We analyzed cross-sectional data from 585 cancer survivors who reside in central Pennsylvania. Survivors were identified using the Pennsylvania Cancer Registry and were mailed a survey using Behavioral Risk Factor Surveillance Survey-based items from May-September, 2017. We categorized race/ethnicity into: non-Hispanic whites (NHW; 89%), non-Hispanic blacks (NHB; 4%), Hispanics (4%), and others (3%). We classified respondents as participating in any physical activities/exercises, meeting aerobic guidelines ($\geq$150 minutes/week), muscle-strengthening guidelines ($\geq$2 times/week), or both guidelines. We also assessed whether participants were overweight/obese, current smokers, had multiple comorbid conditions, and perceived health status. Analyses were adjusted for sex, age, education, and income.
RESULTS: Sixty-seven percent reported participating in any physical activities in the past month. NHW reported higher levels of physical activity than NHB and Hispanics but these differences were not significant (p>.05). Neither race/ethnicity was associated (p>.05) with meeting aerobic guidelines, muscle-strengthening guidelines, or both. More NHB were overweight/obese than NHW or Hispanics but these differences were not significant (p>.05). Hispanics reported higher levels of smoking, however, race/ethnicity was not associated with smoking status (p>.05). All groups reported similar levels of comorbid conditions and perceived health status.
CONCLUSIONS: It was encouraging to find no evidence of racial/ethnic disparities in physical activity and behavioral risk factors in our sample. However, non-adherence to physical activity guidelines was high in all racial/ethnic groups. Future studies with more diverse samples are needed to further explore racial/ethnic differences in physical activity and their potential impact on cancer survivors' health.

D-12   Clinical Case Slide - **Cervical and Thoracic Spine**

Thursday, May 31, 2018, 1:00 PM - 2:40 PM
Room: CC-200E

1557   Chair: John P. Batson, FACSM. *Lowcountry Spine & Sport, LLC, Hilton Head Island, SC.*

(No relevant relationships reported)

1558   Discussant: Jeffrey M. Mjaanes, FACSM. *Northwestern University, Evanston, IL.*

(No relevant relationships reported)

1559   Discussant: Sherrie L. Ballantine-Talmadge. *CU Sports Medicine and Performance Center, Boulder, CO.*

(No relevant relationships reported)

1560   May 31 1:00 PM - 1:20 PM

Thoracic Pain in a Competitive Middle-Aged Tennis Player

Stacey Bennis[1], Daniel Blatz[2]. *[1]McGaw Medical Center of Northwestern University/Shirley Ryan AbilityLab, Chicago, IL. [2]Northwestern University/Shirley Ryan AbilityLab, Chicago, IL.* (Sponsor: Joseph Ihm, MD, FACSM)

(No relevant relationships reported)

HISTORY: A 47-year-old male competitive tennis player presented to a musculoskeletal clinic with nine day history of acute right-sided mid-thoracic back pain that started after serving a tennis ball. One week later, the patient developed a thoracic rash, treated as herpes zoster by his internist. Eight months later, he returned to the musculoskeletal clinic with one week history of acute bilateral thoracic back pain and one day history of left thoracic rash. He described two prior episodes of herpes zoster (10 years prior, 8 months prior) and mild varicella zoster as a child. He denied neurologic complaints or immunocompromise.
PHYSICAL EXAMINATION: Initial examination revealed normal neurologic findings, negative lower limb dural tension tests, and right mid-thoracic paraspinal muscle tenderness exacerbated by left trunk rotation. At follow up, examination was stable except for a new erythematous vesicular rash with surrounding allodynia in dermatomal distribution at the left mid-thoracic spine.
DIFFERENTIAL DIAGNOSIS:
1. Acute recurrent herpes zoster
2. Thoracic radiculitis
3. Post-herpetic neuralgia
4. Thoracic paraspinal muscle strain
TEST AND RESULTS:
- MRI Thoracic Spine without Contrast: Multilevel degenerative changes. Moderate left foraminal stenosis at T7-8. Moderate to severe right foraminal stenosis at T9-10.
- HIV Ag/Ab: negative.
- Infectious Disease Consult: "heavy tennis playing may have resulted in re-activation of VZV."
FINAL WORKING DIAGNOSIS:
1. Acute left thoracic radiculitis due to recurrent herpes zoster reactivation from heavy tennis playing
2. Acute right thoracic radiculitis due to zoster sine herpete versus thoracic neural foraminal stenosis
3. Chronic right thoracic pain due to post-herpetic neuralgia versus thoracic radiculitis
TREATMENT AND OUTCOMES:
1. Valtrex 1000mg PO TID x7 days and 1000mg TID at onset of any future symptoms
2. Topical lidocaine patch versus capsaicin patch for treatment of post-herpetic neuralgia neuropathic pain
3. Discussed possibility of gabapentin as an alternative option for management of post-herpetic neuralgia
4. 2-3 weeks rest from tennis, and rest from tennis at onset of any future symptoms
5. Follow up after MRI (patient has not yet followed up in the office)

1561   May 31 1:20 PM - 1:40 PM

Cervical Spinal Injury: Presenting Issue —Decreased Range Of Motion Globally, Mild-to-moderate Stiffness With Chronic Pain

Zenon R. Jimenez. *Mercy College, Dobbs Ferry, NY.* (Sponsor: M. Allison Williams, FACSM)

(No relevant relationships reported)

Cervical Spinal Injury: Presenting Issue —decreased range of motion globally, mild-to-moderate stiffness with chronic painHISTORY:36 y/o retired rugby player sustained multiple collisions during his professional career is now presenting with signs and symptoms indicative of cervical spinal trauma. He reports having many concussions, after which he wouldn't recall his own memories of finishing a game and regained awareness of self many hours post event. Also, he reports that "every Sunday while he played professionally felt as if he was in a car accident" at the high level of intensity he was expected to perform.**PHYSICAL EXAMINATION**:Last seven years, individual has been waking up to both arms presenting completely numb through his hands. Last six months, symptoms have intensified; experiencing local burning into right latissimus dorsi during trunk flexion. Furthermore, right leg also experiences a local burning sensation whenever he's driving. Left arm and hand severely cramp whenever he performs any actions, which require a greater than usual amount of exertion and may limit many of his career functions. Chronic cervical pain at the base with stiffness. Occasional left drop foot that impedes ambulation**DIFFERENTIAL DIAGNOSIS**:Suspected herniated nucleus pulposusPossible cervical spinal stenosis**TEST AND RESULTS**:Exaggerated deep tendon reflexes left of midline Clonus with multiple beats with quick stretch of left foot into dorsiflexion(+) Hoffman's & Babinski sign bilaterallyInverted brachioradialis reflex on left armDecreased ROM globally in all directionsMild tenderness to palpation locally near the spinous process of C6X-ray(+) MRI HNP**FINAL / WORKING DIAGNOSIS**:Cervical spondylotic myelopathy from long standing protrusion of the C5/6 disc resulting in cord flatting.**TREATMENT AND OUTCOMES**:Physical therapy with non-significant changes from the baseline. Underwent two courses of methyl-prednisone, which alleviated complications during the admission, but shortly after the medication was discontinued, complications presented to pre medication levels. Non-steroidal inflammatory drugs were unsuccessful at ameliorating signs and symptoms.Surgery for C4/5, C5/6 disc replacement with prestige LP prosthesis, via anterior cervical discectomy with replacement instead of fusion.

1562   May 31 1:40 PM - 2:00 PM

Spinal Trauma in a Division 1 Football Player

Arjun K. Ramprasad. *Crozer-Keystone Health System, Springfield, PA.* (Sponsor: Tom Kaminski, PhD, FACSM)

(No relevant relationships reported)

CLINICAL CASE SAMPLE

HISTORY: A division 1 football player developed acute onset shortness of breath after a tackle during game play. He made a proper form tackle but was struck in the sternum by an opposing player and the side by a teammate. On the field he initially complained of difficulty breathing but his airway remained patent. He then complained of rib and upper back pain but was able to walk off the field under his own power. A sideline evaluation demonstrated thoracic spine tenderness. He was then transported to the ER via EMS.

PHYSICAL EXAMINATION: Initial on-field examination revealed no sternal or laryngeal tenderness but did show right sided posterior rib tenderness. Additional sideline exam revealed midline thoracic tenderness around T6. He was neurovascularly intact and had full active range of motion of his neck and all extremities.

DIFFERENTIAL DIAGNOSIS:
1. Laryngeal fracture
2. Sternal fracture
3. Traumatic rib fracture
4. Vertebral fracture
5. Spinal cord trauma

TESTS AND RESULTS:
CT scan of cervical spine:
— No acute cervical spine fracture
CT scan of thoracic spine:
— Acute burst type compression fracture of T6 with 4mm of retropulsion
MRI or thoracic spine
— Acute burst fracture of T6 vertebral body with approximate 25% height loss along with marrow edema. A strain of the interspinous ligaments between T-6 & T-7 is also seen

FINAL/WORKING DIAGNOSIS:
Acute traumatic burst fracture of T6 vertebrae

TREATMENT AND OUTCOMES:
1. The initial concern was for airway compromise, but his airway remained patent. Spinal cord injury was a concern due to midline thoracic tenderness but unlikely as he was ambulatory and had an intact neurological exam.
2. After admission, imaging and a discussion with orthopedics, it was decided not to use a thoracic body brace as he would need a cervical extension due to his T6 fracture.
3. He was kept overnight for observation then discharged with instructions to limit spine flexion and extension. Repeat MRI at 2 weeks showed no worsening of his fracture or ligament sprain. His pain was controlled with oxycodone and muscle relaxers.
4. The plan is to work with physical therapy to progress his movement as he heals

1563   May 31 2:00 PM - 2:20 PM

Thoracic Radiculopathy Case

Malia Cali, Jacques Courseault. *LSUHSC, New Orleans, LA.*

(No relevant relationships reported)

HISTORY: A 44-year-old male with greater than 100 miles/week biking regimen presented to clinic with symptoms of chest pain, nausea and abdominal pain associated with a 30lb weight loss over 3 months. His pain was exacerbated by flexion and prolonged sitting. Pain was relieved by remaining in an upright position. Extensive cardiac work-up and MRI of the abdomen and pelvis were performed prior to presentation in clinic and were negative. A GI consultant was unable to establish a diagnosis.

PHYSICAL EXAM: Examination of the left upper abdomen near the insertion of the rectus on the rib cage exhibited severe active myofascial trigger points. Palpation of these trigger points induced nausea, abdominal, and chest pain. There was severe tenderness of the thoracic paraspinals from T6-T10. Reflexes and upper and lower extremity strength testing was normal. Sensation was normal.

DIFFERENTIAL DIAGNOSES:
1. Thoracic Radiculopathy with Active Myofascial Abdominal Trigger Points
2. Gastritis
3. Malignancy
4. Coronary Artery Disease

TEST AND RESULTS:
1. MRI of the thoracic spine:
• Scattered small perineural cysts, the largest measuring 0.7cm in diameter in the T10-T11 foramen, as well as slight central posterior protrusion of the T6-T7, T8-T9, and T9-T10 discs.
1. EMG and NCV:
• Findings consistent with inactive, subacute multilevel mid thoracic radiculopathy.

FINAL/WORKING DIAGNOSES:
Thoracic Radiculopathy due to Tarlov cysts and posterior protrusion of discs

TREATMENT AND OUTCOMES:
1. Trigger point injections under needle EMG guidance into the thoracic paraspinals and rectus abdominis were successful for symptom relief
2. Physical Therapy
3. Lyrica
4. Avoidance of prolonged flexion activities such as the cycling position
5. Returned to most daily activities. Symptoms improved significantly after trigger point injections and physical therapy with a focus on traction and extension-based exercises.

1564   May 31 2:20 PM - 2:40 PM

Persistent Right Upper Limb Weakness: Football

Melissa Lau, Michael Baria. *Ohio State University, Columbus, OH.*

(No relevant relationships reported)

HISTORY:
Patient is a 15 year old previously healthy male linebacker presenting with the chief complaint of right upper limb weakness after tackling an opponent. He completed a form tackle, hitting his opponent with the right shoulder. Upon contact he experienced immediate right upper limb dysesthetic pain down to the hand with concomitant loss of strength of his entire right arm. Over the next 24 hours, his pain resolved but profound weakness persisted with complete inability to abduct the upper limb.

PHYSICAL EXAM:
-Neurological: Strength exam demonstrated 1/5 weakness in all shoulder movements including flexion, abduction, and external rotation. He has 3+/5 strength with elbow flexion, and 4/5 with wrist flexion and extension. Biceps reflex was depressed but present. Sensation was normal.
-Musculoskeletal: Full active range of motion in cervical spine, mild tenderness to palpation at approximately C5 but no step off appreciated. Shoulder examination demonstrated no deformity, tenderness, or range of motion impairment.

DIFFERENTIAL DIAGNOSIS:
1. Cervical spine injury with resultant spinal cord injury
2. Cervical radiculopathy
3. Cervical nerve root avulsion
4. Right upper trunk brachial plexopathy
5. Suprascapular and/or axillary neuropathy
6. Rotator cuff tear
7. Shoulder fracture / dislocation

TESTS AND RESULTS:
-XR cervical spine (flexion/extension) and XR right shoulder (AP views with internal/ external rotation and axillary views): no acute pathology with no evidence of laxity
-MRI cervical spine: Mild right foraminal disc protrusion at C5-C6 contributing to mild neural foraminal stenosis. Torg ratio 0.77
-EMG: Severe C5 and moderate C6 radiculopathy. Severe axonotmesis without neurotmesis

WORKING DIAGNOSIS:
C5 and C6 radiculopathy with axonotmesis

TREATMENT/OUTCOMES:
-Initial: C-spine precautions and R arm sling placement until cervical spine was cleared by MRI
-2 weeks post injury: Neuromuscular re-education and active assisted range of motion started
-Return To Play: No sporting activity until neurologic recovery completed. It remains controversial as to whether he should resume football or wrestling. Given the Torg ratio and the severity of his injury, there is an unquantifiable risk of recurrence if collision sports are resumed should he eventually regain full neurological function.

D-13   Clinical Case Slide - **Knee III**

Thursday, May 31, 2018, 1:00 PM - 3:00 PM
Room: CC-200F

1565   **Chair:** Scott A. Paluska, FACSM. *Christie Clinic Sports Medicine, Champaign, IL.*
(No relevant relationships reported)

1566   **Discussant:** Kentaro Onishi. *University of Pittsburgh Medical Center, Pittsburgh, PA.*
(No relevant relationships reported)

1567   **Discussant:** Dennis Khalili-Borna, FACSM. *Kaiser Permanente, Fontana, CA.*
(No relevant relationships reported)

1568   May 31 1:00 PM - 1:20 PM
Knee Pain - Football, Basketball

Alexandra Warrick, Julie Ingwerson, Brian Haus. *UC Davis, Sacramento, CA.* (Sponsor: Brian Davis, M.D., FACSM)
(No relevant relationships reported)

HISTORY: 16 year-old high school football and basketball athlete was referred to Sports Medicine. He could not recall a specific injury, but had 2 months of recurrent pain and swelling with high-impact activities. No neuropathic, mechanical, nor instability symptoms. No prior knee orthopedic history.
PHYSICAL EXAMINATION:
Inspection showed slight genu valgum and small right knee effusion. No pain with palpation of all bony and soft tissue landmarks of the knee. Active range of motion was pain free and symmetric for knee flexion and extension. Strength was intact at 5/5 hip flexion, knee extension and knee flexion. Provocative maneuvers showed no pain with bounce and McMurrays, firm 1+ endpoint with Lachmans, anterior drawer, and posterior drawer. He was stable and symmetric with no laxity or pain during varus and valgus stressing of the knee at 0 and 30 degrees of flexion. No pain with patellar compression and negative dial testing.
DIFFERENTIAL DIAGNOSIS: Includes meniscus pathology, plica syndrome, patellofemoral pain, osteochondritis dissecans (OCD), stress injury
TESTS AND RESULTS:
1. Standing knee xrays showed medial femoral condyle OCD with knee effusion and loose body in suprapatellar space.
2. MRI of right knee showed 1.7 x 1.3 cm osteochondral defect at the central weight-bearing surface of the medial femoral condyle with displaced osteochondral fragment in the suprapatellar bursa.
FINAL WORKING DIAGNOSIS:
Grade IV osteochondritis dissecans lesion
TREATMENT AND OUTCOMES:
1. Recommended non-weight bearing and medial unloader brace requested while physical therapy initiated.
2. Diagnostic arthroscopy for loose body removal and biopsy for matrix-induced chondrocyte implantation.
3. Low impact activities only, physical therapy and medial unloader brace with ambulation until harvested cells ready for implantation.
4. Matrix-induced autologous chondrocyte implantation was performed after 6 weeks of cell culturing.
5. Athlete treated with post-operative rehabilitation protocol.
6. MRI at 6 months demonstrated interval progression of healing medial femoral condyle OCD.
7. Athlete will continue post-operative rehabilitation protocol and will be assessed for readiness for sport progression at 12 and 18 months.

1569   May 31 1:20 PM - 1:40 PM
Knee Pain And Instability - Soccer Player

Allison N. Schroeder, Kentaro Onishi. *University of Pittsburgh Medical Center, Pittsburgh, PA.* (Sponsor: Thomas Best, FACSM)
(No relevant relationships reported)

HISTORY:
A 24-year-old male soccer player presented to an orthopedic sports medicine clinic with 7 years of left knee "looseness." He first noticed this following a soccer match. His main complaint was instability and his knee would buckle 3-4 times a week, but it would never fully give-way or cause him to fall. He had a reported history of left "grade 1-2 PCL sprain." He has been avoiding aggravating activities, including playing soccer.
PHYSICAL EXAM:
No discoloration or swelling of the left posterior knee. Full active and passive range of motion without pain at end range of motion. McMurry's, Lachman's, and anterior drawer were negative. Posterior drawer was 1+. Posterior sag was 1+. Negative dial test.
DIFFERENTIAL DIAGNOSIS:
1. PCL sprain or tear
2. Posterior lateral corner injury
3. Posterior horn of medial or lateral meniscus injury
4. Meniscofemoral ligament (ligament of Wrisberg or Humphrey) injury
5. Patellar subluxation/dislocation
6. Osteochondral defect
7. Cyst in the posterior knee
TEST AND RESULTS:
MRI revealed 8x7x6mm ganglion cyst adjacent to the posteromedial aspect of the PCL near the distal insertion on the tibia. Reverse KT1000 measurement revealed laxity of the left PCL that was 3mm greater than the right. Ultrasound of the insertional PCL visualized in long axis showed no pathology but appeared kinked at the proximal 1/3 when compared to the right. Cyst lying adjacent to the PCL in the posterior medial direction was visualized.
FINAL WORKING DIAGNOSIS:
PCL sprain and adjacent PCL ganglion cyst
TREATMENT AND OUTCOMES:
He was referred to our sports ultrasound clinic for sonographic evaluation and possible intervention. Sonographically guided intervention was performed from a distal to proximal approach with the patient supine. The cyst was fenestrated 10 times and 1mL of a 1:2:2 mixture of 50% dextrose, sterile water, and 1% lidocaine solution was injected into the cyst. An additional 2mL of the solution was injected peri-PCL. He had >50% improvement in instability at 1 month. Repeat sonographic exam showed decompression of the cyst. He reported 80% improvement in the feeling of "looseness" and KT1000 testing (completed by the same provider as the initial measurement) revealed a 1mm difference in laxity of the PCL on the left compared to the right 7 weeks after the injection. He had no limit in daily activity.

1570   May 31 1:40 PM - 2:00 PM
Keen Pain and a Moveable Mass in Basketball Player

James Wilcox, Robert Baker, FACSM, Keith Kenter. *Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.* (Sponsor: Robert Baker, FACSM)
(No relevant relationships reported)

HISTORY:
A 16-year-old high school basketball player was evaluated for left knee pain and a moveable mass in his knee. He started having pain, swelling, and locking of his left knee when he played basketball. He would have to manually unlock his knee sometimes. He sat out the rest of the season, but now the pain and locking has returned, and he feels a moveable mass above his knee cap. He denied any specific injury or traumatic event. He was previously diagnosed with osteochondritis dissecans (OCD) in his right knee 2 years prior and was told to sit out of football that season, but now he is having trouble with his left knee. He denied any other joint complaints. He denied any constitutional complaints. Family history was significant only for osteoarthritis and rheumatologic disease in his mother.
PHYSICAL EXAMINATION:
Generally he is a well-nourished normal appearing 16 year old male. Examination of the left knee revealed lateral joint line tenderness and a moveable mass superior to his patella. McMurray's test was positive for clicking, and he had a trace knee joint effusion on exam. Small abrasion over the tibial tubercle. He had some general laxity of his joints, but sensation, strength, range of motion, and ligamentous testing were all normal. Normal gait, no antalgic limp. Examination of the right knee was normal.
DIFFERENTIAL DIAGNOSIS:
1. Loose chondral body 2. Lipoma arborescens 3. Bucket handle meniscal tear 4. Pigmented villonodular synovitis 5. Plica 6. Synovial osteochondromatosis 7. Juvenile Rheumatoid Arthritis 8. Synovial chondrosarcoma 9. Synovial sarcoma 10. Synovial metastases
TEST AND RESULTS:
Xray of left knee - lateral femoral condyle OCD, closed growth plates Xray of right knee - lateral femoral condyle OCD with sclerosis
MRI of left knee - small effusion with lateral femoral osteochondral defect about 2.5 cm
Arthroscopy of left knee - OCD with loose bodies and chondral defect
FINAL WORKING DIAGNOSIS:
Osteochondritis Dissecans with loose bodies
TREATMENT AND OUTCOMES:

He was treated with an arthroscopic procedure to remove the 2 loose chondral bodies. He had cartilage cobble stoning debrided and a microfracture procedure performed to help fill in the chondral defect. He then participated in 6 weeks of non-weight bearing and then a formal therapy program.

1571   May 31 2:00 PM - 2:20 PM
Anterior Knee Pain - Golf
Shawn D. Felton, Arie J. van Duijn, Mitchell L. Cordova, FACSM. *Florida Gulf Coast University, Fort Myers, FL.* (Sponsor: Mitchell L. Cordova, FACSM)
(No relevant relationships reported)

HISTORY:
Athlete is a 71-year-old recreational golfer. Athlete's previous medical history includes bi-lateral Achilles tendon repairs, contralateral quadriceps tendon repair and Right supraspinatus tendon repair. Athlete is borderline diabetic with developing osteoarthritis.
PHYSICAL EXAMINATION:
Athlete fell while walking on pine straw on anterior knee causing right leg to be hyper flexed under weight of the patient. The athlete was unable to move and EMS summoned for transport. Upon physical exam, individual had palpable deformity proximal to the patella. Individual unable to actively extend right leg. Individual appeared with obvious swelling. Neurological and circulatory exam WNL. No signs or symptoms of fracture. Ultrasound imaging was performed and revealed a full thickness hypoechoic area indicative of a quadriceps rupture.
DIFFERENTIAL DIAGNOSIS:
1. Anterior Knee Contusion 2. Posterior Cruciate Ligament Tear 3. Medial meniscus tear 4. Anterior Cruciate Ligament Tear 5. Quadriceps Tendon Rupture
TEST AND RESULTS:
DDX Ultrasound - Full thickness hypoechoic lesion in the quadriceps tendon was visible both on the long and short axis views of the quadriceps tendon indicating full thickness tear, with hypoechoic areas around the surrounding structures suggestive of interstitial bleeding.
MRI w/o contrast - Portion of Quadriceps tendon extensor mechanism completely torn - Superficial aspect of rectus femoris is avulsed from its patellar attachment and retracted proximally - Marked anterior swelling - Patellar tendon intact
FINAL WORKING DIAGNOSIS:
Quadriceps tendon injury, superficial aspect (rectus femoris) avulsed and retracted proximally.
TREATMENT AND OUTCOMES:
Athlete underwent surgical repair of the right quadriceps tendon. Following immobilization athlete began contemporary rehabilitation program and has made full recovery without problems or complaints. This case report demonstrates the use of ultrasound imaging in a clinical setting that was as precise of eth follow-up MRI. Furthermore, it is imperative for clinicians to ensure both long and short axis views of the quadriceps tendon to ensure proper diagnosis.

1572   May 31 2:20 PM - 2:40 PM
Knee Swelling in a Football Player
Daniel Evering, Jr[1], David Webner[1], Kevin DuPrey[1], A.J. Duffy, III[2]. [1]*Crozer Keystone Sports Medicine, Springfield, PA.* [2]*Widener University, Chester, PA.* (Sponsor: Dr. Thomas Kaminski, FACSM)
(No relevant relationships reported)

HISTORY: An 18-Year-Old Male Division III quarterback presented to the office with left knee swelling and pain. He was playing in a game 10 days prior in which he was sacked twice, each time landing on his left knee and medial thigh. Right after the game, he noted swelling over the superior aspect of the patella and pain with direct pressure and full flexion. He described the pain as sharp and fiery, non-radiating, 3/10, waxing and waning. He has been wearing a compression sleeve and icing his knee.
PHYSICAL EXAMINATION: Examination of the patient's Left knee revealed decreased ROM with flexion and extension to 120/0 degrees. Large, 4+, suprapatellar effusion. Strength intact. Negative patellar compression test for pain and crepitus. No patellar instability. No ligamentous laxity to anterior, posterior, varus and valgus (30°) stress testing. Negative Lachman's testing. Negative anterior and posterior drawer testing. No joint line tenderness. Negative McMurray's testing. No patellar tendon tenderness. No pes anserine bursa tenderness. The patient was otherwise neurovascularly intact.
DIFFERENTIAL DIAGNOSIS: 1. Suprapatellar Bursitis 2. Prepatellar Bursitis 3. Patella Fracture 4. Intraarticular Injury with knee effusion 5. Morel-Lavallée lesion
TEST AND RESULTS: Ultrasound exam revealed large collection of fluid in the suprapatellar and medial thigh region. X-ray showed no fracture and moderate soft tissue swelling anterior to the left patella.
FINAL WORKING DIAGNOSIS: Morel-Lavallée lesion
TREATMENT AND OUTCOMES: 1. Under US guidance 75 cc of serosanguinous fluid was aspirated from the suprapatellar bursa on the left knee on the first visit.

Compression wrap applied. 2. 75 cc of serosanguinous fluid was aspirated 3 days later. Compression continued. 3. 50 cc of serosanguinous fluid was aspirated 4 day later, 7 days after the initial visit 4. 1 week later there was only mild accumulation of fluid. No aspiration was required. He had near full ROM and no pain with activity. He was cleared to return to football at that visit and successfully returned with no issues.

1573   May 31 2:40 PM - 3:00 PM
Knee Injury-soccer
Ankur Verma[1], Melody Hrubes[2], Terry Nicola, FACSM[2]. [1]*University of Chicago/Schwab Rehabilitation Hospital, Chicago, IL.* [2]*University of Illinois-Chicago, Chicago, IL.* (Sponsor: Terry Nicola MD, FACSM)
(No relevant relationships reported)

HISTORY: A 17-year-old male high school varsity soccer player with a history of right knee patellar dislocation 6 months ago managed non-operatively with physical therapy and bracing with successful return to sport presented with right knee swelling, pain, and decreased range of motion after being struck on the lateral aspect of his right knee during a game yesterday. He felt a pop and had swelling. He is unable to bear weight, and is unable to fully extend or flex his knee. He has been icing. He denies numbness, tingling, or weakness.
PHYSICAL EXAMINATION: Examination revealed moderate effusion and tenderness to palpation over the medial aspect of his patella, as well as the MPFL. There was some tenderness over the MCL. He has a positive apprehension sign with positive ballottement. There was no tenderness over the LCL. There was a negative Lachman's test or posterior drawer sign. There was no joint opening with varus or valgus stress. There was no medial or lateral joint line tenderness. McMurray's was unable to be attempted because of limited range of motion. He can actively extend his knee to 20 degrees short of full extension and actively flex his knee to 90 degrees.
DIFFERENTIAL DIAGNOSIS: 1. Patellar dislocation 2. Osteochondral defect 3. MPFL tear
TEST AND RESULTS: XR Right Knee: Sunrise view demonstrated a medial patellar avulsion fracture
MRI Right Knee without Contrast: Acute lateral patellar tracking injury with medial patellar avulsion fracture, kissing contusion on the femoral condyle, and high-grade medial patellar retinaculum sprain
FINAL WORKING DIAGNOSIS: Medial patellar avulsion fracture
TREATMENT AND OUTCOMES:
Re-initiate the Lateral Patella Knee Brace for stabilization
Physical therapy for range of motion, quadriceps activation, gait biomechanics and modalities to decrease swelling
Orthopaedic Surgery referral. Surgery was recommended once swelling subsides
Plan is for surgery 3-4 months after injury

D-36   Thematic Poster - Body Composition - Sport and Physiologic Considerations
Thursday, May 31, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100C

1642   Chair: Kelly Massey. *Milledgeville, GA.*
(No relevant relationships reported)

1643   Board #1   May 31 3:15 PM - 5:15 PM
Comparison of Bone and Body Composition in the Affected and Unaffected Arms in Breast Cancer Survivors
Ashley Artese, Rachael L. Hunt, Daniel R. Marshall, Jeong-Su Kim, Michael J. Ormsbee, Robert Moffatt, Lynn B. Panton, FACSM. *Florida State University, Tallahassee, FL.*
(No relevant relationships reported)

Following surgery and treatments, breast cancer survivors (BCS) may experience weakness, pain, and swelling in the arm next to the breast where the cancer was present (affected arm), resulting in decreased use of that arm. Treatments can also cause losses in bone mineral density (BMD), lean mass (LM), and gains in fat mass (FM). There is a lack of research on the effects of cancer treatment on BMD and body composition specifically in the affected compared to the unaffected arm. **PURPOSE:** To examine BMD, LM and FM in the affected compared to the unaffected arm in BCS. **METHODS:** Arm BMD, LM, and FM were assessed on 43 BCS (60 ± 8 yrs) using dual-energy X-ray absorptiometry. Paired t-tests were used to compare arm BMD, LM, and FM. Significance was accepted at $p \leq 0.05$. **RESULTS:** BCS were 6.6 ± 7.3 yrs post treatment. Mean values of arm BMD, LM, and FM were 0.681 ± 0.097 g/cm² 2.23 ± 0.52 kg, and 1.79 ± 0.75 kg, respectively. The affected arm had lower BMD (0.674 ±

0.095 g/cm^2) and FM (1.70 ± 0.60 kg) compared to the unaffected arm (BMD: 0.689 ± 0.104 g/cm^2; FM: 1.89 ± 0.93 kg). There was no difference in LM. **CONCLUSION:** Our findings suggest that breast cancer treatments can result in accelerated changes in BMD and FM in the affected arm, which may place BCS at a higher risk for fractures on the affected side. These findings warrant the need for exercise interventions to improve BMD and body composition in the affected arm following cancer treatments. Research supported by the ACSM Doctoral Student Research Grant and the National Strength and Conditioning (NSCA) Graduate Research Grant

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1644   Board #2   May 31 3:15 PM - 5:15 PM

Phase Angle and Body Composition in Breast Cancer Survivors Compared to Healthy Age-Matched Women

Caroline D. Deaterly, Elizabeth Evans, Takudzwa A. Madzima. *Elon University, Elon, NC.* (Sponsor: Paul C. Miller, FACSM)
(No relevant relationships reported)

Breast cancer survivors (BCS) experience well documented treatment induced alterations in body composition, particularly the loss of lean mass (LM) and bone mineral density. Less is known about the treatment-related effects on phase angle, body cell mass (BCM), extracellular mass (ECM) and the ratio of ECM/BCM. Phase angle is an objective indicator of cellular health and integrity, and BCM is a measure of the actively metabolizing component of LM that also decreases with age. A phase angle less than 5° is indicative of poorer cellular health and nutritional status. An ECM/BCM ratio less than 1.0 is optimal. **PURPOSE:** To identify any differences in measures of body composition, phase angle, BCM, ECM and ECM/BCM in BCS compared to healthy age-matched women (HC). **METHODS:** Thirty post-menopausal BCS (stages 0-III) (age: 57 ± 8yrs; BMI: 26.4 ± 4.8 kg/m^2) and 26 HC (age: 58 ± 7 yrs; BMI: 26.9 ± 5.3 kg/m^2) participated in this cross-sectional study. After an 8 hr fast, whole body bioelectric impedance analysis was used to assess measures of body composition including lean mass, fat mass, body fat (%), phase angle, BCM, ECM, and ECM/BCM. Data were analyzed via one-way ANOVA. Significance was accepted at p<0.05. **RESULTS:** There were no significant differences in lean mass (BCS: 45.7 ± 5.7; HC: 47.0 ± 7.1 kg), fat mass (BCS: 24.4 ± 8.3; HC: 25.7 ± 8.2 kg), body fat % (BCS: 34.0 ± 6.0; HC: 34.8 ± 5.7 %), BCM (BCS: 20.9 ± 3.0; HC: 21.3 ± 2.8 kg), ECM (BCS: 34.9 ± 3.1; HC: 25.2 ± 3.9 kg), ECM/BCM (BCS: 1.20 ± 0.1; HC: 1.18 ± 0.1), phase angle (BCS: 6.06 ± 0.7; HC: 6.17 ± 1.0 °). Only one BCS had a phase angle less than 5°. **CONCLUSION:** Our findings suggest that BCS that are at least five years into survivorship appear to have similar phase angle, BCM, ECM, ECM/BCM as HC. Future research should be conducted to determine the effects of cancer treatments on these phase angle, BCM and ECM/BCM in BCS that have recently completed treatment.

1645   Board #3   May 31 3:15 PM - 5:15 PM

The Influence of Body Composition and Skinfold Thickness on Skin Temperature Changes after Resistance Exercise

Martin Weigert, Nico Nitzsche, Christiane Lösch, Lutz Baumgärtel, Henry Schulz. *Chemnitz University of Technology, Chemnitz, Germany.*
(No relevant relationships reported)

Resistance exercise leads to an increase in skin temperature (T) in the area of the exercised muscle. Non-contact infrared thermography seems to be applicable to identify these primary used functional muscles with measuring T changes. In previous studies, lean men showed homogenous T patterns after standardized exercise protocols.
Purpose
To examine the influence of body fat percentage (BF%) and skinfold thickness on T patterns after resistance exercise.
Methods
38 male subjects (19-32 years, BMI 20.4-55.2 kg/m^2) participated. Means (min-max) of BF% and skinfold thickness of biceps brachii were 19.2 % (6.2-51.5) and 9 mm (2-36) respectively. After 15 min of acclimatization, the participants completed three sets with ten repetitions of unilateral biceps curl with 50 % of the individual one-repetition-maximum (two min rest between the sets). T of the exercised biceps was measured at rest (T$_{rest}$), immediately following set 1, 2 and 3 (T$_{S1}$, T$_{S2}$, T$_{S3}$) and up to 30 min post exercise (T$_1$-T$_{30}$) with an infrared camera. For statistical analysis, Δ-values to T$_{rest}$ for every measuring time point, as well as T$_{max}$, ΔT$_{max}$ (=T$_{max}$ -T$_{rest}$) and time to T$_{max}$ (min after the final set) were calculated.
Results
One-way ANOVA detected a time effect on the T-values T$_{rest}$ to T$_{30}$ (Eta^2=0.64, p<0.001). Means (min-max) of T$_{rest}$, T$_{max}$, ΔT$_{max}$ and time to T$_{max}$ were 32.3 °C (28.0-34.6), 34.0 °C (29.7-36.8), 1.7 °C (-0.3-2.8) and 8 min (2-30) respectively. BF% and skinfold thickness showed a negative correlation with T$_{rest}$, T$_{max}$, ΔT$_{max}$ and time to T$_{max}$ (r>-0.52, p<0.001). A negative correlation between BF% and skinfold thickness with the Δ-values to T$_{rest}$ was found from T$_{S2}$ to T$_{10}$ (for BF%: r>-0.49, p<0.001; for skinfold thickness: r>-0.66, p<0.001). All subjects up to a skinfold thickness of 10 mm showed a homogeneous T pattern in reaction to the exercise with a minimum ΔT$_{max}$ of 1.3

°C and a time to T$_{max}$ between 2 and 9 min. The T patterns in subjects with a higher skinfold thickness were heterogeneous and some of these subjects did not respond to the resistance exercise with an increase of T.
Conclusion
A higher BF% and a higher skinfold thickness is associated with delayed and lower increases in T after resistance exercise. In contrast to lean subjects, identifying the primary used functional muscles by infrared thermography in obese subjects seems to be challenging.

1646   Board #4   May 31 3:15 PM - 5:15 PM

Body Composition of Collegiate Baseball and Softball Athletes, Consortium of College Athlete Research (C-CAR) Study

Madeline A. Czeck[1], Christiana J. Raymond-Pope[1], Tyler A. Bosch[1], Jack W. Ransone, FACSM[2], Jonathan M. Oliver[3], Aaron Carbuhn[4], Philip R. Stanforth[5]. *[1]University of Minnesota, Minneapolis, MN. [2]University of Nebraska, Lincoln, NE. [3]Texas Christian University, Fort Worth, TX. [4]University of Kansas, Lawrence, KS. [5]University of Texas, Austin, TX.* (Sponsor: Donald R. Dengel, FACSM)
(No relevant relationships reported)

PURPOSE: To evaluate total body composition measures across player positions in NCAA Division I male baseball and female softball players using dual X-ray absorptiometry (DXA). **METHODS:** Three hundred and twenty-nine male and female (201/128) collegiate baseball and softball athletes from multiple universities (M/F: age = 20.1±0.1/20.0±0.1 yrs.; height = 1.8±0.02/1.7±0.03 m; weight = 88.6±2.4/73.1±3.03 kg; body mass index = 26.5±0.8/25.0±0.3 kg/m^2) received one whole body DXA scan. The athletes were separated into four positions: pitchers (P; M/F=92/32), catchers (C; M/F=25/13), outfielders (OF; M/F=43/39), and infielders (IF; M/F=41/44). Total fat mass (FM), lean mass (LM), bone mineral density (BMD) and abdominal visceral adipose tissue (VAT) were measured by DXA. ANOVA and Tukey's HSD assessed total differences between positions for each sex (adjusted *p*-value given). **RESULTS**: Male IF had significantly (*p*=0.003; 0.018) lower total LM (65.8±6.0 kg) than P and OF (69.6±5.7, 69.6±5.9 kg), but was not significantly different from C (69.4±5.4 kg, *p*=0.079). Additionally, male OF had significantly (*p*=0.033; 0.044) lower total FM (14.4±3.1 kg) compared to P and C (16.7±4.5, 17.7±4.6 kg) but not compared to IF (16.5±6.3 kg; *p*=0.188). No significant (*p*>0.05) differences between male P, C, OF, and IF were observed for total BMD (1.47±0.1, 1.50±0.1, 1.50±0.08, 1.46±0.10 g/cm^3) and VAT (0.28±0.22, 0.31±0.21, 0.33±0.14, 0.36±0.27 kg). Female OF had significantly (*p*=0.012) lower total FM (18.5±5.9 kg) compared to P (23.8±8.8 kg), but not compared to C and IF (20.8±40, 20.6±7.2 kg; *p*=0.544; 0.731). No significant (*p*>0.05) differences for female softball P, C, OF, and IF were observed for total LM (50.8±5.5, 49.7±4.8, 48.9±4.8, 49.3±5.8 kg), BMD (1.34±0.13, 1.34±0.10, 1.32±0.10, 1.34±0.10 g/cm^3), and VAT (0.22±0.33, 0.08±0.06, 0.12±0.16, 0.14±0.26 kg). **CONCLUSIONS:** We observed that there were more positional differences in baseball players than softball players. The greater differences within positions between sports may be related to the larger field dimensions and demands of the game. These values may be used for normative DXA data for collegiate baseball and softball players.

1647   Board #5   May 31 3:15 PM - 5:15 PM

Body Composition of Division I Collegiate Basketball Athletes, Consortium of College Athlete Research (C-CAR) Study

Anna L. Solfest[1], Christiana J. Raymond-Pope[1], Aaron Carbuhn[2], Philip R. Stanforth[3], Jonathon M. Oliver[4], Jack W. Ransone, FACSM[5], Tyler A. Bosch[1], Donald R. Dengel, FACSM[1]. *[1]University of Minnesota, Minneapolis, MN. [2]University of Kansas, Lawrence, KS. [3]University of Texas, Austin, TX. [4]Texas Christian University, Fort Worth, TX. [5]University of Nebraska, Lincoln, NE.* (Sponsor: Donald R. Dengel, FACSM)
(No relevant relationships reported)

PURPOSE: To examine measures of total body composition using dual x-ray absorptiometry (DXA) in male and female NCAA Division I collegiate basketball athletes. **METHODS:** Two-hundred and eight male and eight female (88/120) collegiate basketball athletes (M/F: age=19.8±1.4/19.9±1.3 yrs; height=1.95±0.09/1.78±0.09 m; weight=95.2±13.8/77.5±13.3 kg; body mass index=25.0±2.4/24.2±2.9 kg/m^2) received one whole body DXA scan. Athletes were classified into five positions: point guards (PG; M/F=27/32), shooting guards (SG; M/F=18/27), small forwards (SF; M/F=13/18), power forwards (PF; M/F=21/27), and centers (C; M/F=9/16). Total fat mass (FM), lean mass (LM), bone mineral density (BMD) and abdominal visceral adipose tissue (VAT) were measured by DXA. MANOVA and Tukey's HSD assessed total differences between positions for each sex (adjusted *p*=0.0125). **RESULTS:** Male C had significantly higher total FM, LM, and VAT compared to all other positions except PF. Male C and PF had significantly greater total FM (18.0±7.8; 15.6±5.6 kg) than SF

Abstracts were prepared by the authors and printed as submitted.

and SG (11.0±3.0; 10.9±3.0; p=0.001), but not PG (12.5±4.4 kg; p=0.025), and greater total LM (89.9±8.9; 84.1±5.5 kg) compared to PG, SG, and SF (68.9±6.1; 73.3±6.1; 75.6±5.2 kg; $p \leq 0.001$). Male C and PF VAT measurements (0.44±0.24; 0.43±0.1 kg) were significantly higher compared to SF, SG, and PG (0.23±0.11; 0.22±0.12; 0.26±0.12 kg; all p<0.001). Before and after adjustment for weight, males did not show significant differences in BMD across position (p=0.156; p=0.559). In females, C had significantly greater (p<0.001) total FM compared to all other positions. Female SF, PF, and C had significantly (p<0.001) greater total LM (56.6±6.3; 59.0±5.0; 60.6±5.5 kg) compared to PG and SG (48.0±3.4; 51.4±3.9 kg). After adjustment for weight, no significant differences were observed in BMD across position (p=0.276). Female C had significantly higher VAT (0.29±0.24 kg) compared to PG and SG (0.06±0.06, 0.07±0.04 kg; p<0.005) but not SF and PF (0.13±0.14, 0.19±0.18 kg; p=0.11-0.44). **CONCLUSIONS:** Within collegiate male and female basketball players FM, LM, and VAT differed by position. After adjustment for weight, BMD was not significantly different for males or females. These position-specific measurements provide normative data on male and female basketball players.

1648   Board #6   May 31 3:15 PM - 5:15 PM

Positional Body Composition of Division I Volleyball Players, Consortium of College Athlete Research (C-CAR) Study

Katie L. Bisch[1], Tyler A. Bosch[1], Aaron Carbuhn[2], Philip R. Stanforth[3], Jonathan M. Oliver[4], Jack W. Ransone, FACSM[5], Andreas Kreutzer[4], Donald R. Dengel, FACSM[1]. [1]University of Minnesota, Minneapolis, MN. [2]University of Kansas, Lawrence, KS. [3]University of Texas at Austin, Austin, TX. [4]Texas Christian University, Fort Worth, TX. [5]University of Nebraska, Lincoln, NE. (Sponsor: Donald R. Dengel, FACSM)

(No relevant relationships reported)

PURPOSE: To identify normative values for total and regional body composition by position for female NCAA Division I collegiate volleyball players using dual X-ray absorptiometry (DXA). **METHODS:** Eighty-nine female volleyball players (ages 17-23) from multiple universities received a DXA scan. Athletes were categorized by position: Middle Blocker (MB=30), Outside Hitter (OH=32), Setter (ST=9), and Libero (LB=18). Total fat mass (FM) and lean masses (LM) were measured by DXA, as well as abdominal visceral adipose tissue (VAT) and total and regional measures of bone mineral density (BMD). An ANOVA assessed the effect of position on body composition and BMD measurements. Tukey's HSD post-hoc analysis test identified significance between positions. **RESULTS:** As expected, height was statistically significant (p<0.01) between all positions: MB (185.8 ± 4.6 cm) > OH (181.7 ± 4.1 cm) > ST (174.7 ± 3.7 cm) > LB (167.8 ± 8.0 cm). Weight was significantly greater in MB and OH (80.1 ± 9.3 kg, 76.6 ± 7.8 kg) compared to LB (64.5 ± 7.6 kg, p<0.001), and MB compared to ST (69.7 ± 5.7 kg, p=0.006). Body percent fat was not statistically significant by position (mean = 25.3%). Total LM was greater in MB and OH (55.7 ± 4.6 kg, 54.1 ± 4.7 kg) compared to LB and ST (45.9 ± 4.9 kg, 48.3 ± 3.2 kg, p<0.01). Total FM was significantly greater in MB than LB (21.0 ± 6.9 kg, 16.1 ± 4.0 kg, p=0.016). VAT mass was not significantly (p>0.05) different between positions. After adjusting for weight, total BMD was significantly greater in MB (1.39 ± 0.1 g/cm³, p<0.001) and OH (1.41 ± 0.09 g/cm³, p=0.002) compared to LB (1.30 ± 0.08 g/cm³), but not ST (1.31 ± 0.07 g/cm³, p>0.05). Leg BMD was higher in MB and OH (1.54 ± 0.11 g/cm³, 1.53 ± 0.11 g/cm³) compared to LB and ST (1.39 ± 0.09 g/cm³, 1.4 ± 0.06 g/cm³, p=0.001-0.008). Spine BMD was higher in MB and OH (1.32 ± 0.15 g/cm³, 1.33 ± 0.12 g/cm³) compared to LB (1.22 ± 0.09 g/cm³, p=0.03). **CONCLUSIONS:** Total body composition measures vary significantly by position; however, the similarities in percent body fat imply differences may be influenced primarily by height. Future studies should examine the distribution of mass. BMD differences may be influenced by repeated impacts of jumping during the attacking and blocking actions of front row players. These data provide some normative DXA data for collegiate volleyball players.

1649   Board #7   May 31 3:15 PM - 5:15 PM

Body Composition of Division I Collegiate Female Equestrian Athletes

Olivia H. Dengel[1], Christiana J. Raymond-Pope[2], Jonathan M. Oliver[3], Tyler A. Bosch[2], Donald R. Dengel, FACSM[2]. [1]College of St. Benedict, St. Joseph, MN. [2]University of Minnesota, Minneapolis, MN. [3]Texas Christian University, Fort Worth, TX. (Sponsor: Donald R. Dengel, FACSM)

(No relevant relationships reported)

PURPOSE: To compare measures of total and regional body composition using dual X-ray absorptiometry (DXA) in NCAA Division I collegiate equestrian athletes to a group of age, sex and BMI matched non-athlete college students. **METHODS:** Thirty-one female collegiate equestrian athletes were matched to a population of normal, non-athlete college students by age (19.8±0.2 vs. 19.8±0.2 yrs.), body mass index (22.3±0.4 vs. 22.6±0.4 kg/m²), sex and ethnicity. Total and regional fat tissue mass (FM), lean

tissue mass (LM), bone mineral density (BMD), and abdominal visceral adipose tissue (VAT) were measured by DXA. Paired t-tests assessed total and regional differences between equestrian athletes and controls. **RESULTS:** Equestrian athletes had a lower total fat percentage (%fat) than controls (30.7±0.9 vs. 33.1±0.1%, p=0.03). There was a trend for the equestrian athletes to have lower total FM (18.4±0.8 vs. 20.0±0.9 kg, p=0.06) than controls. There were no significant differences in total LM (41.0±0.9 vs. 39.9±0.8 kg, p=0.33), total BMD (1.15±0.02 vs. 1.15±0.02 g/cm³, p=0.92) and VAT (0.13±0.03 vs. 0.16±0.03 kg, p=0.25) between equestrian athletes and controls. However, equestrian athletes, when compared to the controls, had significantly lower leg %fat (33.0±0.8 vs. 37.3±0.9%, p<0.001), leg FM (7.0±0.3 vs. 8.0±0.4 kg, p=0.01) and higher leg LM (14.1±0.4 vs. 13.2±0.3 kg, p=0.04). The greater leg lean mass in equestrian riders resulted in a smaller upper to lower body lean mass ratio (1.706 ± 0.019 vs. 1.812 ± 0.030, p=0.005) compared to controls. There was no difference in leg BMD between equestrian athletes and controls (1.19±0.02 vs. 1.21±0.02 g/cm³, p=0.46). **CONCLUSIONS:** The lower total percent body fat in equestrian athletes seems to be influenced by differences in leg composition with equestrian athletes having significantly more lean mass and less fat mass. These results are consistent with the role the legs play in horseback riding and demonstrate an effect of either training or horseback riding on body composition compared to matched controls.

D-37   Thematic Poster - Exercise Training in Cancer Patients

Thursday, May 31, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100E

1650   Chair: Karen M. Mustian. *University of Rochester/James P. Wilmot Cancer Center, Rochester, NY.*

(No relevant relationships reported)

1651   Board #1   May 31 3:15 PM - 5:15 PM

How Does a Supervised Exercise Program Improve Quality Of Life In Patients With Cancer?

Maike G. Sweegers. *VU University Medical Center, Amsterdam, Netherlands.*

(No relevant relationships reported)

Purpose: Previous systematic reviews and meta-analyses demonstrated beneficial effects of exercise during or following cancer treatment on quality of life (QoL). Aiming to understand how exercise contributes to a patient's QoL, we examined patients' perspectives via a process called concept mapping. This unique method provides structure and objectivity to rich qualitative data.
Methods: Patients with cancer participating in an exercise program were invited to enrol. Eleven meetings with 3-10 patients were organized in which patients generated ideas in response to the statement: 'How has participating in a supervised exercise program contributed positively to your QoL'. Next, patients individually clustered (based on similarity) and rated (based on importance) the ideas online. The online assessments were combined and one concept map was created, visualizing clusters of ideas of how patients' perceive that participating in a supervised exercise program improved their QoL. The research team labelled the clusters of ideas, and physiotherapists reflected on the clusters during semi-structured interviews.
Results: Sixty patients attended the meetings of whom one patient was not able to generate an idea in response to the statement. Forty-four patients completed the online clustering and rating of ideas. The resulting concept map yielded 6 clusters: *personalized care, coaching by a physiotherapist, social environment, self-concept, coping* and *physical fitness and health. Personalized care* was rated as most important. Overall, physiotherapists recognized these clusters in practice.
Conclusion: Patients with cancer reported that participating in a supervised exercise program improved their physical fitness and influenced social, mental and cognitive factors, resulting in improvements in QoL. These results can be used to increase the awareness of the importance of supervised exercise programs for the QoL of patients with cancer.

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1652   Board #2   May 31 3:15 PM - 5:15 PM

Exercise and The Cancer Patient: Function Improves Independent of Cardiovascular and Anthropometric Changes

Sarah R. McDowell[1], Cynthia Villalobos[1], Justin C. Brown[2], Paul D. Vosti[3], Courtney D. Jensen[1]. *[1]University of the Pacific, Stockton, CA. [2]Harvard University, Cambridge, MA. [3]St. Joseph's Medical Center, Stockton, CA.* (Sponsor: Kathryn H. Schmitz, FACSM)
(No relevant relationships reported)

Each year, approximately 1.6 million Americans are diagnosed with cancer. The consequences of cancer and its associated treatment include elevations in cardiovascular risk, deteriorating body composition, and diminishing physical function. Exercise is an effective countermeasure; however, limitations in adherence may compromise the magnitude of improvement experienced. **PURPOSE**: To evaluate cardiovascular, anthropometric, and functional adaptations to an exercise program in cancer survivors. **METHODS**: We conducted a 10-week exercise intervention on 157 cancer survivors; 58 were retained through follow-up. At baseline, we recorded demographic, anthropometric, cardiovascular, and functional data. Anthropometric measurements were weight, body mass index (BMI), and body fat percent (BF%). Cardiovascular measurements were blood pressure and heart rate. Functional tests were VO2 max, six-minute walk, timed up-and-go, chair stand, sit-to-stand, arm curl, grip strength, Universal Machine (UM) push and pull, epic lift, sit-and-reach, functional reach, and back scratch. Paired-samples t tests measured changes from baseline to follow-up. **RESULTS**: Anthropometric variables did not change: body weight (p=0.585), BMI (p=0.477), and BF% (p=0.367). Cardiovascular variables did not change: systolic blood pressure (p=0.560), diastolic pressure (p=0.292), and heart rate (p=1.000). Improvement was detected in 11 of 13 functional tests: VO2 max (p=0.005), six-minute walk (p<0.001), timed up-and-go (p<0.001), chair stand (p<0.001), sit-to-stand (p=0.005), arm curl (p<0.001), grip strength (p<0.001), UM push (p<0.001), UM pull (p<0.001), epic lift (p=0.005), and functional reach (p=0.001). Mean values improved in sit-and-reach (p=0.321) and back-scratch (p=0.099), but pre-post comparisons were not significant. **CONCLUSION**: Exercise had no effect on anthropometric or cardiovascular profiles, but physical functioning improved in nearly every domain. In this population, maintenance of functional capacity can help preserve the ability to perform tasks of daily living, and it associates with survival. Although we found exercise to improve strength, aerobic capacity, and flexibility, the high rate of attrition is a potential limitation; further research is necessary to confirm our findings.

1653   Board #3   May 31 3:15 PM - 5:15 PM

Piloting the Effect of Aerobic Exercise during Chemotherapy Infusion in Patients with Cancer

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(No relevant relationships reported)

Exercise in cancer patients is safe and can improve a range of outcomes including cancer-related fatigue, physical functioning and quality of life. Preclinical trials suggest an acute exercise bout during chemotherapy infusion may improve the treatment efficiency. It would also present an additional opportunity for supervised exercise. However, there are currently no published human trials of such an intervention. **PURPOSE:** To determine the safety and feasibility of delivering an aerobic exercise intervention to cancer patients during chemotherapy infusion. **METHODS:** A randomised crossover trial has commenced with eligible patients receiving either usual care or performing 20 minutes of low intensity cycling during infusion. Data collection includes patient uptake, physiological exercise response, perceived exertion, patient experience and a daily symptom diary for 1 week subsequent. **RESULTS:** Exercise has been safely delivered with neither adverse events nor interference to usual care reported for all subjects (N=3, Female, 52 ± 8 yrs). 60% of patients approached agreed to participate, and all reported that the exercise was no less comfortable, no more difficult, and less boring than usual care. Heart rate rose to the target 30%-40%HRR within 5-8 minutes and was steady during exercise, recovering to within 10 beats of resting rates in 4.7 ± 4.6 min. On average, systolic blood pressure rose 15% during exercise, with a maximum reading of 153mmHg, and full recovery to resting levels within 15 minutes. Oxygen saturation remained above 95% at all times. Rated perceived exertion during exercise ranged from 9-13 on the Borg scale. Reported daily symptom data was similar after both exercise and usual care. **CONCLUSIONS:** Exercise during chemotherapy infusion may be a safe and feasible addition to chemotherapy. Larger data collection is required to evaluate drug delivery efficiency, symptom reduction and opportunity for physical activity increase.

1654   Board #4   May 31 3:15 PM - 5:15 PM

Effect of Exercise on Chemotherapy-Induced Peripheral Neuropathy Symptoms in Women with Breast Cancer

Kelcey A. Bland[1], Amy A. Kirkham[2], Josh Bovard[1], Tamara Shenkier[3], David Zucker[4], Margot K. Davis[1], Don C. McKenzie[1], Karen A. Gelmon[3], Kristin L. Campbell[1]. *[1]University of British Columbia, Vancouver, BC, Canada. [2]University of Alberta, Edmonton, AB, Canada. [3]British Columbia Cancer Agency, Vancouver, BC, Canada. [4]Swedish Cancer Institute, Seattle, WA.*
(No relevant relationships reported)

Chemotherapy-induced peripheral neuropathy (CIPN) is a common, dose-limiting side effect of taxane treatment for breast cancer. Given the limited medical or pharmacological treatment options to reduce CIPN, understanding the impact of lifestyle interventions is of interest. **Purpose:** To evaluate the effect of exercise during taxane treatment on CIPN symptoms in women with breast cancer. **Methods:** Women with early-stage breast cancer were randomized to supervised exercise (EX) or usual care (UC) during taxane treatment (~4 cycles, 2-3 weeks apart). Exercise included thrice-weekly progressive aerobic (50-75% HRR, 25-35 min), resistance (1-2 sets, 10-12 reps, 50-65% estimated-1RM) and balance training. CIPN symptoms were evaluated via: 1) the EORTC-QLQ CIPN20 subscale (scored from 0-100, with higher scores indicating greater symptom burden, and summarized as % of participants experiencing symptoms "quite a bit" or "very much") and; 2) quantitative sensory testing at the foot (vibration and pinprick). Assessments occurred at: 1) baseline (pre-taxane chemotherapy); 2) post-taxane cycle 3 and; 3) end of chemotherapy. **Results:** Twenty-seven women enrolled (UC: n=15, EX: n=12). Relative to baseline, both groups reported worse total sensory symptoms post-cycle 3 (Δ16.3, p<0.01) that progressed further by the end of chemotherapy (Δ24.3, p<0.01). At post-cycle 3, sensory symptoms were 38% lower in EX compared to UC but this was not statistically significant (UC=26.3±4.7, EX=16.3±5.4, p=0.17). The most frequently reported symptoms were tingling and numbness in both the hands and feet. Post-cycle 3, foot numbness was less prevalent (UC=50%, EX=9%, p=0.04), and foot tingling trended toward reduced prevalence (UC=43%, EX=9%, p=0.08) in the EX group. No group differences were found at the end of chemotherapy, or for hand symptoms at any time point. More UC participants had impaired vibration sense post-cycle 3 (UC=67%, EX=17%, p=0.02). There were no group differences for pinprick testing. **Conclusion:** Multi-model exercise during taxane treatment may delay CIPN symptom progression in breast cancer patients. Specifically, our findings indicate that exercise may reduce patient-reported and quantitative sensory symptoms in the feet after three taxane treatment cycles, where onset is frequently reported.

1655   Board #5   May 31 3:15 PM - 5:15 PM

Benefits of Immediate Versus Delayed Exercise in Men Initiating ADT for Prostate Cancer

Dennis R. Taaffe, FACSM[1], Robert U. Newton[1], Nigel Spry[2], David Joseph[3], Suzanne K. Chambers[4], Robert A. Gardiner[5], Prue Cormie[6], David HK Shum[4], Daniel A. Galvao[1]. *[1]Edith Cowan University, Perth, Australia. [2]Genesis CancerCare, Perth, Australia. [3]Sir Charles Gairdner Hospital, Perth, Australia. [4]Griffith University, Gold Coast, Australia. [5]University of Queensland, Brisbane, Australia. [6]Australian Catholic University, Melbourne, Australia.*
(No relevant relationships reported)

Androgen deprivation therapy (ADT) in men with prostate cancer (PCa) results in adverse effects including reduced muscle strength and physical performance, potentially compromising daily functioning. **PURPOSE:** To examine whether it was more efficacious to commence exercise at the onset of ADT rather than later in treatment to counter declines in strength and physical function. **METHODS:** One hundred and four men with PCa (68.3±7.0 years, 29.7±5.2 % fat, Gleason score 7.6±0.9) initiating ADT were randomised to immediate exercise (EX, n=54) or delayed exercise (DEL, n=50) for 12 months. EX comprised 6 months of supervised resistance/aerobic/impact exercise initiated at onset of ADT with 6-month follow-up. DEL comprised 6 months usual care followed by 6 months of resistance/aerobic/impact exercise. Muscle strength (chest press, leg press, seated row) and physical performance (6-m usual and fast walk, 6-m backwards walk, 400-m walk, stair climb, repeated chair rise) were assessed at baseline, 6 and 12 months. Data were analysed by ANCOVA using an intention-to-treat approach. **RESULTS:** There was a significant difference for all strength measures at 6 months favouring EX (p<0.001), with net differences in leg press, seated row and chest press strength of 19.9 kg (95% CI, 12.3 to 27.5 kg), 5.6 kg (3.8 to 7.4 kg), and 4.3kg (2.7 to 5.8 kg), respectively. From 6-12 months DEL increased in all strength measures (p<0.001) such that there were no differences between groups at 12 months. Similarly, physical performance improved (p<0.001) in EX compared to DEL at 6 months for the 400-m walk (-9.7 s, 95% CI -14.8 to -4.6 s), stair climb (-0.4 s, -0.6 to -0.2 s) and chair rise (-1.0 s, -1.4 to -0.7 s), with no differences between groups by 12 months. **CONCLUSION:** Exercise either

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at the onset or after 6 months ADT preserves/enhances muscle strength and physical function. However, to avoid any initial treatment-related adverse effects on strength and function, exercise should be prescribed and commenced at the onset of ADT. Supported by Cancer Australia (ID# 1029901).

1656   Board #6   May 31 3:15 PM - 5:15 PM

Effects of an Exercise Intervention on Lung Cancer Patients Who Have Undergone a Lobectomy

Nicholas Harman[1], Jessica M. Brown[2], Daniel Shackelford[2], Reid Hayward[1]. [1]*University of Northern Colorado, Greeley, CO.* [2]*Carroll University, Waukesha, WI.*
(No relevant relationships reported)

Lung cancer is the second most commonly diagnosed form of cancer, and is often treated surgically via tumor resection and lobectomy. Removal of lung tissue often impairs cardiopulmonary function, reduces activities of daily living, and lowers quality of life. Exercise interventions improve cardiopulmonary health and may attenuate the negative effects of lung cancer and its treatment. **Purpose:** To evaluate the response of lung cancer patients who had previously undergone a lobectomy to a structured, supervised 12-week exercise intervention, and compare these results with all other cancer patients completing the same exercise intervention. **Methods:** Nine male and female lung cancer survivors who had previously undergone a lobectomy, were recruited to participate in a 12-week exercise-based rehabilitation program. The program consisted of one hour sessions, three days per week, and included cardiovascular endurance, muscular strength and endurance, balance, and flexibility exercises. Subjects completed pre and post assessments of cardiopulmonary function, consisting of a graded exercise test, yielding peak oxygen consumption (VO_2 peak), and spirometry, yielding forced vital capacity (FVC) and forced expiratory volume (FEV_1). Subjects were divided into two groups: surgical resection including lobectomy (LOB, n = 9), and all other cancers (AOC, n = 205). **Results:** There were significant improvements in VO_2 peak in the LOB group (Pre: 15 ± 2 mL/kg/min, Post: 19 ± 5 mL/kg/min; +20%; p = 0.03) and no significant changes in FVC and FEV_1. There were significant improvements in VO_2 peak (Pre: 21 ± 0.5 mL/kg/min, Post: 24 ± 0.6 mL/kg/min; +13%; p = 0.00) and FEV_1 (Pre: 95 ± 1 %-predicted, Post: 97 ± 1 %-predicted; +2.2%; p = 0.02) in the AOC group. Between group comparisons yielded no significant difference in improvement to VO_2 peak for LOB vs AOC (p = 0.77). **Conclusion:** Results from this study demonstrate that lung cancer patients who have previously undergone a lobectomy can safely and effectively complete an individualized, prescriptive exercise intervention. These data also show that lung cancer survivors who have previously undergone a lobectomy are able to improve cardiopulmonary function to the same degree as all other cancer survivors completing a rehabilitative exercise intervention.

D-38   Thematic Poster - Hydration

Thursday, May 31, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100C

1657   Chair: Samuel N. Cheuvront, FACSM. *USARIEM, Natick, MA.*

(No relevant relationships reported)

1658   Board #1   May 31 3:15 PM - 5:15 PM

Ad LibitumFluid Consumption off-sets Thermal and Cardiovascular Strain Exacerbated by Dehydration during Heat Waves

Connor Graham, Nathan B. Morris, Ollie Jay, FACSM. *University of Sydney, Sydney, Australia.* (Sponsor: Ollie Jay, FACSM)
(No relevant relationships reported)

Purpose: We compared the impact of different fluid replacement practices on the development of dehydration and the associated changes in thermal and cardiovascular strain throughout 3 hours of light exercise in peak heat wave conditions (40°C, 40%RH). **Methods:** Seven participants completed four separate 180-min trials, exercising at 3 METs in 40°C, 40%RH. In each trial a different hydration plan was employed; i) *ad libitum* consumption of 20°C water (ALTAP); ii) *ad libitum* consumption of 4°C water (ALCHILL); iii) no fluid replacement (NOFR); iv) full replacement of sweat loss (FULLFR). Fluid consumption (FC), resultant dehydration (%DEH), rectal temperature (T_{re}), mean skin temperature (T_{sk}), heart rate (HR), whole body sweat rate (WBSR), and local sweat rate (LSR) were measured. **Results:** Compared to NOFR, FC was greater in FULLFR (1.39±0.27 L; P<0.001), ALTAP (1.36±0.46 L; P=0.001) and ALCHILL (1.04±0.39 L; P=0.002). FC was greater in ALTAP than ALCHILL (P=0.01). %DEH was greater in NOFR (1.79±0.18%)

compared to FULLFR (0.03±0.14%; P<0.001), ALTAP (0.08±0.65%; P=0.002) and ALCHILL (0.46±0.59%; P=0.004). The rise in T_{re} from rest was greater in NOFR (1.13±0.34°C) compared to ALTAP (0.68±0.32°C; P<0.001), ALCHILL (0.72±0.34°C; P<0.001) and FULLFR (0.72±0.35°C; P<0.001). HR was higher after 180 min in NOFR (100±11 beats·min^{-1}) compared to ALTAP (86±12 beats·min^{-1}; P<0.001), ALCHILL (87±15 beats·min^{-1}; P<0.001), and FULLFR (91±11 beats·min^{-1}; P=0.003). No differences in T_{sk}, LSR or WBSR were observed between trials. **Conclusions:** No fluid consumption throughout a 3-h heat wave exposure with light physical activity exacerbated both thermal and cardiovascular strain, although differences in T_{re} were not due to difference in sweating. *Ad libitum* consumption of 4°C or 20°C water was sufficient to prevent levels of dehydration that exacerbate physiological heat strain. Preliminary findings show 4°C water seems to blunt thirst, and hence fluid intake relative to 20°C water.

1659   Board #2   May 31 3:15 PM - 5:15 PM

Energy Drink Consumption and Running Performance in a Hot Environment

Emma L. Reed[1], Lindsey N. Russo[1], Zachary J. Schlader[1], Jennifer L. Temple[1], David Hostler, FACSM[2]. [1]*University at Buffalo, BUFFALO, NY.* [2]*University at Buffalo, Buffalo, NY.*
(Sponsor: Dave Hostler, FACSM)
(No relevant relationships reported)

Energy drinks have been reported to have an ergogenic effect on exercise performance but there are few objective reports about the interaction of energy drinks and exercise in the heat in healthy, young adults. **PURPOSE**: To determine if energy drink consumption prior to a 5-km trial improves performance or alters thermoregulation when running in a hot environment.
METHODS: Experienced runners (4 males and 1 female; age: 22 ± 2.9 y; VO_{2max}: 51.16 ± 7.55 ml/kg/min) completed two 5-km trials in a double-blinded, randomized, crossover design 45 minutes after consuming a 500mL solution of a commercially available energy drink (ED) (~215 mg caffeine, ~480 mg taurine) or an equal volume of similarly flavored placebo (P). Both trials were completed on a treadmill in an environmental chamber set to 34°C and 40% relative humidity. Subjects were instructed to complete the 5-km run as fast as possible but were blinded to time, speed, and distance. Subjects were told the distance completed every 500 m. Physiological and perceptual variables were collected during the trials. **RESULTS**: There was no difference in time to complete the 5-km trial (1447 ± 296 (ED) vs. 1440 ± 264 sec (P)). Core temperature (39.27°C ± 0.33°C (ED) vs. 39.14°C ± 0.53°C (P)), skin temperature (36.2°C ± 0.4°C (ED) vs. 35.3°C ± 1.2 °C (P)), rate of perceived exertion (both 9.4 ± 0.5), and heart rate (193 ± 9 bpm (ED) vs. 193 ± 12 bpm (P)) at the end of exercise did not differ. **CONCLUSIONS**: Consuming an energy drink before running a 5-km trial in the heat did not affect thermoregulation or improve performance.

1660   Board #3   May 31 3:15 PM - 5:15 PM

100% Orange Juice Consumption on Hydration, Electrolyte, and Cardiovascular Measures Following Exercise In The Heat

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(No relevant relationships reported)

Compared to commonly consumed carbohydrate electrolyte beverages (CEB), 100% orange juice (OJ) has a similar carbohydrate content, less sodium, and an increased amount of potassium, vitamins, and minerals, making it a possible fluid replacement option. **PURPOSE:** To investigate OJ, water (W), and CEB on hydration, electrolyte, and cardiovascular measures following exercise in the heat. **METHODS:** We used a randomized, controlled, single-blind design to determine the effects of OJ, a commercially available flavored W, and a commercially available CEB on plasma osmolality (Posm); plasma sodium (PNa+), potassium (PK+), calcium (PCa+), and chloride (PCl-); urine volume (Uvol); fluid volume (Fvol); heart rate (HR); and blood pressure (BP). Participants (n = 26, 20 male, 6 female, age: 22.1 ± 3.3 yrs; weight: 72.9 ± 10.0 kg; height: 174.3 ± 7.9 cm; VO2max: 48.8 ± 7.3 mL/kg/min) cycled 80 min at 70% VO2max in a hot, humid environment (30.1 ± 0.2°C, 51.6 ± 4.0% relative humidity) on 5 consecutive days. After exercise, participants consumed 237 mL (8 oz) of assigned beverage then rested 1 hr in an ambient environment. Dependent measures were taken pre-, during, post-, and 1 hr post-cycling. **RESULTS:** There were no significant differences between conditions at any time point for Posm, PNa+, PCa+, PCl-, Fvol, Uvol, HR, or BP. Participants began exercise euhydrated (Posm = 266.9 ± 16.6 mOsm/L) and maintained hydration to post- (266.3 ± 19.5 mOsm/L) and 1 hr post-cycling (261.9 ± 12.8 mOsm/L). PK+ post-cycling was significantly greater in OJ (4.3 ± 0.2) than CEB (4.0 ± 0.1, P = .04). PK+ 1 hr post-cycling was significantly lower in CEB (3.9 ± 0.1) than W (4.3 ± 0.2, P = .003) and OJ (4.2 ± 0.3, P = .01). Overall, pre- PK+ (3.9 ± 1.9 mmol/L) was significantly lower than post- (4.2 ± 0.2 mmol/L, P < .001) and 1 hr post-cycling (4.1 ± 0.3 mmol/L, P < .001). **CONCLUSION:** Consuming 8 oz of OJ on multiple days after moderately intense cycling in the heat

maintained fluid, electrolyte, and cardiovascular measures similar to W and CEB. Only PK$^+$ was significantly affected by OJ, with post-cycling measures being higher, but within normal limits. 100% OJ is a viable rehydration option after exercise. Funded by the Florida Department of Citrus (#STE0075600).

1661   Board #4   May 31 3:15 PM - 5:15 PM

Rehydrating Efficacy of Maple Water After Exercise-Induced Dehydration: Potential Sex

Alexs A. Matias, Monique D. Dudar, Josip Kauzlaric, Kimberley A. Frederick, Stephen J. Ives. *Skidmore College, Saratoga Springs, NY.* (Sponsor: Paul J. Arciero, FACSM)

(No relevant relationships reported)

BACKGROUND: Physical work, exacerbated by environmental heat stress, can induce dehydration, impairing physiological function. Therefore, understanding efficient rehydration strategies is paramount. The rehydrating effects of carbohydrate-electrolyte drinks and coconut water are well documented. To the best of our knowledge, no studies have investigated the rehydrating efficacy of maple water (MW). **PURPOSE:** Investigate the rehydrating efficacy of MW following exercise induced dehydration. **METHODS:** 26 healthy college-aged (24±1 kg/m^2, 22±1 yrs) males (n=13) and females (n=13) participated in a single blind, counterbalanced, crossover design study investigating the rehydrating efficacy of MW vs. maple flavored bottled water after exercise-induced dehydration (~2.0%Δ Body Weight [BW]) in an environmental chamber (30°C, 50% RH). Post-exercise, participants consumed either: 1L of MW or control. Assessments of hydration (BW, salivary and urine osmolality [Sosm/Uosm]), urine specific gravity (USG), urine output (UO), urine color (UC), thirst, fatigue, heart rate (HR), and HR variability (HRV) were taken at baseline, immediately post-exercise, and 0.5, 1, and 2h post-consumption. **RESULTS:** Following dehydration (p<0.05), MW had no differential (p>0.05) impact on rehydration. Thirst sensation was 12% higher in the MW condition (p<0.05). When analyzed by sex, females had lower UO (30%, p<0.05), higher ΔBW (25%, p<0.05), USG (p<0.05), and Usom (23%, p<0.05), but similar Sosm (p>0.05). Analysis of MW revealed higher electrolyte content (Ca^{2+}, K$^+$, Mg$^+$, Mn$^+$, CO$_3^{2-}$, PO$_4^-$, SO$_2^-$, Cl-, but not Na$^+$), osmolality (81 vs. 11 mOsm/kg), and antioxidant potential (AP; FRAP assay, 3.9 ± 0.0 vs. 1.0 ± 0.1), which tended to increase urine AP following MW consumption (9.4 ± 0.7 vs 7.6 ± 1.0 mmol; MW vs. control). **CONCLUSION:** MW is an equally effective rehydrating beverage to water, but has higher electrolyte concentration and osmolality which might better trigger thirst mechanisms when rehydration is performed ad libitum. Further, MW has a superior antioxidant capacity, which tended to increase urinary antioxidant capacity and might reduce free radicals associated with exercise. There are apparent sex differences in urinary (UO, ΔBW, USG, Uosm), but not salivary, based measures of rehydration and warrants further study.

1662   Board #5   May 31 3:15 PM - 5:15 PM

Commercial Hydration Beverages Effectively Prolong Positive Fluid Balance in Older Adults Compared to Water

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(No relevant relationships reported)

Glucose-based beverages are often prescribed when mild-to-moderate dehydration is suspected because glucose-sodium cotransporters in the small intestine facilitate active transport of Na+ and resultant water diffusion. Alternatively, amino acid (AA)-based beverages use AA-sodium cotransporters to facilitate increases in vascular volume in the short-term with potentially fewer negative GI issues. **PURPOSE:** To compare effects of commercially available hydration solutions on short term fluid balance after an overnight fast. We hypothesized that (1) older subjects would stay in positive fluid balance longer after fluid ingestion due to decreased renal excretion rates, and (2) consumption of commercially-available hydration products would further delay negative fluid balance compared to water. **METHODS:** On five separate visits following an overnight fast, 12 young (Y, 23±3 yr; 7M/5F) and 12 older (O, 67±6 yr; 5M/7F) subjects consumed 1 L of distilled water, Gatorade (6% glu, 20 mmol/L Na$^+$), Pedialyte (2.5% glu, 45 mmol/L Na$^+$), Enterade (5 AA, 30 mmol/L Na$^+$), or Enterade-AD (anti-diarrheal; 8 AA, 60 mmol/L Na$^+$) over a 30-minute period. Urine samples were collected before ingestion and at 0, 60, 120, 180, and 240 min post-ingestion. Net fluid balance was calculated at each time point and time spent in positive fluid balance (g urine < g fluid consumed) was determined for each beverage by non-linear exponential decay modeling. **RESULTS:** GFR was lower in O compared to Y (71±3 vs. 94±6 ml/min, P<0.01). There was no difference among beverages for Y in time spent in positive fluid balance. Time in positive fluid balance was significantly longer for O compared to Y following ingestion of 1L of Pedialyte (234±34 vs. 140±18 min; P<0.01), Enterade (291±49 vs. 152±18 min; P<0.01), and Enterade-AD (228±27 vs. 161±25 min; P=0.04) and was significantly increased in O with Enterade compared to water (291±49 vs. 204±35 min, P=0.02). **CONCLUSIONS:** After a bolus fluid load, healthy older adults exhibit a prolonged time course for urine excretion due to

decreased GFR. Ingestion of commercially-available hydration solutions prolongs positive fluid balance compared to water ingestion in healthy older -- but not young -- adults. An AA based hydration product was the most effective short-term (0-4 h) oral hydration strategy for older adults.

1663   Board #6   May 31 3:15 PM - 5:15 PM

Consumption of a Caffeinated Soft Drink during Exercise in the Heat Worsens Dehydration

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(No relevant relationships reported)

Chronic dehydration is linked to kidney dysfunction in workers regularly exposed to hot environments. Sugar-rich beverages, such as soft drinks, are regularly consumed on work sites. Such hypertonic drinks decrease plasma and extracellular fluid volumes during rest. Consuming a soft drink-like beverage after resting heat exposure worsens dehydration in rats. It is unknown if drinking a caffeinated soft drink exacerbates dehydration during exercise in the heat.
PURPOSE: Test the hypothesis that consuming a caffeinated soft drink during exercise in the heat increases the magnitude of dehydration.
METHODS: Twelve healthy subjects (age: 24±5 y, 3 females) completed randomized soft drink (Mtn Dew, Soda), and water control (Water) trials. Subjects completed four 1 h work-rest cycles (45 min exercise, 15 min seated rest) in a 35°C, 65% RH environment. During rest, subjects drank 500 mL of the assigned rehydration beverage (~11°C). Physiological variables, and venous blood and urine samples were taken pre-(PRE), and post-exercise (POST) after 15 min supine rest in a moderate environment. Percent changes in plasma volume were estimated from changes in hemoglobin and hematocrit. Data are reported as a change from Pre (mean±SD).
RESULTS: Increases in core temperature (Soda: 0.8±0.3, Water: 0.8±0.3°C, p=0.46) and changes in nude body weight (Soda: -0.3±0.8, Water: 0.0±0.7%, p=0.20) were not different between trials. Urine specific gravity was higher at POST (p<0.05), but there were no differences between trials (Soda: 0.006±0.013, Water: 0.007±0.009, p=0.89). At POST, plasma osmolality was elevated in Soda (2±3 mOsm/kg) and reduced in Water (-6±3 mOsm/kg, p<0.01). Urine osmolality was higher at POST (p<0.01), but there were no differences between trials (Soda: 69±368, Water: 185±311 mOsm/kg, p=0.12). Plasma volume was lower in Soda at POST (p<0.02), but there were no differences between trials (Soda: -5±6, Water: -2±7%, p=0.15). Elevations in heart rate were higher in Soda at POST (Soda: 20±12, Water: 12±12 bpm, p<0.03). Mean arterial pressure was elevated in Soda (p<0.01) at POST, but was not different between trials (Soda: 5±8, Water: 2±5 mmHg, p=0.33).
CONCLUSION: These data indicate that consuming a caffeinated soft drink during exercise in the heat worsens dehydration and elevates cardiovascular strain.

1664   Board #7   May 31 3:15 PM - 5:15 PM

Effects of Different Water and Sodium Consumption Volumes on Fluid Retention and Hyperhydration.

David M. Morris, Elizaveta Roslanova. *University of Texas - Permian Basin, Odessa, TX.*

(No relevant relationships reported)

Previous research has shown that co-consumption of sodium and water prior to exercise is effective in promoting hyperhydration. However, optimum fluid and sodium consumption volumes for attaining hyperhydration have not been systematically studied. While consumption of larger volumes of fluid may seem to be advantageous, overconsumption of fluid may trigger excess diuresis and, thus, not provide advantages over smaller fluid doses. **PURPOSE:** To compare the effects of different water and sodium dose volumes on fluid retention.
METHODS: Urine excretion was measured during four separate 2-hr hyperhydration protocols in 13 well hydrated male subjects (24 ± 4 yr, 177.0 ± 8.9 cm, 75.2 ± 9.5 kg) who were free from known renal, digestive, and cardiovascular disease. Each protocol began with a complete bladder void and assessment of urine specific gravity (USG). Subjects then consumed water and NaCl in an isotonic mixture in four different dosing strategies: 20 mL H$_2$O · kg bm^{-1} with 94 mg NaCl · kg bm^{-1} (20), 15 mL H$_2$O · kg bm^{-1} with 70.5 mg NaCl · kg bm^{-1} (15), 10 mL H$_2$O · kg bm^{-1} with 47 mg NaCl · kg bm^{-1} (10), or 5 mL H$_2$O · kg bm^{-1} with 23.5 mg NaCl · kg bm^{-1} (5). Protocols were applied in a randomized, crossover fashion. Each treatment was divided into three equal portions and consumed at 0, 45, and 90-min of the 2 hr hyperhydration period. Total urine excretion for the two hour period was subtracted from the fluid consumed to determine total fluid retention (TFR). USG and TFR, expressed in mL · kg bm^{-1}, were compared using separate, one-way repeated-measures ANOVAs and Sidak *post hoc* analyses.
RESULTS: USGs were 1.009 ± 0.005 (20), 1.016 ± 0.028 (15), 1.010 ± 0.003 (10) and 1.009 ± 0.005 (5) (P = 0.93 - 1.00) indicating that subjects were well and similarly hydrated for each trial. TFR, expressed in mL · kg bm^{-1}, were 10.8 ± 2.7 (20), 7.5 ± 2.3 (15), 5.0 ± 2.5 (10) and 2.6 ± 1.4 (5) (P = 0.001 - 0.039).

CONCLUSIONS: The data suggest that, when consuming a water and NaCl mixture in volumes ranging from 5 - 20 mL $H_2O \cdot kg\ bm^{-1}$, fluid retention rates are approximately 50% regardless of the volume of fluid consumed. Thus, to achieve maximum hyperhydration, at least 20 mL $H_2O \cdot kg\ bm^{-1}$ should be consumed.

D-39 Thematic Poster - **Knee Biomechanics**

Thursday, May 31, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100F

1665 **Chair:** Max R. Paquette. *University of Memphis, Memphis, TN.*

(No relevant relationships reported)

1666 Board #1 May 31 3:15 PM - 5:15 PM
Dynamic Knee Hyperextension in Competitive High School Soccer Players

Stacy J. Ingraham[1], Jon-Paul W. Ciszewski[2], David W. McGehee[2], Jessica N. Schindler[2], Sarah J. Ingraham[3], William W. Newhouse[4], Daniel D. Hanson[5], Jane R. Yank[2]. *[1]Crown College, St. Bonifacious, MN. [2]Bethel University, St. Paul, MN. [3]Norwich University, Northfield, VT. [4]University of Minnesota, Minneapolis, MN. [5]Wheaton College, Wheaton, IL.*

(No relevant relationships reported)

Purpose: The purpose of this study was to explore the incidence of dynamic knee hyperextension in high school soccer athletes by sex and team level (freshman, junior varsity and varsity), as observed through high-speed photography. In addition, the data was gathered to explore if the difference of dynamic hyperextension noted between men and women was similar to the differences found in ACL injury surveillance data incidence statistics. **Methods:** Dynamic knee extension of 87 male (*n*=41) and female (*n*=46) high school soccer athletes was captured using high-speed photography while punting a soccer ball 8 times in a single session. One photo demonstrating each athlete's maximal knee extension was assessed for degree of extension, both visually and using Kinovea, a motion analysis software program. **Results:** Multinomial logistic regression regarding certainty of hyperextension with a 5-point scale by two judges showed no significant differences by sex of the player (*p*=.456) or team level (*p*=.064). The incidence of hyperextension for females and males across all skill levels was approximately 16/41 (39%) and 16/36 (44%), respectively. Results of binary logistic regression on the presence or absence of observed hyperextension showed no significant differences by sex of the players (*p*=.702) or by team level (*p*=.191). Results of categorical data analysis showed no significant differences among six player groups consisting of freshman, junior varsity, and varsity levels for both boys and girls (chi-square=3.928, *p*=.560). Interestingly, there was a marginal increased incidence of hyperextension in freshman high school athletes (p=.099). The incidence of hyperextension among all participants of this study is not congruent with published ACL injury surveillance, confirming the multifactorial nature of ACL injuries. **Conclusion:** The results indicate that with a larger sample size, a difference between team levels may emerge. The lack of difference of hyperextension between males and females suggest hyperextension incidence is not a good predictor of injury differences between sexes. More research is needed to identify the relationship between observed dynamic knee hyperextension, recoil and ACL injury.

1667 Board #2 May 31 3:15 PM - 5:15 PM
A Novel Approach To Investigate Differences In Knee Mechanics After ACL Reconstruction Using Inertial Sensors

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(No relevant relationships reported)

Hop testing after an Anterior Cruciate Ligament reconstruction (ACLR) is a common functional test to determine return to play status. However, hop tests are not very sport specific, as they do not capture other tasks in sports like accelerating, decelerating, cutting and turning. A figure 8 running task is proposed as an alternative, involving these sport specific movements. Knee mechanics during this task can be objectified using inertial sensors. These sensors have been used previously to objectify hop tests and showed differences in knee kinematics in ACLR patients.
PURPOSE: To investigate sagittal knee mechanics in ACLR patients during a 5 minute figure 8 running task, using inertial magnetic measurement units (IMUs).

METHODS: 5 ACLR patients (2M 3F, 20.4 ± 2.1 yrs, 164.2 ± 10.7 cm, 69.1 ± 23.5 kg) one year post ACLR, and 10 healthy controls (7M 3F, 21.8 ± 2.0 yrs, 178.3± 10.2 cm, 73.5± 14.3 kg) performed a 5 minute figure 8 running task wearing a lycra suit equipped with 8 IMUs at the feet, tibia, upper legs, sacrum and sternum. Sagittal knee mechanics were determined at the straights since this is the most standardized part of the figure 8. The absolute difference in peak knee flexion (ADPK) during stance phase was determined between reconstructed and healthy leg for the ACLR group and between both legs for the healthy (HLTH) population. An independent Mann-Whitney U-test was used to test for a statistical difference in ADPK between ACLR and HLTH. **RESULTS:** ADPK was significantly higher (p < 0.05) for the ACLR group versus the healthy population.
CONCLUSIONS: Subjects who have had an ACLR have a larger difference in peak knee flexion between their reconstructed and healthy leg (less flexion in the reconstructed knee) at the straights of a figure 8 Running task compared to healthy controls. The figure 8 test might serve as a new test to determine return to play and to assess re-injury risk. Future research should test this and include (frontal plane) knee mechanics during cutting and turning.

Table 1: Peak knee flexion (degrees) of the reconstructed and healthy leg during stance phase of the individual ACLR subjects (ACLR#) and ACLR group and for the left and right leg for the HLTH group. An asterisk denotes the statistical significant difference.

	ACLR1	ACLR2	ACLR3	ACLR4	ACLR5	ACLR (N=5)	HLTH (n= 10)
ACLR side	Right	Right	Right	Left	Right		
Reconstructed leg	27.9 ± 5.2	26.8 ± 3.1	47.5 ± 2.4	28.4 ± 5.1	44.0 ± 5.6	34.9 ± 11.4	46.3 ± 8.4
Non-injured leg	48.3 ± 5.0	48.6 ± 3.4	48.3 ± 1.7	37.4 ± 3.0	43.2 ± 3.3	45.2 ± 5.5	48.2 ± 9.5
ADPK	22.9 ± 4.9	21.8 ± 3.8	1.9 ± 1.9	9.1 ± 6.8	2.3 ± 2.5	12.0 ± 5.2 *	4.9 ± 5.2

1668 Board #3 May 31 3:15 PM - 5:15 PM
Reductions in Peak Knee Adduction Moment in Three Previously Studied Gait Modification Strategies: Preliminary Analysis

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(No relevant relationships reported)

First peak knee adduction moment (PKAM) has been associated with osteoarthritis (OA) progression. Gait modification strategies using real-time biofeedback (RTB) including lateral trunk lean (TL), medial knee thrust (MKT), and reduced foot progression angle (FPA) have reduced PKAM in both healthy and OA populations. However, heterogeneity between limited study designs makes it unclear which strategy most effectively reduces PKAM. **PURPOSE:** To compare the effects of TL, MKT, and FPA strategies on PKAM in healthy individuals during gait. **METHODS:** 10 healthy individuals volunteered for this study (28.4 ± 3.8 years, 1.73 ± 0.1 m, 75.3 ± 12.5 kg). Mean and standard deviation (SD) for PKAM, trunk angle, knee angle (KA), and foot angle during stance was calculated from 10 baseline trials using a motion capture system and force plates. 10 trials completed for each strategy using RTB so that joint angles fell within a determined range (1-5 SD) relative to baseline. Visual 3D was used to project visual RTB as a line graph displaying real-time joint angle during stance. Visual 3D was used to calculate joint angles (°) and internal moments (Nm/kgm). Participants modified their gait so the line fell within a highlighted bandwidth representing target ranges. Repeated measures ANOVA was used to assess differences in PKAM between conditions. Dependent t-tests were conducted to compare joint angles between baseline and modification strategy (p<0.05). **RESULTS:** Compared to baseline (0.10±.04) only MKT (.18±.09) showed a statistically significant difference in PKAM (p=0.014). No other statistically significant difference was found (p>0.05). **CONCLUSION:** Contrary to prior studies, results showed no differences in PKAM during LTL and FPA gait. Lack of significant changes in joint angles across conditions suggest that gait modifications were too small to significantly alter PKAM. MKT gait increased internal PKAM despite no significant differences in KA compared to baseline. It is possible that reductions in PKAM during gait modification are offset due compensatory mechanisms that remain poorly understood. More research is required to identify the magnitude of kinematic change needed to reduce PKAM and understand mechanical changes occurring along the entire kinetic chain during gait modification.

1669 Board #4 May 31 3:15 PM - 5:15 PM
Lack of Association Between Clinical Measures of Symmetry and Knee Loading Mechanics After ACL Reconstruction

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(No relevant relationships reported)

Distance hopped in the anterior cruciate ligament reconstructed limb (ACLR) limb relative to the contralateral limb (i.e. limb symmetry index [LSI]) has been used

as a clinical criterion to help guide safe return to sport. However, it is unclear if laboratory measures of knee kinematic and kinetic loading symmetry are related to clinical symmetry. Ongoing asymmetry in knee loading mechanics may predispose the individual to recurrent injury. Identifying whether clinical symmetry is related to knee loading symmetry is important to fully understand readiness to return to sport. **PURPOSE:** To evaluate whether clinical limb symmetry, measured by distance hopped during the single leg hop for distance (SLHD) test, is associated with landing mechanics symmetry in participants with a history of ACLR. **METHODS:** Motion analysis data were collected on participants with a history of ACLR (n=10, 6f/4m, 22.4±2.1yrs, 1.6±0.8m, 65.6±12.1kg, time from surgery to test 5.8±1.9yrs). The LSI ([ACLR limb/contralateral limb] x100) was calculated for the following parameters collected during the loading phase of the SLHD: distance hopped, peak knee flexion angle at initial contact, peak knee flexion angle, peak knee extensor moment, and the area under the curve (AUC) for knee flexion angle and knee extensor moment. Spearman correlations were used to determine if symmetry in distance hopped was associated with symmetrical landing mechanics. **RESULTS:** Distance hopped symmetry (99.5±5.1%) was not associated with peak knee flexion angle at initial contact (72.8±26.9%, rho=-0.164, P=0.651), peak knee flexion angle (90.1±10.7%, rho=0.103, P=0.777), AUC knee flexion angle (88.3±14.8%, rho=-0.006, P=0.987), peak knee extensor moment (89.9±19.2%, rho=0.576, P=0.082) or AUC knee extensor moment (87.0±23.5%, rho=0.188, P=0.603) symmetry. **CONCLUSION:** Clinical symmetry was not associated with any laboratory measures of knee kinematic or kinetic loading symmetry. The lack of association between clinical symmetry and knee loading mechanics suggests that individuals with a history of ACLR use altered inter-limb biomechanical strategies to achieve the same functional outcomes. This finding suggests that additional assessment of loading mechanics may be warranted to help guide safe return to sport after ACLR.

1670   Board #5   May 31 3:15 PM - 5:15 PM

The Effects of Wearing Knee Wraps on Total Concentric Work Performed During the Back Squat Exercise.

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(No relevant relationships reported)

PURPOSE: To investigate the effects of using knee wraps on vertical displacement, lifting duration, and work performed during the concentric phase of the back squat exercise. **METHODS**: Resistance-trained men performed a back squat protocol over three testing sessions, along with two training days, over a 2-week period. Each testing session involved performing six single repetition sets of the back squat with 5-min of rest. During each testing session, participants underwent 2 different treatments such that the first three sets were performed unassisted (U) and the second three sets were performed with knee wraps (W). The two training days occurred between the second and third testing sessions. On these training days, participants were randomly assigned to a back squat training group; one that trained with knee wraps (TW; n=7) (mean±SD; Age: 26±4yrs, Height: 1.81±0.06m, Mass: 88.4±13.7kg, 1RM: 144±23kg) and one that trained without knee wraps (TU; n=7) (Age: 24±5yrs, Height: 1.78±6.4m, Mass: 81.4±3.8kg, 1RM: 143±25kg). A linear position transducer was used to measure concentric vertical displacement, lifting duration, and work [Force*distance]. Repeated measures ANOVAs were used to determine differences in back squat across time (testing days 1(D_1), 2(D_2), and 3(D_3)), treatment (U vs. W), and training group (TW vs. TU). **RESULTS**: A significant main effect of time (p<0.001) was observed such that during the third back squat testing session concentric vertical displacement (D_3- 0.46±0.06m) was greater than the first two sessions (D_1- 0.43±0.08m, D_2- 0.44±0.06m) regardless of treatment or training group. Lifting duration significantly decreased (p<0.001) during the third session (D_3- 0.99±0.16s) that was also significantly different from the first two sessions (D_1- 1.06±0.23s, D_2- 1.05±0.19s) regardless of treatment or training group. Concentric work was also significantly greater (p<0.001) during the third session (D_3- 911±135Nm) compared to the first two sessions (D_1- 844±176Nm, D_2- 861±144Nm), independent of treatment or training group. **CONCLUSION**: Our data suggest that knee wraps didn't significantly alter concentric vertical displacement, duration, or work of the back squat exercise for single repetition sets.
*Supported by the Louisiana State University Graduate Research Stipend.

1671   Board #6   May 31 3:15 PM - 5:15 PM

Acute Effects of Two Hip Flexor Stretching Techniques on Knee Joint Position Sense and Balance

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(No relevant relationships reported)

Tightness of hip flexor (THF) muscles has been recognized as a risk factor for various musculoskeletal injuries in the lower extremities. Abnormal knee joint position sense (JPS) has also been linked to several orthopedic and musculoskeletal conditions in the knee joint. **Purpose:** To examine the acute effects of two hip flexor stretching techniques on hip extension range of motion (ROM), knee JPS and dynamic balance performance (DB). **Methods:** Thirty-six healthy college age students (24 males, 11 females, mean age 22.37 ± 1.63 years, height 171.05 ± 9.64 cm, and weight 72 ± 13.70 kg) with THF participated in this study. Hip extension ROM, knee JPS and DB were measured pre- and post-stretching using a digital inclinometer, an iPod touch and the Y-balance kit, respectively. Subjects were randomly divided into dynamic stretching (DS), and hold-relax proprioceptive neuromuscular facilitation (HR-PNF) groups. Three-way mixed analysis of variance (ANOVA) was used to explore if an interaction existed between the groups (DS vs. HR-PNF), time (pre-and post) and side of hip (right vs. left) in hip extension ROM, knee JPS and DB measurements. **Results:** There was a significant effect of time on hip extension ROM in both stretching groups (pre = 9.37°, 9.64°, vs post = 0.18°, 0.27°, right and left hips, respectively; *p* < 0.001). Also, there was a significant effect of stretch type on hip extension ROM (-3.87°, -2.48 °) and (-0.90°, -0.26°) right, left, PNF versus DS group, post- stretching time points, respectively; *p* = 0.004) favoring HR-PNF over DS. There was a non-significant effect of time on mean knee JPS replication error in both groups. In DB measurement, there was a significant main effect of time and directions of reach on the Y-balance test's mean distance. The total mean distance of reach to posterolateral direction for both stretching groups (pre = 110.96 %, post = 113.48 %) was larger than the total mean distance of reach to posteromedial direction (pre = 103.82 %, post = 107.94 %) which was in turn larger than the total mean distance of reach to the anterior direction (pre = 66.49 %, post = 65.64 %; *p* < 0.001). **Conclusions:** DS and HR-PNF stretching resulted in a significant acute improvement in hip extension ROM and DB measures. However, knee JPS replication error results showed nonsignificant improvement over time in either stretching group.

1672   Board #7   May 31 3:15 PM - 5:15 PM

Movement Efficiency Profile Affects Knee Loading Responses to a Controlled Acute Exposure to High Metabolic and Mechanical Training Load

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(No relevant relationships reported)

Exposure to acute high training loads (HTL) induces biomechanics associated with knee joint injury. **Purpose:** Determine if individuals with high-risk (HR) and low-risk (LR) biomechanics exhibit different changes in tri-planar knee loading in response to a controlled HTL exposure. **Methods:** 43 physically active, healthy, college-aged field or court sport female athletes (n=43; age=20.5±1.6 yrs, height=167.7±7.0 cm, mass=62.8±7.1 kg) were assigned to a LR (n=21) or HR (n=22) movement profile group defined by the landing error scoring system. Peak anterior tibial shear force (ATSF ($N•N_{bw}$-1)), internal knee varus (IKVRM), and internal knee external rotation (IKERM) moments ($Nm•N_{bw}$-1$•m_{ht}$-1) were measured during a jump-landing task prior to and after a metabolically and mechanically controlled HTL exposure. Participants completed five sets of treadmill running at a speed (LR:11.1±1.2 km•h-1, HR:11.3±1.0 km•h-1, t$_{41}$=0.702, p>0.05) coincident with 110-120% of their ventilatory threshold (LR:37.1±3.6 ml•kg-1•min-1, HR:37.1±3.6 ml•kg-1•min-1, t$_{41}$=0.072, p>0.05) for five minutes and 10 jump-landings from a 30 cm box half their height from a landing target line. **Results:** A significant group-by-time interaction was observed for ATSF (F$_{1,41}$=5.000, p<0.05) The HR group experienced increases in ATSF (HR-Pre-HTL: 0.86±0.10[0.82, 0.90], HR-Post-HTL: 0.90±0.08[0.86,0.93]), whereas the LR group experienced decreases in ATSF (LR-Pre-HTL: 0.82±0.17[0.76,0.90], LR-Post-HTL: 0.79±0.13[0.74,0.85]) from pre-to-post HTL exposure. No significant group-by-time interactions were observed for IKVRM (F$_{1,41}$=0.648, p>0.05; HR-Pre-HTL: 0.41±0.23[0.31, 0.51], HR-Post-HTL: 0.42±0.22[0.33, 0.52] & LR-Pre-HTL: 0.28±0.14[0.22, 0.34], LR-Post-HTL: 0.25±0.11[0.21, 0.30]) or IKERM (F$_{1,41}$=0.083, p>0.05; HR-Pre-HTL: 0.21±0.09[0.25,0.17], HR-Post-HTL: 0.17±0.11[0.22,0.12] & LR-Pre-HTL: 0.21±0.09[0.24,0.17], LR-Post-HTL: 0.16±0.08[0.19,0.12]). **Conclusion:** Movement profile has a large effect (d=0.98) on HTL-induced sagittal plane knee loading responses linked to knee joint injury. Individuals with greater movement efficiency appear to be more biomechanically resilient to acute HTL exposure compared to individuals with high-risk biomechanics.

1673   Board #8   May 31 3:15 PM - 5:15 PM

Effects Of Load Carriage and Step Length Manipulation on Knee Loads During Walking

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(No relevant relationships reported)

PURPOSE: Effects of load carriage on medial tibiofemoral joint (mTFJ) and patellofemoral joint (PFJ) contact forces were evaluated using preferred, 7.5% shorter

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and 7.5% longer step lengths. **METHODS:** Sixteen male Army ROTC Cadets (20.1 ±2.5 years, 77.4 ±13.4 kg) completed walking treadmill trials (1.3 m/s) with and without 20-kg load carriage. Trials were then collected with altered step lengths (±7.5%) with load carriage. Joint contact forces normalized to body weight (BW) per step and per 1-km were estimated for the mTFJ and PFJ via musculoskeletal modeling. **RESULTS:** At preferred step length, the load carriage increased peak mTFJ contact force per step by 19.3% (p<0.001, d=1.33) and mTFJ impulse per 1-km by 22% or 89 additional BW*s per km (p<0.001, d=1.49). Relative to body mass, the load carriage increased peak PFJ contact force per step by 14.2% (p<0.001, d=0.66) and PFJ impulse per km by +18.7% or 19 additional BW*s per km (p<0.001, d=0.69). There was a 1:2 relationship between the load carriage and absolute peak mTFJ contact force increase versus a more modest 1:1 relationship between load carriage and absolute peak PFJ contact force increase. Compared with preferred step length with load carriage, a short step with load carriage did not alter mTFJ or PFJ contact forces (all p>0.05). In contrast, a long step magnified the effect of load carriage on all metrics of mTFJ and PFJ contact forces. Specifically, a long step with load carriage increased peak mTFJ contact force by 9.0% (p<0.004, d=0.63) and mTFJ impulse per 1-km by 6.6% or 32.8 additional BW*s per km (p=0.001, d=0.48). A long step increased peak PFJ contact force by 26.6% (p=0.004, d=0.68) and PFJ impulse per 1-km by 22.7% or 27.1 additional BW*s impulse per km (p=0.001, d=0.48) compared with preferred step length with load carriage. A long step with load carriage resulted in 1:3.2 and 1:2.4 relationship between added load weight and absolute increases in peak mTFJ and PFJ contact forces, respectively. **CONCLUSIONS:** The added load carriage was preferentially borne by the mTFJ with a smaller increase in PFJ contact forces. A short step was not an effective strategy to reduce mTFJ and PFJ loads. A longer than preferred step length, often observed in shorter individuals during formation marching, increased both mTFJ and PFJ contact forces with greatest increases noted in the PFJ.

D-40   Thematic Poster - **Step it Up! Walking Toward Health**

Thursday, May 31, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100H

1674   Chair: David R. Bassett, FACSM. *University of Tennessee, Knoxville, TN.*

(No relevant relationships reported)

1675   Board #1   May 31 3:15 PM - 5:15 PM

Trends In The Prevalence And Volume Of Transportation And Leisure Walking Among U.S. Adults, 2005-2015

Emily N. Ussery[1], Susan A. Carlson[1], Geoffrey P. Whitfield[1], Kathleen B. Watson[1], David Berrigan[2], Janet E. Fulton, FACSM[1]. *[1]Centers for Disease Control and Prevention, Atlanta, GA. [2]National Cancer Institute, Bethesda, MD.* (Sponsor: Janet Fulton, FACSM)

(No relevant relationships reported)

Promotion of walking is an important strategy for increasing physical activity levels in the US, as highlighted in *Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities*. Public health monitoring of walking behaviors can guide future efforts to promote walking. The proportion of adults who walk for transportation or leisure has increased in recent years, but trend data on walking for specific purposes is limited.
PURPOSE: To examine trends in the prevalence and volume of self-reported walking for transportation and leisure among US adults from 2005 to 2015.
METHODS: The 2005, 2010, and 2015 National Health Interview Survey assessed participation in and time spent walking for transportation and leisure in the past week among adults (n=83,933). For each year, the prevalence and mean volume (minutes/week) of walking were calculated for those reporting any transportation walking, any leisure walking, and both transportation and leisure walking. Trends were evaluated using logistic (prevalence) and linear (volume) regression.
RESULTS: The prevalence of transportation walking increased steadily from 2005 to 2015 (linear: p<0.05). Leisure walking prevalence increased overall, but slowed between 2010 and 2015 (linear and quadratic: p<0.05). Reported transportation and leisure walking volume decreased from 2005 to 2015, with no change between 2010 and 2015 (linear and quadratic: p<0.05). The prevalence of walking for both transportation and leisure increased steadily from 2005 to 2015 (linear: p<0.05); walking volume also decreased in this group, with no change between 2010 and 2015 (linear and quadratic: p<0.05).
CONCLUSION: Transportation and leisure walking prevalence increased over the last decade, but time spent walking decreased. Encouraging walking for multiple purposes may increase participation in and time spent walking. Promotion efforts could benefit from a better understanding of factors explaining these trends.

Measure	2005			2010			2015		
	n	Estimate	(95% CI)	n	Estimate	(95% CI)	n	Estimate	(95% CI)
Prevalence of walking (%)									
Any transportation	8,302	28.4	(27.5-29.3)	7,582	29.2	(28.4-30.1)	9,895	31.7	(30.8-32.5)b
Any leisure	11,775	42.1	(41.2-42.9)	12,059	49.9	(49.0-50.8)	15,744	52.2	(51.2-53.1)b,c
Both transportation and leisure	4,506	15.5	(14.9-16.2)	4,516	17.6	(17.0-18.3)	6,353	20.6	(19.9-21.3)b
Mean volume of walking (minutes/week)a									
Any transportation	8,302	75.3	(73.3-77.4)	7,582	58.3	(56.4-60.2)	9,895	59.1	(57.5-60.9)b,c
Any leisure	11,775	90.2	(88.3-92.1)	12,059	79.8	(78.3-81.5)	15,744	79.3	(77.6-81.0)b,c
Both transportation and leisure	4,506	199.2	(193.5-205.2)	4,516	164.0	(159.1-169.0)	6,353	165.0	(160.4-169.7)b,c

Estimates are weighted and age-standardized to the 2000 US standard population.

a Walking volume was calculated by multiplying the number of walking bouts in the past week by the average minutes per bout among those reporting walking participation.

b Significant linear trend from 2005 to 2015 (p<0.05).

c Significant quadratic trend from 2005 to 2015 (p<0.05).

1676   Board #2   May 31 3:15 PM - 5:15 PM

Association Between Walkable Community Design Features and Walking Among U.S. Adults — 2015

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(No relevant relationships reported)

Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities calls for community design that makes it safe and easy to walk for people of all ages and abilities. Determining which community design features are associated with walking at the national level can inform strategies to improve and monitor walkability in the U.S.
PURPOSE: To document the associations between walking and walkable supports and destination types among U.S. adults.
METHODS: Adult respondents (n=29,925) to the 2015 National Health Interview Survey reported the presence of two near-home walkable supports (roads, sidewalks, paths, or trails; sidewalks on most streets) and four destination types (shops, stores, or markets; bus or transit stops; movies, libraries, or churches; places that help one relax, clear one's mind, and reduce stress). Stepwise logistic regression was used to identify features significantly associated with self-reported walking for leisure or transportation in the past week. From the resulting model, the prevalence of walking was calculated for each combination of features.
RESULTS: When combined in a single model, one support and three destination types were associated with walking: roads, sidewalks, paths, or trails (prevalence ratio [PR], present vs. absent [95% confidence interval]: 1.11 [1.07-1.16]); transit (1.07 [1.04-1.10]); movies, libraries, or churches (1.07 [1.04-1.11]); and places to relax (1.39 [1.34-1.44]). For specific combinations of the four, 7.4% reported absence of all features, 36.5% of whom reported any walking. In comparison, 32.5% reported presence of all features, 73.7% of whom reported any walking (PR: 2.02 [1.82-2.22]). The prevalence of walking was generally higher among adults who reported a greater number of features (p<0.001 for linear trend).
CONCLUSIONS: Among U.S. adults, one near home walkable support (roads, sidewalks, paths, or trails) and three walkable destination types (transit; movies, libraries, churches; places to relax) were associated with walking. Walking was two times more common among adults who reported all four features versus no features. These results support the idea that multiple built environment features may combine to influence walking and designing communities with these features may help improve walkability in the U.S.

1677   Board #3   May 31 3:15 PM - 5:15 PM

Walkability, Health Behaviors, And Body Mass Index In Twins

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(No relevant relationships reported)

Built environments (BE) may influence health behaviors and subsequently obesity. However, most research in the BE literature has been fraught by methodological problems including self-selection bias and structural confounding. Twin studies provide a quasi-experimental approach to address these issues. **PURPOSE**: This study examined relationships among BE walkability, health behaviors, and body mass index (BMI) between and within twin pairs, and how these relationships differ when considering walkability of the home neighborhood and each twins' full activity space. **METHODS**: Geocoded home addresses and continuous physical activity data from accelerometers and GPS loggers were obtained in 144 identical twin pairs over 2 weeks. Dietary energy density (DED) was assessed by food frequency questionnaire, and BMI was derived from measured height and weight. Walk Score™ (WS) was used to estimate walkability; home WS refers to walkability of the home neighborhood and GPS WS refers to the mean of individual WS values matched to every GPS point collected by each participant, reflecting the walkability of each twins' activity space. **RESULTS**: Home WS was related to GPS WS between-pairs (r = 0.52; 95% CI: 0.38, 0.63); the relationship was attenuated but significant within-pairs (r = 0.25; 95% CI: 0.08, 0.41). DED was related to GPS WS but not home WS (r = -0.20; 95% CI: -0.36, -0.04) between-pairs; this relationship was not significant within-pairs. Moderate-to-vigorous physical activity (MVPA) performed outside of the home neighborhood, defined using both 833 and 1,666m buffers, was related to GPS WS between-pairs (both r = 0.22; 95% CI: 0.06, 0.38); the relationship was attenuated but significant within-pairs (both r = 0.18; 95% CI: 0.00, 0.35). BMI was related to GPS WS but not home WS (r = -0.23; 95% CI: -0.36, -0.04) between-pairs; this relationship was not significant within-pairs. BMI was related to walking bouts and MVPA performed within the 1,666m home neighborhood buffer between-pairs (both r = -0.23; 95% CI: -0.38, -0.06), but not within-pairs. However, BMI was not related to DED levels either between or within-pairs. **CONCLUSIONS**: Twin studies support the concept that aspects of the BE are indirectly associated with BMI through its influence on health behaviors, particularly physical activity. Supported by R01AG042176.

1678   Board #4   May 31 3:15 PM - 5:15 PM

Physical Activity and Biological Aging: Is Walking Enough? An NHANES Investigation

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(No relevant relationships reported)

PURPOSE: Research indicates that high levels of total physical activity are predictive of lower levels of biologic aging. However, research has never studied the extent to which walking alone contributes to reduced cellular aging. The principal objective of the present study was to determine the extent to which walking accounts for differences in leukocyte telomere length (LTL) in a large random sample of U.S. men and women. Another purpose was to assess the extent to which multiple demographic and lifestyle covariates affect the relationship between walking and LTL. **METHODS**: A total of 5,823 adults from the National Health and Nutrition Examination Survey (NHANES) were studied cross-sectionally. The quantitative polymerase chain reaction method was employed to compare LTL to standard reference DNA. Adults were divided into three walking groups based on self-reported minutes of walking per week: No Walking (< 10 minutes of walking per wk), Some Walking (10-149 min. of walking per wk) and Achieved Guidelines (≥ 150 min. of walking per wk). Participation in 61 physical activities other than walking was also measured and total MET-minutes of activity other than walking was calculated based on the frequency, duration, and intensity of each activity. Non-walking activity (i.e., other activity) was controlled statistically, with the other covariates. **RESULTS**: Telomeres were 15.5 base pairs shorter for each year of chronological age (F=723.2, P < 0.0001). After adjusting for age, sex, race, marital status, and income (F=4.9, P=0.0153), adults who met the PA Guidelines by walking ≥ 150 min per week had significantly longer telomeres than those reporting No Walking and also those reporting Some Walking. Differences in LTL remained significant after controlling for smoking, BMI, and other physical activity along with the demographic covariates (F=3.6, P=0.0406). Adults with ≥ 150 min of walking per week were estimated to have a biologic aging advantage of 6.6 years (102.8 base pairs ÷ 15.5) over Non-Walkers. **CONCLUSIONS**: Evidently, adults who engage regularly in ≥ 150 min per week of walking tend to have longer telomeres, accounting for years of reduced cellular aging, compared to adults who do not walk regularly and also those who accumulate less than 150 minutes per week of walking.

1679   Board #5   May 31 3:15 PM - 5:15 PM

Daily Step Counts in Service Members with Lower Limb Amputation

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(No relevant relationships reported)

Lower limb amputation can be a life-altering event given the critical role the lower limb plays in transferring, standing, and walking. The physical impairments an individual may experience can decrease his or her ability to function in the free-living environment. It has been reported that, on average, civilians with lower limb amputations of all levels walk only 2,000-3,000 steps per day. Although potentially not surprising that they are less active than able-bodied individuals, the magnitude of the activity gap is remarkable. **PURPOSE**: To quantify physical activity in Service Members with lower limb loss in the months following amputation. **METHODS**: Activity data were collected on 27 Service Members who received amputations during the recent military conflicts (N=16 unilateral transtibial, N=7 unilateral transfemoral, N=1 bilateral transtibial, N=3 bilateral transfemoral) using a StepWatch3 (Orthocare Innovations, Oklahoma City, OK) secured to the prosthesis and worn for one week. **RESULTS**: Service Members with lower limb amputations fell substantially below the recommended 10,000 steps per day to maintain an active lifestyle and averaged only $3,142 \pm 1,308$ steps per day. The individuals included in this data set were tested during their rehabilitation at the Center for the Intrepid and Walter Reed Military Medical Center and had been walking with a prosthetic limb for an average of 7.3 ± 3.6 months (range 2 to 12 months). There were no indications that individuals farther along in the rehabilitative process walked more steps per day than those in the earlier stages of rehabilitation (R^2=0.008). **CONCLUSION**: Although these young and previously highly active Service Members have extensive access to rehabilitative care and prosthetic technology, these data raise considerable concern about activity levels after amputation. These low activity levels indicate high risk for progressive declines in overall physical health. One limitation of this study was that these individuals may have been engaging in strength training or other exercises without a prosthetic limb as part of physical therapy, or recovering when not in therapy. It is unknown if their step counts are representative of activity once discharged from rehabilitation. Funding: Military Amputee Research Program W81XWH-06-2-0073

1680   Board #6   May 31 3:15 PM - 5:15 PM

Leisure-time Physical Activity, Work-related Walking and Incidence of Kidney Stones In Japanese Workers: The Niigata Wellness Study

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(No relevant relationships reported)

Limited data are available on the relationship of physical activity (PA) with the incidence of kidney stones. **PURPOSE**: The purpose of this study is to investigate the independent and joint effects of leisure-time PA (LTPA) and work-related walking (WRW) on the incidence of kidney stones among Japanese workers in the Niigata Wellness Study. **METHODS**: A cohort of 16,458 Japanese men [median (IQR) age 49 (43-53) years] and 7,140 women [median (IQR) age 48 (43-52) years] free of kidney stones completed a medical examination, and reported on LTPA and WRW in 2001. The participants were divided into three categories (0 min/week; LTPA-none, 1-119 min/week; LTPA-M$_1$, ≥120 min/week; LTPA-M$_2$) based on LTPA, and also divided into two categories based on existence of WRW (no; WRW-no, yes; WRW-yes). The development of kidney stones during follow-up from 2002 to 2006 was based on self-reports from questionnaires at another medical examination in 2006. Odds ratios and 95% confidence intervals (95%CI) for the incidence of kidney stones were obtained using logistic regression models while adjusting for sex, age, body mass index, cigarette smoking (5 categories), and alcohol intake (3 categories). **RESULTS**: During the 5 year follow-up period, 169 participants developed kidney stones. In regards to the independent effects of LTPA and WRW. Using LTPA-none as reference, odds ratios and 95% CIs for LTPA-M$_1$ and LTPA-M$_2$ were 0.72 (0.44-1.17) and 0.64 (0.40-1.02) (P for trend=0.034). Also, using WRW-no as reference, odds ratios and 95% CIs for WRW-yes was 0.85 (0.62-1.17). With regards to the joint effects of LTPA and WRW, using the LTPA-none and WRW-no group as reference, odds ratios and 95% CIs were 0.72 (0.42-1.24) for the LTPA-M$_2$ and WRW-no group, 0.39 (0.16-0.97) for LTPA-M$_2$ and WRW-yes group, respectively. **CONCLUSIONS**: These results suggest that there

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Abstracts were prepared by the authors and printed as submitted.

is an independent effect of LTPA on the incidence of kidney stones. Also, there is a strong joint effect of LTPA and WRW on the incidence of kidney stones in Japanese workers.

1681   Board #7   May 31 3:15 PM - 5:15 PM

HealtheSteps Lifestyle Prescription Program Can Increase Physical Activity and Decrease Blood Pressure in At Risk Adults

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(No relevant relationships reported)

Approximately 30% of Canadian adults have one or more chronic diseases. This number is expected to grow as the Canadian population ages and risk factors for chronic disease continue to climb.
PURPOSE: 1) To evaluate the effectiveness of HealtheSteps (HeS), a 6-month lifestyle prescription program, on increasing physical activity (PA) and decreasing systolic blood pressure (SBP) in adults at-risk for chronic disease; 2) To explore long-term maintenance of these outcomes.
METHODS: Pragmatic randomized controlled trial where adults from 5 primary care settings in Ontario, Canada (N = 118; mean age 57 (SD=12) years; 76% female) with ≥1 chronic disease risk factor (metabolic syndrome or type 2 diabetes; body mass index >25 kg/m²; exercise <150 min/wk; sit ≥3 hr/d; eat <8 servings of fruit and vegetables/d) were randomized to intervention (HeS) or comparator (wait-list control; WL). Over 6 months, HeS included 4 bi-monthly coaching sessions (setting lifestyle prescriptions and strategies to achieve goals) and access to eHealth technologies (phone coaching; social network; smartphone apps; website). From 6 to 12 months, in-person coaching was removed but participants could access all eHealth technologies. By 12 months, participants only had access to publically available technologies. We examined *within* and *between* group differences in mean steps/day (Yamax Digi-Walker SW-200 pedometers) and SBP (BP-Tru BPM-100 automated BP monitors) using linear mixed models adjusted for age, sex and site.
RESULTS: By 6 months, HeS increased their steps/day more than WL [mean change (95% CI); p-value for difference – HeS: 1646 (786, 2507); WL: -1486 (-2312, -659); p<0.001]. By 12 months, the increase in PA was still evident *within* HeS [mean change from baseline (95% CI): 1890 (888, 2892)]. Although there were no differences between groups (p=0.93), both groups decreased their SBP (mmHg) over 6 months [mean change (95% CI) – HeS: -6.38 (-10.43, -2.33); WL: -6.61 (-10.52 to -2.70)]; HeS maintained this to 18 months [mean change from baseline (95% CI): -6.58 (-11.35, -1.81)].
CONCLUSION: HeS was effective in improving physical activity over 6 months, compared to usual care, in adults at risk for chronic disease; these improvements were maintained 1-year later. Results also suggest that HeS may reduce SBP in both the short and long-term.

1682   Board #8   May 31 3:15 PM - 5:15 PM

The Effect of 2 Walking Programs on Hba1c in Sedentary Employees During a 10 Week Intervention

Mynor G. Rodriguez-Hernandez, James R. McDonald, David D. Pascoe, FACSM, Michael D. Roberts, Danielle D. Wadsworth. *Auburn University, Auburn, AL.* (Sponsor: David D. Pascoe, FACSM)
(No relevant relationships reported)

Physical activity is related to many benefits for metabolic impairments such as type 2 diabetes. However, it remains unclear whether different physical activity programs affect blood glucose in the same way. **PURPOSE**: The present study examined changes on HbA1c in sedentary employees exposed to two different walking programs during 10-week intervention. **METHODS**: 67 sedentary employees were enrolled in a 10-week walking intervention. Participants were randomly assigned to one of three groups: intermittent walking (Age = 46±9, BMI= 30.33±5.79 kg/m²), continuous walking (Age = 48±9, BMI= 30.53±6.17 kg/m²), or a no intervention control group (Age = 42±10, BMI= 27.66±5.11 kg/m²). Notably, the two walking groups were instructed to complete a program time and intensity matched. A1cNOW+ was used to test HbA1c from finger prick blood and accelerometer assessed physical activity. **RESULTS**: Statistically significant changes were observed in HbA1c as the overall analysis $F(1,64) = 4.229$, $p=.044$) with a medium size effect of $n^2=062$. Bonferroni Post-Hoc test shows that the continuous walking group was significantly affected, F=8.463, p=.009, with a large size effect $n^2=.297$. There were no changes within the multiple break group or control group (p>0.05). Accelerometry showed a main effect of time by group interaction $F(4,124) = 5.091$, $p=.001$) with a large effect size $n^2= .14$, the Post-Hoc indicated that the continuous walking group took significantly longer bouts at moderate to vigorous intensity at week-6 compared to pre-test (p=0.009). There were no changes in the length of bouts in the intermittent or control groups

(p>0.05). **CONCLUSIONS**: As preventive strategy, blood glucose may be better controlled by a continuous moderate intensity walking program compared to an intermittent walking program for sedentary office employees.

D-41   Free Communication/Slide - Exercise Immunology

Thursday, May 31, 2018, 3:15 PM - 4:45 PM
Room: CC-101CD

1683   Chair: Jill A. Kanaley, FACSM. *University of Missouri, Columbia, MO.*

(No relevant relationships reported)

1684   May 31 3:15 PM - 3:30 PM

The Impact of Physical Activity Level on the Oral Microbiome: A Cross-Sectional Investigation

Stephanie P. Kurti[1], Jacob M. Allen[2], Javier Abello[3], Lucy J. Mailing[2], Jeffrey A. Woods, FACSM[2], Sara K. Rosenkranz[3], Craig A. Harms, FACSM[3]. *[1]James Madison University, Harrisonburg, VA. [2]University of Illinois, Champaign-Urbana, IL. [3]Kansas State University, Manhattan, KS.* (Sponsor: Craig A. Harms, FACSM)
(No relevant relationships reported)

Previous research indicates that the composition and diversity of the gut and lung microbiome is associated with many autoimmune and inflammatory diseases. However, aerobic exercise has recently been shown to preferentially shift the composition of the gut microbiome. The physiological significance of these changes is not well understood, and currently there are no published data exploring whether physical activity may impact the composition and diversity of the oral microbiome. **Purpose:** We conducted this exploratory analysis to determine whether the composition of the oral microbiome was impacted by habitual physical activity (PA) level. **Methods:** Sixteen young adults between the ages of 18- 35 years (n=8 physically inactive (PI) subjects accumulating <30 minutes of planned exercise per week; n=8 trained athletes (TA) >150 minutes of moderate-to-vigorous PA per week) visited the laboratory after an overnight fast and without using any toothpaste or antibacterial mouthwash for 24 hours. Upon arrival to the laboratory, body composition assessment and PA questionnaires were administered, followed by saliva and sputum sample collection. Processing and DNA extraction was performed on samples within 48 hours of collection, and the bacterial 16S rNA gene was amplified followed by sequencing. Subjects were given an accelerometer to wear around their waist for one week to verify chronic PA level. Principle components analysis followed by linear regression was used to compare oral microbial taxonomy across PA levels. **Results:** PI and TA had significantly different chronic PA levels (PI: 240±26 METS/wk, TA: 3810±1656 METS/wk) ($p<0.01$). The amount of vigorous PA that subjects accumulated in METS/week explained 19.69% of the composition in the oral microbiome. Of particular interest, *Veillonella spp.*, *Streptococcus spp., Gemella spp.* and *Enterococcus spp.* were significantly higher in PI versus TA ($p<0.05$, respectively), which have been associated with various types of lung diseases, including chronic obstructive pulmonary disease and asthma. **Conclusion:** These data indicate that: (1) habitual PA level differentially impacts the oral microbiome and (2) that the amount of vigorous activity accumulated per week explains a significant portion of the variance in the oral microbiota composition.

1685   May 31 3:30 PM - 3:45 PM

Respiratory Infections in Young Elite Female Gymnasts

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(No relevant relationships reported)

PURPOSE: Immune function can be suppressed during periods of hard training and competition with Upper Respiratory Tract Infections (URTI's) as a possible consequence. The main aims of the study were (1) to map the incidence of URTI's in a non-endurance sport as gymnastics, and (2) to determine to which extent Immunoglobulin A (IgA) can be associated with URTI in young elite female gymnasts. **METHODS**: This study included 17 elite female gymnasts from the High Performance School Artistic Gymnastics in Ghent (Belgium) (age: 16.6 ± 3.4 years; body mass: 46.5 ± 6.7 kg; height: 153.9 ± 6.5 cm; VO2MAX: 52.09 ± 4.63 ml·min-1·kg-1). Before the first training of every week (after a minimum of 36h without training) for a period of 56 weeks, every gymnast completed an URTI and fatigue (VAS scale) questionnaire and donated 1 ml of unstimulated whole saliva for its assessment (saliva flow rate,

IgA secretion rate, absolute IgA and relative IgA (= mean values when URTI/Mean values when no URTI)). The saliva was analyzed using an ELISA assay kit (Salivary Secretory IgA Enzyme Immunoassay Kit, Salimetrics, USA). After normality checks through Shapiro-Wilk tests, Spearman rank correlations were used for the evaluation of relations between URTI, immune parameters and fatigue. **RESULTS**: Over the 56 weeks, gymnasts had 2.3 ± 2.8 URTI episodes and 99.5 ± 82.5 URTI symptoms with a mean fatigue score of 5.5 ± 0.6. During this period, 632 saliva samples were collected and analyzed, resulting in 1.00 ± 0.42 ml $\cdot$ min[-1] for saliva flow rate, 130.40 ± 39.05 μg $\cdot$ ml[-1] for absolute IgA concentration, 119.17 ± 49.83 μg $\cdot$ min[-1] for IgA secretion rate and 101.10 ± 5.03 % for relative IgA values. A significant correlation was found between URTI symptoms and relative IgA concentration (R=-0.733, P=0.003*). **CONCLUSIONS:** Values for amount of URTI's and immunological parameters of young elite gymnasts were similar to those of adult sailors (Neville et al., MSSE. 2008; 40: 1228-36), with relative IgA concentrations being associated with the development of URTI symptoms. Thus, young athletes are as prone as adult athletes to develop URTI's. However, since these athletes exercise indoor in contrast to an outdoor sport as sailing, environment may have an impact on the prevalence of URTI's.

1686   May 31 3:45 PM - 4:00 PM

The Percentage Of Non-classical Monocytes In Obese Individuals Is Reduced By High-intensity Interval Training

Fabiano T. Amorim[1], Mariana Aguiar de Matos[2], Bruna C. Chaves Garcia[2], Kaio C. Pinhal[2], Vanessa O. Fernandes[2], Denia V. Vargas[2], Flávio de Castro Magalhães[2], Etel Rocha-Vieira[2]. [1]University of New Mexico, Albuquerque, NM. [2]Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Brazil. (Sponsor: Dr. Ann Gibson, FACSM)

(No relevant relationships reported)

Obesity is associated with both metabolic and inflammatory disturbances. Exercise training represents an efficacious strategy to modulate these deleterious aspects of obesity. **PURPOSE:** To evaluate the effects of high-intensity interval training (HIIT) in monocyte subtypes distribution patterns of obese individuals. **METHODS:** Nine lean control (CON, BMI = 20.8 ± 1.7 kg•m[-2]), nine obese insulin sensitive (OBS, BMI = 35.1 ± 3.8 kg•m[-2]) and nine obese insulin resistant (OBR, BMI = 37.8 ± 4.6 kg•m[-2]) subjects were used in this study. The OBS and OBR underwent 8 weeks of HIIT, 3 x/week, using a cycle ergometer, with progressive increases in intensity and volume (8 to 12 bouts of 1 min at 80 to 110% of the maximum power output separated by 1 min active recovery at 30 W). Insulin resistance was defined as homeostasis model assessment index (HOMA-IR) ≥ 2.71. Venous blood was collected after 12 hours fasting, before and after HIIT for the quantification of monocyte subtypes (classics, intermediaries and non-classics) and metabolic parameters (insulin, glucose, triglycerides and cholesterol fractions). β-pancreatic cell function (HOMA-β) were also calculated. Volunteers also underwent an oral glucose tolerance test (OGTT). Body composition was evaluated using dual-energy X-ray absorptiometry (DXA). **RESULTS:** Pre-training blood triglycerides, VLDL-cholesterol, HOMA- β and insulin concentration were higher (p<0.05) in OBR compared to OBS and CON. OBR also had higher mass of visceral adipose tissue compared to OBS and CON (1,785 ± 754, $1,153 \pm 431$ and 149 ± 80 g, respectively). Both OBS and OBR individuals had increased (p<0.05) percentage of non-classical monocytes (11.0 ± 5.5 and 12.2 ± 5.9%, respectively), compared to CON (4.8 ± 2.2%). The percentage of non-classical monocytes was positively correlated to BMI, fat percentage, HOMA-β and OGTT. After 8 weeks of HIIT, the frequency of non-classical monocytes was reduced (p<0.05) by almost 40% in OBS and OBR (12.1 ± 5.6 and 8.7 ± 3.2%, pre- and post-HIIT, respectively). Although training had no effect on BMI and body fat, HOMA- β was improved (p<0.05) after HIIT (267 ± 166 and 183 ± 109, pre- and post-HIIT, respectively). **CONCLUSION:** HIIT reduces inflammation and improve metabolic parameters in obese insulin sensitive and insulin resistant individuals.Supported by CAPES, CNPq, FAPEMIG

1687   May 31 4:00 PM - 4:15 PM

Inflammatory Cytokine Production is Elevated in MAIT Cells Following Acute Exercise

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(No relevant relationships reported)

Mucosal associated invariant T (MAIT) cells occupy a unique niche within human immunity yet little is known regarding the effects of exercise on activation or cytokine production. **PURPOSE:** To determine if exercise alters MAIT cell proinflammatory cytokine production and early activation markers after submaximal aerobic exercise. **METHODS:** 17 healthy young males [age 22 (4y), VO_2max 51.6 (10.2 mL/kg/min), %fat 18.0 (5.0%)] performed a graded exercise test on a cycle ergometer until

volitional exhaustion. Participants cycled for 40 min at 86% of ventilatory threshold following an overnight fast. Peripheral blood mononuclear cells were isolated from blood samples obtained at rest, 0h and 1h after submaximal exercise. Following a 4h stimulation with phorbol 12-myristate 13-acetate and ionomycin, MAIT cells counts and intracellular interferon gamma (IFNγ), tumor necrosis factor alpha (TNFα) and interleukin 17 (IL-17) production were quantified using flow cytometry. Data were analyzed using one-way ANOVA and are expressed as mean (SD). **RESULTS:** Stimulated Vα7.2^{+}CD161^{+} MAIT cells were 2.3 (1.2%) of all T cells at rest and increased to 3.2 (2.2%) at 0h but this did not reach significance (p=0.134). MAIT cells expression of CD69 was 76.0 (13.4%) and remained constant with exercise. TNFα expression significantly increased with exercise before returning to baseline [rest: 71(18%), 0h: 79 (13%), 1h: 65 (19%); p=0.017] whereas IL-17 and IFNγ were unchanged. The total number of circulating cells significantly increased at 0h for MAIT cells [73.4 (85.6%); p=0.003] and MAIT cells expressing TNFα [89.4 (139.9%); p=0.018], IL-17 [275.4 (370.5%); p=0.026], but not IFNγ [64.5 (127.5%); p=0.061] with all counts returning to baseline at 1h. **CONCLUSIONS:** Submaximal aerobic exercise transiently increased the percentage and total number of MAIT cells expressing TNFα, which may aid in activation and recruitment of additional immune cells. The total number of MAIT cells positive for IL-17 and IFNγ are higher but are driven by the exercise-stimulated lymphocytosis. The increase in proinflammatory cytokine production is part of the enhanced immune response seen immediately following vigorous exercise and suggests that MAIT cells may play an important role within this response.

1688   May 31 4:15 PM - 4:30 PM

Environmental Mobilization Of Hematopoetic Stem Cells With Exercise, Compression, And Cooling

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(No relevant relationships reported)

Hematopoetic stem cells (HSC) have recently been studied to improve healing and rehabilitation from musculoskeletal injury. HSC are currently collected using invasive bone marrow aspiration and peripheral harvest after pharmaceutical mobilization. Animal studies show environmental stresses including heat, hypoxia, and cold mobilize HSC. HSC have also been mobilized to peripheral circulation (PC) with exercise. We hypothesized that the combination of environmental stress and exercise can mobilize HSC to PC. Mechanisms for environmental mobilization will aid in understanding healing and rehabilitation mechanisms and may provide a more convenient method to harvest HSC. **PURPOSE:** To determine if the combination of compression and cooling during exercise can mobilize HSC in PC. **METHODS:** Ten healthy, active males (height $1.78 \pm .06$ m, weight 85.1 ± 13.3 kg, age 30.4 ± 4.7 y) completed a 20-min exercise protocol on the Vasper™ recumbent cross trainer. The protocol entailed a 7-min warm up and 6 sprints alternating between 30s and 60s in duration with 90s recoveries. Compression cuffs were placed around the upper arms and thighs and inflated to 40 and 65 mmHg, respectively. Subjects sat on a cooling pad and wore a cooling vest to decrease body temperature. Blood samples were collected via forearm vein access prior to exercise and at 20 (T20), 30, 60, 90, 120, 150, 180 min and 24h post exercise. A complete blood count with differential and flow cytometry was performed on each sample. A linear mixed model analysis was used to evaluate differences in each variable. **RESULTS:** A spike in white blood cell (WBC) count was seen between baseline and T20 ($M_{diff} = 1.740$, $SE = .48$, $p = .004$). The WBC differential revealed a decrease in neutrophils (M_{diff} 4.13, $SE = 1.52$, $p = .015$) and eosinophils ($M_{diff} = .42$, $SE = .13$, $p = .009$), and an increase in lymphocytes ($M_{diff} = 4.51$, $SE = 1.62$, $p = .014$) from baseline to T20, with no change in basophils, monocytes, or immature granulocytes. Flow cytometry indicated an increase in CD34(+), a cell surface marker for HSC, from baseline to T20 ($M_{diff} = 1.25$, $SE = .48$, $p = .028$) with no change in the viability of the WBCs. **CONCLUSION:** The Vasper™ consistently mobilizes HSC to PC when used to a high level of exertion. Further study is required to determine if these cells can be consistently harvested from PC after mobilization.

1689   May 31 4:30 PM - 4:45 PM

Effects of Acute Eccentric Exercise on Immune Responses to Vaccination in Young and Aged Mice.

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(No relevant relationships reported)

Several published studies suggest that acute eccentric exercise can improve vaccination responses in humans. However, whether this strategy can improve sub-optimal vaccine responses in the aged is unknown. While it has been suggested that such damaging exercise acts as an inflammatory adjuvant, the mechanism behind the effect is unknown. **Purpose**: To determine the effects of acute eccentric exercise on primary

antibody and cell-mediated immune responses in young and aged mice. **Methods**: C57BL/6 male mice, aged 6-8 week (n=19) and 27 months (n=16) were randomized into either eccentric exercise (Y-ECC, A-ECC) or sedentary (Y-SED, A-SED) groups. For the Y-ECC and A-ECC groups, mice were exercised at 17m/min at -20% grade for 45 min on a treadmill. Y-SED and A-SED mice remained in their home cages. All mice were inoculated in the gastrocnemius with 100μg of OVA and 200 μg aluminum hydroxide (a suboptimal dosage based on titration experiments) immediately after the exercise. Blood was collected prior to, and one, two and four weeks after vaccination. ELISA was performed to analyze anti-OVA IgG. At three weeks post exercise, all mice were injected with 100μg OVA into the dorsal side of the right pinnae to determine the delayed-type hypersensitivity (DTH) response. Left pinnae were treated as controls. Ear thickness was measured immediately before and every 24h after intradermal injection. **Results**: Acute eccentric exercise did not improve primary antibody responses in either young (p=0.06) or aged (p=0.76) mice, compared to their sedentary control groups. We did not find significant differences between Y-ECC and Y-SED in their DTH responses (p=0.25). However, acute eccentric exercise enhanced DTH responses in aged mice, especially at 1 day post intradermal injection (p=0.001). We also documented a significant immunosenescent effect in antibody (p< 0.001), but not cell-mediated (p=0.813), immune responses to vaccination. **Conclusion**: Our results suggest that acute eccentric exercise improved the cell-mediated immune response to OVA vaccination in aged, but not in young mice and failed to affect the anti-OVA antibody response in young or aged mice.

D-42   Free Communication/Slide - **Obesity Patterns and Interventions**

Thursday, May 31, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100D

1690   **Chair:** Kathleen Woolf, FACSM. *New York University, New York, NY.*

(No relevant relationships reported)

1691   May 31 3:15 PM - 3:30 PM
Association Between Body Composition and Physical Activity Behaviors

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(No relevant relationships reported)

Evidence has shown that replacing sedentary time with equivalent amounts of light-intensity physical activity (LIPA) or moderate-to-vigorous intensity physical activity (MVPA) yielded associated health benefits on body composition. Therefore, because time is finite, to know these associations is relevant for physical activity promotion strategies.
PURPOSE: To analyze the effect of the sedentary and active times proportions on body composition in overweight and obese subjects.**METHODS**: Ninety-six (46 males and 50 females) overweight and obese participants (body mass index 25-34.9 kg/m²), aged 18-50 years, participated in this study. Body composition was assessed by DXA and physical activity was measured by accelerometry. Pearson correlations were used to determine the association between body composition and physical activity behaviours. Sedentary time (≤1.5 METs), LIPA (>1.5 - <3.0 METs) and MVPA (≥3.0 METs) were expressed in percentage of the daily time.
RESULTS: Significant correlations were found between sedentary time and fat mass ($r = 0.36$; $p < 0.001$), android fat mass ($r = 0.23$; $p = 0.03$) and lean body mass ($r = -0.36$; $p < 0.001$). In the same way, MVPA was correlated with these variables (fat mass: $r = -0.39$; $p < 0.001$; android fat mass: $r = -0.21$; $p = 0.04$ and lean body mass $r = 0.39$; $p <0.001$). LIPA only was correlated with body weight ($r = -0.28$; $p = 0.01$).
CONCLUSIONS: Our results highlight the importance of reducing sedentary time and promoting MVPA, which may improve body composition in overweight and obese people. LIPA seems to have less impact in the body tissues distribution.**Supported by Spanish Government Grant DEP2008-06354-C04-01.**

1692   May 31 3:30 PM - 3:45 PM
Change in Energy Intake and Health Eating Index in Response to Exercise During Weight Maintenance

Lauren T. Ptomey, Anna M. Gorczyca, Amanda N. Szabo, Felicia S. Steger, Ron Krebill, Matthew S. Mayo, Debra K. Sullivan, Richard A. Washburn, FACSM, Joseph E. Donnelly, FACSM. *University of Kansas Medical Center, Kansas City, KS.*
(No relevant relationships reported)

PURPOSE: It is hypothesized that energy intake increases and diet quality improves in response to increased exercise energy expenditure, thus diminishing the impact of exercise for weight loss and maintenance. The purpose of this analysis was to examine the impact of 3 levels of recommended exercise on energy intake and diet quality during weight maintenance. **METHODS**: Overweight/obese adults (n=175, age= 43 yrs., BMI~32 kg•m²) who lost ≥ 5% of their initial body weight in response to a 3-mo. weight loss intervention which included energy restriction, increased exercise (100 min•wk⁻¹) and weekly behavioral counseling, completed a 12 mo. weight maintenance intervention. All participants were prescribed a weight maintenance diet (estimated RMR x 1.4), asked to attend biweekly behavioral sessions, and were randomized to one of 3 levels of exercise (150, 225, 300 min•wk⁻¹), with a minimum of 3 exercise sessions•wk⁻¹ completed under supervision. Exercise minutes across 12 mos. were obtained from direct observation or heart rate monitors for supervised and unsupervised sessions, respectively. Energy intake (3-day food records) was assessed at randomization (mo. 0), 6 and 12 mos. Energy intake and diet quality (Healthy Eating Index-2010 (HEI)) were calculated using the Nutrition Data System for Research 2014. **RESULTS:** Energy intake at mo. 0 was 1337 ± 309, 1284 ± 25, and 1344 ± 317 kcals•day⁻¹, and total HEI scores were 59.0, 57.9, and 60.8 in the 150, 225, and 300 min•wk⁻¹ groups, respectively. Average exercise across 12 mos. was 120, 147, and 170 min•wk⁻¹ in the 150, 225, and 300 min•wk⁻¹ groups, respectively. As expected with a weight maintenance diet, energy intake (kcals•day⁻¹) increased from 0-12 mos. in the 150 (319 ± 523), 225 (164 ± 441), and 300 min•wk⁻¹ groups (266 ± 454). However, the between group difference for change in energy intake (0-12 mos.) was not significant (p=0.18). There was no significant difference for change in HEI (0-12 mos.) between the 150 (+0.93), 225 (-2.38), and 300 min•wk⁻¹ groups (-2.60, p=0.29). Exercise min•wk⁻¹ was not associated with energy intake (r= 0.01, p= 0.94) or HEI (r=0.11, p=0.15). **CONCLUSION:** There was no impact of the volume of exercise (min•wk⁻¹) on energy intake or HEI in initially overweight/obese adults completing a weight maintenance intervention.

1693   May 31 3:45 PM - 4:00 PM
Vo2max Is Associated With Energy Expenditure Measures, Including Diet Induced Thermogenesis, Under Sedentary Conditions

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(No relevant relationships reported)

Low cardiorespiratory fitness predicts subsequent weight gain independently of physical activity. However, the physiological mechanisms underlying this relationship have not been fully explained. One hypothesis is that VO2max is related to measures of energy expenditure, in particular diet induced thermogenesis. Results from previous studies exploring these associations have been mixed. However, these studies may have been limited by methodological issues regarding the adjustment for energy expenditure (EE) by confounding factors and small sample size.
PURPOSE: To determine the association between VO2max and measures of 24-h thermogenesis under predominantly sedentary condition and in particular awake fed thermogenesis (AFT) a measure of diet induced thermogenesis. **METHODS:** Two hundred twenty-nine American Indians from the southwest (132 men, 97 women) had measures of body composition by hydrodensitometry, resting metabolic rate (RMR) by the ventilated hood method, and then performed the intermittent treadmill run test for assessment of VO2max. On a separate day, they spent 24 hours in a whole-room calorimeter for assessment of 24-h EE, AFT, sleeping metabolic rate (SMR), and spontaneous physical activity (SPA) by radar system. As we have reported previously, AFT was calculated as the intercept of EE vs. SPA at zero activity minus SMR. **RESULTS:** After adjustment for fat free mass, fat mass, age and sex, multiple regression analysis showed that a higher VO2max (L/min) was associated with a higher RMR (beta = 45.9 kcal/day per L/min, standardized beta = 0.184, p = 0.010, n = 181) and 24-h EE (beta = 62.1, standardized beta = 0.125, p = 0.028, n = 229) and including additional adjustment for energy intake higher AFT (beta = 65.8, standardized beta = 0.334, p = 0.012, n = 179). Neither SMR (p = 0.64) nor SPA (p = 0.80) were associated with VO2max. **CONCLUSION:** VO2max was associated with RMR, AFT and 24-h EE. In particular the association with AFT indicates a possible common mechanism regulating both processes and that the protective effect of higher VO2max on weight change reflect its association with measure of 24-h thermogenesis.

THURSDAY, MAY 31, 2018

1694   May 31 4:00 PM - 4:15 PM

Weight Loss is Associated with Change inLeftVentricular Mass in Adults with Obesity: The Heart Health Study

Renee J. Rogers, Erik B. Schelbert, Yaron Fridman, Meghan R. Maher, John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA.* (Sponsor: John M. Jakicic, FACSM)

Reported Relationships: R.J. Rogers: *Contracted Research - Including Principle Investigator; Weight Watchers International, Inc..*

Greater left ventricular mass (LVM) has been associated with incidence of cardiovascular events in cohort studies. LVM has been shown to be associated with larger body mass index (BMI), which may partially explain the association between obesity and cardiovascular disease (CVD). However, despite the importance of cardiorespiratory fitness (CRF) to lower CVD, few studies have examined how CRF contributes to LVM within the context of weight loss. **PURPOSE**: To examine the change in weight, cardiorespiratory fitness, and LVM in response to a behavioral weight loss intervention, and to examine the association between change in body weight, CRF and LVM in relation to a behavioral weight loss intervention. **METHODS**: Data were examined from sedentary adults (N=290; BMI: 32.2±3.8 kg/m^2) that engaged in a 12-month behavioral weight loss program. All participants received weekly in-person intervention sessions for months 1-6, with combined in-person and telephonic sessions for months 7-12. Participants were prescribed weight loss through diet or diet + physical activity. Diet was prescribed at 1200-1800 kcal/day and physical activity was progressively increased to 150-250 min/wk. Assessment of body weight, CRF expressed as time to termination from a graded exercise test (GXT) and oxygen uptake, along with LVM using cardiac magnetic resonance imaging were assessed at both baseline and 12 months. **RESULTS**: There was a significant change in body weight (90.4±13.9 to 80.2±13.5 kg; p<0.001), CRF (22.6±4.5 to 25.6±5.1 ml/kg/min; p<0.001), GXT termination time (7.8±3.0 to 9.7±3.5 min; p<0.001) and LVM (88.5±21.3 to 84.1±20.0 g; p<0.001). Weight loss was correlated with reduced LVM (r=0.263; p<0.001), but the reduced LVM was not correlated with the increase in CRF (r=-0.07; p=0.10) or increase in GXT termination time (r=-0.04; p=0.35). **CONCLUSIONS**: LVM may be associated with poor cardiovascular health outcomes. It appears that weight loss reduces LVM, suggesting that a lifestyle intervention for inducing weight loss may be effective in reducing cardiovascular disease risk.

1695   May 31 4:15 PM - 4:30 PM

Attenuation of Excessive Weight Gain One Year Post Pediatric Obesity Treatment Initiation

Kate A. Heelan, FACSM, Holly Bower, Bryce M. Abbey, Roderick T. Bartee. *University of Nebraska - Kearney, Kearney, NE.*

(No relevant relationships reported)

In the United States, the prevalence of obesity among 6 to 11 year-old children is 18.4% (Hales et al., 2017). Over the past 30 years, family-based pediatric obesity treatment programs have been implemented demonstrating both short-term and long-term results (Epstein et al., 1998). Building Healthy Families (BHF) was adapted from Epstein's efficacious family-based weight control treatment program and implemented for 6-12 year-old obese children in a rural mid-western community. Fifty-eight families including 69 obese children (BMI percentile 96.5 ± 3.9%) participated in BHF; a 12-week nutrition, physical activity and lifestyle modification program. Child health outcomes included a clinically and statistically significant reduction in child BMI z-score (-0.27 ± 0.22) at 12-weeks. **PURPOSE:** To determine long-term weight loss success by assessing body mass and stature one-year post BHF initiation and compare to a match control group that participated in yearly health screenings at school. **METHODS:** BHF participants (n=69, age: 9.30 ± 1.84 years) and 70 match control (age: 9.43 ± 2.08 years) were measured for body mass and stature at baseline and one year later. BMI, BMI percentile, and BMI z-scores were calculated based on age and gender. **RESULTS:** After one year, BHF participants grew 5.72 ± 2.46 cm and gained 3.48 ± 6.89 kg resulting in a BMI z-score change of -0.22 ± 0.40. In comparison, the match control group grew 5.97 ± 2.67 cm (p>0.05), gained 6.12 ± 5.01 kg (p<0.05) resulting in a BMI z-score change of -0.07 ± 0.21 (p<0.05). **CONCULUSION:** The match control group gained 43% more body mass in one year compared to the BHF participants (p<0.05). Previous data have suggested normal weight children of the same age gain approximately 3.2 ± 1.5 kg per year (Holt et al., 2009) suggesting that BHF participants demonstrated an attenuation in excessive weight gain. A BMI z-score change of -0.22 ± 0.40 in one year presents clinically significant changes that may enhance health. Family based intensive treatment programs are time consuming, expensive, and require family commitment; but appear to have long-term positive influence on growth and maturation among participants.

1696   May 31 4:30 PM - 4:45 PM

Association Between Family Health Behaviors and Obesity Severity: Does Weight Metric Matter?

Karissa L. Peyer[1], Joani Jack[2], Gregory W. Heath, FACSM[1]. [1]*University of Tennessee at Chattanooga, Chattanooga, TN.* [2]*University of Tennessee College of Medicine Chattanooga and Children's Hospital at Erlanger, Chattanooga, TN.*

(No relevant relationships reported)

PURPOSE: Family behaviors regarding physical activity (PA), nutrition and screen time are associated with increased risk for obesity. With increased levels of severe obesity in American youth, the association of these factors with extremely high weight status should be evaluated. The purpose of this study was to examine potential difference in screen, nutrition, and PA activity behaviors among children attending a youth obesity clinic.
METHODS: Subjects included 484 youth (mean age = 11.5) attending their first visit at a Childhood Healthy Eating and Active Living clinic. Height, weight, and age assessed and used to calculate sex- and age-reference Body Mass Index Percentile (BMI%) as well as percent over the 50th (BMI50) and 95th (BMI95) percentiles. Parents completed a behavioral survey including questions about a number of health behaviors including whether their child consumed second helpings (rarely, sometimes, or always), had a TV in the Bedroom (yes/no), or ate with the TV on (yes/no). Parents also reported typical screen (< 2 hours, 2-4 hours, 5+ hours) and PA (< 30 minutes, 30-60 minutes, ≥ 1 hour per day) behaviors. Analysis of Variance and T-tests were used to examine differences in BMI variables based on reported behaviors. All analyses were performed using SAS Enterprise Guide 7.1 with alpha set at 0.05.
RESULTS: Average BMI% was over 99 while BMI50 and BMI95 median splits were 185% and 137%, respectively. BMI50 and BMI95, but not BMI% were significantly higher in children obtaining ≥ 1 hour of PA compared to those obtaining < 30 minutes per day (p < 0.04). BMI50 and BMI95, but not BMI%, were significantly higher for children who had a TV in the bedroom than for those who did not (p < 0.0001 and 0.002). Only BMI50 was significantly lower among Screen Time categories (p = 0.0104). All BMI variables were significantly higher for children who ate with the TV on compared to those who did not (p < 0.001) and for children who always asked for seconds compared to those who rarely did (p < 0.05).
CONCLUSIONS: Among obese children/youth, commonly targeted health behaviors resulted in differences in weight status, although the extent of these relationships depends on the weight metric being used. Further analysis should examine the influence of interventions to alter these behaviors and the change captured by these weight metrics.

1697   May 31 4:45 PM - 5:00 PM

Outdoor Time and Metabolically Healthy Obesity in Children: Results from the Canadian Health Measures Survey

Brittany V. Rioux, Neeru Gupta, Danielle R. Bouchard, James Dunbar, Martin Sénéchal. *University of New Brunswick, Fredericton, NB, Canada.*

(No relevant relationships reported)

A large proportion of children are recognized as metabolically healthy obese (MHO) and present a favorable cardio-metabolic profile. However, the contribution of outdoor time physical activity (PA) to the MHO phenotype is unknown.
PURPOSE: To investigate the association between outdoor time PA and the MHO phenotype in children. **METHODS**: An analysis of overweight and obese children aged 6-14 (n=386) from the Canadian Health Measures Survey (cycles 3-4) was performed. Outdoor time PA (hours/week) was self-reported using a series of questions in relation to the school schedule, such as: "during the past month, on an average school day, how much time did you usually spend outside?" Participants were given a score of 0-5 based on their response: 0 min. (0); 1 to <15 mins. (1); 15 to <30 mins. (2); 30 to <1 hour (3); 1 to <2 hours (4); and ≥2 hours (5). Then, a computed score, ranging from 0-25, was created for outdoor time PA. MHO status was determined based on the absence of cardio-metabolic risk factors including: triglycerides, HDL-cholesterol, systolic or diastolic blood pressure, and glucose (MHO: 0 cardio-metabolic risk factors; non-MHO: ≥1 cardio-metabolic risk factors). Multiple logistic regression analyses for the likelihood of MHO were adjusted for age, sex, socioeconomic status, and moderate-to-vigorous PA (MVPA) intensity. **RESULTS**: The proportion of MHO children was 58.5%. No significant differences were observed between MHO and non-MHO according to outdoor time PA, sedentary time, or MVPA (*p*>0.05). Logistic regressions indicated that outdoor time PA was not significantly associated with the MHO phenotype (OR: 0.99, 95% CI=0.92-1.05; *p*=0.69), while MVPA was significantly associated with the MHO phenotype (OR: 1.01, 95% CI=1.00-1.02; *p*=0.03). **CONCLUSIONS**: Outdoor time PA is not associated with the MHO phenotype. Children are more likely to be MHO with greater amounts of MVPA, regardless of whether these activities are completed outdoors or indoors.

THURSDAY, MAY 31, 2018

1698   May 31 5:00 PM - 5:15 PM
Anthropometric Changes in Elementary School Children Receiving Varying Amounts of Obesity Prevention Programming

Abigail E. Duffine, Emily N. Werner, Brianna D. Higgins, Dorothy Hanrahan, Kristen Kochenour, Patricia A. Shewokis, Stella L. Volpe, FACSM. *Drexel University, Philadelphia, PA.* (Sponsor: Stella L. Volpe, FACSM)

(No relevant relationships reported)

PURPOSE: To assess the change in body mass index (BMI) and waist circumference of elementary school students receiving varying amounts of obesity prevention programming during the first year of a multi-year, ecological school-based health intervention.
METHODS: These data were collected from 214 students enrolled in the fourth grade of four schools. The intervention included programs focused on improving nutritional intake and increasing physical activity. Two schools received a high amount of programming (HP) (> 40 programs/year), while two schools received a low amount of programming (LP) (< 20 programs/year). Height, body weight and waist circumference were measured at baseline and post-intervention.
RESULTS: At baseline, BMI (± standard deviation [SD]) in HP and LP schools were 18.9 ± 4.7 kg/m^2 and 19.4 ± 3.6 kg/m^2 (p=0.319), respectively. Post-intervention BMI for HP and LP schools were 19.3 ± 4.4 kg/m^2 and 19.4 ± 3.5 kg/m^2 (p=0.775), respectively. Waist circumference (± SD) at baseline in HP and LP schools were 63.3 ± 4.7 cm and 67.5 ± 10.2 cm (p=0.002), respectively. Post-intervention waist circumference were 64.4 ± 9.8 cm and 66.8 ± 10.0 cm (p=0.081) for the HP and LP schools, respectively.
CONCLUSIONS: The high and low program schools both exhibited increases in BMI after program implementation; though, there were no significant differences between the groups over time. However, BMI alone is not the most effective assessment of adiposity in children; utilizing waist circumference may provide additional information. At baseline, the HP schools had a significantly lower waist circumference compared to the LP schools. Although there was a slight increase in waist circumference in the HP schools and a slight decrease in the LP schools at post-intervention, these were not significantly different. Though the difference in programming did not significantly influence BMI or waist circumference, assessing the changes in anthropometric measures throughout the larger, multi-year intervention may reveal more meaningful impact on the change in adiposity in children.
This study was funded by Independence Blue Cross Foundation

D-43   Clinical Case Slide - **Head**
Thursday, May 31, 2018, 3:15 PM - 4:55 PM
Room: CC-200E

1699   **Chair:** Anastasia Noel Fischer, FACSM. *Nationwide Children's Hospital, Columbus, OH.*
(No relevant relationships reported)

1700   **Discussant:** Sean Engel. *University of Minnesota, Minneapolis, MN.*
(No relevant relationships reported)

1701   **Discussant:** Robert B. Kiningham, FACSM. *University of Michigan, Ann Arbor, MI.*
(No relevant relationships reported)

1702   May 31 3:15 PM - 3:35 PM
Different Strokes for Different Folks - Football

Tu Dan Nguyen[1], Mark Chassay, FACSM[1], Jocelyn Szeto[1], Noor Alzarka[2]. *[1]University of Texas Health Science Center at Houston, Houston, TX. [2]Memorial Family Medicine Residency, Sugar Land, TX.*

(No relevant relationships reported)

History:
22-year-old D1 University Football Long Snapper presents to the training room for migraines. He's had migraines for 6-7 years and 4 concussions since HS. The night prior he had a migraine in the temporal region associated with transient left-sided vision loss & left arm numbness for 30-40 minutes. A diffuse headache lasting for 4-5 hours followed. Sumatriptan relieved the pain. He's had increased migraine frequency for the past 6 months. Episodes were described to his neurologist. MRI of the Brain & Cervical Spine were ordered.

Physical Examination:
AF VSS. NAD, well appearing. PERRLA, EOMI, NCAT
Cranial nerves intact, no nystagmus, normal face symmetry, tongue & palate midline
Sensation intact
Strength/tone normal bilaterally
Reflexes 2+
Coordination and gait intact
Differential Diagnosis:
Migraine (hemiplegic/retinal) with brainstem aura
Transient Ischemic Attack or Cerebrovascular Accident
Cerebral Aneurysm
Intracranial space-occupying lesion
Dissection Syndrome
Tests & Results:
MRI Brain w/o contrast: small subacute infarct in the right cerebellum. No mass effect or ICH.
MRI C-Spine: mild degenerative changes. No canal stenosis
Admitted to the hospital further work up. Labwork negative.
US LE w/ doppler - No DVT
CTA head/neck: Normal vessels. No dissection
MRA Neck: Common and internal carotid arteries w/ normal caliber and contour. Normal vertebral arteries. Left vertebral a. is dominant. No flow-limiting stenosis.
TTE: Small right to left shunt on agitated saline contrast study suggestive of a patent foramen ovale.
Transcranial Doppler US Bubble Study: Right to left shunting, showering bubbles
Final / Working Diagnosis:
Cryptogenic subacute right cerebellar infarct secondary to a PFO
Treatment and Outcomes:
Aspirin & Clopidogrel started inpatient. Discharged after workup.
PFO closure and transseptal left heart catheterization completed with Cardiovascular Surgery.
Continue ASA and Clopidogrel for 6 months post-op; ASA lifelong.
Retired from the football team.
Repeat TTE: well seated closure device.
Cardiac rehabilitation for first 2 months post-op.
4 months post-op: running about 1 mile daily, 6 days/week. Endurance and circuit training with low weights.
He's been migraine free since 2 months post-op. He takes Indomethacin as needed. Follow up scheduled for 6 months post-operation.

1703   May 31 3:35 PM - 3:55 PM
Head Injury - Trampoline

Michael J. Cools, Jason Mihalik, Kevin Carneiro. *University of North Carolina, Chapel Hill, NC.* (Sponsor: Kevin Guskiewicz, FACSM)

(No relevant relationships reported)

HISTORY: A 14-year-old boy was jumping on a trampoline when he struck his right mastoid on a netting support pole. He did not lose consciousness or have other symptoms at that time. He had a small abrasion at the impact site, but no visible hematoma. The following day, he noted a droop on the right side of his face and inability to close his right eye. He also noted that sounds in his right ear were much louder than sounds in his left.
PHYSICAL EXAMINATION: He presented to a sports concussion clinic the following week. Examination of the patient's head demonstrated a small abrasion on his right mastoid. No other signs of traumatic injury were noted. Neurologic examination demonstrated a right-sided facial droop (House-Brackmann grade 4). Hearing was now symmetric. No abnormalities were noted when examining the other cranial nerves. The rest of his neurologic examination was normal and he exhibited no signs or symptoms of a concussion.
DIFFERENTIAL DIAGNOSIS:
1. Bell's Palsy
2. Temporal bone fracture
3. Facial nerve edema
TEST AND RESULTS:
Head and temporal bone computed tomography (CT) scan:
— No acute intracranial process
— No temporal bone fracture
Magnetic Resonance Image (MRI) with focus on the facial nerve:
— No facial nerve abnormality
— No evidence of microfractures within the temporal bone.
FINAL WORKING DIAGNOSIS:
Traumatic facial nerve edema without temporal bone fracture
TREATMENT AND OUTCOMES:
He was placed on valacyclovir and prednisone taper. He was instructed to use eye lubricant frequently and tape his eye closed at night to prevent corneal abrasions. He was referred to an otolaryngologist, who saw him 1 month later. At that time, his facial nerve function had returned to normal.

1704   May 31 3:55 PM - 4:15 PM
Head And Neck Injury-Soccer

Tracy Bras. *Evergreen Sports Medicine Fellowship, Augusta, ME.* (Sponsor: Jim Dunlap, FACSM)
(No relevant relationships reported)

HISTORY A 16-year-old male soccer player twisted his neck awkwardly while heading a ball. He continued to play despite neck soreness. Six days later he headed the ball several more times during a game and developed worsening pain and swelling. The next morning, he had a headache, dizziness and photophobia. He felt very tired, sleeping more than usual. He was seen by his pediatrician and referred to sports medicine with concern for concussion and cervical strain. When evaluated 13 days after the initial injury, symptoms included intermittent headache, pressure in his head, earache and occasional dizziness. He reported good sleep, but still felt tired. He denied cognitive or emotional symptoms. Neck pain and swelling was the most concerning symptom. He endorsed odynophagia but had no difficulty breathing. He denied radicular or neurologic symptoms. He denied fevers. He had one prior concussion 5 months ago. Symptoms included memory problems, difficulty concentrating, and headache. Recovery time was two weeks. **PHYSICAL EXAMINATION** Well appearing. Pupils equal and reactive to light. No nystagmus. Normal accomodation. Negative VOMS Cervical spine: Cervical spine ROM normal, painful with side bending and rotation. Paraspinals and sternocleidomastoids are tender to palpation, right worse than the left. Bilateral posterior chain lymphadenopathy noted. Spurling's negative. Upper extremity strength and sensation are intact. Abdomen: No hepatosplenomegaly. **DIFFERENTIAL DIAGNOSIS** Concussion, cervical strain, cervical spine fracture, infection, hematologic malignancy **TESTS AND RESULTS**. Ultrasound right sternocleidomastoid : No evidence of hematoma or disorganized muscle architecture. There was a large lymph node just posterior to the muscle measuring 2.5 cm in diameter with a mixed echogenic appearance. Labs: WBC 9.7, Hemoglobin 13.7, Hematocrit 40, Platelets 130, Basic Metabolic Panel normal, ALT 148, AST 87, Alkaline Phosphatase 131, albumin 4.0, Bilirubin 0.5, ESR 5, EBV IgM Positive, EBV IgG Positive **FINAL WORKING DIAGNOSIS** Infectious Mononucleosis **TREATMENT AND OUTCOMES** Patient was held from sports participation for two additional weeks. Symptoms improved over that time period. He was seen by his pediatrician and was cleared to return to contact sports and increase activity level as tolerated.

1705   May 31 4:15 PM - 4:35 PM
Vision and Vestibular Problems: A Bumpy Ride

Olivia E. Podolak, MD, Fairuz Mohammed, MPH, Christina L. Master, MD, CAQSM. *Children's Hospital of Philadelphia, Philadelphia, PA.*
(No relevant relationships reported)

HISTORY: A 16-year old female with hypermobility experienced a whiplash injury on a flight due to sudden turbulence and immediately developed headache and nausea. She subsequently suffered from persistent headaches, dizziness, motion sickness, nausea, and fatigue for weeks following the incident. A full laboratory workup was within normal limits. The family worried her symptoms were due to a concussion and sought evaluation by a Sports Medicine Physician.
The patient's medical history revealed congenital cataract of the right eye and glaucoma. She underwent surgical removal of the cataract as an infant, which resulted in amblyopia. Since childhood, she suffered from strabismus of the right eye and underwent patching for nine years with residual exophoria.
As a result of the concussion, the exophoria and glaucoma progressed. Corrective lenses for her exophoria began to overcompensate, resulting in esotropia.
PHYSICAL EXAMINATION: Initial presentation was 97 days post-injury. Her self-reported Post-Concussion Symptom Inventory (PCSI) score was 108 compared to a pre-injury symptom score of 1.
A vestibular/ocular exam revealed abnormalities with smooth pursuits, saccades, vestibulo-ocular reflex, visual motion sensitivity, near point of convergence (NPC) and accommodation tests. The exam provoked headache, dizziness, nausea, fogginess, and diplopia symptoms. The patient's NPC was assessed but she reported discomfort with drifting of the eye. Assessment for monocular accommodation of the right eye was unsuccessful due to diplopia.
DIFFERENTIAL DIAGNOSIS:
1. Concussion
2. Natural progression of amblyopic strabismus
3. Vestibular migraine
WORKING DIAGNOSIS:
- Concussion with post-concussive monocular esotropia of the right eye requiring surgical intervention.
TEST AND RESULTS:
- Clinical examination and PCSI survey at both the initial and follow up visits.
TREATMENT AND OUTCOMES:
1. Surgical correction of strabismus.
2. 18 days after initial presentation and following surgical intervention:
a. PCSI score decreased to 100.

b. Primary complaints of motion sickness and diplopia resolved.
c. Symptoms and performance on clinical examination improved.
d. No esotropia was present during NPC assessment.
e.Assessment for monocular accommodation of the right eye was successful.

1706   May 31 4:35 PM - 4:55 PM
Sustained Post-concussive Learning Disorder And Severe Emotional Dysregulation In A Pediatric Patient

Mary Daley. *Tufts Medical Center, Boston, MA.*
(No relevant relationships reported)

HISTORY: 10-year-old female with persistent emotional dysregulation and learning disorder after sustaining a mild head injury in a motor vehicle accident at age 5. She was evaluated in the ED but had no head imaging at the time. In the immediate aftermath of the injury, she developed headache, neck and shoulder pain, and generalized fatigue. These symptoms gradually resolved within several months. However, she also developed depression, irritability, and aggressive behaviors, all of which began within weeks of the accident and represented a drastic change of personality. She developed a regression in counting and language skills, and began struggling with inverting numbers and letters. She exhibited impairments in language processing, working memory, and concentration. In addition to sustained emotional dysregulation and excessive irritability, learning and memory difficulties have persisted for more than four years.
PHYSICAL EXAM: 10-year-old girl with mildly restricted affect. Cooperative but with latency of speech. The remainder of the physical and neurological exam, including cranial nerves, gait, coordination, strength, reflexes, and sensation was within normal limits.
DIFFERENTIAL DIAGNOSIS:1. Post-concussive syndrome
2. Post-traumatic stress disorder
3. Specific learning disorder in reading; dyslexia
4. Attention deficit hyperactivity disorder; inattentive type
TESTS AND RESULTS:1. MRI Brain obtained at age 6 - normal for age. 2. Neuropsychological Evaluation - consistent with severe dyslexia as well as ADHD, inattentive type, notable understood as *secondary* to her learning disability and exacerbated by emotional factors.
FINAL/WORKING DIAGNOSIS:1. Traumatic brain injury
2. ADHD, Inattentive Type 3. Dyslexia 4. Dyscravia (voicing substitution dysgraphia)
TREATMENT AND OUTCOMES
1.IEP implemented with minimal improvement academically.
2.Stimulant trial resulted in mild improvement in attention difficulties, but was discontinued after 5 months due to intolerable side effects.
3.Currently treated with alpha-agonist with moderate improvement in irritability and aggressive behaviors.
4.Patient continues with significant learning disorder including severe dyslexia and dyscravia, as well as sustained impairments in working memory.

D-44   Clinical Case Slide - **Leg**

Thursday, May 31, 2018, 3:15 PM - 5:15 PM
Room: CC-200F

1707   **Chair:** Philip F. Skiba. *Advocate Lutheran General Hospital, Park Ridge, IL.*
(No relevant relationships reported)

1708   **Discussant:** Terry Nicola, FACSM. *UIC Sports Medicine Center, Chicago, IL.*
(No relevant relationships reported)

1709   **Discussant:** Pierre L. Viviers, FACSM. *Stellenbosch University, Stellenbosch, South Africa.*
(No relevant relationships reported)

1710   May 31 3:15 PM - 3:35 PM
Right Distal Thigh Pain - Water Polo

Erin M. Conlee[1], Brett J. Kindle[2], Jay Smith[1]. *[1]Mayo Clinic, Rochester, MN. [2]Andrews Institute, Gulf Breeze, FL.* (Sponsor: Karen L Newcomer, MD, FACSM)
(No relevant relationships reported)

HISTORY: A 15 year old male experienced spontaneous onset of distal lateral thigh pain during his water polo season without preceding event. Symptoms, including an ache and hypersensitivity, responded to activity modification but recurred immediately

Abstracts were prepared by the authors and printed as submitted.

upon activity resumption, with knee extension even against gravity. He noted no mechanical symptoms, swelling or discoloration. Patient had been receiving physical therapy for presumed distal quadriceps tendinosis but was soon unable to tolerate even topical treatments to the region.
PHYSICAL EXAMINATION: Exam revealed tenderness localized to the superior pole of the patella and the vastus lateralis-retinacular interface without nodularity. No knee effusion was present, and all provocative maneuvers of the knee were negative. Give-way weakness of the right quadriceps was present as was skin hypersensitivity.
DIFFERENTIAL DIAGNOSIS: 1. Proliferative synovial disorder 2. Vascular malformation 3. Chronic musculotendinous strain of the vastus lateralis-retinacular region 4. Malignancy
TEST AND RESULTS: Femur radiographs were negative but contrast MRI of the distal thigh revealed a T2 hyperintense lobulated mass deep to the vastus lateralis and quadriceps tendon, separate from the suprapatellar recess. CT guided biopsy showed benign fibrovascular tissue consistent with an arteriovenous malformation (AVM).
FINAL WORKING DIAGNOSIS: Slow flow arteriovenous malformation
TREATMENT AND OUTCOMES: The patient underwent percutaneous sclerotherapy with 2cc of absolute alcohol. He reported complete resolution of pain within 1-2 weeks and returned to all previous competitive activity.
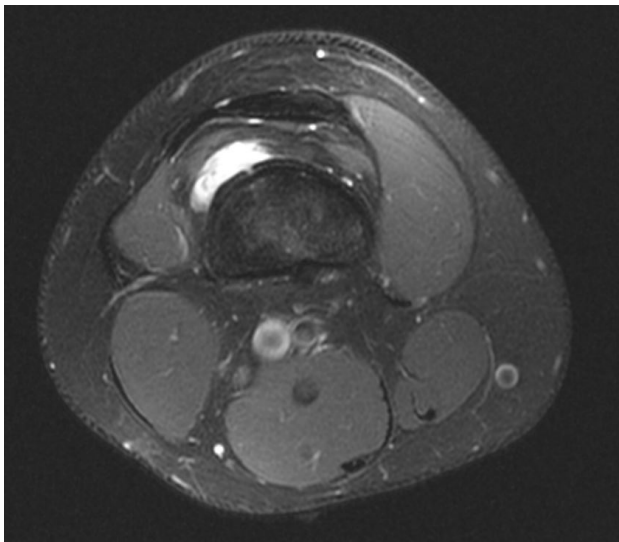
1711 May 31 3:35 PM - 3:55 PM
Anterior Thigh Pain - Shot put/Discus

Casey Muir, Edward Laskowski, FACSM. *Mayo Clinic, Rochester, MN.*
(No relevant relationships reported)

History: A 17 year-old male who was a first year participant in shot put and discus events presented with gradual onset aching left hip pain for 3 weeks. He denied any precipitating trauma or injury prior to symptom onset. His pain localized primarily to the left proximal anterior thigh. Hip flexion and abduction aggravated the pain. He tried intermittent ice without improvement. He denied radicular pain, weakness, sensory, or mechanical hip symptoms. After 1 physical therapy session, the pain progressed to a 10/10 intensity, constant throbbing, sharp pain in the proximal anterior thigh. **Physical Examination:** Antalgic gait with shortened stance phase on the left. Focal tenderness to palpation at the AIIS and proximal hip flexor tendons. Range of motion was full and symmetric. Pain was elicited at the extremes of left hip flexion, internal rotation, and external rotation. No weakness with manual muscle testing, but he had pain with resisted hip flexion. Stinchfield elicited hip flexor and AIIS pain. FABER and FADIR aggravated left anterior hip pain. **Differential Diagnosis:** 1. Proximal Left Hip Flexor Muscle Strain 2. Traction Apophysitis 3. Labral Tear or other intra-articular hip pathology 4. Femur Stress Fracture 5. Abscess/infection **Tests and Results:** Left Hip X-ray - Negative left hip. Left Hip MRI - Partial thickness tearing of direct/indirect heads of rectus femoris tendons with extensive surrounding edema. Between the direct/indirect heads, lateral to AIIS, a 2 cm x 1.5 cm oval mass-like lesion heterogeneously dark and bright on T2 and intermediate to minimally dark on T1 with suggestion of a rim of decreased T1/T2 signal. Minimal periosteal reaction with bone marrow edema. Normal articular cartilage. **Final/Working Diagnosis:** Myositis Ossificans **Treatment and Outcomes:** 1. Crutches given with instructions to weight bear as tolerated. 2. Naproxen BID started after MRI findings. 3. Continued therapy with only range of motion initially. 4. Instructed to avoid impact exercises/activities. 5. Repeat left hip x-ray six weeks later revealed calcification in soft tissues lateral to left hip consistent with heterotopic ossification. 6. Therapy program was advanced. Eight weeks later reported no symptoms during over 85% of activity. 7. Returned to football in the fall and completed outstanding season, no hip region pain.

1712 May 31 3:55 PM - 4:15 PM
Atypical Leg Pain in a Chi Runner

Jennifer Oberstar. *University of Minnesota, Minneapolis, MN.*
(Sponsor: Steven Stovitz, FACSM)
(No relevant relationships reported)

General Medicine- Chi Running
HISTORY:
A 67-year-old white male, using Chi running to treat bilateral calf pain presented with worsening pains over the past month. He exercises for 30 minutes, 3 times/week, and has sharp cramping pain in both calves exacerbated by running. After increasing the intensity of runs, his right leg goes to sleep. Gait modifications have helped reduce pain slightly. The patient's history included the following: shin splints and chondromalacia patella since age 30, non-smoker, non-diabetic, no cardiac history, and treatment for hypertension and hyperlipidemia. Family history included coronary artery disease. The patient was sent to Interventional Radiology (IR) for an ankle-brachial index (ABI) and was started on aspirin. No mechanical or structural cause of pain was identified, but moderate peripheral arterial disease (PAD) was discovered in the right leg. CT angiogram of the pelvis and lower extremities was recommended. Results of the CTA lead to the patient's direct admission.
PHYSICAL EXAMINATION:
BMI: 34.91, CONSTITUTIONAL: Healthy, HEENT: normocephalic, LUNGS: clear, CV: RRR, no bruits, GI: soft, NT/ND, SKIN: No rashes, NEURO: intact sensory and motor function of the lower extremities, VASCULAR: No bruits
DIFFERENTIAL DIAGNOSIS:
1. Claudication
2. Abnormal gait
3. PAD
TEST AND RESULTS:
Ultrasound ABI Doppler with Exercise-
Right: Resting ABI of 0.84, Positive exercise study
Left: Resting ABI of 1.29, Negative exercise study
CT angiogram of the pelvis and bilateral lower extremity-
Abdominal aorta Large fusiform infrarenal AAA 8.6 x 7.5 cm. Dilated right and left common iliac arteries 2.4 and 2.8 cm. Focal fusiform aneurysmal dilatation of the mid to distal main trunk of the left internal iliac artery 3.2 cm.
Right leg elongated thrombus within the right popliteal artery appearing to attach to the arterial wall proximally resulted in high-grade stenosis
FINAL WORKING DIAGNOSIS:
1. Large fusiform infrarenal AAA
2. Left internal and bilateral common iliac aneurysms
3. Popliteal artery embolism
TREATMENT AND OUTCOMES:
1. Evaluation: IR, Vascular surgery, and Cardiology
2. AAA repair: left internal and bilateral common iliac aneurysms and right popliteal embolectomy
3. Walking 3-4 miles with mild pressure but no pain in his calves at 5 weeks postoperatively

1713 May 31 4:15 PM - 4:35 PM
Unilateral Quadriceps Weakness

Jacqui Stone. *University of Calgary, CALGARY, AB, Canada.*
(No relevant relationships reported)

HISTORY: 17-year-old male athlete presenting with insidious onset of isolated, painless, unilateral quadriceps weakness and wasting. PHYSICAL EXAMINATION: Significant unilateral quadriceps atrophy with relative rectus femoris sparing. Strength was mildly reduced on the affected side, but much less than would be expected given his level of atrophy. There were no other sensory or focal neurologic deficits on examination. DIFFERENTIAL DIAGNOSIS: Monomelic Amyotrophy, Amyotrophic Lateral Sclerosis, Cord compression, Nerve root/plexopathy TESTS AND RESULTS: Nerve conduction studies, EMG, and MRI findings consistent with final diagnosis FINAL WORKING DIAGNOSIS: Monomelic Amyotrophy (quite rare) TREATMENT AND OUTCOMES: Observation and long-term follow up, conservative management with physiotherapy. Typically clinical deficit remains stable and isolated, but follow-up is required to ensure it is not a different diagnosis. In this clinical case presentation, we review the natural history, epidemiology, diagnosis, differential considerations, prognosis and management of this rare entity.

1714   May 31 4:35 PM - 4:55 PM

Say It Aint Sew: A Unique Cause of Calf Pain in Marathoner

Matthew D. Sedgley, MD FAAFP CAQSM. *MedStar Sports Medicine, Ellicott City, MD.* (Sponsor: Nailah Coleman, MD, FACSM)

(No relevant relationships reported)

HISTORY: 53 year old female who is a marathoner presents with a chief complaint of calf pain. Located near the gastrocnemius muscle on the left leg. Mechanism of injury was she is training for a marathon in order ot qualify for Boston Marathon. It is worse with fast running. Better with rest. There is no numbness.
PHYSICAL EXAMINATION: General: Fit appearing masters level runner WNWD, NAD ENT: NCAT, normal teethSkin: No rashes or ulcersCardiac Vasc: normal capillary refill, no cyanosis and palpable pulses distally at dorsalis pedis bilaterallyNeuro: normal sensation, no tremors, symmetric knee and ankle reflex +2 bilaterally, negative slump signPsyche: nervous that she will not BQ in qualifying race, no depressionMSK: Inspection: no atrophy, swelling or bruisingPalpation: tender gastrocnemius on the left leg only, no defect ROM: ankle dorsiflexion -15 degrees bilaterally and plantar flexion 40 degrees bilaterallyStrength: 5 out of 5 dorsiflexions, plantar flexion, inversion and eversion and FHL and EHL bilaterally.Special Testing: negative slump sign, negative homans sign, negative Thompson test.
DIFFERENTIAL DIAGNOSIS: Tennis calf/muscle strainLumbar radiculitisMTSS vs stress fractureCECSPAESPeripheral neuritis/entrapment
TEST AND RESULTS: Xray left tibia and fibula 2 views: possible foreign object in calf muscleMSK ultrasound: on long and short axis a sewing needle is seen in the gastrocnemius muscle deep fibers.
FINAL WORKING DIAGNOSIS: Foreign object in muscle
TREATMENT AND OUTCOMES: Anke surgeon consulted. Opted for watchful waiting instead of surgery. Patient qualified for Boston and chose after hearing benefits and risks to avoid surgery.

1715   May 31 4:55 PM - 5:15 PM

Leg Pain in Recreational Runner with Parkinson's Disease - Running

Timothy M. Dekker, George G.A. Pujalte, FACSM. *Mayo Clinic, Jacksonville, FL.*
(No relevant relationships reported)

HISTORY: A 76-year-old male, with known Parkinson's disease since 15 years ago, presented due to left posterior thigh pain that started a week prior. He was running and felt a "tug," sharp pain and weakness. At rest it was a pulling sensation, 5/10 in intensity. Running and prolonged sitting made it worse. He denies any back pain, numbness or tingling. He had been trying to walk/run about 2 miles a day, and strength training. He had a very similar pain on the right side a year ago and with a hamstring strain, given a methylprednisolone dose pack, and physical therapy focusing on his hamstrings. He was able to run pain-free until this injury. He was very distressed that he was unable to run as he believed exercise has been essential in managing his Parkinson's.
PHYSICAL EXAMINATION: No leg swelling or ecchymosis. Normal hip and knee range of motion. Normal strength. Pain with resisted hamstrings testing. Right-favoring antalgic gait, but takes small steps. Tenderness to palpation of left proximal hamstring. Straight leg test caused mild pain in left hamstring.
DIFFERENTIAL DIAGNOSIS: Hamstring strain Piriformis syndrome Lumbar radiculopathy
TEST AND RESULTS: X-ray of left thigh: Mild pelvic enthesopathy at hamstrings' tendinous origins along bilateral ischial tuberosities Hips and knees with mild degenerative changes.
FINAL WORKING DIAGNOSIS: Recurrent proximal hamstring strains, in a Parkinson's disease sufferer intent on running recreationally.
TREATMENT AND OUTCOMES:
The challenge is that the patient insists on running, but gait changes caused by Parkinson's make it difficult.
Physical Therapy initiated special program starting with light stretching and submaximal strengthening, progressing to increased resistance training. Refrained from running initially; after weeks of therapy, was able to walk/run again. Patient made to understand gait effects of Parkinson's; continues therapy, wants to run in spite of condition.

D-45   Clinical Case Slide - **Medical Issues III**

Thursday, May 31, 2018, 3:15 PM - 4:55 PM
Room: CC-Mezzanine M100F

1716   **Chair:** Carrie A. Jaworski, FACSM. *NorthShore University Healthsystems, Chicago, IL.*

(No relevant relationships reported)

1717   **Discussant:** Kathryn E. Ackerman, FACSM. *Boston Children's Hospital, Boston, MA.*

(No relevant relationships reported)

1719   May 31 3:15 PM - 3:35 PM

Seizure - Running

Vanessa Franco. *Kaiser Los Angeles Medical Center, Los Angeles, CA.*
(No relevant relationships reported)

HISTORY: A 13-year-old boy was running laps when he began convulsing. He was brought to the Emergency Department (ED) where vital signs, basic labs, CT brain, and EEG were normal. An EKG was read by the ED physician as normal, but the QTc was 491ms. The patient was discharged with neurology follow-up. Two months later, the patient was playing basketball when he developed convulsions and collapsed. Paramedics noted the patient to be pulseless. En route to the ED, he received 1 minute of CPR followed by 1 shock and 2 minutes of CPR. He then achieved return of spontaneous circulation.
PHYSICAL EXAMINATION: Examination of the patient on his 1st ED visit was normal. During his second ED visit, the patient's Glasgow Coma Scale was 1-1-1. The patient was hypotensive with a blood pressure of 91/47. His pulse was 80 and he was saturating 100% on BVM. He had abrasions to his chin and neck. His pupils were equal and reactive to light bilaterally.
DIFFERENTIAL DIAGNOSIS:
1. Intracranial process such as traumatic brain injury, hemorrhage, tumor, infection.
2. Toxicologic etiology such as cocaine use, alcohol or benzodiazepine withdrawal, or overdose of buproprion or a tricyclic antidepressant.
3. Metabolic abnormality such as hypoglycemia, hyponatremia, or hypernatremia.
4. Cardiac process such as arrhythmia, ischemia, or total anomalous coronary artery.
5. Pulmonary embolism.
TEST AND RESULTS:
Labs 1st visit: Normal, 2nd visit: HCO3 18, Glucose 257, BUN 19, Cr 0.9, Na 137, K 3.7, CO2 16, AG 19, Ca 8.1, CK 209, BNP 110, Lactate 4.4, Mg 1.9, Trop 0.03, TSH 6, WBC 8.9, Hbg 13, plt 267, INR 1.3
Urine drug screen 2nd visit: neg
Chest xray 1st and 2nd visit: mild cardiomegaly.
EKG 1st visit: LVH and QTc of 491ms, 2nd visit: LVH and dagger-like Q waves, QTc of 504ms.
Bedside Cardiac Ultrasound 2nd visit: Focal hypertrophy of the interventricular septum to 23 mm.
FINAL/WORKING DIAGNOSIS:
Hypertrophic Cardiomyopathy
TREATMENT AND OUTCOMES:

The patient was intubated, resuscitated, and transported by helicopter to the nearest Pediatric Intensive Care Unit. Seizure-like activity is often thought to reflect a primary brain disorder; however, poor cardiac function and arrhythmias can decrease perfusion to the brain and cause convulsions. Seizure-like activity during exercise should increase suspicion of a cardiac etiology.

1720   May 31 3:35 PM - 3:55 PM

Primum Non Nocere - A Case Of Medication Overuse

Sahil Shah, Shaun Knox, Andrew Martin. *Campbell University School of Osteopathic Medicine, Lillington, NC.*

(No relevant relationships reported)

HISTORY: 19 year old female college track athlete (100, 200 sprints) with past medical history significant for familial hypercholesterolemia acutely developed right posterior thigh pain during practice, 8 months prior to initial presentation to the clinic. Medications included oral contraceptive pills and simvastatin. She was seen at a different physician office and was diagnosed with a hamstring strain via MRI. Treatment course outlined at that time included rest, acupuncture. This was not completed and she presented to the sports medicine clinic for evaluation and continued treatment due to persistent pain. **PHYSICAL EXAMINATION**: Stable vital signs and general physical examination, including no rash in the affected area. Musculoskeletal exam revealed full AROM, strength 5/5 and pain at the myotendinous junction of the right biceps femoris. **DIFFERENTIAL DIAGNOSIS**: 1. Hamstring strain 2. Iliotibial band syndrome 3. Statin side effect 4. Meralgia paresthetica
TEST AND RESULTS: Vitamin D level - 34.4 Lipid panel (on simvastatin): Total - 206, TG - 110, HDL - 42, VLDL - 22, LDL - 142 Lipid panel (off simvastatin): Total - 215, TG - 93, HDL - 46, VLDL - 19, LDL - 150
FINAL WORKING DIAGNOSIS: Right biceps femoris strain Familial Hypercholesterolemia
TREATMENT AND OUTCOMES:
1. She was taken off her statin medication as this may have been contributing to muscular pain, and was not likely providing benefit for preventing cardiovascular disease at this point. 2. Percutaneous/transcutaneous electric nerve stimulation to the local area. 3. Range of motion exercises, eccentric strengthening of the affected area 4. Modified practice until able to perform event pain free, then return to full activity.

1721   May 31 3:55 PM - 4:15 PM

Preparticipation Physical Exam: More Than a Hernia Check.

Joshua Priddle DO[1], Michael Goodlett MD[2], Siraj Abdullah DO[1], Joseph Edison DO[1]. *[1]VCOM-Auburn, Auburn, AL. [2]Auburn University, Auburn, AL.*

(No relevant relationships reported)

HISTORY: A 17 year old male NCAA Div 1 football player presents for his intake physical exam with the complaint of right medial knee pain. He had a recent history of a right MCL sprain two weeks prior. He has a significant past medical history of a right nondisplaced fracture of his proximal tibia repaired by ORIF at the age of 12. The hardware was removed 3 months later. The patient has no other complaints.
PHYSICAL EXAMINATION: His vital signs were within normal limits. The HEENT, CV, Respiratory, and Skin exam were unremarkable. On musculoskeletal exam of his right knee he was tender to palpation over the right medial tibial plateau, medial joint line, and over his MCL. He had no obvious effusions. His right knee opens 1+ to valgus stress testing. He had a 1 cm shorter leg length discrepancy on the right compared to the left. He had full range of motion. His knee was otherwise stable to varus stress. He had a stable anterior and posterior drawer and he was neurovascularly intact.
DIFFERENTIAL DIAGNOSIS: 1. MCL Sprain, 2. Tibial Bone Bruise, 3. Tibial Fracture, 4. Medial Meniscal Injury.
TEST AND RESULTS: X-ray obtained for evaluation of his right knee pain demonstrated a multiloculated cystic bone lesion with sclerotic and thin margins abutting the articular surface of the proximal tibia. MRI confirmed a 3.7 X 3.6 X 6.9 cm multiloculated mass in the medial metaphysis of the right tibia extending to the subchondral surface. There was no enhancement of the ACL, PCL, MCL, or LCL.
SECONDARY DIFFERENTIAL DIAGNOSIS: 1. Giant Cell Tumor, 2. Aneurysmal Bone Cyst, 3. Chondromyxofibroma, 4. Osteosarcoma
Orthopedic oncology performed an open bone biopsy of the lesion and the patient was subsequently diagnosed with a simple bone cyst.
FINAL WORKING DIAGNOSIS: Simple Bone Cyst
TREATMENT AND OUTCOMES: Curettage and bone grafting were performed. The patient was discharged and kept on 50% weight bearing with no ROM restrictions with progression of crutches for 6 weeks. At his 6 week post op appointment the patient was off crutches and doing well. He was ambulating without assistance. X-rays obtained at that time showed improvement and new bone growth. At his 3 month follow up he was pain free. X-rays showed bone growth and no interval growth of the lesion. At that time he was cleared for full practice and sport participation.

1722   May 31 4:15 PM - 4:35 PM

18yo Female Lacrosse Player with Abdominal Pain

Kyle H. Yost, Valerie Cothran, Paul Goleb. *University of Maryland, Baltimore, MD.*

(No relevant relationships reported)

History:
An 18yo college lacrosse player was injured when she was struck in the abdomen with a lacrosse stick early in practice. She developed epigastric abdominal pain and reported her symptoms to her athletic trainer. Five months prior, she sustained a splenic laceration during lacrosse and was instructed to wear an abdominal pad during lacrosse activities. She was wearing an abdominal pad when she sustained this abdominal injury. She reported her symptoms a 4/10 and that it was different than her previous splenic injury. She was then sent to the emergency room of a community hospital. In the emergency room she had a CT scan performed, which showed physiological fluid without evidence of abdominal or pelvic organ injury. She was then transferred to a level one trauma hospital for observation. Overnight her pain remained minimal and the next day she was going to be discharged. Before she was discharged her pain increased and it was determined she would have an exploratory laparotomy.
Physical Exam:
Constitutional: Well-developed and well-nourished. No distress.
Cardiovascular: Normal rate and rhythm.
Pulmonary: Lungs clear to auscultation.
Abdominal: Soft, non-distended. Diffusely tender over the abdomen with the pain concentrated over the epigastric area. Normal bowel sounds.
Differential Diagnosis:
1. Abdominal muscle contusion.
2. Pancreatic laceration/contusion.
3. Splenic laceration.
4. Liver laceration/contusion.
Tests and Results:
CT 9/19/17: Pelvic peritoneal free fluid within the pelvis most likely physiologic, without specific evidence of abdominal or pelvic organ injury.
Exploratory Laparotomy 9/20/17: Contusion to mid to distal body of the pancreas, no other intra-abdominal pathology identified.
Final working diagnosis:
1. Pancreatic contusion secondary to blunt abdominal trauma.
Treatments and Outcomes
1. Admitted to the surgical ICU.
2. Post op day five her peri-pancrearic drains removed and nocturnal jejunal feeds were stopped.
3. Post op day six she was discharged from the hospital with GJ tube in place.
4. Eight weeks post op her GJ tube will be removed.
5. She will resume sports activities at 3 months post op with contact starting at 6 months post op.

1723   May 31 4:35 PM - 4:55 PM

General Medicine - Ultramarathon Runner

Kristin Schwarz, Laura Moretti, Kathryn Ackerman, FACSM. *Boston Children's Hospital, Boston, MA.*

(No relevant relationships reported)

HISTORY:
19-yo male ultramarathoner presents for performance advice. He runs 20 hr/wk, avg 120 mi/wk. 100-mi race avg pace is 8:30 min/mi. Follows vegan, gluten-free, raw food diet. Refuses to use vitamins/supplements. Does not feel he needs to gain weight. Minimal sexual interest, absence of morning erections. PMH: Low weight, 1 prior fracture. Fam Hx: Sister -celiac disease, Neg for osteoporosis or eating disorders.
PHYSICAL EXAMINATION:
Temp: 36.6° C. Refuses Ht and Wt. BP Lying: 110/70, P 54; Standing 106/64, P 65 A&Ox3 and no acute distress; Eyes: PERRLA, +Conjunctival pallor; CV: RRR, No murmurs, rubs, gallops; Lungs: Clear; Thyroid: Normal; Skin: No rashes or lesions.
DIFFERENTIAL DIAGNOSIS:
1. Malabsorptive disorder
2. Hypogonadism
3. Hypothyroidism
4. Relative Energy Deficiency in Sport (RED-S)
TESTS AND RESULTS:
EKG: sinus bradycardia, 48 bpm
DXA: BMI 17.6. Lumbar spine Z-score -2.3 (*-6.6%), Fem neck Z-score -0.6 (*-9.8%), total hip Z-score -0.2 (*-10.5%), % Fat Z-score -1.0
*(*Change from DXA 3 yr prior)*
Labs: WBC 3200/uL (L), MCV 101.2 fL (H), Ferritin 15 ng/mL (L), Iron 82 mcg/dL, TIBC 325 mcg/dL, B12 334 pg/mL (L), Folate wnl; Free testosterone 44 (L), Total testosterone 32 ng/dL (L), SHBG 44 nmol/L (wnl); 25-OH Vit D 20 ng/mL (L). TSH 2.14 mIU/L (wnl), Free T4 1.1 ng/dL (wnl), T3 2.2 pg/mL (L); IGF1 wnl, prolactin wnl; AST 23, ALT 7 (L), TTG IGA and Total IgA wnl; ESR and CRP wnl.
FINAL/WORKING DIAGNOSIS:

-Relative Energy Deficiency in Sport (RED-S)
-Secondary to: Inadequate energy intake, eating disorder
TREATMENT AND OUTCOMES:
1. Nutrition Evaluation:
-Dietary recall: 2700 to 3000 kcal/d (protein: 1.4 g/kg/d, carb: 8 g/kg/d, fat 0.5 g/kg/d). 1000-1500 kcal deficit/d.
Goal= 4,000+ kcal/d. Diet insufficient in macronutrients. Initial goal: begin with small change- increase fat to 1 g/kg/d.
Recommended: Vit D, Iron, and B12 supplements (patient refused).
2. Refused anthropometrics for months - contracted that weights required for medical/nutrition appts.
3. Top finish in national ultramarathon. 2d later: Lying: BP 104/62, P 52; Standing 110/60, P 72 (+Orthostasis); EKG: sinus bradycardia. Recommended: higher level of care, but patient refused.
4. Sports Psych Referral: Felt he was "hitting a wall" in training. Went from pre-contemplative to contemplative stage regarding dietary changes.
5. Close follow-up.

D-56   Free Communication/Poster - **Fitness Assessment**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1740   Board #1   May 31 2:00 PM - 3:30 PM

The Association of Asymmetry in Hopping Tests and Non-contact Injuries in Division I Female Student-athletes

Meghan Warren[1], Monica Lininger[1], Craig A. Smith[2], Adam Copp[1], Nicole J. Chimera[3]. *[1]Northern Arizona University, Flagstaff, AZ. [2]Smith Performance Center, Tucson, AZ. [3]Daemen College, Amherst, NY.*

(No relevant relationships reported)

PURPOSE: Limb differences in hopping for distance tests (single, triple, and crossover) are commonly used for return to play readiness after anterior cruciate ligament (ACL) injury. Females athletes are at high risk of ACL injury and risk factor identification and early prevention is critical. No study has been conducted to assess the ability of these three tests to identify high-risk athletes. To determine the association between asymmetry in hopping tests and non-contact and overuse injuries in Division I female basketball, soccer, and volleyball student-athletes. **METHODS**: 65 female student-athletes (SA; 19.1±1.1 yrs, 171.1±8.8 cm, 68.5±9.6 kg), injury-free at testing (prior to the season) were included in the study. The order of the clinical tests was randomized for each SA, and included the single, triple, and crossover hop for distance, and isometric hip strength and jumping tests. Any injury that caused the SA to report to the athletic training room was abstracted from the medical record. Only the first injury for each SA was recorded. Contact injuries were excluded. ROC curves and area under the curve (AUC) were calculated using absolute values of the difference between the right and left leg for each hopping test to determine the optimal cut-point. Logistic regression determined the odds of non-contact or overuse injury with each hopping test using the cut-point determine from ROC curve. History of previous injury was assessed for confounding. **RESULTS**: 53 athletes were injured during their sport season. The cut-point for single hop was 6 (sensitivity = 0.55, specificity = 0.67, AUC = 0.51), and triple and crossover hop was 12 (sensitivity = 0.74 and 0.66, specificity = 0.75 and 0.58, AUC = 0.42 and 0.41, respectively). After adjusting for previous injury, a statistically significant association was found with the triple hop and the odds for non-contact injuries (odds ratio = 7.43 [95% confidence interval 1.72 - 32.17]). No significant association was found with single or crossover hop after adjusting for previous injury. **CONCLUSIONS**: Using a clinically relevant injury definition, the triple hop showed the strongest predictive ability for non-contact and overuse injuries. This hopping test may be a clinically useful tool to help identify increased risk of injury in female athletes playing high-risk sports.

1741   Board #2   May 31 2:00 PM - 3:30 PM

The Association of Proximal Hip Strength and Non-Contact Injury in Division I Female Student-Athletes

Nicole J. Chimera[1], Monica R. Lininger[2], Craig A. Smith[3], Adam Copp[2], Meghan Warren[2]. *[1]Daemen College, Amherst, NY. [2]Northern Arizona University, Flagstaff, AZ. [3]Smith Performance Center, Tucson, AZ.*

(No relevant relationships reported)

Rehabilitation progress has been measured using jump performance and strength testing. However, there remains a paucity of research examining the relationship between strength performance and future injury. If strength tests are able to determine which athletes are at an increased risk of injury, then education and targeted injury-prevention programs can be implemented. **PURPOSE**: To determine the association between proximal hip strength and non-contact and overuse injuries in Division I female basketball, soccer, and volleyball student-athletes. **METHODS**: 68 female student-athletes (SA; 19.1 ± 11 yrs, 171.3±8.7 cm, 68.4± 2.5 kg), recruited over 3 years, injury-free at the time of testing (prior to their respective seasons) were included in the study. Clinical tests were randomized for each SA, and included isometric hip abduction, external rotation, and extension using a handheld dynamometer, as well as hopping and jumping tests. The first non-contact injury that caused the SA to report to the athletic training room was abstracted from the medical record. Contact injuries were excluded. Strength was adjusted for body weight and categorized into tertiles. Logistic regression determined the odds of non-contact or overuse injury with each clinical test. History of previous injury was assessed for confounding. **RESULTS**: 54 SA were injured during their sport season. No statistically significant association was found between injury and hip abduction (weakest vs. strongest odds ratio: 1.52 (95% confidence interval 0.31-7.50), middle tertile vs. strongest: 0.70 (0.18-2.82)), external rotation (weakest vs. strongest odds ratio: 3.87 (95% confidence interval 0.67-22.36), middle tertile vs. strongest: 0.95 (0.24-3.71)), or extension (weakest vs. strongest: 1.15 (0.25-5.23), middle tertile vs. strongest OR = 0.80 (0.18 - 3.62)). **CONCLUSIONS**: None of the strength tests were associated with non-contact and overuse injury in this group of Division I female SA. Type II error cannot be ruled out for the findings.

1742   Board #3   May 31 2:00 PM - 3:30 PM

Wearable Contour Sensors to Assess Neuromuscular Control During Repeated Unilateral Partial Squat Task

Shannon E. Linderman[1], Donna Moxley Scarborough[2], Eric M. Berkson[1], Mary M. Eckert[1], Nan-Wei Gong[3]. *[1]Massachusetts General Hospital, Boston, MA. [2]MGH Institute of Health Professions, Charlestown, MA. [3]Figur8 Inc, Boston, MA.*

Reported Relationships: S.E. Linderman: *Salary; figur8, Inc.*

PURPOSE: Improved quantification of muscle balance and symmetry, key facets of neuromuscular control, could aid sports medicine clinicians' assessment of injury risk and readiness to return-to-sport. This proof-of-concept study evaluates a body contouring sensor network for assessment of neuromuscular control via intra-subject test-retest and intra-limb symmetry testing of peak quadriceps (Quads) and hamstring (HS) muscle contraction during a repeated unilateral partial squat (RUPS) task. **METHODS:** Wireless contour stretch sensors were placed bilaterally across the Quads and HS muscle bulks of 5 healthy females (23 ± 4.3 years) who exercise regularly (4.6 ± 0.96 times/week). Subjects performed 3 trials of the RUPS activity. Total Quads and HS muscle bulk displacements were collected for 3 squat repetitions during the 3rd RUPS trial. Four subjects performed same day re-testing sessions. Statistical analyses included ICC 2-way mixed effects consistency model evaluation of intra-subject test-retest reliability (n= 4) and paired t-test analysis of limb symmetry (n= 5). **RESULTS:** Both measurements of Quad and HS total muscle displacement displayed excellent correlation during test-retest reliability, $ICC_{2,1}$=0.91 (0.18-0.99) and $ICC_{2,1}$=0.97 (0.58-0.99). Quad and HS muscle contraction displacement differed significantly between dominant and non-dominant limbs, p = 0.026 and p = 0.041, respectively (Table 1). A significantly greater Quad/HS total displacement ratio was observed for the dominant limb, p = 0.014. **CONCLUSIONS:** The wearable contour-sensor demonstrated consistent Quad and HS peak muscle displacement detection during the RUPS task. We observed differences in muscle ratios and peak muscle displacement between limbs among a small sample of healthy females. These findings demonstrate proof of concept for further investigation of this on-body contour sensor system for assessment of neuromuscular control.

THURSDAY, MAY 31, 2018

Table 1: Average peak muscle displacement of 3 partial squats during repeated unilateral partial squat (RUPS) activity.

Measure (n = 5)	Right limb Mean ± standard deviation (% sensor stretch)	Left limb Mean ± standard deviation (% sensor stretch)
Quadriceps Peak displacement	**3.047 ± 0.742**	**2.877 ± 0.764**
Hamstrings Peak displacement	**5.025 ± 0.754**	**6.195 ± 0.906**
Quadriceps/Hamstrings Ratio	**0.630 ± 0.218**	**0.487 ± 0.200**

1743 Board #4 May 31 2:00 PM - 3:30 PM

Knee Extension Strength Asymmetry does not affect Peak Power or Fatigue during the Wingate Test

Stuart Best, Reiley Bergin, Scott Royer, Joshua Winters, Kathleen Poploski, Nicholas Heebner, John Abt, FACSM, Scott Lephart, FACSM. *University of Kentucky, Lexington, KY.* (Sponsor: John Abt, FACSM)
(No relevant relationships reported)

PURPOSE: Peak and mean power during the Wingate test is associated with knee extensor strength, however it is unknown if knee extensor asymmetry affects this relationship. We hypothesized that increased muscle asymmetry would be associated with decreased peak and mean power during the Wingate test in healthy subjects. **METHODS**: 206 highly active male subjects (27 ±4 yrs, 84 ±9 kg) completed individual limb isokinetic strength testing on a dynamometer ($60° \cdot sec^{-1}$), as well as a 30 second Wingate anaerobic test in a seated position. Strength testing included maximal knee extension strength (% Body Weight). Knee extension asymmetry ratio between legs (A_{ext}) was calculated as $A_{ext} = E_{min}/E_{max}$, where E_{max} = strongest leg, E_{min} = weakest leg. Subjects were later classified as High Symmetry (HS, $A_{ext} \geq 0.95$, n=76), Moderate Symmetry (MS, $0.90 \leq A_{ext} < 0.95$, n=60), Moderate Asymmetry (MA, $0.85 \leq A_{ext} < 0.90$, n=35) or High Asymmetry (HA, $A_{ext} < 0.85$, n=35). Wingate data ($W \cdot kg^{-1}$) were analyzed for peak power (P_{peak}), mean power (P_{mean}), as well as power output at 5 second intervals. **RESULTS**: There were significant differences in E_{min} (HS > MA, p=0.012; HS > HA, p<0.001; MS > HA, p=0.044) but not E_{max} between groups. No significant differences in P_{peak} (12.89 ±0.68, 12.74 ±0.63, 12.71 ±0.52, 12.87 ±0.79 $W \cdot kg^{-1}$), P_{mean} (9.26 ±0.81, 9.05 ±0.82, 9.15 ±0.78, 9.32 ±1.08 $W \cdot kg^{-1}$) or any other power variables were found between the HS, MS, MA and HA groups respectively (all p>0.055). When all subjects were combined, knee extensor asymmetry (A_{ext}) was not associated with any power variables (all p>0.133). P_{peak} and P_{mean} respectively were positively associated with E_{max} (r=0.414, p<0.001; r=0.464, p<0.001) and E_{min} (r=0.397, p<0.001; r=0.420, p<0.001). Although all relationships were significant, the associations between strength variables (E_{min} and E_{max} respectively) and power decreased from 5 seconds (r=0.490, p<0.001; r=0.490, p<0.001) to 30 seconds (r=0.265, p<0.001; r=0.331, p<0.001). **CONCLUSIONS**: Greater knee extensor strength imbalance between legs is not associated with decreased power throughout a 30 second Wingate test. These data suggest that for bilateral tasks in which the legs do not move independently, such as cycling, training focused only on improving strength symmetry between legs may not improve peak power production.

1744 Board #5 May 31 2:00 PM - 3:30 PM

Cardiorespiratory Fitness of Otherwise Healthy Obese Women

Vipa Bernhardt[1], Dharini M. Bhammar[2], Rubria Marines-Price[3], Tony G. Babb, FACSM[3]. *[1]Texas A&M University Commerce, Commerce, TX. [2]University of Nevada-Las Vegas, Las Vegas, NV. [3]Institute for Exercise and Environmental Medicine, Texas Health Presbyterian Hospital and UT Southwestern Medical Center, Dallas, TX.* (Sponsor: Tony G Babb, FACSM)
(No relevant relationships reported)

PURPOSE: Cardiorespiratory fitness (CRF) is used as a diagnostic and prognostic health indicator for all-cause and cardiovascular disease mortality (Lee et al, 2010). Thus, properly quantifying and interpreting CRF is important for accurate diagnoses. The current EACPR/AHA Scientific Statement includes peak oxygen uptake (VO₂peak) both in ml/min/kg and as percent of predicted (Guazzi et al, 2016).We have previously shown, in a small cohort of otherwise healthy obese women (n = 26), that obese adults have normal or slightly reduced CRF (~85% of predicted), depending on the prediction equation used (Lorenzo & Babb, 2012). Here, we wanted to validate our earlier findings in a larger sample of women. **METHODS:** Obese women underwent hydrostatic weighing to assess body fat percentage, fat mass, and lean body mass. They then completed an incremental cycling test to exhaustion to determine VO₂peak. Prediction equations from Riddle et al (R; 1980), Wasserman et al (W; 2005), and Gläser (G; 2010) were used to assess CRF as previously described. Differences between percent predicted VO₂peak values derived from the three equations were analyzed using repeated measures ANOVA. **RESULTS:** Data from 121 women (34 ± 7 yr, 36 ± 4 kg/m² BMI, 46 ± 5% body fat, 44 ± 9 kg fat mass, 52 ± 6 kg lean body mass, mean ± SD) were analyzed. VO₂peak (ml/min/kg) was low (18.9 ± 3.0 ml/min/kg) and decreased with increasing body mass, severely penalizing heavier individuals. In fact, applying the current ACSM CRF classification, 113 women would be considered "very poor" and 8 as "poor" (all below the 25th percentile). Mean values of % predicted VO₂peak were significantly different between equations R and W, and W and G, but not between R and G (R: 92 ± 14%, W: 91 ± 14%, G: 92 ± 14%, p < 0.01). Using a cutoff for low CRF of < 84% of predicted VO₂peak, only 27-32% of women fell into this category, depending on the equation used. **CONCLUSIONS:** The commonly used method of evaluating VO₂peak based on body weight (ml/kg/min) is not appropriate in obese individuals; VO₂peak as percent of predicted is a better alternative when assessing CRF. Similar to our previous data in a small cohort of otherwise healthy obese women, the current data show that the majority of obese women have normal CRF, independent of the prediction equation used.

1745 Board #6 May 31 2:00 PM - 3:30 PM

A Cluster Analysis and Validation of Health-related Fitness Tests in College Students

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(No relevant relationships reported)

PURPOSE: Because health-related fitness consists of several domains, understanding clustering of scores from a testing battery can help practitioners derive exercise programs. The purpose of this study was to explore the clustering of health-related fitness test scores in college students and to validate the solution against criterion measures. **METHODS**: Participants were college students (Mean age = 19.2 0.6 years; N = 523; 342 females, 181 males) recruited from a university in the southwestern U.S. The health-related fitness assessments consisted of BMI, estimated VO₂ Peak from the Astrand-Ryhming cycle ergometer test, and standard push-ups. Criterion measures consisted of DXA-assessed percent body fat (%BF), measured VO₂ Peak from a maximal treadmill test, and a 1-Repetition Maximum (1-RM) bench press score. A hierarchical cluster analysis was performed to derive groupings. One-way ANOVA tests were used to explore the differences among the derived cluster groups on each criterion measure. **RESULTS**: Six cluster groups were formed representing various fitness "phenotypes" (Pseudo-F = 179.7). The cluster groups differed in %BF (F(5, 517) = 44.6, p < 0.001, eta-squared = 0.31), measured VO₂ Peak (F(5, 517) = 49.7, p < 0.001, eta-squared = 0.33), and 1-RM bench press scores (F(5, 517) = 17.0, p < 0.001, eta-squared = 0.12), providing validation evidence. **CONCLUSIONS**: Six cluster groups were formed from a health-related fitness test battery in college students that were validated against criterion measures of health-related fitness. The cluster groups can be used to inform current fitness status and for the derivation of exercise programs.

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Work Performed Above The Respiratory Compensation Point Is Not Equivalent To W′

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(No relevant relationships reported)

The hyperbolic power-time relationship for severe-intensity cycling exercise is defined by two physiological parameters: (i) the asymptote, critical power (CP); and (ii) the curvature constant, $W′$. Recently, we reported that the respiratory compensation point (RCP) displays poor measurement agreement with the CP. However, it is unknown whether the amount of supra-RCP mechanical work ($RCP′$) performed during ramp-incremental cycling is similar to that performed above the CP (i.e., $W′$). **PURPOSE:** We sought to determine the measurement agreement between $W′$ and $RCP′$ obtained during incremental cycling of varying ramp slopes. **METHODS:** Twelve male cyclists completed three separate ramp-incremental cycling protocols, where the work rate increment was slow (SR, 15 $W \cdot min^{-1}$), medium (MR, 30 $W \cdot min^{-1}$), or fast (FR, 45 $W \cdot min^{-1}$). Initially, the RCP (adjusted for mean response time) was obtained using the ventilatory equivalent for CO_2 method. To assess $RCP′$, we calculated the power–time integral between the RCP and the instantaneous power output observed at exercise termination for each ramp-incremental test, separately. $W′$ was determined via Morton's model for ramp-incremental exercise. The assumption that $W′$ and $RCP′$ occur at equivalent kilojoule (kJ) values was assessed by one-way repeated-measures ANOVA and by evaluating the concordance correlation coefficient (CCC) and typical error (root-mean-square error [RMSE]) for each ramp-incremental test, separately. **RESULTS:** $RCP′$ decreased with increases in the ramp-incremental slope ($P < 0.05$). $RCP′$ in SR (21.5 ± 6.5 kJ), MR (16.8 ± 5.6 kJ) and FR (13.3 ± 4.3 kJ) were not

different from W' (15.7 ± 6.9 kJ). The degree to which the relationship between W' and RCP' approximated the line of identity was poor for SR (CCC = -0.09 and RMSE = 11.3 kJ), MR (CCC = 0.23 and RMSE = 7.5 kJ) and FR (CCC = 0.37 and RMSE = 6.5 kJ).

CONCLUSION: Our data demonstrate that RCP' is lower when the ramp-incremental slope is increased. Furthermore, despite occurring at similar kJ values, we observed poor measurement agreement between W' and RCP', as evidenced by the low CCC and the large RMSE values, irrespective of the ramp-incremental protocol. Together, these findings indicate that RCP' obtained during ramp-incremental cycling is not equivalent to W'.

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Effectiveness of Preseason Conditioning on Vo$_{2max}$ in College Athletes Assessed via Ift and Gxt

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(No relevant relationships reported)

Developing a greater aerobic capacity is essential for successful performance in college athletics (Helgerud, Engen, Wisloff & Hoff, 2001). Specifically, the preseason training program can be utilized for aerobic capacity improvement to optimize performance throughout the competitive season (Castagna, et al. 2013). Moreover, accurately assessing aerobic capacity is important to quantify the effectiveness of an aerobic training program.
PURPOSE: The purpose of the study was to determine the aerobic capacity changes via Intermittent Fitness Testing (IFT) and Graded Exercise Testing (GXT) in Division II collegiate athletes following a preseason conditioning program.
METHODS: Fourteen college athletes (male = 7; age = 19±1 yrs) participated in the study. Subjects performed the 30-15 IFT (Buchheit, 2007), an interval running assessment with progressively increasing speed until maximal effort is reached, and a modified Balke GXT assessment on a treadmill to failure. Aerobic fitness was assessed before and after an 8-week preseason interval training program. Paired t-tests evaluated mean differences within IFT and GXT assessments for pre- and post-training variables. Independent t-tests compared the IFT and GXT assessments between genders. Correlations between IFT and GXT assessment were reported via Pearson's correlation coefficients.
RESULTS: The measured VO$_{2max}$ via GXT (45.1 vs. 48.9 ml/kg/min, P<0.001) and estimated 30-15 IFT VO$_{2max}$ (46.7 vs. 48.9 ml/kg/min, P<0.001) both significantly increased over the 8-week preseason training period. Heart rate (HR) at 2 min post-GXT was significantly lower (150bpm vs. 141bpm, P=0.019) following preseason training. GXT measured VO2max and 30-15 IFT estimate VO2max displayed a strong correlation before and after preseason interval training (r=0.84, P<0.001 vs. r=0.77, P<0.001). Weight was significantly lower in post testing (1.5±2kg, P=0.019).
CONCLUSIONS: Preseason interval training produced positive aerobic capacity improvements and were similarly detected with IFT and GXT. Further studies could investigate the relationship between in-season athletic performance and preseason aerobic capacity changes.

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Comparison of Non-Maximal Tests for Exercise Prescription and Outcome Assessment

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(No relevant relationships reported)

Introduction Although maximal incremental exercise tests (GXT) are the gold standard for outcome assessment and exercise proscription, they are not widely available in either fitness or clinical exercise programs. **Purpose** This study compares the prediction of VO$_2$max in healthy, sedentary volunteers using a non-exercise prediction (Matthews), RPE extrapolation to 19 & 20 and the Rockport Walking Test (RWT) and of VT using the Talk Test and RPE @ 13,14,15. **Methods** Subjects performed treadmill GXT with gas exchange, submaximal treadmill with RPE and Talk Test, the RWT and Matthews **Results** All methods provided reasonable estimates of both VO$_2$max and VT, with correlations >0.80 and SEE ~1 MET. VO$_2$max was best estimated with extrapolation to RPE=19. VT was intermediate between the TT Last Positive & Equivocal stages and between RPE 13 & 14. **Conclusion** Non-maximal evaluation can be used in place of maximal GXT with gas exchange to make reasonable estimates of both VO$_2$max and VT.
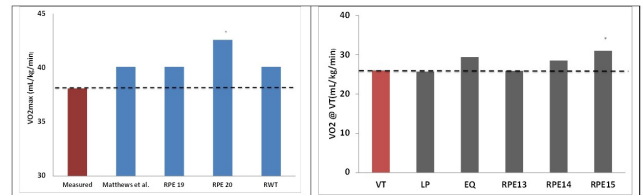
1749   Board #10   May 31 2:00 PM - 3:30 PM

Normative Benchmark Workout Scores Forcrossfit® Athletes

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(No relevant relationships reported)

PURPOSE: To provide normative reference values for the five most common benchmark workouts for male (M) and female (F) CrossFit® athletes competing in the teen (T), individual (I), and masters (MS) divisions The CrossFit Games®.
METHODS: Five-hundred uniform resource locators were scraped from a publicly-available online database and yielded 133,857 user profiles that contained self-reported anthropometric and performance data. Profiles were sorted by sex and age (i.e., T, I, or MS) and then screened for errors. Profiles were eliminated from the analysis if they: 1) contained data points that exceeded four standard deviations (i.e., < 0.001% of all values) from their respective mean; or 2) did not contain more than one completed benchmark workout (i.e., Fran, Grace, Helen, Filthy-50, and Fight-Gone-Bad). Subsequently, a randomly-selected sample was used to calculate the mean, standard deviation, and normative percentiles (in deciles) for each workout in I$_M$ (n = 500; 178.7 ± 7.4 cm; 86.1 ± 10.1 kg), I$_F$ (n = 500; 164.0 ± 6.7 cm; 64.2 ± 7.3 kg), MS$_M$ (n = 500; 178.8 ± 7.4 cm; 87.1 ± 10.6 kg), and MS$_F$ (n = 500; 164.7 ± 6.7 cm; 64.3 ± 7.7 kg). Due to limited user profiles, the entire populations were assessed for T$_M$ (n = 285; 175.8 ± 8.5 cm; 73.7 ± 11.6 kg) and T$_F$ (n = 136; 163.7 ± 7.1 cm; 61.6 ± 9.1 kg).
RESULTS: Separate norms were calculated for each sex and age category for Fran (T$_M$: 314.6 ± 142.5 sec; T$_F$: 250.0 ± 109.4 sec; I$_M$: 300.2 ± 125.2 sec; I$_F$: 361.3 ± 129 sec; MS$_M$: 330.2 ± 138.4 sec; MS$_F$: 363.1 ± 145 sec), Grace (T$_M$: 212.8 ± 76.8 sec; T$_F$: 257.3 ± 97.9 sec; I$_M$: 178.8 ± 86.5 sec; I$_F$: 207.4 ± 80.5 sec; MS$_M$: 213.4 ± 95.4 sec; M$_F$: 242.4 ± 114.8 sec), Helen (T$_M$: 9.8 ± 1.8 min; T$_F$: 12.0 ± 1.9 min; I$_M$: 9.5 ± 2.0 min; I$_F$: 10.9 ± 1.9 min; MS$_M$: 10.1 ± 2.0 min; MS$_F$: 11.3 ± 2.2 min), Filthy-50 (T$_M$: 24.3 ± 6.1 min; T$_F$: 29.2 ± 6.6 min; I$_M$: 24.9 ± 5.5 min; I$_F$: 26.8 ± 6.3 min; MS$_M$: 26.9 ± 6.7 min; MS$_F$: 27.4 ± 5.6 min), and Fight-Gone-Bad (T$_M$: 291 ± 50 reps; T$_F$: 269 ± 48 reps; I$_M$: 331 ± 60 reps; I$_F$: 284 ± 60 reps; MS$_M$: 314 ± 60 reps; MS$_F$: 283 ± 51).
CONCLUSION: This study presents norms for the five most common benchmark workouts for male and female athletes participating in The CrossFit Games® across the three major divisions. The norms can be used to assess competency in these sport-specific challenges within these populations.

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Assessment And Application Of The 'bunkie Test' In College Students

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(No relevant relationships reported)

In an attempt to improve athletic performance and assess potential dysfunction of core fascial lines, the 'Bunkie test' is a functional performance test consisting of five different plank positions. There is no current literature that establishes appropriate rest intervals for in-between plank positions, as well as no established termination criteria.
PURPOSE: The current study was conducted to examine the rest interval duration and test termination criteria for the Bunkie test. interval duration and test termination criteria for the Bunkie test **METHODS:** Forty college students from two universities volunteered to participate in the study. Participants completed three sessions separated by at least 48 hours, which consisted of 5 plank positions held bilaterally. Positions included the anterior power line (APL), lateral stabilizing line (LSL), posterior power line (PPL), posterior stabilizing line (PSL), and medial stabilizing line (MSL). The plank positions were held for as long as possible with proper form. Each session utilized a different rest interval of either 30s, 1min, or 2min between each of the plank positions.

Abstracts were prepared by the authors and printed as submitted.

RESULTS: A repeated measures ANOVA revealed significant differences bilaterally among rest intervals for APL (p=.009; p=.001) whereas, no significant differences (p<.05) were observed for PPL. LSL and MSL and PSL had significant differences among rest intervals on one side (LSL left, p=.002; MSL right, p=.006; PSL right p=.005)). Post hoc analysis with a Bonferroni adjustment revealed less variability among times between the 1min and 2min rest intervals between plank positions **CONCLUSIONS**: The results of the current study revealed that utilizing a shorter rest interval time frame (30s) appears to create greater variability in performance outcomes. Since no differences were found between using a 1 min or 2 min rest interval for both the final hold times and tension times, a rest interval of at least 1 min will allow for more dependable data.

1751   Board #12   May 31 2:00 PM - 3:30 PM

Worker's Cardiorespiratory Fitness Evaluation Using a 3-min Step Test with Daily Physical Activity Assessments

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(No relevant relationships reported)

As measuring VO_{2max} in the workplace can be burdensome, the development of time-efficient, safe, and validated cardiorespiratory fitness (CRF) evaluation methods would be effective. Although step tests can be used to estimate VO_{2max}, their validity is not sufficient. Recently, precise physical activity (PA) information has been obtained from sophisticated wearable devices. **PURPOSE:** We developed a new CRF measurement procedure using a 3-min step test along with daily PA assessments. This study investigated the validity of the new method. **METHODS:** Our study subjects included 80 Japanese workers (45 men and 35 women, aged 30 to 59 years). We measured our subjects' VO_{2max} by the Bruce protocol using treadmill exercise and an indirect calorimeter. The subjects completed two types of step test: the Chester step test (CST) for ≥6-min, and the JNIOSH step test (JST). The latter was newly developed by our institute and consists of a 3-min (60, 80, 100 BPMs) stepping exercise followed by a 1-min rest. Daily PA levels were assessed by subjects wearing a 7-day accelerometer, and also a questionnaire which measured three types of workers' PA levels: during working time, non-working time on workdays, and non-workdays. We performed multiple regression analyses using VO_{2max} as the dependent variable, and age, sex, BMI, heart rates from step tests, time (min) spent in given PA levels from the accelerometer, and scored points on the questionnaire, as the independent variables. **RESULTS:** The correlation coefficients of the step tests and VO_{2max} were 0.65 (R^2 = 0.42) in the CST and 0.64 in the JST (0.41). In addition to age, sex, and BMI, the time spent in vigorous (>6.0 METs) PA and PA intensity points on the questionnaire were observed as significant independent variables ($P<0.05$). Multiple regression analyses showed that the adjusted R^2 increased to 0.73 when age, sex, BMI, heart rates during the JST, time spent in vigorous PA, and the questionnaire's PA intensity points were included as independent variables. **CONCLUSION:** Our study suggests that this procedure can potentially be used to assess CRF at workers' health check-ups when VO_{2max} measurements are not available. Supported by the Industrial Disease Clinical Research Grants from the Ministry of Health, Labour and Welfare, Government of Japan (150903-01).

1752   Board #13   May 31 2:00 PM - 3:30 PM

Investigating The Effects Of Obesity On Fitness Among Community-dwelling Older Adults In Taiwan

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(No relevant relationships reported)

Obesity is a critical health issue, increasing the risk for chronic diseases, including hypertension, diabetes mellitus, and coronary artery disease, in the elderly. However, the impact of obesity on physical fitness, which is important for functional performance of daily activities among the community-dwelling elderly, has not been evaluated.
PURPOSE: We investigated obesity-related changes in physical fitness among community-dwelling elderly individuals.
METHODS: Sixty-nine elderly individuals (67 women and 2 men; age, 73.26±6 years) were recruited and classified into the obese (BMI ≥27.0 kg/m², n=17) or non-obesity (BMI <27.0 kg/m², n=52) group. Weight, height, and waist girth were measured for all individuals. The following physical fitness tests were evaluated: back scratch, sit-and-reach, 30-s sit-to-stand, 2-min leg lift, single leg balance, and the timed up-and-go (8 feet walk distance). Between-group differences were evaluated using independent sample *t*-tests, with a p-value <0.05 denoting statistical significance (SPSS statistical software, version 19.0).

RESULTS: The prevalence of obesity was 24.6% in our study group. Weight and waist girth were lower in the non-obese than in the obese group: 19% ($t_{(67)}$ =5.492, p<0.01) and 13% ($t_{(67)}$ = 3.443, p=0.001), respectively. Performance on the back scratch test and single leg balance was better for the non-obese than for the obese group: back scratch (-22.9±15.3 cm *versus* -10.1±16.1 cm, respectively, p=0.005) and single leg balance (12.4±14.8 s *versus* 26.1±31.7 s, respectively, p=0.018). Performance for the non-obese and obese group was comparable on the sit-and-reach test (7.9±13.7 cm *versus* 7.0±8.0 cm, respectively, p=0.790), 30-s sit-to-stand (19.3±5.3 repetitions *versus* 18.1±3.5, respectively, p=0.412) and 2-min leg lift (131.9±36.9 repetitions *versus* 114.7±25.5, respectively, p=0.079).
CONCLUSIONS: We identified some effects of obesity among community-dwelling elderly individuals, such as single leg balance, which could lead to restriction in activities of daily living and an increased risk of falling.

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Relationship Between Body Mass Index, Core Strength, and Balance in Adults

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(No relevant relationships reported)

Previous research suggests that obesity is associated with physical function limitations and poor balance, which may interfere with activities of daily living and lead to an increased risk of falls and injuries. Impaired balance has been attributed to low core strength in obese individuals. **PURPOSE**: To determine the relationships among body mass index (BMI), core strength, and balance in normal (BMI 18.5-24.9 kg•m⁻²), overweight (25.0-29.9 kg•m⁻²), and obese (≥30.0 kg•m⁻²) adults. **METHODS**: Seventeen adults (mean±SD: age, 39.4±9.8 y; BMI 28.3±5.3 kg•m⁻²), completed two assessments: a timed plank test, in which the time a subject could hold a static plank position was measured, and the Star Excursion Balance Test (SEBT), in which the distance is measured while a subject stands on one foot and reaches as far as possible at eight different angles with the opposite foot. **RESULTS**: There was a significant relationship between BMI and plank time (r=0.66, p=0.004), but not between plank time and SEBT performance (r=0.39, p=0.12) or BMI and SEBT (r=0.19, p=0.46). Mean plank time was significantly higher (p<0.001) in normal (85.3±6.5 s) compared to the overweight (56.8±10.8 s) and obese (51.1±11.2 s) subjects. The reach distance for all SEBT angles were lower in the obese subjects compared to the normal and overweight groups, although these differences were not statistically significant (all p>0.05). **CONCLUSIONS**: There is a significant relationship between BMI and core strength. Additionally, plank time is significantly lower in obese subjects indicating reduced core strength. There are also small, but non-significant, differences in balance among BMI groups. These findings suggest that obesity is associated with core strength and balance deficits that should be addressed in a fitness program.

1754   Board #15   May 31 2:00 PM - 3:30 PM

Inertial Load Influences Power Measures during the Wingate Test

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(No relevant relationships reported)

The Wingate Test is a commonly used assessment of anaerobic capacity and power during cycling. Wingate Protocol involves participants reaching maximal pedal cadence prior to resistance being added to the cycling flywheel. **PURPOSE:** The purpose of this study was to create a method to correct power measures to account for the influence of inertial load during a Wingate Test. **METHODS:** This study was performed using a Velotron ergometer and the Velotron Wingate Software. Ergometers were pedaled up to three different cadences (130, 150, and 170 revolutions per minute) at five different loads (3.75, 5.25, 6.75, 8.25, and 9.75 kp). Pedaling force was removed immediately before resistance was added to the flywheel. Data were collected for a full 30-seconds as utilized in a standard Wingate Test. **RESULTS:** Peak power resulting from inertial load ranged from 482-1615 W. Average power resulting from inertial load over the first portion of the test varied between 282-735 W based on flywheel resistance and initial cadence while no work was performed. Statistical modeling allowed the development of a regression curve (r^2 = 0.986) accounting for second by second predictions of the influence of inertial load on power output readings. **CONCLUSION:** The Wingate Test can be valuable tool in a participant's work assessment. However, caution needs to be taken in the interpretation and application of power output as this study has demonstrated.

1755   Board #16   May 31 2:00 PM - 3:30 PM

Comparison of 3 Alternative Systems for Measuring Vertical Jump Height

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(No relevant relationships reported)

Muscular power is a skill-related component of physical fitness and is most often associated with athletic performance. A simple and effective way to measure lower body muscular power is the vertical jump test. **PURPOSE:** To compare 3 different vertical jump measurement devices and to determine the reliability of the 3 devices. **METHODS:** A convenience sample of 30 college students (16 males and 14 females; mean age 20.7 ± 3.3 years), volunteered to participate in this study. The vertical jump heights were determined by the 3 devices (Just Jump™ mat, Vertec™, and the Vert™ device) simultaneously. The Just Jump™ mat was placed on the ground next to the Vertec™, and the subject wore the Vert™ device, clipped to their waist, while jumping. The subjects completed a brief, dynamic warm-up prior to performing the counter movement vertical jumps. Each subject was allowed 2 submaximal effort practice jumps prior to performing 5 maximum effort vertical jumps. After each jump, the 3 measurements were recorded. Each subject completed a 2nd series of 5 jumps 2-3 days after the first testing session. The protocol for the 2nd day was exactly the same as the first day. An ANOVA was used to determine differences between vertical jump heights between the 3 measurement devices and a paired T-test was used to compare vertical jump measurements between the 2 testing days on each device. Significance was defined as $p < .05$ for all statistical calculations. **RESULTS:** There was no significant difference in vertical jump heights measured between the 3 devices on either day (Day 1 - Just Jump™ mat: 21.2 ± 6.2 in.; Vertec™: 21.0 ± 6.2 in.; Vert™: 20.1 ± 4.9 in.; $p = 0.227$; Day 2 - Just Jump™ mat: 21.2 ± 6.0 in.; Vertec™: 21.1 ± 6.2 in.; Vert™: 20.2 ± 4.9 in.; $p = 0.233$). In addition, there were no significant differences between the vertical jumps between the 2 days for any of the devices (Just Jump™ mat: $p = 0.616$; Vertec™: $p = 0.141$; Vert™: $p = 0.897$). **CONCLUSION:** The results of this study indicated that the Vert™ device recorded values approximately 1 inch lower than the Vertec™ and the Just Jump™ mat, however, the difference was not statistically significant. In addition, all 3 devices recorded similar measurements on both days of testing. Based on these results, any one of the 3 devices would be adequate to provide consistent and reliable vertical jump results in a field setting.

1756   Board #17   May 31 2:00 PM - 3:30 PM

Comparison of Anaerobic Power Tests During Cycle and Non-Motorized Treadmill Ergometry at Optimized Loads.

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(No relevant relationships reported)

Electromagnetically braked cycle ergometers (CE) have been the standard modality for maximal anaerobic power (AP) testing in applied research settings; however, modern non-motorized treadmill (NMT) ergometers may prove a viable alternative for testing. **PURPOSE:** To compare performance markers derived from a 30-s maximal sprint on CE and NMT under optimized loads **METHODS:** Recreationally active men ($n = 5$; 24.8 ± 4.4 yrs) and women ($n = 6$; 21.3 ± 3.4 yrs) volunteered for the study. First visit consisted of a force-velocity-power test on the CE and NMT to determine optimal resistance for peak power production. Remaining two visits were performed in a randomized crossover order, consisting of a single 30-s maximal AP test on the CE or NMT. Peak power (PP), mean power (MP), minimal power (Pmin), and fatigue index (FI) were averaged over three revolutions on the CE and three strides on the NMT. Rating of perceived exertion (RPE), maximal heart rate (HRmax) and blood lactate concentration (BLa) were collected as a measure of intensity. All markers were analyzed using paired samples t-tests and Pearson product correlation coefficients. **RESULTS:** PP, MP and Pmin were higher (P < 0.001) on NMT (924.44 ± 297.72 W, 636.90 ± 309.55 W and 364.34 ± 123.20 W, respectively) than CE (501.90 ± 154.20 W, 309.55 ± 115.28 W and 178.11 ± 58.93 W, respectively). Significant correlation was found between PP ($r = 0.938$, $p < 0.001$), relative PP ($r = 0.871$, $p < 0.001$), MP ($r = 0.859$, $p = 0.001$), relative MP ($r = 0.721$, $p = 0.012$), Pmin ($r = 0.824$, $p = 0.02$) and relative Pmin ($r = 0.779$, $p = 0.05$). FI was not significantly different on the NMT $= 59.9 \pm 9.6\%$ compared to the CE $= 63.9 \pm 6.7\%$, $p = 0.172$, although they were not significantly correlated, $p > 0.05$. HRmax was higher on the NMT than CE (184.1 ± 11.0 bpm and 177.7 ± 11.0 bpm, $p = 0.001$, respectively). BLa (NMT $= 11.6 \pm 2.5$ mmol/l; CE $= 10.4 \pm 2.4$ mmol/l) and RPE (NMT $= 17.6$; CE $= 17.1$), ($p > 0.05$), were not significantly different. Optimal braking force on the NMT was $20.8 \pm 4.3\%$ for males and $14.5 \pm 1.9\%$ for females. Optimal torque factor on the CE was 0.76 ± 0.25 Nm/kg for males and 0.52 ± 0.08 Nm/kg for females. **CONCLUSION:** There is a strong relationship between CE and NMT in assessing AP at optimized loads, however higher power output and maximal heart rates were observed on a NMT. Further research is necessary to clarify FI relationship.

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Stride Time Variation and Resilience in Healthy Young Adults during a Graded Exercise Task

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(No relevant relationships reported)

Trait level of ego-resilience is how well individuals can adapt and be open to events as they occur. Cardiac and locomotor behaviors during exercise may represent physiological manifestations of resilience in an individual. Resilience has been related to parasympathetic activity, which may predict changes in heart rate during a graded exercise task. The prediction of performance during an exercise task has implications towards training as well as injury. Gait fluctuations have been previously associated with fall risk and trained runners tend to demonstrate smaller variability of stride time intervals than untrained runners. **PURPOSE:** The purpose of this study was to investigate the association between ego-resilience scores and physiological characteristics during a graded exercise test in young, healthy adults. **METHODS:** 30 young, healthy participants (21.73 ± 1.88 yrs) completed a valid and reliable online questionnaire assessing ego-resilience and demographic information. Prior to the task, blood pressure, using a sphygmomanometer, and resting heart rate, using electrocardiogram (ECG) were collected. Each participant then completed a graded exercise protocol on a treadmill. The protocol began with a 3-minute warm-up at 4.0 mph and 0% grade followed by 90-second stages of increasing speed (+0.5 mph) at 3% grade until the person reached exhaustion or until the 10th stage was completed. From the trial, cardiac and locomotor rhythms were measured using ECG and digital video, respectively. **RESULTS:** Ego-resilience was not significantly related to blood pressure, resting heart rate, total time spent on the exercise task, or average change in heart rate ($p > .05$). The coefficient of variation of stride time during recovery was significantly positively related to ego-resilience score ($r = .38$, $p < .05$). **CONCLUSION:** Higher ego-resilience was associated with more variance in stride time throughout the exercise task. Increased variability in stride time may reflect a more robust, or resilient, running behavior. In this study, cardiovascular measures did not demonstrate significant relationships with ego-resilience. However, the data do suggest that ego-resilience may have behavioral manifestations, such as more robust movement patterns.

1758   Board #19   May 31 2:00 PM - 3:30 PM

Using Vertical Shoulder Press To Find The Occurrence Of Bilateral Deficit In Recreationally Trained Participants

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(No relevant relationships reported)

Bilateral deficit (BLD) is an occurrence where the unilateral sum in force output is higher than the bilateral force output in the upper or lower limbs. Maximal bilateral and unilateral lifts can be used to determine if a BLD is present. BLD can often have negative effects on performance and daily activity due to an uneven force output per limb in bilateral movements. This is important for health and fitness professionals because it can help them to recognize and reduce the occurrence of BLD. **PURPOSE**: To determine if there was a difference between a combined maximal unilateral lift (cMUL) and a maximal bilateral lift (MBL) for vertical shoulder press (VSP) and to determine if BLD was present in recreationally trained participants. It was hypothesized that the cMUL will be significantly greater than the MBL. **METHODS**: Thirty participants (19 male, 11 female) were recruited for this study. Participants engaged in three separate visits which were each 72 hours apart. The first visit consisted of a movement screening that assessed biomechanical functionality when performing the VSP. This was accomplished by observing efficiency in a set of 8 to 10 repetitions at 30% of their one repetition maximum (1RM) for the VSP. Participants were then randomly assigned for visit 2 to either a MUL or MBL testing condition and completed the other condition during visit 3. In each testing condition, participants performed 6 to 8 repetitions at 50% 1RM. Participants then proceeded to lift one repetition at 70% 1RM, which was increased by 10% after a successful lift. This pattern was followed until volitional fatigue was present. Unilateral values for the left and right limbs were combined (cMUL). A paired samples t-test was used to determine if there was a difference between cMUL and MBL ($p < 0.05$). **RESULTS**: Participants were 22.96 ± 3.72 years old, 170.1 ± 9.3cm tall, and weighed 73.7 ± 11.50kg. Although 15 participants presented a BLD, a significant difference was not observed between the MBL (99.0 ± 36.4 lbs) and cMUL (98.3 ± 32.3 lbs). **CONCLUSIONS**: The results did not support the hypothesis that the cMUL would be greater than the MBL. This could be due to the training status of the participants. Future studies are needed to assess training programs and their effect on the occurrence of BLD.

1759 Board #20 May 31 2:00 PM - 3:30 PM

Does a Push-Up Using the Spyder 360 ™ Elicit More Muscle Activation Compared with a Standard Push-up?

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(No relevant relationships reported)

The conventional push-up is a common method for assessing a person's muscular endurance or as an exercise to improve muscle performance in the upper extremities or trunk. Many organizations encourage using the push-up as a test to assess muscular endurance (including the American College of Sports Medicine). A relatively new device called the **Spyder 360 ™** is being promoted as a method to maximize muscle activation during a push-up due to its unstable platform on wheels. **PURPOSE:** To compare muscle activation in select muscle groups during a standard push-up activity with and without the **Spyder 360 ™. METHODOLOGY:** Twelve healthy male subjects volunteered for the study (age=26.67±5.74yrs; WT=85.58±9.40kg; HT=182.14±6.04cm; Percent Fat=13.78±5.40; BMI=25.87±3.28). Volunteers reported to the laboratory and were randomly assigned to test first using either stable push-up handles (PUH) or **Spyder 360 ™** (PU360). EMG electrodes were placed over the following muscles to determine muscle activation: 1) clavicular fibers of the pectoralis major (PM); 2) middle triceps (TR); 3) middle latissimus dorsi (LD); 4) middle portion of the rectus abdominus (RA); and 5) anterior deltoid (AD). Subjects were asked to perform 5 push-ups each using the PUH and PU360. The maximal one push-up EMG data was used for comparison between the two interventions (PUH or PU360). **RESULTS:** Results indicate that the PU360 elicits significantly more muscle activation during a push-up activity in the pectoralis major (29%; $p<0.001$); triceps brachii (42%; $p=0.0086$); latissimus dorsi (26%; $p=0.0157$); and rectus abdominus (32%; $p=0.0054$). There was no significant difference in the anterior deltoid (8%; $p=.1653$). **CONCLUSION:** These results demonstrate that the PU360 elicits more muscle activation in the PM, TR, LD and RA compared with PUH for the subjects in this study.

1760 Board #21 May 31 2:00 PM - 3:30 PM

Lifespan Physical Fitness Analysis In A University-Sponsored, Guided Exercise Program

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(No relevant relationships reported)

BACKGROUND: Professional guidance is integral to assist individuals adopting an active lifestyle to enhance physical fitness, yet there is clarity lacking regarding which aspects of exercise programming (aerobic and resistance training) should be targeted across the lifespan. PURPOSE: To provide a lifespan, descriptive analysis of aerobic and muscular fitness in individuals seeking guidance in initiating an exercise program through a University program. METHODS: Upon registering in a University sponsored, guided exercise program, participants (N=991) received a comprehensive health analysis, measuring variables largely influenced by aerobic training (predicted VO_2 from the YMCA cycle test and skinfold body fat percentage) and resistance training (hand grip strength and push ups). One sample t-tests were used to compare mean data with 50th percentile ranking/good ranking (ACSM), stratified by the following age groups: 20-29 years (n=615), 30-39 years (n=178), 40-49 years (n=62), 50-59 years (n=98), ≥60 years (n=38). RESULTS: Regarding outcomes largely influenced by aerobic exercise, VO_{2max} values were lower in the male 20s (40.0±12.8 ml/kg/min) and 30s groups (33.7±11.3 ml/kg/min) and the female 20s group (33.8±9.7 ml/kg/min, all p=.000), yet higher in the female 50s group (28.8±5.3 ml/kg/min, $p<.05$); body fat percentage was higher in the female 20s (27.0±6.6%), 30s (28.0±8.9%), and 40s groups (34.4±8.9%, all p=.000). For outcomes largely influenced by resistance training, grip strength was significantly lower in the male 20s (86.8±24.4 lbs) and 30s (66.0±30.2 lbs, both p=.000) groups, whereas the 60s female group was significantly higher (57.6±12.0 lbs, $p<.05$); for pushups men performed significantly worse in the 30s (14.0±10.9 repetitions) and 40s (11.2±4.6 repetitions, both $p<.05$) groups, whereas women performed better in the 20s (19.8±10.9 repetitions), 40s (18.5±10.6 repetitions), and 50s (13.3±8.1 repetitions, all p=.000) groups. CONCLUSION: Aerobic fitness was markedly low in the early lifespan for men and women. Specific to genders, muscular fitness was low in men through the 30s and body fat percentage high in women through the 40s. Focus should be placed on enhancing all physical fitness values early in the lifespan to more effectively raise and maintain throughout older adulthood.

1761 Board #22 May 31 2:00 PM - 3:30 PM

Chinese Collegiate Fitness Index Report Based on the Supporting Active Lifestyle Perspective

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(No relevant relationships reported)

PURPOSE: Physical activity of college students was heavily influenced by individual interest, educational policies, social support, and the physical environment (including the built environment). The purpose of this study was to assess the status of Chinese collegiate fitness and to develop a promotion strategy from the supporting active lifestyle perspective.
METHODS: Drawing on National Academy of Kinesiology released the National Collegiate Fitness Index Report 2015 (NCFI) to develop Chinese collegiate fitness index (CCFI). The advisory committee members used the Delphi method to rate the importance of the fitness factors of CCFI. Finally, three domain was included in the CCFI and named transportation, exercise facilities, and physical education policies and services. A total of 789colleges and universities were surveyed, 386 were recovered, and 245 were valid questionnaires. The missing data that schools with incomplete responses were filled with the mean by SPSS24.0. The domain score was calculated by the rank of each group.
RESULTS: Finally, 245 colleges and universities came from 29 Provinces, Municipalities, Autonomous Regions and Hong Kong Special Administrative Region joining in the survey. Three groups were identified according to the difference of the attribution, the difference between public and private, as well as the different institutions and vocational institutions. Among the 245 colleges and universities, 48 were recognized as the subordinate universities, 152 were determined as the provincial universities, and 45 were defined as the public vocational or private colleges. The top three of universities are (1) Tsinghua University (74.7); (2) Beijing Normal University (72.1); (3) South China University of Technology (72.0).
CONCLUSIONS: There are obvious regional differences in the fitness index of Chinese collegiate ($p=0.009<0.05$); The fitness index of the subordinate universities was significantly higher than other two group universities ($p=0.000<0.05$).

1762 Board #23 May 31 2:00 PM - 3:30 PM

Unsupervised Home-based Intermittent Walking Effectively Improves Physiological and Psychological Health

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(No relevant relationships reported)

Laboratory-based intermittent exercise (IE) improves exercise tolerance and other independent cardiovascular disease (CVD) risk factors in a range of populations. For IE to be truly effective this must translate to the unsupervised home environment, and overcome key perceived barriers to exercise participation. This requires that the exercise be achievable, but of a sufficient intensity to drive physiological adaptations, and also promote increases in health-related quality of life (HRQoL). **PURPOSE** To investigate whether unsupervised home-based IE walking presents an achievable, but sufficient, physiological stimulus to reduce perceived barriers to exercise, CVD risk and, as a consequence, increase HRQoL in an overweight, but otherwise healthy population. **METHODS** 25 participants (45 ± 10 yr; 32 ± 3.8 kg/m²; 10 m, 15 f) undertook 12 weeks of home-based IE walking, completing 3 sessions/week and 32 min/session of IE$_{SHORT}$; 60 s of fast walking interspersed with 60 s recovery, or IE$_{LONG}$; 4 min of fast walking interspersed with 4 min recovery. Pre- and post-IE training, perceived barriers to exercise, maximal oxygen uptake (VO_{2max}), body mass, blood pressure (BP), resting heart rate (HR), blood biomarkers, and HRQoL were all measured using standard techniques. **RESULTS** Perceived barriers to exercise were reduced following IE ($p < 0.05$), this was largely driven by reductions in IE$_{LONG}$ (IE$_{LONG}$ vs. IE$_{SHORT}$: 11 ± 13 vs. 3 ± 15 % reduction). Body mass index and resting HR were both reduced following IE ($p < 0.05$); however, blood biomarkers and BP were unchanged. VO_{2max} increased following IE ($p < 0.05$; pre-post increase ιν VO_{2max}; IE$_{LONG}$ 2.7 ± 3.7; IE$_{SHORT}$ 1.6 ± 2.6 ml·kg^{-1}·min^{-1}). HRQoL increased following IE, with this a consequence of an increase in IE$_{LONG}$ (IE$_{LONG}$ vs. IE$_{SHORT}$: 23 ± 22 vs. 7 ± 15 % increase; $p < 0.05$). It is also noteworthy that adherence to IE$_{LONG}$ was greater than IE$_{SHORT}$ (78 ± 24 vs. 58 ± 36 %; $p < 0.05$). **CONCLUSION** Home-based IE walking was achievable and provided a sufficient exercise stimulus to improve physiological

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and psychological markers of health in an overweight, but otherwise healthy population. IE_{LONG} may be more effective than IE_{SHORT} for reducing barriers to exercise, CVD risk and increasing HRQoL. Support: Heart Research UK RG2631

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Examination of the Relationship between Handgrip Strength and Upper Body Muscular Endurance in College-age Females

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(No relevant relationships reported)

Knowledge regarding upper body muscular endurance and strength measures in college-age females is limited due to a relative lack of investigation. Since the implementation of Title IX, a large number of females regularly participate in strength and muscular endurance activities, and as such, more observational, descriptive fitness data on this population is needed. **PURPOSE:** While push-ups are traditionally a measure of muscular endurance, many females lack the upper body strength to perform a single standard push-up. This study seeks to determine the correlation between performance of push-ups from the standard position and a standard measure of upper extremity isometric strength, handgrip. **METHODS:** Healthy, non-pregnant females were recruited from the student population at CCSU. Subjects were excluded if they had uncontrolled asthma or any other medical condition that would prevent them from participating in strenuous physical activity. Following a short warm-up, subjects completed standard push-ups to exhaustion and completed a right-left maximum handgrip assessment using a dynamometer. **RESULTS:** Our 60 subjects had a mean age of 20.6 years (SD ± 2.5, range 18-27), and performed an average of 11.7 push-ups (SEM ± 1.30, range 0-47). Their average right and left handgrip was 35.1 kg (SEM ± 0.63) and 32.8 kg (SEM ± 0.62), respectively. Both Spearman rank and Kendall's Tau correlations showed no signification relationship between push-up performance and handgrip strength for either hand (Left hand: $r = 0.17$, $p = 0.27$; Right Hand: $r = -0.04$, $p = 0.78$). **CONCLUSIONS:** Our results demonstrate that college-age females are capable of performing standard push-ups to exhaustion, but that upper extremity isometric strength is a poor predictor of push-up performance in this population.

1764   Board #25   May 31 2:00 PM - 3:30 PM

Effects Of A 12-minute Daily Physical Activity Intervention On Health Measures Of Office Workers

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(No relevant relationships reported)

Office workers are known to sit for 65-75% of their working hours. Prolonged sedentary behaviour is linked to chronic disease. Physical activity programmes offered at the worksite tend to be generally attended only by the fitter or highly motivated office workers and are still unsuccessful in the long-term.
PURPOSE: To investigate the effects of a six-week 'bite size' physical activity intervention (3 x 4 minutes daily) on health measures and exercise adherence of office workers.
METHODS: Forty office workers employed in administrative positions (age range 24 to 59 yrs) performed a series of physiological measurements including body mass (BM; kg), body fat (BF; %), blood pressure (BP; mmHg), resting heart rate (HR; bpm), waist to hip ratio (WHR), upper and lower body endurance test (number of push ups and timed wall squat), and core endurance (timed plank; s) at baseline and at the end of the study. For the bite size intervention, participants worked in small groups andcompleted nine stretch and strengthening exercises in approximately 4 min, three times a day, for 6-weeks. Participants also completed a Wellness questionnaire pre- and post-intervention and recorded their adherence to sessions in a self-administered log.
RESULTS: The bite size intervention significantly improved muscular endurance of the upper body (pre: 11.6 ± 3.5 v post: 20.1 ± 2.6 push ups), lower body (8.36 ± 4.2 s v 22.7 ± 5.6 s; p=0.001) and core (43.2 ± 6.1 s v 50.8 s ± 4.8 s; p=0.005). No significant effects were found for BM, BF% or WHR, HR or BP (all at p>0.05). Wellness questionnaire results showed improved mood, sleep quality and reduction in stress levels and fatigue post-intervention. Adherence rate was 67.5%, as only 13 participants completed the intervention. **CONCLUSIONS**: The improvements in upper/lower and core endurance shown in this study could be beneficial in improving posture and alleviating low back pain often experienced by office workers due to prolonged sitting. Bite size exercise in just four minutes 3x a day might be a time saving and effective alternative to previous methods aiming to improve the health and well being of office workers.

1765   Board #26   May 31 2:00 PM - 3:30 PM

Bone Strength Differences According to Peak Power Norm Table Categories

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(No relevant relationships reported)

Purpose: To determine if a commonly used peak power (PP) norm table (Patterson & Peterson, 2004) discerns differences in bone strength between PP categories. Fractures become more prevalent with age due to bone strength losses. Bone strength is a predictive factor of fracture risk (Clark et al., 2006; Schuit et al., 2004) and previous research has shown muscle strength is significantly correlated to bone strength variables (Frost, 2003; Yingling, 2017). An accessible field measure of PP that detects differences in bone strength may be an important step in optimizing bone strength, thus preventing fracture later in life. **Methods**: 114 participants, 62 F and 52 M (age (yrs) 21.1∓3.3) performed a maximal vertical jump test. PP was calculated from vertical jump height (Sayers, 1999) and categorized into the following groups: Well Above Average, Average, and Well Below Average. Moment of Inertia (J), Cortical Area (Ct. Ar), cortical Bone Mineral Density (cBMD), and Strength-Strain Index (SSI) were measured using peripheral Quantitative Computed Tomography (pQCT) to quantify bone strength at the 50% tibia site. A one-way ANOVA and a Tukey post hoc test assessed differences between PP categories at a significance level of $p<0.05$ (Graphpad Prism). **Results**: Bone strength variables were significantly different between PP norm table categories, except cBMD in males. Females: SSI (*p=0.0001*), J (*p=0.0001*), Ct.Ar (*p=0.0001*), cBMD (*p=0.0063*). Males: SSI (*p=0.0457*), J (*p=0.0101*), Ct.Ar (*p=0.0226*). Post hoc testing revealed a significant difference between the Well Above Average and Well Below Average groups for both genders. **Conclusion**: Current PP norm table categories show a significant difference between Well Above Average and Well Below Average. This indicates that those in the Well Below Average category for PP could benefit from exercise prescription targeted for bone strength optimization.

1766   Board #27   May 31 2:00 PM - 3:30 PM

Aerobic And Anaerobic Parameters Of A Three-minute All-out Test Are Associated With Rowing Performance

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(No relevant relationships reported)

Critical power can be estimated utilizing a three-minute all-out exercise test. The 2000-m rowing test is utilized by US rowing as a standard test for all of their rowers. Critical power has been reported to predict 2000-m rowing performance, however the three-minute all-out test has not been used to predict 2000-m rowing performance.
PURPOSE: The purpose of this study was to examine the relationship between 2000-m rowing performance and the parameters of a three-minute all-out rowing test in collegiate club rowers.
METHODS: Ten (F=6, M=4) collegiate rowers (mean ± SD; age 19.3 ± 1.2 y; height 176.7 ± 10.0 cm; weight 75.6 ± 19.5 kg) completed a peak power test to determine peak power output (PPO) and a one-minute all-out test, a three-minute all-out test to determine end-power (EP) and work done above end-power (WEP), and a 2000-m time trial on a rowing ergometer. Testing days were separated by 72 hours and began with a five-minute warm-up on the rowing ergometer. The peak power, one-minute, and three-minute tests were all completed on a damper setting 10 whereas the 2000-m time trial was completed at a self-selected damper setting. Repeated measures ANOVA was used to compare PPO for all the tests and Pearson's product moment correlations were conducted to measure the relationships between 2000-m time and the parameters of the all-out rowing tests.
RESULTS: The strongest relationship with 2000-m time was average power for the 3-minute test ($r = -0.968$, $p <0.001$). Additionally, 2000-m time was significantly correlated with EP ($r = -0.931$, $p <0.001$), average power during 1-minute test ($r = -0.784$, $p <0.01$), and PPO ($r = -0.762$, $p = 0.01$). Work above end-power (WEP) was significantly related to PP of all the tests. There were significant differences between PP for all tests ($p < 0.01$).
CONCLUSIONS: These results suggest that a single 3-minute all-out rowing test can predict both peak power output and 2000-m time, therefore rowing coaches could use this test to more efficiently assess rowers.

1767   Board #28   May 31 2:00 PM - 3:30 PM

Counting Talk Test Measurements and the Relationship to Heart Rate for Exercise Prescription

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(No relevant relationships reported)

BACKGROUND: Exercise is commonly prescribed using various heart rate (HR) methods (e.g., %HRreserve, %HRmax). Exercise can also be described using the Counting Talk Test (CTT). Studies analyzing the correlation between exercise HR and CTT are limited, as well as data supporting the validity of the CTT as a method of exercise prescription. **PURPOSE**: To investigate whether CTT results are associated with exercise HRs and can therefore be used as a valid method of exercise prescription. **METHODS:** This study included 26 women with a mean age of 20.5 ± 1.6 years. Subjects performed exercise testing on a Stages ergometer once a week for three consecutive weeks. Data was collected at rest, during five stages of self-selected exercise intensities corresponding to RPE values of 8, 10, 12, 14 and 16 based on the Borg 6-20 scale, and during recovery. Data collection included measurements of Heart Rate, CTT Number, CTT Duration, average watts, and average RPM. Calculations were performed after testing to determine the subjects' %CTT using the equation (exercise CTT/ resting CTT) x 100. Pearson Correlation Coefficients were calculated to analyze the relationship between Heart Rate and CTT Number, Heart Rate and CTT Duration, as well as between %HRmax and %CTT. **RESULTS:** A statistically significant inverse correlation was found between HR and CTT number (r= -0.4188, p< 0.05) as well as between HR and CTT Duration (r= -0.5675, p< 0.05). A statistically significant inverse relationship was also found between %HRmax and %CTT (r= -0.5211, p< 0.05). A statistically significant positive correlation was found between CTT number and CTT duration (r= 0.6866, p< 0.05). **CONCLUSION:** Heart Rate was inversely associated with both CTT number and CTT duration. There was also an inverse relationship between %HRmax and %CTT. This data supports the idea that CTT is a possible alternative method of exercise prescription. Using CTT as exercise intensity prescription may improve patient adherence, making the monitoring of exercise intensity more accessible to the general population. More research is needed to ensure proper exercise prescription using the CTT in practice.

1768   Board #29   May 31 2:00 PM - 3:30 PM

Effects of Eight Weeks of Self-Determined Training on Cardiorespiratory Fitness in Recreationally Trained Females

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(No relevant relationships reported)

Maintaining or increasing cardiorespiratory fitness (CRF) throughout a training season can be challenging for recreationally trained endurance athletes. Even if athletes intend to increase training during a training season, variables such as the total number of minutes they train per week (min·wk⁻¹) and/or the min·wk⁻¹ of moderate to high intensity training (MHIT) they participate in may affect these athletes' ability to maintain or increase CRF. **Purpose:** The purpose of this study was twofold: 1) to examine changes in CRF over 8 weeks of self-determined training in recreational female endurance athletes who indicated they planned to increase training min·wk⁻¹; and 2) to examine changes in minutes of total training and MHIT per week from self-reported exercise logs from weeks 1 and 8. **Methods:** Fourteen recreationally trained female endurance athletes (cyclists (n=4) and runners (n=10)), all of whom had a baseline $VO_{2max} \geq 80^{th}$ percentile for their age, completed incremental running or cycling trials to exhaustion to determine VO_{2max}, and provided 7 d exercise training logs at weeks 1 and 8. Runners completed incremental trials on a motorized treadmill, cyclists completed trials on an electronically braked cycle ergometer, and expired gases were measured with a metabolic system during all trials. To record training, athletes were instructed on the use of the Borg RPE scale (15-grade scale) to estimate exercise intensity (*I*), and were asked to record exercise min and *I* independently for all phases of exercise sessions. MHIT was considered to be any exercise $I \geq$ an RPE of 13 (Somewhat Hard to Maximal Exertion on the Borg scale). **Results:** There was no significant change in mean VO_{2max} values in weeks 1 vs. 8 (p=0.062, 46.50 ± 3.68 vs. 45.87 ± 4.21 mL·kg⁻¹·min⁻¹). There was also no significant change in mean total training minutes (p=0.32, 601.8 ± 221.4 vs. 551.9 ± 194.2 min·wk⁻¹) or mean total MHIT minutes (p=0.38, 272.5 ± 193.3 vs. 334.5 ± 218.1 min·wk⁻¹) in weeks 1 vs. 8. **Conclusions:** On average, CRF was maintained during the 8 weeks of self-determined recreational training. In addition, we found that average total training min and MHIT min did not change for this group in weeks 1 vs. 8, even though these recreational endurance athletes intended to increase their training during this 8-week period.

1769   Board #30   May 31 2:00 PM - 3:30 PM

The Impact of Exercise on Stress Management in Federal Officers

Scott R. Richmond[1], Thomas S. Altena[2], Amanda M. Perkins-Ball[3], Riley Galloway[2], Sam D. Enright[2]. [1]*Lindenwood University, St. Charles, MO.* [2]*Missouri State University, Springfield, MO.* [3]*Rice University, Houston, TX.*
(No relevant relationships reported)

Many Federal Officers (FO) serve in a high-stress, yet highly sedentary position. This combination places FO at greater risk for a variety of health issues. **PURPOSE**: The purpose of this descriptive study was to examine the level of physical fitness in FO and determine the relationship between exercise (EX) on Quality of Life (QoL) scores. **METHODS**: A total of 19 FO participated in this study (10 males and 9 females; mean $\pm$ SD age = 39.1 ± 8.1y, height = 172.1 ± 8.6cm, weight = 75.9 ± 15.3kg, and BMI = 25.5 ± 3.8kg/m²). The Cooper's Test of physical fitness (1.5mile run, 1-min max push-ups, 1-min max sit-ups, and vertical jump) as well as a 150m shuttle run and max grip strength were performed before and after six-months of unsupervised, voluntary exercise. In addition, subjects completed weekly online surveys indicating EX type, weekly total EX time, feelings of well-being, and a 10-point questionnaire on weekly stress (QoL). **RESULTS**: Time reported performing cardiorespiratory and resistance training was slightly below ACSM recommendations (cardio = 129.5 ± 20.3 min/week, resistance = 81.0 ± 18.5 min/week). A paired-samples t-test showed no significant changes in any anthropometric scores after 6-months of unsupervised training. Baseline vs 6-month Cooper's Test fitness results showed no significant changes with the exception of performance on the Sit-&-Reach (pre = 34.5 ± 9.2cm, 6-month = 41.9 ± 8.8cm, p<0.05). There was little to no correlation between QoL scores and amount or type of EX (average r² = 0.03). During follow up interviews, some participants indicated they were less likely to respond to weekly surveys if they did not exercise that week. The average response rate ranged from 36% to 80%. **CONCLUSIONS**: While EX is an important element for overall health and well-being, in FO there was little connection between amount of type of EX and overall QoL.

1770   Board #31   May 31 2:00 PM - 3:30 PM

Measured Fitness and Self-Reported Exercise and Stress in Law Enforcement Officers: A Longitudinal Study

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(No relevant relationships reported)

The job duties of law enforcement officers (LEO) are highly sedentary and stressful. **PURPOSE**: The purpose of this year-long descriptive study was assess physical activity levels in LEO and to determine if self-reported stress indicators were related to exercise. **METHODS**: Twelve LEO completed a 12-month unsupervised exercise program (7 males and 5 females; age = 38.5 ± 7.6y, height = 171.4 ± 9.2cm, weight = 77.2 ± 16.4kg, body fat % = 25.7 ± 6.1, BMI = 26.0 ± 4.2kg/m²). Participants completed the Cooper's Test of physical fitness as well as a 150m shuttle run and max grip strength at baseline, at 6-months and again at 12-months. Participants also completed an online survey indicating EX type, weekly total EX time, feelings of well-being, and a 10-point questionnaire on weekly stress. **RESULTS**: Survey response rates ranged from 36% to 80% over the course of the study. Reported cardiorespiratory and resistance training exercise levels were slightly below ACSM recommendations (cardio = 145.0 ± 34.4 min/week, resistance = 58.4 ± 15.7 min/week). Time was significantly lowered (p=0.002) in the 1.5 mile run over a 12 month period. No significant changes were observed in body weight (p=0.149) or BMI (p=0.447); however, body fat percentage was significantly reduced by 2.61% (p=0.47). Total 12 month volume of exercise in LEO did not meet ACSM recommendations and was ineffective in changing self-reported stress (r=-0.037, p>0.05). In addition, some subjects indicated reduced weekly response rate because they did not exercise that week. **CONCLUSIONS**: The overall level of fitness among the tested sample of LEO was in the fair category. A 12-month, unsupervised training program of this particular volume was sufficient in maintaining fitness parameters but did not influence self-reported stress in this law enforcement population.

1771   Board #32   May 31 2:00 PM - 3:30 PM

Association Between Anthropometric Characteristics And Aerobic Capacity In Firefighters

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(No relevant relationships reported)

Firefighting is a physically demanding profession with high requirements for aerobic capacity (VO_{2max}). However, this population has a high rate of obesity, consistent with the general population. Previous research in general populations has identified a relationship between VO_{2max} and anthropometrics, specifically the impact of body weight and lean body mass. Moreover, research suggests an association between increased percent body fat (%BF) and decreased aerobic and strength measures in similar tactical populations such as military. However, this relationship has not been thoroughly examined in firefighters. **PURPOSE:** To determine the association between anthropometric characteristics and VO_{2max} of firefighters. **METHODS:** Eighteen healthy firefighters (Age= 39.9 ± 11.0 years; Body Mass Index (BMI)= 28.0 ± 3.4kg/ m²; %BF= 27.1 ± 8.7%; Waist to Hip Ratio (WHR)= 0.88 ± 0.04; VO_{2max}= 41.2 ± 7.5ml/kg/min) completed measurements of anthropometry (height, weight, bioelectrical impedance analysis, waist and hip circumferences) and a treadmill graded exercise test (GXT) to determine VO_{2max} utilizing open circuit spirometry. Normality was assessed, and Pearson correlation and Spearman coefficients were used when appropriate to determine the associations between VO_{2max} and anthropometric characteristics (BMI, %BF, WHR). **RESULTS:** Data revealed a significant moderate correlation (r= -0.636; *p= 0.005*) between %BF and VO_{2max}, indicating that higher levels of body composition are related to lower VO_{2max}. No relationship was found between BMI and VO_{2max} (r= 0.05; *p= 0.845*), and the association between WHR and VO_{2max} approached significance (r=-0.462; *p=0.053*). **CONCLUSION:** Results of the current investigation suggest %BF may be associated with maximal aerobic capacity. Additionally, data revealed no significant relationship between BMI and VO_{2max}, suggesting that total body weight may not have a significant impact on aerobic capacity. Future research should continue to investigate the effects that maintaining an ideal body composition have on work performance and injury risk, including the negative effects of obesity on thermoregulation in job specific tasks for firefighters.

1772   Board #33   May 31 2:00 PM - 3:30 PM

Validity of Hit & Turn Tennis Test in Estimating Aerobic Capacity with Amateur Players

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(No relevant relationships reported)

Validity of Hit & Turn Tennis Test (H&TTT) in Estimating Aerobic Capacity with Amateur Players
The Hit & Turn Tennis Test (H&TTT) is an acoustically controlled on-court test designed for evaluating tennis-specific endurance. Performance levels achieved during this test has been proposed to estimate the peak oxygen uptake (VO_{2peak}), but the validity of the regression equations warrant further investigation.
Purpose: To evaluate the validity of H&TTT in estimating VO_{2peak}.
Methods: Sixteen collegiate tennis players (age: 22.2 ± 1.7 yrs; height: 175 ± 5 cm; mass: 69.2 ± 6.1 kg; tennis training experience: 2.3 ± 0.8 yrs) volunteered to perform H&TTT on an indoor synthetic field. A portable spirometric system (K4b², Cosmed, Italy) was utilized to measure the ventilatory activities to calculate VO_{2peak} during the test. VO_{2peak} was also estimated with a H&TTT regression equation (VO_{2peak}=[Level*2+30]ml/min/kg). Additionally, for the directly measured ventilator activities two smoothing methods (5 vs. 3 successive points) were utilized to process VO_2 data, and five different methods (the highest consecutive 5 points vs 5s vs 10s vs 15s) were utilized to calculate VO_{2peak}.
Result: The levels subjects achieved in H&TTT were 14.6 ± 3.4. The estimated VO_{2peak} were 59.3 ± 6.7ml/min/kg using the regression equation. The calculated VO_{2peak} using different smoothing methods and criterion ranged between 53.5 ± 5.1 and 57.7 ± 6.0 ml/min/kg. No significant correlation was found between estimated and calculated VO_{2peak} (r < 0.3, p > 0.05). Significant differences were found for calcualted VO_{2peak} using different smoothing methods and criterion (p<0.01).
Conclusion: Inconsistent with the literature, the validity of H&TTT in estimating VO_{2peak} was not supported by this study. Caution should be paid when this test is utilized. In addition, a fixed method of data processing is recommended when calculating VO_2 from direct measurements.

D-57   Free Communication/Poster - **Resistance Training**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1773   Board #34   May 31 2:00 PM - 3:30 PM

Ambulation and Physical Function after Eccentric Resistance Training in Adults with Incomplete Spinal Cord Injury

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(No relevant relationships reported)

Strengthening the lower extremities positively influences walking mechanics for people with a neurological deficit. Eccentric resistance training (ERT) is a potent stimulus for the development of muscular strength characterized by low metabolic demand. This mode of training may serve to benefit those with incomplete spinal cord injuries (iSCI) seeking to improve ambulatory capacity.
PURPOSE: Determine the effect of ERT on walking speed, mobility, independence, and at-home function in those with iSCI. A secondary goal was to evaluate the relationship of daily step activity to ambulation and physical function variables.
METHODS: Training intervention with pre-, mid-, post-assessments. Adults (N = 11) with longstanding (> 1 year) iSCI, with no concurrent musculoskeletal injuries or lower extremity strength training, trained twice a week for 12 weeks on a motor driven, eccentrically biased recumbent stepper. Walking speed (10 meter walk test; 10MWT), mobility (timed up and go; TUG), independence (Walking Index for Spinal Cord Injury; WISCI), and at home function (Spinal Cord Independence Measure; SCIM) were assessed at baseline, after 6 weeks, and after 12 weeks of ERT. **RESULTS:** There were improvements in walking mobility ($p = .034, d = 0.62$), speed ($p = .005, d = .23$), and independence ($p = .004, d = .73$) after 12 weeks of ERT. At home function was unchanged ($p = .10, d = .12$). The TUG and 10MWT were correlated with step activity at mid- and post-test whereas the WISCI was significantly related at mid-test. **CONCLUSION**: The ERT improved walking function in the absence of gait training. Training on an isokinetic ergometer to improve eccentric strength promoted independence and, may potentially improve exercise self-efficacy. Additionally, this mode of ERT may diminish therapist burden in programs designed to improve ambulatory capacity or strength in those with iSCI.

1774   Board #35   May 31 2:00 PM - 3:30 PM

Preservation Of Explosive Force In Long-term Strength Trained Elders Is Determined By Neural Adaptations

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(No relevant relationships reported)

Preservation of explosive force in long-term strength trained elders is determined by neural adaptations
PURPOSE: To understand the effects of long-term strength training in the neural and contractile properties of explosive force in young adults and elders. **METHODS:** 54 healthy males were divided in four groups: untrained young control (YC - n=14; 26 ± 4 yrs), untrained elder control (EC - n=14; 66 ± 3 yrs), strength trained young (YT - n=14; 27 ± 3 yrs), and strength trained elder (ET - n=12; 64 ± 4 yrs). Knee extension isometric torque was recorded during: 1) maximum voluntary isometric contractions (MVIC; peak torque); 2) explosive voluntary contractions (rate of torque development – RTD at 0 -50 and -150 ms); and 3) supramaximally-evoked octets (8 pulses at 300 Hz; torque at 50 and 75 ms). Surface electromyography (sEMG; 0-50, 50-100 ms) of the quadriceps muscle was recorded during explosive contractions and was normalized to the MVIC sEMG root mean square (RMS) data. The skeletal muscle index (SMI) was estimated using DXA. One-way ANOVA (Tukey post hoc) was used to compare groups. **RESULTS:** Displayed in table 1.
Table 1. SMI, MVIC and octets torque, RTD and sEMG (mean ± SD).

Variables		EC	ET	YC	YT
SMI (kg/height²)		8.9 ± 1.0[A]	10.0 ± 1.3[B]	9.3 ± 0.9[AB]	11.5 ± 0.7[C]
MVIC peak torque (N·m)		212 ± 39[A]	245 ± 50[AB]	290 ± 55[B]	358 ± 67[C]
RTD (N·m·s⁻¹)	0-50 ms	981 ± 219[A]	1340 ± 252[B]	1396 ± 483[B]	1938 ± 493[C]
	0-150 ms	870 ± 182[A]	1125 ± 195[B]	1255 ± 291[B]	1545 ± 276[C]
Octets torque (N·m)	50 ms	52 ± 18[A]	62 ± 12[A]	77 ± 13[B]	95 ± 18[C]
	75 ms	72 ± 29[A]	85 ± 17[A]	112 ± 19[B]	136 ± 26[C]
sEMG (% RMS)	0-50 ms	39 ± 13[A]	83 ± 24[B]	35 ± 14[A]	72 ± 16[B]
	50-100 ms	95 ± 28[AB]	119 ± 25[C]	80 ± 25[B]	106 ± 18[AC]

Different letters within the same factors are significantly different (p < .05).
CONCLUSIONS: Strength training optimizes the RTD through different mechanisms. YT benefited from adaptations in the neural (increased activation capacity - sEMG) and intrinsic contractile (i.e. increased octet torque) properties of the neuromuscular system. ET showed higher RTD due to adaptations in the neural (sEMG: ET > EC and YC) but not in the intrinsic contractile (Octet torque: ET = EC) properties. YC showed greater intrinsic contractile capacity than ET; however, the lower magnitude of muscle activation during the explosive contractions limited YC RTD, resulting in similar performance compared to ET. Thus, long-term strength training preserves explosive force in elders mainly due to positive neural adaptations.

1775   Board #36   May 31 2:00 PM - 3:30 PM

Suspended Weight Training During Squats: Does It Improve Balance More Than Traditional Squats?

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(No relevant relationships reported)

Unstable surface training has been popular in physical rehabilitation settings for decades. A more recent training technique in strength and conditioning is to create instability by using a suspended weight during resistance training exercises. Suspend weights could create a greater challenge for the core and potentially improve balance. **PURPOSE:** To determine if a 6 week training program using suspended weights during squats will lead to improvements in balance. **METHODS:** As part of their 6 week off-season strength and conditioning program 38 collegiate baseball players were randomly assigned to one of two groups. A group that completed the squats in the traditional fashion and a group that completed the squats while weights were suspended below the barbell. The subjects were tested pre and post for balance using a four direction Star Excursion Balance Test (SEBT). The results for each subject were normalized to a percent of their individual leg length. Difference scores were calculated between the percent of leg length scores pre-test and post-test. An independent samples t-test was conducted between these difference scores. Finally, a paired samples pre and post t-test was conducted within groups to see if there were any significant improvements within each group. **RESULTS:** The mean percent change of both the control (2.13±4.42%) and treatment (0.60+6.37%) groups improved slightly from pre-test to post-post but there were no significant differences (t = 0.79, p= 0.44) between the two groups. The paired samples t-test were not significant for the traditional squat (pre mean = 99.80 ± 8.30%, post mean = 101.93 ± 7.11%, t = 1.92, p= 0.074) or the suspended loaded squat (pre mean = 99.70 ± 6.86%, post mean = 100.30 ± 7.94%, t = .375, p= 0.71), indicating that neither technique significantly improved balance. **CONCLUSION:** The results of this study indicate that completing traditional or suspended weight squats as part of an overall 6-week strength and conditioning program will not lead to significant improvements in balance in highly trained college athletes.

1776   Board #37   May 31 2:00 PM - 3:30 PM

Male And Female Fatigue Responses To Heavier- And Lighter-load Lumbar Extension Resistance Training

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(No relevant relationships reported)

The literature has suggested higher endurance levels in females compared to males, allowing them to withstand fatigue for a longer period. Though these gender disparities are well supported research is specific to muscle groups, and disparity in fatigue between sexes are less significant when load of resistance increases. PURPOSE: To determine force and fatigue differences in the lumbar extensors between males and females following heavy- (HL) and light-load (LL) exercise conditions. METHODS: A sample of 17 recreationally active participants (9 males; 23.8 yrs, and 8 females;

21.3 yrs) were tested for maximal voluntary isometric torque (MViT) of the lumbar extensors before, and immediately following 3 conditions; dynamic lumbar extension exercise at 80% (HL) and 50% (LL) of MViT and a non-exercising control condition (CON). The three conditions were performed in a randomised order with no less than 72 hours between conditions. Fatigue comparisons between sex and condition were made using ANOVA with repeated measures. RESULTS: Analyses revealed a significant effect by condition for absolute change in strength ($p<0.001$), furthermore there was a significant interaction effect ($p<0.016$). Independent t-tests revealed differences in decrement in maximal force between males and females for heavy ($p=0.04$; males = -18.7%, females = -12.0%) and light-load ($p=0.005$; males = -29.3%, females = -25.9%).
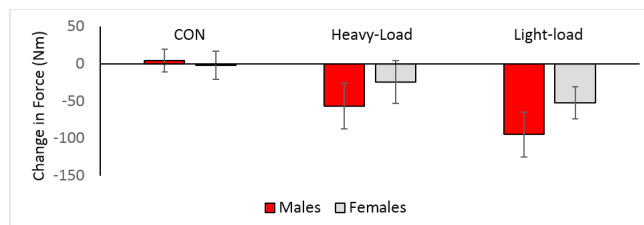
CONCLUSION: Fatigue responses in the lumbar extensors differ based on exercise load and sex of participant. Women showed either a more immediate recovery, or a smaller decrement in maximal force production compared to males, following fatiguing exercise at both heavy- and light-loads. This lends practical support to previous research reporting a greater number of slow twitch muscle fibres in the lumbar musculature of females compared to males.

1777   Board #38   May 31 2:00 PM - 3:30 PM

Effects of Vibration Resistance Training on Bone Mineral Density of Postmenopausal Females

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(No relevant relationships reported)

PURPOSE: To determine the effects of vibration resistance training on bone mineral density (BMD) of postmenopausal females, and to compare the results of different resistance trainings.
METHOD: Forty eight postmenopausal females (66.1±0.9 yrs) were randomized into two groups. One group participated in a conventional resistance training (CRT), and another completed a vibration resistance training (VCT) on lower limbs 40 min one day, 3 days a week for 24 weeks. BMD at spine, femur neck and greater trochanter were determined before and after trainings. Data were compared and analyzed using 2-way repeated measures ANOVA.
RESULTS: There was no obvious before-after change in BMD at spine (1.06±0.04 vs. 1.07±0.05 g/cm²; p > 0.05, ES=1.92, but a positive change at femur neck (0.82±0.05 vs.0.86±0.04 g/cm²; p<0.05, ES=26.50) and greater trochanter (0.73±0.03vs. 0.78±0.03 g/cm²; p<0.05, ES=17.52) of postmenopausal females in CRT group. BMD at spine (1.07±0.05 vs. 1.10±0.03 g/cm², p<0.05, ES=7.91), femur neck (0.83±0.04 vs. 0.93±0.03g/cm², p<0.05, ES=19.26) and greater trochanter (0.73±0.04 vs. 0.80±0.06 g/cm², p<0.05, ES=4.88) were elevated significantly in VRT group after training. BMD at each part was increased greater in CRT group than those in VRT group.
CONCLUSIONS: While CRT on lower limbs was more effective in improving BMD of the femur region in postmenopausal females, VRT showed a more significant improvement at both spine and femur regions. Therefore, VRT may be a more effective intervention for promoting core strength and balance ability, as a result for reducing fall frequency of postmenopausal females. The effectiveness of a combined CRT and VRT should be examined.

1778   Board #39   May 31 2:00 PM - 3:30 PM

Impact of a Restricted Breathing Mask on Proteolytic Activity Post Resistance Training

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(No relevant relationships reported)

Circulating glucocorticoids are elevated during stressful situations and act as an inhibitor of protein synthesis through varied mechanisms. Evidence suggests the stimulation of glucocorticoids on muscle proteolysis also occurs with activation

of the UPS, the lysomal system (autophagy), and the calcium-dependent calpain system. **PURPOSE:** To define the impact a restricted breathing mask (RBM) has on serum cortisol and proteolytic genes during resistance exercise. **METHODS:** In a counterbalanced cross-over design, ten resistance trained male participants (20.3 ± 1.3 years) performed two separate testing sessions, RBM and No Mask, consisting of squat, leg press, and leg extension. Muscle samples were obtained at baseline, 3hr, 6hr, and 24hr post-exercise. Blood samples were obtained at baseline, 30min, 3hr, 6hr, and 24hr post-exercise. From each muscle sample, glucocorticoid receptor-DNA (GR-DNA) binding and mRNA expression of Atrogin-1, Foxo1, MuRF1, MAFbx, Myostatin, and REDD1 were determined. Two-way repeated-measures analyses of variance (ANOVA) were performed with condition and time as main effects ($p \leq 0.05$). **RESULTS:** No significant interactions between session and time for Atrogin-1, Foxo1, MuRF1, MAFbx, Myostatin, and REDD1. There was no main effect for session for serum cortisol. There was a significant interaction between session and time for GR-DNA binding. For the RBM session, compared to baseline GR-DNA binding was significantly elevated at 3-hr ($p = .007$), 6-hr ($p > .001$), and 24-hr ($p = .002$) post-exercise. **CONCLUSION:** The use of a RBM failed to affect serum cortisol or alter the mRNA expression of proteolytic genes. However, there was an increase in delta change GR-DNA binding during the RBM compared to the no mask session.

1779   Board #40   May 31 2:00 PM - 3:30 PM

Comparative Responses To Squats Done With Free Weights And An Exoskeleton.

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(No relevant relationships reported)

PURPOSE: To compare physiological, performance and perceptual responses to the squat exercise done with a barbell, to those using an exoskeleton (Institute of Human and Machine Cognition; Pensacola FL) designed for use during manned space flight. **METHODS**:Subjects (n = 15) made four laboratory visits, which began with two familiarization sessions on the exoskeleton, followed by two squat workouts in which the exercise mode (exoskeleton, barbell) was administered in a randomized sequence. Per workout they performed four repetitions each against progressively heavier (23, 34, 45.5 and 57 kg) loads separated by 90-second rests. A series of physiological, performance and perceptual data from the final two laboratory visits were collected before, during and after workouts. Per workout, we collected the same dependent variables. Z-scores were used to identify outliers, which along with its paired value from the other workout, were eliminated from further analyses. To assess data validity, dependent physiological, performance and perceptual variables from each workout were compared with paired t-tests and Cohen's d. **RESULTS**: All subjects completed each workout (100% compliance). Z-scores results show less than 0.5% of our total data were deemed outliers. Average t-test and Cohen's d values were 0.68 and 0.25 respectively. **CONCLUSIONS**: Prior research suggests t-test and Cohen's d values less than 1.0 and 0.4 respectively denote acceptable degrees of data similarity. Based upon these guidelines, current results denote an acceptable degree of data validity derived from exoskeleton squats. We conclude exoskeleton squats yield physiological, performance and perceptual responses like those done with a barbell, and warrant continued inquiry involving microgravity simulation in human subjects.

1780   Board #41   May 31 2:00 PM - 3:30 PM

A Comparison Between Bench Press and Overhead Press Concentric Velocity and Power

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(No relevant relationships reported)

Measuring average concentric velocity (ACV) during barbell exercises can be used for autoregulation of training loads; however, research is needed to clarify the load-velocity relationship for different barbell exercises. Training age, frequency, relative strength and limb length may influence the ACV on an individual basis. PURPOSE: To compare the ACV of the bench press and press over a spectrum of relative loads and to determine the influence of training age, frequency, relative strength, and limb length on ACV for the bench press (BP) and overhead press (OHP). METHODS: BP and OHP one-repetition maximum (1RM) was assessed in fifty-one individuals (33 males, 18 females). Height, body mass, and humerus length were measured while training age and frequency were obtained via questionnaire. ACV was measured during warm-up sets and 1RM attempts using a TENDO Power and Speed Analyzer. Relative 1RM was calculated as the 1RM divided by body mass. Average power (AP) was calculated as the load (kg) multiplied by 9.81 m/s2 multiplied by the ACV. Paired samples t-tests were used to determine differences in ACV and AP between the BP and OHP at loads 35-100% 1RM. Pearson's product moment correlations were used to determine relationships between variables. RESULTS: ACV values were significantly ($p<0.05$) greater for the OHP compared to the BP at all submaximal loads (35-95% 1RM) as well as the 1RM (0.24 ± 0.09 vs. 0.18 ± 0.07 m/s; $p<0.01$). AP values were significantly

greater ($p<0.05$) for the BP compared to the OHP at loads ≤85% 1RM but similar at 95% 1RM (228 ± 113 vs. 219 ± 118 watts; $p=0.405$) and the 1RM (156 ± 81 vs. 146 ± 78 watts/kg; $p=0.371$). Neither BP nor OHP 1RM ACV were significantly ($p>0.05$) related to humerus length, training age, or training frequency. Only BP 1RM AVC was significantly related to relative strength ($r=-0.399$; $p=0.003$). CONCLUSIONS: These data suggest velocity ranges used for prescribing training loads should not be used interchangeably for the BP and OHP; OHP velocity ranges should be greater than BP velocity ranges for the same relative loading. Velocity ranges for the BP may need to be reduced as a trainee's relative strength increases.

1781   Board #42   May 31 2:00 PM - 3:30 PM

A Comparision Between Squat And Deadlift Concentric Velocity And Power

Lindy M. Rossow[1], Abigail Boushard[1], Kathryn Blomenkamp[1], Julia C. Blumkaitis[1], Christopher A. Fahs[1], Chad M. Kerksick, FACSM[2]. *[1]Lindenwood University - Belleville, Belleville, IL. [2]Lindenwood University, St. Charles, MO.*
(No relevant relationships reported)

The average concentric velocity (ACV) of barbell exercises can be used to adjust training loads (autoregulation). The velocity ranges used for autoregulation can vary and research is needed to clarify the load-velocity relationship for each exercise. Anthropometric factors and training history may also affect the load-velocity relationship. **PURPOSE**: To compare the ACV of the squat and deadlift over a spectrum of relative loads and to determine the influence of training age, training frequency, limb length, and relative strength on ACV for the squat and deadlift. **METHODS**: One-repetition maximum (1RM) for the squat and deadlift was assessed in fifty-one individuals (33 males, 18 females). Height, body mass, and femur length were measured while training age and frequency were obtained via questionnaire. ACV was measured during warm-up sets and 1RM attempts using a TENDO Power and Speed Analyzer. Relative 1RM was calculated as the 1RM divided by body mass. Average power (AP) was calculated as the load (kg) multiplied by 9.81 m/s^2 multiplied by the ACV. Paired samples t-tests were used to determine differences between the squat and deadlift. Pearson's product moment correlations were used to determine relationships between variables. **RESULTS**: ACV values were significantly ($p<0.05$) greater for the squat compared to the deadlift at loads ≥55% 1RM including the 1RM (0.26 ± 0.08 vs. 0.22 ± 0.10 m/s; $p=0.004$). AP values were significantly greater ($p<0.05$) for the deadlift compared to the squat at loads ≤55% 1RM but similar at loads ≥65% 1RM including the 1RM (321 ± 134 vs. 317 ± 141 watts/kg; $p=0.844$). Squat 1RM AVC was significantly related to relative strength ($r=-0.297$; $p=0.033$). Deadlift 1RM AVC was significantly related to relative strength ($r=-0.308$; $p=0.028$) and training frequency ($r=-0.489$; $p<0.001$). **CONCLUSION**: These data suggest velocity ranges used for autoregulating training loads should not be used interchangeably for the squat and deadlift; Deadlift velocity ranges should be lower than squat velocity ranges for the same relative loading. Velocity ranges for both exercises may need to be reduced as a trainee's relative strength increases.

1782   Board #43   May 31 2:00 PM - 3:30 PM

Unilateral Strength Training Changes Direction Of Strength Asymmetry But Not Magnitude In Healthy Individuals

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(No relevant relationships reported)

Unilateral strength training is now recognized as an effective exercise intervention that can attenuate strength asymmetries in clinical conditions (i.e., fracture, neurological damage). The magnitude and direction of muscle strength asymmetry following unilateral strength training may provide insight regarding the adaptability of the central nervous system and further guide rehabilitation programs. **PURPOSE**: To determine the influence of unilateral isometric strength training of the non-dominant elbow flexors on strength asymmetry between limbs. **METHODS**: Ten volunteers (8 male, 2 left hand dominant) completed twelve training visits of the non-dominant elbow flexors across four weeks. The training protocol required the subjects to complete five sets of five, five-second isometric contractions at 80% of their MVIC force. Strength asymmetry of the dominant and non-dominant limbs were determined at baseline and following the training intervention with the equation: (dominant arm - non dominant arm)/stronger arm x 100. The resulting score reflects the magnitude of strength asymmetry and its direction (i.e., negative values favor the non-dominant limb). A paired samples t-test was used to compare the mean strength asymmetry scores before and after the training intervention. **RESULTS**: There was a significant ($P = 0.031$) mean difference in the direction of strength asymmetry post-training (mean ± SD: $-2.21 \pm 5.83\%$, range: $-9.8 - 4.5\%$) compared to baseline (mean ± SD: $2.12 \pm 5.34\%$, range: $-5.9 - 9.7\%$). However, the magnitude of asymmetry was unchanged ($P = 0.875$). **CONCLUSIONS**: The mean strength asymmetries were relatively small

before and after training. Nevertheless, the mean strength asymmetry shifted from the dominant limb at baseline to the trained, non-dominant limb following the training intervention. However, the individual responses were highly variable, as the magnitude of strength asymmetry decreased (40%), increased, (40%), or was relatively unchanged (20%). Collectively, these data show that unilateral non-dominant limb training reversed the direction of muscle strength asymmetry yet maintained its magnitude.

1783   Board #44   May 31 2:00 PM - 3:30 PM

An Examination of Performance and Cognitive Outcomes following Lower-Body Resistance Training in Males

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(No relevant relationships reported)

PURPOSE: The purpose of the present study was to investigate physiological and cognitive changes following a 6-week lower-body resistance training protocol. **METHODS:** Eight healthy men volunteered to participate in a 6-week resistance training protocol using the back squat (BS) and conventional deadlift (DL). Each participant went through a 1-week pre-testing period consisting of anthropometric measurements, vertical jump performance, 1-repetition maximum (1RM) testing of BS and DL, maximal aerobic capacity (VO_2max), cognitive performance, and total mood disturbance (TMD). Participants were then randomly placed into one of two experimental groups. The two groups were 90-seconds (90s) rest between sets (n= 5) and 3-minutes (3m) rest between sets (n= 3). Each group came into the lab for testing sessions twice per week, separated by at least forty-eight hours. In each session, the participants performed 3 sets of 5 repetitions using eighty-five percent of the previously determined 1RM for DL and BS. **RESULTS:** Analysis of variance (ANOVA) revealed a main effect of time for BS ($p = 0.026$), and main effect of group for vertical jump ($p = 0.041$). The 3m group increased BS performance ($p = 0.020$), while the 90s group improved vertical jump ($p = 0.031$). Group by time interactions were observed for two measures of cognitive performance: Interference score ($p = 0.048$) and Word-Color score ($p = 0.050$). Additionally, a group by time interaction was also observed for TMD ($p = 0.004$). Despite the trending increase of executive function in the 3m group, a worsened TMD score post-intervention was observed ($p = 0.008$). **CONCLUSION:** Minimal rest improved power within the 90s group while the 3m group significantly improved lower body strength. Cognitive function only appeared to improve in the 3m group. Despite no increase in strength for the 90s group, it appears minimal rest is advantageous for athletes looking to enhance power performance, although further research is necessary.

1784   Board #45   May 31 2:00 PM - 3:30 PM

The "Unregulated" World Of Strength And Conditioning: Are CSCCa Coaches The Most Effective?

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(No relevant relationships reported)

When designing training protocols, safety and effectiveness are the ultimate goals, with safety being a prerequisite of effectiveness (a protocol cannot be effective if not safe first). However, in January 2017, three Pacific-12 Conference football athletes were hospitalized with rhabdomyolysis. The affected players were supervised by a strength and conditioning coach (SCC), certified by the U.S. Track and Field and Cross Country Coaches Association (USTFCCCA). The National Collegiate Athletic Association (NCAA) only requires a nationally-accredited strength and conditioning certification program and USTFCCCA is one of them. This revived the debate about the effectiveness of several SCC certifications. Among them, the Collegiate Strength and Conditioning Coaches association (CSCCa), the only SCC certifying organization that includes a two-part practical in their exam, claim they are the only ones devoted to meeting the unique needs of the collegiate SCC. We used 2016-17 NCAA DI-III championship data to determine coaching effectiveness.**Purpose**: To investigate retrospectively the relationship between NCAA national championship data and CSCCa-certified SCCs.**Methods**: Championship data was retrieved from NCAA archives. All SCCs, who won national championships in any sport within the past year/season, were recruited via email/phone in order to acquire information regarding certification. The response rate was 60%. We identified the number of CSCCa-certified coaches who worked in 2016-17 for NCAA programs that (a) did not win a championship and (b) won a championship. Using z-score for proportion (one-tailed hypothesis, significance level at 0.05), we tested for statistical significance. **Results**: Last season/year, CSCCa-certified coaches worked for 2.7% of NCAA non-championship teams and for 15.5% of championship teams. The z-score is 5.9979. The p-value is 0.0001. The result is significant at p<0.05.**Conclusion**: The SCC credential is essential for most NCAA teams. The regulation of the strength and conditioning

world is crucial to prevent future incidents of unsafe and therefore, ineffective exercise prescription. Without accounting for other factors, the process of obtaining a CSCCa certification could be a potential solution to increase the effectiveness of SCCs.

1785   Board #46   May 31 2:00 PM - 3:30 PM

The Effects Of An Acute Bout Of Resistance Training On College-aged Male 24hr Rmr

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(No relevant relationships reported)

It has been demonstrated that increasing caloric expenditure through exercise participation is one mechanism by which to modify caloric balance in favor of weight loss. While chronic resistance training (RT) has been demonstrated to elevate resting metabolic rate (RMR) due to increased lean mass, there has been less research on the acute effects of a single bout of resistance training on RMR. **PURPOSE:** To determine the effects of an acute bout of resistance training on the 24 h RMR of college-aged males. **METHODS:** Ten healthy men aged 18-24yr performed 8 exercises (2 sets, 10 repetitions, 2 min recovery, 70% 1RM & 8RM) following ACSM Guidelines for RT. Subjects reported for testing following a 12 h fast and engaged in 7, 30 min RMR measurements over the next 24 h. Subjects completed both an experimental (RT) and control (no exercise) day separated by 1 week. **RESULTS:** RMR (kcal) data was analyzed using a 1 way ANOVA with repeated measures on 2 factors (group and time). Statistical analysis revealed that there was no significant main effect for group (2179.58 ± 44.82 kcal vs. 2143.16 ± 44.82 kcal; F = .330, p = .567) or group x time interaction (F =.592, p =.736, Table 1). There was a significant main effect for time (F = 5.126, p < .001, Table 2). **CONCLUSION**: We conclude that an acute bout of RT, following ACSM guidelines, did not significantly impact RMR in RT males 24 hrs post-exercise.

Table 1.
Mean 24-hour RMR Values by Group

RMR Measure-ment	1	2	3	4	5	6	7
Experi-mental (kcals)	1922.76 ± 118.57	2199.89 ± 118.57	2426.10 ± 118.57	2066.59 ± 118.57	2427.42 ± 118.57	2205.77 ± 118.57	2008.55 ± 118.57
Control (kcals)	1783.70 ± 118.57	2336.24 ± 118.57	2189.38 ± 118.57	2010.28 ± 118.57	2392.67 ± 118.57	2180.48 ± 118.57	2109.41 ± 118.57

Note. Values are means ± standard error.

Table 2.
Mean RMR Values across Measurements

RMR Measure-ment	1	2	3	4	5	6	7
kcal	1853.23 ± (83.85)	2268.07 ±* (83.85)	2307.74 ±* (83.85)	2038.43 ± (83.85)	2410.04 ±*◊ (83.85)	2193.13 ± (83.85)	2058.98 ± (83.85)

Note. Values are means ± standard error. * = Significant difference vs. Measure 1; ◊ = Significant difference vs. measure 4

1786   Board #47   May 31 2:00 PM - 3:30 PM

Cluster Sets Attenuate Power Loss at Higher Intensities During the Back Squat Exercise

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(No relevant relationships reported)

Cluster sets (CLU), a training method in which a brief rest is inserted between a group of repetitions, attenuates the loss in power typically observed in traditional set (TRD) configurations during resistance training. Training studies report greater gains in strength and power when using CLU at lower intensities. However, few data exist on the kinetics and kinematics of CLU at higher intensities (>80%). **PURPOSE**: To compare the kinetics and kinematics during TRD and CLU at a high intensity. **METHODS**: Eight resistance trained men (23.9±3.3y; 177.2±7.9cm; 82.7±11.0kg; 11.9±3.5% body fat) had body composition and one-repetition maximum (1RM) back squat assessed. After at least 48 hours, in a randomized crossover, participants completed 4 sets 6 repetitions (TRD) with 180 seconds inter-set rest or 4 sets 2 clusters

of 3 (4 x [2 x 3]) (CLU) with 30 seconds intra-set rest and150 seconds inter-set rest, both configurations at 80% 1RM separated by 72 hours. Data were collected using a bilateral force plate and motion capture system, and smoothed using a 4th order Butterworth filter (12 Hz cutoff). Data were analyzed by a repeated measures ANOVA (p ≤ 0.05). **RESULTS**: A significant CONDITION x SET (p = 0.038) interaction was observed, with lower power outputs during TRD for SET 2 (p = 0.008), 3 (p = 0.019) and 4 (p = 0.002) compared to SET 1. Only SET 4 was significantly lower than SET 1 (p = 0.006) in CLU. A significant CONDITION x REP interaction (p < 0.001) was also observed. Compared to REP 1, significantly lower power outputs were observed for every subsequent repetition during TRD. In contrast, reduced power output was not observed until later in the set when performing CLU. The greater mean power was attributed to velocity, as no main effect or interactions were observed for mean force (p ≤ 0.05). A CONDITION x SET interaction approached significance (p = 0.069) for velocity, while the CONDITION x REP interaction effect was significant (p < 0.001), mirroring the pattern observed in mean power. **CONCLUSION:** These data demonstrate that the greater power observed during resistance exercise at lower intensities is also observed at higher intensities, and is attributed to higher velocities. Long-term training studies at higher intensities are warranted to determine the adaptations resulting from consistent CLU training.

1787   Board #48   May 31 2:00 PM - 3:30 PM

Hypertrophic Responses Do Not Completely Explain Increases in Strength After 12 Weeks of Resistance Training in Previously Untrained Young Men

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(No relevant relationships reported)

Purpose: It has been suggested that resistance training-induced increases in lean mass are related to increases in strength metrics. We aimed to examine if increased lean mass was related to increased strength in untrained young men after 12 weeks of resistance training. **Methods:** 72 young male subjects performed 12 weeks of supervised resistance training (RT). Ultrasound, dual x-ray absorptiometry (DXA), 3 repetition maximum (RM), isometric mid-thigh pull (IMTP), and isokinetic dynamometry testing were performed before and after the intervention. Training was completed 3 days weekly and consisted of squat, bench press, trap bar deadlift, and barbell rows within an undulated program design. **Results:** While DXA lean mass increased by 4.7%, squat 3RM increased by 48.2% and IMTP increased by 11.7%, on average. Changes in lean mass and 3RM squat were moderately correlated (r^2=0.102, p=0.005) while changes in lean mass and IMTP were not significantly associated (r^2= 0.04, p=0.08). **Conclusion:** While studies have reported that increases in lean mass in trained individuals are seemingly related to increases in strength, we report herein that increases in lean mass do not seem to sufficiently explain changes in strength in previously untrained young men. Supported by: Gifts from Hilmar Inc., BNRG, Lockwood, LLC, JW Nutritional, and Glambia.

1788   Board #49   May 31 2:00 PM - 3:30 PM

Effect of Nine Months of Resistance Exercise on Glycemic Levels and Macrosomia in Pregnant Women

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(No relevant relationships reported)

Resistance training is considered a beneficial strategy to reduce the impact of high glycemic levels in patients with diabetes mellitus (DM). Gestational diabetes mellitus (GDM) is considered one of the most common pathologies during pregnancy, affecting pregnant women and their children both during the pregnancy and after birth. High glycemic index and type 2 diabetes (DM2) are also associated with macrosomia during and after pregnancy. **PURPOSE**: Analyze the chronic effect of 9 months of resistance training on glycemic levels and macrosomia incidence in 54 pregnant women. **METHODS**: Fifty-four pregnant women without any complications related to DM and who were completely inactive before the study were recruited. Participants were randomized into two groups: a control group (CG) who remained inactive during the 9 months of pregnancy or an intervention group (IG) who performed resistance training (60% of 1 RM x 3 times per week). Training was progressively increased every two weeks to sustain the intensity of training. Glucose levels were analyzed before and after the training protocols and two months after pregnancy. The APGAR score was used to determinate the health of the newborn and the incidence of macrosomia. The weight gained during the pregnancy was used to compare CG to IG. **RESULTS**: A

significant difference between CG and IG was observed on glycemic levels during the last 3 months of intervention (122 ± 8.5 to 105 ± 7.2 mg/dl p=0.012). Weight gain was significantly lower in IG compared to CG (21% less, p<0.05). Fetal macrosomia incidence was significantly lower in IG compared to CG (4.32 ± 1.2 to 13.19 ± 3.9 p=0.001). **CONCLUSION**: Regular resistance exercise appears to be a good strategy to avoid GDM, eliciting positive outcomes during the pregnancy and afterwards. The reduction of glycemic levels were significantly correlated in reducing the risks related to macrosomia.

1789   Board #50   May 31 2:00 PM - 3:30 PM

One Set to Failure per week Increases Strength More Effectively than Traditional Resistance Training

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(No relevant relationships reported)

PURPOSE: To determine the efficacy of the current recommendations for increasing strength compared to other, less time consuming programs in untrained sedentary and recreationally active females. **METHODS:** Forty-six female subjects (age = 22.7±4.1 yrs) were randomly assigned to one of four groups that determined the resistance training program they would follow for 6 weeks. All resistance training programs utilized the same two exercises on the same equipment: leg extension and leg curl. The four training groups included: a traditional group (HIGH), two blood flow restriction (BFR) groups (BFR-1 and BFR-2), and a minimalist group (MIN). HIGH group followed ACSM guidelines for increasing strength, which was comprised of 3 sets of 10 repetitions 3x/wk at 50% of 1RM. BFR-1 program consisted of 4 sets of 30, 15, 15, 15 reps 1x/wk at 20% of 1RM. BFR-2 program consisted of 4 sets of 30, 15, 15, 15 reps 2x/wk at 20% of 1RM. MIN program consisted of 1 set to failure 1x/wk at 75% of 1RM. Weight was added each week if subject completed the previous weeks program with proper form. Prior to and following 6 week training period subjects were tested for 1RM strength on leg extension and leg curl exercises. All subjects were at least 8 hours fasted as well as hydrated (determined using clinical urine refractometer) for pre- and post-testing. **RESULTS:** One-way ANOVA found no between-group differences in any of the outcome measures of interest at baseline. Repeated measures ANOVA found a significant time main effect for 1RM (p < 0.01) with all groups improving in strength for leg extension and leg curl. There was also a significant condition difference (p < 0.01) for the MIN group in the 1RM for the leg extension, representing that increases in leg extension 1RM by MIN group was significantly greater than all other conditions. **CONCLUSION:** All training programs were effective at increasing 1RM strength for the leg extension and leg curl. Strength increases by the MIN group for the leg extension were significantly greater than all other groups. These results indicate that a less frequent, more time efficient program is more effective than the current recommendations for increasing strength and it may be an alternative training approach for those who want to minimize the time spent for training but still maximize benefits.

1790   Board #51   May 31 2:00 PM - 3:30 PM

Using Velocity Loss for Monitoring Resistance Training Effort in a Real World Setting

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(No relevant relationships reported)

Previous studies demonstrated the importance of analyzing movement propulsive velocity (MPV) loss during resistance training as an estimate of intensity of effort. However, these studies involved sets performed with maximal intended velocity and used special devices, which is not usual for most people practicing resistance training**PURPOSE**: The purpose of the present study is to evaluate the changes in MPV during resistance training with different loads while the trainees are attempting to move the load at a pre-determined repetition duration. **METHODS**: Twenty-one resistance-trained men (age: 25.7 ± 5 years; height: 177.0 ± 7.2 cm; mass: 85.4 ± 13.56 kg) participated in the study. Participants performed two tests sessions. The first to determine 1 repetition maximum (1RM) load, and the second to evaluate MPV loss during a set to momentary muscle failure (MF) performed at 75% and 50% of 1RM using a 2 second concentric and 2 second eccentric repetition duration controlled by a mobile app metronome. **RESULTS**: Mean one-repetition maximum 1RM load was 98±21.6 Kg, with a relative strength of 1.15±0.2, obtained by ratio of the load of 1RM relative to body mass. The average number of repetitions performed at 75% of 1RM was 7.5±1.7 and 13.7±2,8 for 50% of 1RM. With 75% of 1RM there was a significant difference among repetitions MPV. Post hoc analysis revealed that MPV in the last repetition was lower than in the preceding three. Similarly, MPV during the penultimate repetition was lower than during the antepenultimate and the 4th from last. However, there was no difference in MPV between the 4th last and the antepenultimate repetition. Velocity loss from

the antepenultimate to the penultimate repetition was 5.33%, from the last to the penultimate was 22.11% and the accumulated loss from the last to the 4th last was 25.4%. ANOVA for MPV values obtained at 50% 1RM load showed no significant effects, which suggested the same predetermined velocity pattern was maintained until reaching MF
CONCLUSIONS: Acessing MPV loss during resistance training using simple methods can be an important tool for standardize the intensity of effort employed during submaximal training with high loads, but not with light loads. This can be specially useful in clinical conditions where maximum exertions are contraindicated.

1791   Board #52   May 31 2:00 PM - 3:30 PM

Comparison of Different Eccentric Phase Tempo of Knee Extension Resistance Exercise on Hypertrophy Response

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(No relevant relationships reported)

Regarding resistance training objectives, muscle hypertrophy and strength are primary goals. The movement velocity appears to be important to improve muscle mass and strength. Eccentric exercises have been attributed to greater gains in muscle cross-sectional area, mainly because of a greater time under tension, inducing more stress to muscle fibers and greater adaptation. Therefore, manipulation of the eccentric phase tempo may have different implications to results in resistance training.**PURPOSE**: Evaluate the effects of two different velocities of eccentric phase in isotonic contractions on muscle hypertrophy and strength of the quadriceps femoris in healthy adults.
METHODS: Ten healthy adults underwent in a training program consisting of knee extensions unilaterally, where each leg was allocated in a different pattern of movement. These consisted of two groups Isotonic contractions of one second in concentric phase, 0 seconds in a transition phase and 2 seconds in eccentric phase (G2S); Isotonic contractions of 1 second in concentric phase, 0 seconds in a transition phase and 4 seconds in eccentric phase (G4S). Each protocol consisted of 5 series of exercise until volitional failure, with 70% of 1 maximal repetition and 3 minutes of rest between series, 2 times a week. **RESULTS**: We observed muscle hypertrophy response over time for all muscles (Rectus Femoris (RF), $P = 0.00$; Vastus Lateralis (VL), $P = 0.00$ and Vastus Medialis (VM), $P = 0.00$; the difference between treatments was observed only for VM ($P = 0.022$). The effect size was: RF, 0.78 and 0.82; VL, 1.05 and 0.8; VM, 0.59 and 1.08; for G2S and G4S, respectively. Both groups improved strength over time ($P = 0.00$), with the effect size for G2S of 0.63 and G4S 0.55, with Hedge's g approach; however, there was no difference ($P < 0.05$) between treatments. Time Under Tension (TUT) was different between groups (G2S=1300.6±356 and G4S=2535.6±654).
CONCLUSIONS: Our results suggest that the different eccentric phase tempo is not able to produce differences in strength and muscle hypertrophy for knee extensors, except for the Vastus Medialis, although the time under tension was greater in G4S.

1792   Board #53   May 31 2:00 PM - 3:30 PM

Impact of Explanations onStrength Exercises and Daily Movements

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(Sponsor: Chad Kerksick, FACSM)
(No relevant relationships reported)

Research is needed to clarify if an explanation or technique descriptions may have an impact on biomechanics of individuals, especially in major strength exercises and daily movements such as squat (SQ), sit-stand up (SS), overhead dumbbell press (DBP), and overhead barbell press (OHP). **PURPOSE:** To determine if peak velocity and peak acceleration of SQ, SS, DB, and OHP are influenced by written descriptions and explanations. **METHODS:** Twenty-one subjects (14 males, 7 females) attended two visits with 48-72h separation. At each visit they performed four different exercises (SQ, SS, DBP, OHP) in the same order and with the same resistance during which movement was recorded with the Iron Path Pro Application Version 2.2. Additionally, the app recorded velocity, acceleration, bar distance, and force. At the second visit subjects were randomized to either receive a description on correct SQ and OHP technique or not. Height, body mass, humerus and femur length were measured and resistance training experience and frequency were reported via survey. Two-way mixed ANOVA with repeated measures was used to determine differences between the first and second visit (time) and explanation and non-explanation (condition). **RESULTS:** The subjects had the following descriptive statistics: age of 21.4±1.6 yrs, body mass of 79.38±23.71 kg, height of 1.77±0.10 m, femur length 0.45±0.05 m, humerus length 0.35±0.05 m, lifting experience of 4.68±3.45 yrs, and lifting session 2.6±1.63 days per week. No significant (p>0.05) condition, time, or condition x time effects were found for either peak velocity or peak acceleration for the SS, SQ, DBP, and OHP.

CONCLUSION: These data show that neither repeated trials (time) or condition had a significant impact on peak velocity and peak acceleration in SS, SQ, DBP, or OHP in this sample of young, resistance trained subjects.

D-58   Free Communication/Poster - Renal Physiology

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1793   Board #54   May 31 3:30 PM - 5:00 PM

The Effect of Dietary Nitrates on Exercise Capacity in Chronic Kidney Disease

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(No relevant relationships reported)

PURPOSE The purpose of this study was to test the hypothesis that an acute dose of 12.6mmol dietary nitrate in the form of concentrated beetroot juice (BRJ) would improve exercise capacity and skeletal muscle mitochondria function in adults with moderate to severe chronic kidney disease (CKD). **METHODS** 12 individuals with moderate to severe CKD participated in this study (61±4 yrs; 9 males; eGFR 47.8ml•min^{-1}•1.73m^2). Participants reported to the laboratory and a baseline blood sample was obtained for determination of NO metabolites (NOm; Nitrate, nitrite, s-nitrosothiols and metal bound NO). Participants were then randomized to ingest 12.6mmol of BRJ or a nitrate depleted placebo (PLA). Exercise testing began 2.5 hours post beverage ingestion to coincide with peak plasma nitrite levels. Skeletal muscle mitochondrial oxidative function testing was performed using near infrared spectroscopy (NIRS) followed by a symptom limited graded exercise test (GXT) on a cycle ergometer for determination of peak oxygen consumption (VO$_2$ peak). Participants repeated the entire protocol in the other condition a minimum of 7 days later. **RESULTS** Plasma NOm values were significantly increased in the BRJ condition 2.5 hours post ingestion compared to BRJ baseline as well as PLA at 2.5 hr (2.5 hr: PLA 30.2±6.6uM vs BRJ 973±261uM, p>0.05). We did not observe an improvement in mitochondrial oxidative capacity or VO$_2$ peak in the BRJ condition compared to PLA (p>0.05). The amount of work performed and total exercise time was significantly increased after BRJ compared to PLA (Work: PLA 39.5±9.9 vs BRJ 44.7±10.7kJ; Exercise Time: PLA 627±86 vs BRJ 674±85 seconds; p<0.05 for both). VO$_2$ at the ventilatory threshold (VT) was significantly greater in the BRJ condition compared to PLA (PLA 0.79±0.08L/min vs BRJ 0.95±0.09 L/min; p<0.05). **CONCLUSION** An acute dose of 12.6mmol dietary nitrate significantly improved VO$_2$ at VT, work performed, and total exercise time in adults with moderate to severe CKD. This research was supported by an ACSM Foundation Research Grant from the American College of Sports Medicine Foundation and NIH grant HL113514.

1794   Board #55   May 31 3:30 PM - 5:00 PM

The Kidney As A Hub For Ph Modulation: Interrelationship Of Lactate, Pulse, And Blood Pressure

Roman C. Musselman[1], J. Mark VanNess[1], Greg Roberts[2], Jonathan M. Saxe[2], Lewis E. Jacobson[2], Courtney D. Jensen[1]. *[1]University of the Pacific, Stockton, CA. [2]St. Vincent Hospital, Indianapolis, IN.*
(No relevant relationships reported)

Following the pioneering work of Hill and Meyerhoff, in 1933, Margaria and colleagues published a compelling relationship between pH and lactate in the blood. In 1976, Sahlin and colleagues detected and presented that same relationship in skeletal muscle. These events helped make lactate metabolism one of the most famous and misunderstood phenomena in exercise physiology. We now know that rates of ATP hydrolysis and hydrogen ion clearance are fundamental to exercise-induced metabolic acidosis; however, the role of the kidney in modulation of blood lactate and pH still requires further elucidation in athletic and ill populations. **PURPOSE:** To better understand the determinants of blood pH by examining the interrelationship between lactate, pH, and cardiovascular parameters in a patient population. **METHODS:** We analyzed a sample of 248 patients who were admitted to a Midwestern U.S. hospital for acute trauma. All patients were assessed for predictors of pH based on complete blood count and other measurements collected during intake. Multiple linear regression tested the effect of demographic, anthropometric, and metabolic variables on blood pH. **RESULTS**: Subjects were 63.3% male with a mean age of 50.5 ± 21.6 years, normal blood pH (7.3 ± 0.4), and slightly elevated lactate (2.0 ± 1.7 mmol/L). Mean arterial pressure (98.5 ± 18.5 mmHg) and heart rate (90.7 ± 18.1 bpm) were also slightly elevated. The variables that predicted significant reductions in pH were

lactate (p<0.001) and pulse rate (p=0.040). The variables that predicted significant increase in pH were mean arterial blood pressure (p=0.001), temperature (p=0.010), and pregnancy status (p=.026). Sex (p=0.316), age (p=0.714), obesity (p=0.195), and blood alcohol content (p=0.624) were not statistically significant. Injury severity score was a trending predictor (p=0.057). **CONCLUSIONS:** The strong association between lactate and pH may indicate a need to re-examine components of the lactate/pH framework. The associations between blood pressure, pulse, and pH implicate the kidney; further work needs to be done in outlining renal function and its role in modulation of pH and cardiovascular function.

1795   Board #56   May 31 3:30 PM - 5:00 PM

Home-based Exercise Improves Heart Contractility Determined by 2D Speckle Tracking Strain in Renal Transplant Recipients

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(No relevant relationships reported)

PURPOSE: Renal transplant recipients (RTR) are at high risk for adverse cardiovascular events due to potential cardiotoxic effects of multiple drug therapies and often sedentary behavior. Moderate intensity exercise has been shown to decrease the risk of these potential events. The purpose of this study was to evaluate the changes in myocardial function using global longitudinal strain (GLS), mean strain (Lo) and ejection fraction (EF) determined from 2D speckle tracking strain (STS) before and after participation in a home-based aerobic and strength training program in RTR and to determine if there was a sex difference in the response.
METHODS: A group of 30 RTR's (12 females and 18 males, aged 47.9 ± 12.3 y, BMI: 24.4 ± 3.9, average age at transplant 38.6 ± 13.1 y) participated in an exercise program for 12 months. Individualized exercise programs were created based on the results of a cycle ergometer test, hand grip dynamometry, bioelectrical impedance and skinfold analysis with the goal of achieving 150 minutes*wk^{-1} of activity at moderate intensity (minimal levels were set at 3x*week^{-1} with a goal of at least 30 minutes*session^{-1}. Subjects completed 2D echocardiographic examination at T_0, T_6, and T_{12} months. Repeated measure ANOVA and a two-way mixed ANOVA with Tukey post-hoc analysis were used to detect differences across time and sex differences.
RESULTS: GLS and Lo increased significantly from T_0 to T_6 and remained high at T_{12} (GLS: -17.9 ± 3.3 vs -20.4 ± 3.2 and -20.5 ± 3.8 and Lo: -18.3 ± 3.8 vs -20.4 ± 3.3 and -20.4 ± 3.0) with no changes in EF over time (EF % 60.4 ± 5.3 vs 61.8 ± 6.9 and 64.3 ± 6.2). Men were significantly older at time of transplant (33.8 ± 12.6 vs, 45.7 ± 11.4, p < 0.05) with lower cardiac function at T_0 (-17.1 ± 3.7 vs -19.2 ± 2.2), p < 0.05) than women and accounted for a majority of the improvement in cardiac function in this sample. **CONCLUSIONS**: A moderately intense exercise program was well tolerated by RTR's and significantly improved heart function in men during the initial 6 months of the program. More than EF, 2D ST analysis appears more sensitive in detecting training adaptations. Future studies should investigate the potential role of GLS in the assessment of cardiac function following unsupervised exercise training.

1796   Board #57   May 31 3:30 PM - 5:00 PM

Combined Effects of Hypohydration, Muscle Damage, and Exertional Hyperthermia on Biomarkers of Acute Kidney Injury

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Reported Relationships: C.L. Butts: *Consulting Fee; Gatorade Sports Science Institute.*

Dehydration, exertional hyperthermia, and muscle damage commonly occur in athletic, military, and occupational settings, yet, their combined effects on biomarkers of acute kidney injury are not well understood. **PURPOSE:** Investigate the combination of dehydration, muscle damage, and exercise in the heat on biomarkers of renal stress. **METHODS:** Six male participants (age 24±5 y, body mass 74.9±6.3 kg, body fat 14.5±4.1%) completed two trials, one euhydrated (EU; fluid replacement ≤2% body mass loss) and one hypohydrated (HY; fluid restriction 24-h prior to and throughout exercise), separated by ≥28 days. Trials consisted of muscle damaging unilateral eccentric knee flexion, 60 minutes of treadmill running (~60% VO$_2$max) in the heat (33 °C, 54% RH), and 30 minutes of passive recovery. Participants were provided a rehydration protocol in both trials and returned 24-h later for a follow-up visit. **RESULTS:** Urine osmolality when HY was greater pre- (HY 1045±102, EU 612±142 mOsm/kg; P <0.01) and post-trial (HY 1007±105, EU 503±205 mOsm/kg; P <0.01), but not 24-h post (HY 543±310, EU 545±404 mOsm/kg; P = 0.98). Serum osmolality was also different pre-trial (HY 301±5, EU 290±5 mOsm/kg; P = 0.02), but was

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similar 24-h post (HY 295±4, EU 293±3 mOsm/kg; P = 0.25). Isometric strength was reduced regardless of condition immediately after eccentric exercise (grand mean Δ = -33.6±27.9 N·m, P = 0.03). Rectal temperature increased to a greater degree when HY (2.11±0.60 °C) compared to EU (1.65±0.44 °C; P = 0.01). Plasma neutrophil gelatinase-associated lipocalin (pNGAL) increased independent of condition (grand means: pre- 59.9±7.3, post-exercise 77.6±12.0 ng/mL, P <0.01), but was not different between trials (P = 0.84). However, percent changes from baseline in pNGAL were greater, regardless of time, when HY (19.1±7.5%) compared to EU (6.1±11.2%, P < 0.01). **CONCLUSION:** Exercise in the heat with muscle damage increased renal strain when HY and resulted in greater changes in pNGAL, a biomarker of acute kidney injury. These preliminary findings suggest that improper fluid consumption prior to and during exercise may augment renal stress, yet the long-term consequences of these detriments require further investigation.

1797   Board #58   May 31 3:30 PM - 5:00 PM

Associations of Physical Activity, Diet, and Kidney Function in Pre-diabetic Early Stage Chronic Kidney Disease

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(No relevant relationships reported)

Purpose Early-stage chronic kidney disease (CKD) is prevalent in pre-diabetes. A healthy lifestyle is promoted in those at high risk of developing type 2 diabetes (T2DM) yet any relationships between physical activity and nutritional intake on kidney function in these individuals is unknown. This study aimed to quantify the independent associations that may exist between changes in physical activity, dietary fats and fibre, and estimated kidney function in individuals with pre-diabetic stage-2 CKD. **Methods** The study analysed data from a subset of adults at high risk of T2DM recruited to a lifestyle education programme (Yates et al. Diabet Med. 34:698-707, 2017). At baseline and 24 months, 126 (84 male) pre-diabetic CKD stage 2 (mean(SD) baseline estimated glomerular filtration rate (eGFR) 76.7(8.0) ml/min/1.73 m², age 66(6) years, BMI 31.6(5.1) kg/m²) provided dietary data via the Dietary Instrument for Nutrition Education food frequency questionnaire and physical activity and steps by 7-day accelerometry. Linear regression examined the independent associations of baseline and change at 24 month in eGFR and average number of steps, moderate to vigorous physical activity (MVPA), total fat and unsaturated fat, and dietary fibre against 95% level of significance (p≤0.05). **Results** Between baseline and 24 months eGFR decreased by -3.04(9.4) ml/min/1.73 m². There were no changes in MVPA, steps, fat and fibre intake but responses were highly variable between individuals. Baseline and change in eGFR at 24 months were positively associated with baseline MVPA (Pearson correlation, r=0.182, p=0.02 and r=0.160, p=0.04 for baseline eGFR and change in eGFR respectively), but not change in MVPA. There was a positive association between change in eGFR and average number of steps at baseline (r=0.140, p=0.059). However, after adjustment for known confounders (including age, sex, BMI, smoking status, ethnicity), these associations disappeared. There were no associations between eGFR and dietary fats (total and unsaturated), and fibre. **Conclusions** Higher MVPA and average number of steps were associated with (but not predictive of) higher eGFR in a group of adults with pre-diabetic stage-2 CKD. Therefore, a healthy active lifestyle should be encouraged in pre-diabetes to prevent decline in kidney function.

1798   Board #59   May 31 3:30 PM - 5:00 PM

Aerobic Exercise Improves Subclinical Cardiopulmonary Abnormalities in Chronic Kidney Disease

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(No relevant relationships reported)

PURPOSE Subclinical cardiopulmonary abnormalities have been reported in patients with mild-moderate CKD that may predispose these individuals to overt cardiovascular disease (CVD). This randomized controlled trial investigated whether 12 weeks of moderate to vigorous intensity aerobic exercise could improve cardiopulmonary measures in Stage 3-5 non-dialysis CKD patients.
METHODS 36 Stage 3-5 CKD patients (eGFR, 44±2 ml/min/1.73m²) with no CVD history were randomized to an Exercise Training (EXT) or Control (CON) arm. EXT consisted of 3x45 minutes of supervised exercise per week at 60-85% HRR for 12 weeks. CON received routine care. Cardiopulmonary exercise testing (CPX) was carried out at baseline and after 12 weeks. CPX was performed on a cycle ergometer with workload increased by 15W every minute until volitional fatigue. Breath by breath expired respiratory gas analysis was carried out with an automated gas analyzer and averaged over 10 second intervals.
RESULTS EXT significantly improved exercise capacity as shown by an increase in VO$_2$peak compared to CON (EXT: 17.89±1.21 *vs.* 19.98±1.59; CON: 18.29±1.73

Abstracts were prepared by the authors and printed as submitted.

vs. 17.36±1.60 ml/kg/min; *p*<0.01). Cardiopulmonary reserve improved following EXT as indicated by an increased oxygen uptake efficiency slope (EXT: 1.76±0.13 *vs.* 1.93 ± 0.12; CON: 1.76±0.14 *vs.* 1.68±0.15 AU, *p*<0.01). Relative O_2 pulse improved following EXT, suggestive of improved left ventricular function (EXT: 0.12±0.01 *vs.* 0.14± 0.01; CON: 0.14±0.01 *vs.* 0.14±0.01 ml/beat/kg; *p*=0.03). Ventilation perfusion mismatching (V_E/VCO2) was still evident following EXT (EXT: 32±2 *vs* 33±0.9; CON: 32±2 *vs* 34±1 AU; *p*=0.1). EXT had no effect on the ventilatory cost of oxygen uptake (V_E/VO_2; EXT: 40±2 *vs.* 42±2; CON: 37±2 *vs.* 41±2 AU; *p*=0.5). EXT had no effect on autonomic function assessed by maximal heart rate (EXT: 149±8 *vs.* 143±8; CON: 131±5 *vs.* 129±5 bpm; *p*=0.4) and 1 minute heart rate recovery (EXT: 15±1 *vs.* 16±2; CON: 14±1 *vs* 13±1 %; *p*=0.2).
CONCLUSION Aerobic exercise improved exercise capacity, cardiopulmonary reserve and oxygen delivery in CKD patients. Despite these improvements, CPX measures were not fully restored to those observed in matched sedentary healthy individuals. Additional interventions coupled with exercise may be required enhance cardiopulmonary adaptations to exercise training in CKD.

D-59   Free Communication/Poster - **Imaging and Assessment Methodology**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1799   Board #60   May 31 3:30 PM - 5:00 PM

Using an Accelerometer to Predict Mechanical Load of Physical Activities in Adults

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(No relevant relationships reported)

PURPOSE: The accepted method for quantifying impact forces on the lower skeleton involves force plates to quantify ground reaction forces (GRF) in a lab. This method is not feasible in free-living situations. Developments in accelerometer (accel) technology may provide the ability to evaluate the effects of mechanical loading on bone. Technology is preferred over a compendium approach since the GRF of activities such as jumping, jogging depend on the actual execution of the movement. The purpose of this project was to validate an accel for the prediction of mechanical load by comparing its output to GRF. **METHODS:** Participants (n=20 males, 20 females; 18 to 39 yr) completed 10 repetitions of 9 activities (stand, walk, jog, run, 15 cm jump, step down from curb, drop down from curb, forward hop, side hop) on a force plate with an accel on their right hip. The activities were categorized as standing, ambulation, and jumping and used with 59 accel variables to predict mechanical load. Models were fit using the randomForest package in R using 10-fold cross-validation. Model performance was assessed using coefficient of determination (R^2) and median absolute error. **RESULTS:** The percentage of variation explained by the models ranged from 0.32 to 0.78 with median absolute errors ranging from 0.20 to 0.49. The best model (Model 2) contained the known activity categories and accel variables, but is not realistic for free-living situations where activity categories will not be known. The best free-living model was Model 5, which used derived activity categories and accel variables.

Results from Five Random Forest Models to Predict Mechanical Load.		
Model	R^2	Median Absolute Error
1. Known Activity Categories	0.44	0.43
2. Accel Variables	0.65	0.27
3. Known Activity Categories + Accel Variables	0.78	0.20
4. Derived Activity Categories	0.32	0.49
5. Derived Activity Categories + Accel Variables	0.66	0.23
Known Activity Categories=standing, ambulation, jumping.		
Accel Variables=59 possible accel variables related to measures of central tendency, variability of accel signal, and change in direction.		

CONCLUSION: Models containing the accel variables performed better than those containing only activity categories. The accel data can be used to predict categories and GRF. Accels provide valuable objective information when evaluating mechanical loading on bone and should be used when examining bone-strengthening physical activity in free-living situations.

1800   Board #61   May 31 3:30 PM - 5:00 PM

To Investigation Of The Alignment Abnormality In Pelvic Girdles In One Leg Standing X-ray Examination

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(No relevant relationships reported)

Urinary incontinence is often considered a disorder by pelvic floor dysfunction in post-partum women. Thus we think a lack of care during the puerperal period also influences instability of the pelvic girdle as well as pelvic floor dysfunction. A lumbar X-ray examination was performed as diagnostic imaging for low back pain, and alignment abnormality in the pelvic girdle was often found. At our clinic, diagnostic imaging with a simple load as one leg standing was performed in addition to the above cases to emphasize abnormality in pelvic girdle.**PURPOSE**: To investigate alignment abnormality of pelvic girdles, in particular symphysiolysis, in one leg standing X-ray of the pelvic girdle in post-partum women, and to examine the relationship with alignment abnormality in pelvic girdles and the cross-sectional areas (CSA) of the psoas major.
METHODS: Participants were 30 parous women (61.5±14.5yr, 154.6±6.74cm) who consulted us with low back pain at our clinic. Lumbar X-ray, one leg standing X-ray, and a lumbar MRI were conducted. The difference in the height between right and left superior pubis ramus (the malalignment in pelvic) was measured from a one leg standing X-ray. The CSA of the psoas major was measured from a lumbar MRI at L4-L5, and the difference between right and left CSA was calculated. Analysis of the relationship between the malalignment in pelvic and the CSA of the psoas major was performed using Spearman's rank correlation coefficient.
RESULTS: The malalignment in pelvic measured from a one leg standing was 1.64±1.39 mm (mean ± SD). These malalignment in pelvic varied between right leg standing and left leg standing. The amount of variation between right leg standing and left leg standing was 1.41±0.894. The CSA of psoas major was 711.5±146.6 mm². The difference in CSA between right and left was 13.0±7.31 %. The relationship between the malalignment in pelvic and the CSA of psoas major was not statistically significant (rs = 0.213, p>.05), but the relationship became significant by increasing number of experiments (power analysis; n = 77).
CONCLUSIONS: The alignment abnormality in pelvic girdles could be estimated by a one leg standing X-ray examination. These results suggest that lack of care during the puerperal period influences alignment abnormality in pelvic girdle, and may lead to a future orthopedic disease.

1801   Board #62   May 31 3:30 PM - 5:00 PM

A Comparison of pQCT Versus B-Ultrasound for Lower Leg Muscle Size Assessment in Young Adults

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(No relevant relationships reported)

The current gold standards for assessing muscle cross-sectional area (mCSA) are magnetic resonance imaging and computed tomography, both expensive and largely unavailable methods. **PURPOSE:** The purpose of the investigation was to examine the precision of ultrasound (US) in measuring muscle thickness (MTH) and peripheral quantitative computed tomography (pQCT) for measuring mCSA in the dominant (DOM) and non-dominant (ND) gastrocnemius (GST) muscle group of college-aged males and females (n=4). **METHODS:** pQCT (XCT 3000, Stratec) and B-mode ultrasound (UF-750XT) imaging were performed on both lower legs at the tibia 66% site before and after four weeks of dominant leg plantar flexor strength training. GST muscle thickness was assessed in the lateral head by measuring the distance from fat tissue to the fibula. Two-way repeated measures ANOVAs (leg x time) were performed to detect differences in muscle size between legs across time within each imaging technique. As expected, there were no significant leg or time effects for either device (Table 1), thus, the data were collapsed by leg for correlation analysis. The relationship between mCSA and muscle thickness was determined by Pearson's r. Intraclass correlation coefficients (ICC), coefficient of variation % (CV%), and least significant change (LSC) were calculated to determine precision. **RESULTS:** The ICCs for ND mCSA and ND MTH were 0.999 and 0.967, respectively. The ICC for DOM mCSA was 0.993 and 0.894 for MTH. CV%s for ND mCSA was 1.08% and 3.1% for MTH, and for DOM was 1.59% for mCSA and 7.83% for MTH. LSCs at 95% confidence for ND mCSA and ND MTH were 20.5 cm² and 0.25 cm, respectively. LSCs for DOM mCSA was 37cm² and 0.65 cm for MTH. There was a moderate correlation between mCSA and MTH (r=0.7, p<0.01). **CONCLUSION:** Precision values were comparable between imaging techniques, thus, US may be a viable alternative to measuring muscle size in the gastrocnemius muscle.

Table 1. pQCT and US Measures for Dominant (DOM) and Non Dominant (ND) Lower Legs (means ± SD)						
Variable	DOM (n=4)			ND (n=4)		
pQCT mCSA						
Pre (cm²)	743.36	±	180.76	740.26	±	193.54
Post (cm²)	741.96	±	183.46	748.32	±	193.52
US MTH						
Pre (cm)	2.39	±	0.79	2.43	±	0.49
Post (cm)	2.19	±	0.53	2.46	±	0.61

1802   Board #63   May 31 3:30 PM - 5:00 PM

Measurement Of Nitrate And Nitrite In Biopsy-Sized Muscle Samples

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(No relevant relationships reported)

Studies of rats have demonstrated that skeletal muscle plays a central role in whole-body nitrate (NO_3^-)/nitrite (NO_2^-)/nitric oxide (NO) metabolism. The small size of human muscle biopsy samples, however, presents an analytical challenge in this context. Indeed, a recent study by Nyakayiru et al. (J Appl Physiol 2017; 123:637-644) reported that NO_2^- was below the limit of detection (LOD) using the "gold standard" chemiluminescent method even when assaying 40 mg of tissue. **PURPOSE**: To develop a method to precisely and accurately quantify the NO_3^- and NO_2^- content of biopsy-sized muscle samples. **METHODS**: NO_3^- and NO_2^- were extracted from rat soleus muscle samples using methanol combined with mechanical homogenization + ultrasound, bead beating, pulverization, or pulverization + 0.5% Triton X100. After centrifugation to remove precipitated proteins, NO_3^- and NO_2^- were measured using a dedicated high performance liquid chromatography analyzer with a LOD of <0.5 pmol. **RESULTS**: Mechanical homogenization + ultrasound resulted in the lowest NO_3^- content (62±16 pmol/mg), with high variability (CV >50%) across samples from the same muscle. NO_2^- content (1.00±0.18 pmol/mg) was also elevated, suggestive of NO_3^- reduction during tissue processing. Bead beating or pulverization yielded higher NO_3^- and lower NO_2^- levels, but reproducibility was still poor. Pulverization + 0.5% Triton X100 provided the highest NO_3^- (97±15 pmol/mg) and lowest NO_2^- (0.59±0.16 pmol/mg) contents, with the least variability (CV ~15%). These values are consistent with literature data from larger rat muscle samples analyzed using the chemiluminescent approach. **CONCLUSIONS**: We have developed a method capable of measuring NO_3^- and NO_2^- in muscle samples as small as 10 mg. The theoretical limit is even lower, i.e., 1 mg for both NO_3^- and NO_2^- and 5 ng for NO_3^- alone. This method should prove highly useful in investigating the role of skeletal muscle NO_3^-/NO_2^-/NO metabolism in both healthy and diseased subject populations, in response to exercise and dietary interventions, etc.

1803   Board #64   May 31 3:30 PM - 5:00 PM

2D Ultrasound-Based Characterization of Achilles Tendon Micromorphology in Runners Using Spatial Frequency Parameters

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(No relevant relationships reported)

Achilles tendinopathy is a common overuse condition in runners, and if degenerative can be a precursor to rupture even in absence of symptoms. Ultrasonography and spatial frequency analysis are capable of detecting impaired collagenous organization and tensile strength in Achilles tendons, often not plainly visible. These tools, along with basic clinical tests and athletic history, may help characterize the traits and risk factors for sub-clinical Achilles tendinopathy. **PURPOSE**: To characterize athletic history, waist-to-hip ratio, BMI, ultrasonography findings, heel raise endurance, and composite dorsiflexion associated with symptomatic and asymptomatic Achilles tendons in runners. **METHODS**: 48 self-identified runners (16 F, 42 ± 9.8 years) with 9 ± 7.6 years of running experience were examined. Heel raise endurance and knee-to-wall composite dorsiflexion were assessed. Height, weight, and waist and hip circumferences were taken, and participants filled out a VISA-A and activity questionnaire. Achilles ultrasound images were analyzed for peak spatial frequency radius (PSFR), P6 width (an indirect measure of collagen bundle size), and Q6 (ratio of PSFR to P6) with

MATLAB code developed for prior tendon research. Data were sorted by PSFR into 4 ascending groups (1.50-1.69, 1.70-1.89, 1.90-2.09, 2.10-2.29), and 1-way ANOVA with post-hoc analyses was used to detect and compare between-group differences. **RESULTS**: One-way ANOVA revealed statistically significant differences for knee-to-wall (p=0.043) and BMI (p=0.038). Post-hoc analyses showed that knee-to-wall was higher at PSFR of 1.50-1.69 when compared to PSFR of 1.90-2.09 (p=0.032). Decreased BMI was found at PSFR of 1.50-1.69 versus 1.70-1.89 (p=0.001). **CONCLUSIONS**: In tendons with decreased PSFR (impaired collagenous organization), increased ipsilateral composite dorsiflexion was found. Lower PSFR has been linked to degraded mechanical properties of tendons. Although Achilles tendon stiffness is not the sole factor affecting ankle ROM, findings from this study depict the relationship between the two variables. Where PSFR was at or below the low end of previously-established healthy ranges (1.8-2.4), lower BMI was found with lower PSFR.

1804   Board #65   May 31 3:30 PM - 5:00 PM

Test-Retest Reliability of Muscle Cross Sectional Area and Echo Intensity in Upper Extremity Muscles

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(No relevant relationships reported)

Ultrasonography has become a popular tool to simultaneously examine muscle size and quality due to their important role in muscle function. These variables demonstrate excellent reliability in the lower extremity but have yet to be assessed in upper extremity.
PURPOSE: To determine the test-retest reliability of US-derived cross sectional area (CSA) and echo intensity (EI) in the infraspinatus, supraspinatus, and flexor carpi ulnaris.
METHODS: Twenty two shoulders and forearms were scanned with a brightness mode US one week apart (n=11, age: 19.9 ± 0.94 years; height: 180 ± 6.73cm, mass: 78.37±12.17kg). Shoulder muscles were panoramically assessed at 1/3 the distance from the root of the spine of the scapula and the acromial angle. The flexor carpi ulnaris was assessed 4 cm distal to the medial epicondyle. Images were reduced in ImageJ to assess CSA and EI in each muscle. Relative and absolute consistency were assessed with intraclass correlation coefficients (ICC) and standard error of measurement (SEM), respectively. Minimal detectable change (MDC) scores were determined to identify a difference or change that can be considered real.
RESULTS: Infraspinatus CSA ($ICC_{(2,1)}$=0.960) and EI ($ICC_{(2,1)}$=0.850) demonstrated the highest relative consistency among the three muscles (supraspinatus CSA: $ICC_{(2,1)}$=0.717, EI: $ICC_{(2,1)}$=0.762; flexor carpi ulnaris CSA: $ICC_{(2,1)}$=0.954, EI: $ICC_{(2,1)}$=0.676). Infraspinatus CSA and EI (CSA: SEM=3.28%, MDC=9.09%, EI: SEM=9.40%, MDC=26.05%) also demonstrated the lowest SEM and MDC, expressed as a percentage of the mean values (supraspinatus CSA: SEM=15.83%, MDC=43.89%, EI: SEM=12.99%, MDC=36.01%; flexor carpi ulnaris CSA: SEM=13.56%, MDC=37.61%, EI: SEM=9.90%, MDC=27.45%).
CONCLUSIONS: Of the upper extremity muscles examined, the infraspinatus muscle had the highest relative consistency, and the lowest absolute consistency and MDC scores for CSA and EI. Furthermore, as the primary stabilizer of the glenohumeral joint, future studies may consider examining infraspinatus CSA and EI to assess upper extremity muscle morphology following an intervention, treatment, and/or condition.

1805   Board #66   May 31 3:30 PM - 5:00 PM

Assessment of Muscle Injury Using Diffusion Kurtosis MRI and[1] H MRS

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(No relevant relationships reported)

Muscle strain injuries are typically diagnosed based on physical exam and patient history, although muscle strain injuries can be detected by T_2-weighted magnetic resonance imaging (MRI) and Diffusion Tenser Image (DTI). Proton MR spectroscopy (^{1}H MRS) enables the study of metabolic changes *in-vivo*, such as fat content stored inside fibers as droplets (intra-myocellular lipids, IMCL) or in adipocytes between myofibers (extra-myocellular lipids, EMCL). Diffusion kurtosis imaging (DKI) is a novel technique that allows *in-vivo* characterization of diffusion of water in muscle. **PURPOSE:** To determine the effects of injury on IMCL and EMCL *in vivo*, and if variables calculated from DKI would serve as an earlier and more sensitive marker of damage after muscle strain injury in rats. **METHODS:** The tibialis anterior muscles (TAs) of anesthetized Sprague-Dawley rats (N=3, 300 ± 5 g) were injured by 50 lengthening contractions. DTI and DKI were acquired over the same region as axial T_2 images. A Point-RESolved Spectroscopy pulse sequence was used for MRS data acquisition from TA muscle. LCModel package (Provencher 2001, Version 6.3) was used for quantification of the MRS data. TA imaging was compared to functional

changes, and BODIPY 495/503 staining of TA cross-sections sections was used to identify lipid depositions. **RESULTS:** Injury was confirmed by a significant loss of isometric torque (70 +/- 2% loss). There was a significant lactate accumulation (>= 68 mM) with corresponding reductions of EMCL and total creatine (tCr) at 4 hours post injury. The complicated metabolic patterns were expected during muscle regeneration, remodeling, and maturation. BODIPY staining confirmed the changes quantified by the ^{1}H MRS findings. For DTI, mean diffusion (MD) and fractional anisotropy (FA) values varied little and returned to normal by the time of functional recovery (day 21). Mean kurtosis (MK), however, was significantly different at all time points and remained high, even after recovery. **CONCLUSIONS:** These data suggest that DKI may be a useful indicator of overall muscle health. Furthermore, EMCL and IMCL levels, determined from ^{1}H MRS, can be used as biomarkers of metabolic alterations following muscle injury and subsequent recovery.

1806   Board #67   May 31 3:30 PM - 5:00 PM

Near-Infrared Spectroscopy Derived Total Heme vs. Assay Derived Total Heme

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(No relevant relationships reported)

PURPOSE: The primary aim of this study was to compare frequency-domain multi-distance (FDMD) Near-Infrared Spectroscopy (NIRS) derived total heme concentration (hemoglobin + myoglobin) to the total heme derived during a chemical assay. The secondary aim of this study was to explore the influence of adipose tissue thickness on NIRS measurements of mammalian muscle. We hypothesized that the total heme measured by the FDMD NIRS would not be significantly different from the assay values.
METHODS: Five swine were transported to the Kansas State University Meats Laboratory for harvest under federal inspection. Carcass measurements were taken on the same day as harvest. Immediately post draining of the carcass the NIRS probe was placed along the belly of the *deltoideus* (DT), *triceps brachii lateral head* (TLH), *tensor fasciae latae* (TFL), *longissimus dorsi* (LD), *biceps femoris* (BF), and *semitendinosus* (ST) muscles and a measurement was taken for 1 min. The position of the probe was marked to accurately assess the same region of exposed muscle after processing. After the carcass was processed the muscles were exposed (removal of the skin and adipose tissue layer). The NIRS probe was placed on the exposed muscle and data was collected for 1 min. The muscles were then excised for chemical analysis.
RESULTS: The NIRS total heme signal with the skin intact was significantly less than the assay derived total heme (p<0.05). The NIRS total heme signal during the direct muscle condition was not significantly different from the assay derived total heme for BF, DT, ST, TFL, and TL (p>0.05), but was significantly less than the assay derived total heme for the LL muscle group (p=0.012). The NIRS total heme signal directly on the muscle was significantly correlated with the assay derived total heme concentration (r²=0.56, p<0.0001). The NIRS total heme signal was significantly less for the intact skin compared to direct muscle conditions for BF, DT, ST, TFL, and TL (p<0.05), but not for the LL (p=0.922).
CONCLUSIONS: The similar total heme derived between the assay and the FDMD NIRS (during direct muscle measurements) indicates that the NIRS provides an accurate quantification of the total heme in the muscles, including myoglobin. However, when skin and adipose tissue are intact the signal is attenuated and should be taken into consideration.

1807   Board #68   May 31 3:30 PM - 5:00 PM

Comparison between Dual X-ray Absorptiometry and Magnetic Resonance Imaging for Visceral Fat Assessment in Athletes

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(No relevant relationships reported)

PURPOSE: Heavyweight athletes, e.g., linemen reportedly have excess body fat mass, increased cardiometabolic risk, and insulin resistance, compared to non-heavyweight athletes. Visceral fat is related to cardiometabolic risk. Visceral adipose tissue (VAT) mass is usually assessed with magnetic resonance imaging (MRI). However, this method is labor- and time-intensive. VAT measurement using dual X-ray absorptiometry (DXA) takes less time to scan and analyze findings than MRI. Moreover, DXA can accurately measure abdominal VAT in average-weight individuals. However, this method has not been validated in athletes with a wide range of body habitus. This study compared VAT volume measured by DXA (DXA-VAT) and MRI (MRI-VAT).
METHODS: The study included 30 male collegiate athletes (height 173.3±6.7 cm, weight 90.4±21.3 kg, body mass index 29.9±6.0 kg/m², waist circumference 90.9±16.4 cm) from the following sports: judo, American football, sumo, skiing, and weight

lifting. Paired measurement of VAT was performed using MRI and DXA. MRI-VAT volume was calculated by integrating six 65-mm single MRI slices corresponding to the level of DXA-VAT volume measurement. Data were compared using a paired *t*-test and a Bland-Altman plot was used to assess systematic error.
RESULTS: DXA and MRI-VAT volume differed significantly (p<0.01). Regression analysis showed a linear relationship between DXA and MRI-VAT volume (r=0.90). The fit line for the relationship between MRI and DXA-VAT volume was calculated as follows: DXA-VAT volume = MRI-VAT volume + 97 (cm³). Bland-Altman analysis showed DXA-VAT volume overestimation by 94±53 cm³ compared with MRI-VAT volume, with no systematic error (p=0.203). Less subcutaneous abdominal fat in athletes than in nonathletes may cause overestimation of DXA-VAT volume.
CONCLUSIONS: DXA-VAT volume was overestimated compared with MRI-VAT volume, with strong correlations for a wide range of values. A new equation may be needed to assess DXA-VAT in athletes.

1808   Board #69   May 31 3:30 PM - 5:00 PM

Utilizing Ultrasound Imaging to Evaluate Acute Doppler Flow Adaptions of the Medial Elbow

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(No relevant relationships reported)

The use of musculoskeletal ultrasound imaging (MSKUI) has been rapidly gaining use and application in the orthopedic clinical setting. An emerging feature of MSKUI is power Doppler imaging quantification (PDIQ) that can be used to quantify circulation in MSK tissues and provide a measure of tissue perfusion and/or inflammation.
PURPOSE:
To examine the use of PDQI for evaluation of tissue perfusion of the ulnar collateral ligament (UCL) following an in-game performance in collegiate pitchers.
METHODS:
Ten Division I collegiate baseball pitchers (mean age 20.4 ± 1.4 yrs and mean body fat percentage 18.6 ± 3.9%). with no history of significant upper extremity injuries participated. MSKUI imaging was obtained with a GE LOGIQe ultrasound unit for each athlete prior to and immediately following (< 15 minutes) the pitching performance during his first game of the season. Post-imaging PDQI ratios were calculated to assess the maximum level of tissue perfusion of the UCL in the throwing arm.
RESULTS:
Differences in maximum UCL PDQI ratios pre and post the first pitching outing of the season were analyzed through paired sample t-tests. There was no significant difference (t(9) =-1.37, p≥0.5) between the PDQI ratios before (mean max ratio .082 ± .06) and after pitching (mean max ratio: .22 ±.29). Assessment of the following control variables: pitch count (F$_{1,7}$ = 0.73, p=.42) and innings pitched (F$_{1,7}$ = 0.37, p=.56) indicated no significant effect on the PDQI ratios.
CONCLUSIONS:
No statistically significant difference in perfusion of the UCL, as expressed by PDQI ratios was found after a single pitching outing. However, a numerical increase in the mean PDQI ratio post pitching was seen. Upon further exploration of the data, it was noted that there was significant variability in ratio changes among the subjects, which may be improved upon by increasing the sample size and number of pitching outings. Further research is needed to evaluate the clinical significance of immediate perfusion changes during throwing.

1809   Board #70   May 31 3:30 PM - 5:00 PM

The Use of Dual Energy X-Ray Absorptiometry For the Identification of Knee Osteoarthritis

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(No relevant relationships reported)

Knee osteoarthritis (KOA) severity is currently determined by the presence and magnitude of tibiofemoral osteophytes and joint space width (JSW) narrowing upon weight-bearing radiography. Newer dual-energy x-ray absorptiometry (DEXA) models have a specialized knee scan feature that could serve as a low-radiation, cost effective alternative to radiographic diagnosis. **Purpose**: To 1) evaluate the relationship of DEXA-derived JSW with patient-reported pain and physical function and 2) evaluate the reliability of a semi-automatic knee analysis software for measuring JSW from DEXA-derived images. **Methods**: Eleven adults (6 females; 5 males) with radiographically defined KOA (Mean ± SD: Age= 60.0 ± 9.0 yrs, BMI= 29.0 ± 3.7 kg/m², WOMAC pain=8.3 ± 2.8; WOMAC function=27.4 ± 6.7) completed scans of the involved and uninvolved knees using the GE Lunar iDXA orthopedic application for the knee. Medial and lateral JSW was analyzed using semi-automatic knee analysis

software (OASys 1.0, Optasia Medical, Cheadle, UK). Pain and physical function were evaluated using the respective Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) subscales. **Results**: Despite the non-weight bearing nature of the DEXA scan, greater medial JSW narrowing of the involved knee was significantly correlated with greater WOMAC pain scores (Spearman correlation; R= -0.815; p=0.002). There were no significant correlations with lateral JSW of the involved knee, medial or lateral JSW of the uninvolved knee, and WOMAC subscales (p>0.05). There was strong test-retest reliability for involved lateral (intraclass correlation coefficient [ICC]= 0.95; standard error of the measurement [SEM]= 0.22 mm) and medial (ICC= 0.99; SEM= 0.15 mm) DEXA-derived JSW using the semi-automatic software. **Conclusions**: The strong relationship between WOMAC pain and DEXA-derived JSW suggests potential use of DEXA as a practical tool for tracking severity and pain associated with KOA. Semi-automatic knee analysis software designed to evaluate radiographic images can reliably evaluate JSW from a DEXA-produced image. Further validation of DEXA-derived images of the knee for KOA diagnosis is warranted. Supported by: NIAMS (1R21AR067560 -01) and the Rehabilitation Research Resource to Enhance Clinical Trials (1P2CHD086851-01).

1810   Board #71   May 31 3:30 PM - 5:00 PM
Evaluating Near Infrared Spectroscopy Signals From Skeletal Muscle

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(No relevant relationships reported)

Near Infrared Spectroscopy (NIRS) uses the relative absorption of light at 850 and 760nm to determine skeletal muscle oxygen saturation. There are currently disagreements in the literature over how to report oxygen saturation and the relative contributions of hemoglobin and myoglobin. **Purpose:** 1) Compare the separate 850nm (HbO2) and 760nm (HHb)signals during rest, ischemia, and reperfusion, and 2) test whether electrical stimulation to increase metabolic rate changes oxygen saturation values during 5-6 minutes of complete ischemia. **Method:** Ten participants ages = 20-29 years were measured. NIRS measurements were made in the forearm flexor muscles at rest, after 30 seconds of 6 Hz electrical stimulation, during and after 5-6 minutes of complete ischemia produced by arterial occlusion preceded by 30 seconds of 6 Hz electrical stimulation. After 5-6 minutes of ischemia 30 seconds of 6 Hz electrical stimulation was performed. **Results:** Six Hz stimulation for 30 s increased metabolic rate for HbO2 and HHb; 6.2 ± 3.1 and 5.5 ± 2.7 fold over rest, respectively. Six Hz stimulation during cuff ischemia did not change either the HHb or HbO2 values (p>0.05). There was significantly greater (p<0.05) pulsitility associated with heart rate in the HbO2 ($0.78\pm0.41\%$ range) compared to HHb ($0.16\pm0.09\%$ range). Pulse size increased during reperfusion; HbO2 ($2.37\pm0.38\%$ range) compared to HHb ($0.96\pm0.32\%$ range). **Conclusions:** The difference in the magnitude of pulsitility between HbO2 and HHb signals suggests different anatomical locations for these signals, further suggesting that using various ratios of HbO2 and HHb signals should be performed with caution. Increasing metabolic rate with electrical stimulation during complete ischemia did not further change the NIRS signals, suggesting complete ischemia is obtained with 5-6 minutes of complete cuff occlusion.
Keywords: Skeletal Muscle, Near Infrared Spectroscopy (NIRS), Oxygen consumption, Hemoglobin, Myoglobin
Word Count:
Lines

1811   Board #72   May 31 3:30 PM - 5:00 PM
Measuring Thigh Cross-sectional Areas From CT Scans: Validation Of NIH Image J And SliceOmatic Methods

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(No relevant relationships reported)

PURPOSE: Muscle and fat areas in thigh CT scans are important outcomes in aging and exercise research. NIH Image J and SliceOmatic software programs are often used to quantify these areas but three methodological issues commonly exist between references: the tissue density range used to define muscle and fat varies between studies, areas of intermediate density are omitted, and the handling of areas of matching density (i.e. skin and bone marrow) is unreported. Thus, the purpose of this analysis was to validate methods for using these programs while assessing the effects of these three issues on the results. **METHODS**: CT scans of the mid-thigh were analyzed for two cohorts based on gender (57F, 65-86 yrs v. 44M, 64-91 yrs) and

the effects of resistance exercise training (12 wks, 26M, 62-77 yrs) and detraining (26 wks, subset 16M, 62-75 yrs). The total thigh was segmented into seven regions based on Hounsfield Units range: fat of normal (NDF) and high-density (HDF); muscle of low (LDM), normal (NDM), high (HDM), and very high density (VHDM); and bone. **RESULTS** (mean, SD, cm²): In the first cohort, male thigh total area was smaller (207 ± 27 v 223 ± 42, P=0.02) and contained less NDF (54 ± 19 v 118 ± 38, P<0.0001) but more muscle of all densities (e.g. NDM 108 ± 19 v 69 ± 14, P<0.0001) than female thigh. These results were from Image J and the effect of skin was not considered. However, the results were strongly correlated (R²=0.99) with those from SliceOmatic even if skin was included as subcutaneous fat. In the second cohort, resistance training (pre v post) increased thigh size (220 ± 32 v 229 ± 30, P<0.0001) and muscle content of all densities (e.g. NDM 107 ± 20 v 111 ± 22, P=0.02) except VHDM. Detraining (trained v detrained) decreased thigh size (230 ± 34 v 222 ± 39, P=0.0007) and content of NDM (115 ± 24 v 106 ± 21, P<000.1) and HDM (2.5 ± 1.8 v 1.8 ± 1.6). These results were from SliceOmatic and were not affected by skin fat and bone marrow. **CONCLUSIONS**: Image J and SliceOmatic generate similar results for measurement of muscle and fat of all densities in the thigh. SliceOmatic is the more capable program but Image J is sufficient if areas with density similar to muscle and fat are constant and do not affect the results. Funding: VA RRD Merit RX001203 (RAD) and NIH NIA R01 AG046920 (CAP and MMB).

1812   Board #73   May 31 3:30 PM - 5:00 PM
Common Muscle Tests As Related To Trabecular Bone Strength In Division II Athletes.

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(No relevant relationships reported)

High impact repetitive loading, associated with most sports is beneficial to the skeleton. The mechanostat theory illustrates a dependence of bone strength on muscle strength. Therefore, a field measure of muscle function that can approximate bone strength is important to optimize bone strength in educational and recreational settings. Recent studies reporting significant correlations between muscle power and bone strength (Janz, 2015, Yingling, 2017) have focused on cortical bone sites. Trabecular bone is a common site of stress and osteoporotic fracture. **PURPOSE:** To investigate the relationship between common muscle function tests (Relative Grip Strength, 1 Rep Max of Leg Extensors, Peak Power-vertical jump) and bone strength in the trabecular bone of the distal tibia of Division II athletes. **METHODS:** Eighty-six Division II athletes, 56 females and 30 males (age 20.2 +/- 1.7, height (m) 1.7 +/- 0.1, body fat % 17 +/- 7.4) performed a relative grip strength (RGS) test using a hand dynamometer, a one repetition maximum leg extension test (1RM) and a vertical jump test using a Vertec. PP was calculated from vertical jump height (Sayers, 1999). Trabecular Bone Mineral Content (vBMC.tb), Trabecular Bone Mineral Density (vBMD.tb), Total Area (T.Ar.tb), and Bone Strength in compression (BSIc) were measured using peripheral Quantitative Computed Tomography (pQCT) at the 4% tibial site. Linear regressions were run to relate muscle function and trabecular bone strength. **RESULTS:** All three muscle function measures significantly predicted trabecular bone strength parameters in the distal tibia. However, the R² values for PP were much higher than the values for RGS and 1RM. PP explained 41% of the variance in BSIc compared to 30% for 1RM and 13% for RGS. Similar results were found for vBMC.tb (PP [R²=0.5272], RGS [R²=0.1216], 1RM [R²=0.2818]) and T.Ar.tb (PP [R²=0.4996], RGS [R²=0.1242], 1RM [R²=0.1560]). The R² values for vBMD.tb were low for all muscle function variables. **CONCLUSION:** PP is a predictor of trabecular bone strength parameters. Muscle function seems to have the greatest effect on the strength (BSIc) geometry (T.Ar.tb) and amount of the trabecular bone (vBMC.tb) and is less related to the density of the trabecular bone (vBMD.tb). Lower limb muscle power could provide a means to monitor trabecular bone health.

THURSDAY, MAY 31, 2018

D-60   Free Communication/Poster - **Aging Biomechanics**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1813   Board #74   May 31 3:30 PM - 5:00 PM

Difference in Attentional Involvement and Respiratory Complexity During Static Balance Between Older and Young Adults

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(No relevant relationships reported)

Balance system requires multiple bodily systems working in tandem. Sample entropy (SE), indicator of attentional involvement in balance, measures time series complexity, high values indicating high complexity. In older adults (OA), balance is documented as deteriorating as aging progresses. As such we hypothesized attentional investment on balance is higher among OA, leading to lower SE. **Purpose:** Investigate 1) effects of group and breathing conditions on attentional involvement (AI) in balance 2) group effect on respiratory complexity (RC) and AI in balance between OA and YA. **Methods:** Participants were recruited and placed into 2 groups, OA (n=6) and YA (n=6). Participants were asked to stand on force plate for 2 minutes (Accusway, AMTI, Watertown, MA) with feet apart at 15º one fist apart at heels. Balance tests conducted under 3 breathing conditions, neutral breathing (NB), chest breathing (CB), abdominal breathing (AB). Raw data of CoP were filtered by 4th order low-pass Butterworth filter with cutoff-frequency 10Hz in R software (R software, The R Foundation, Austria). SE of CoP was calculated in mediolateral-direction (SE_x), anteroposterior-direction (SE_y), chest RC (SE_{Ch}), abdominal RC (SE_{Ab}) in R. Factorial MANOVA was used to test the effects of group and breathing conditions (independent variables) on SE_x, SE_y, SE_{Ch}, SE_{Ab} (dependent variables). ANOVA and post-hoc tests used when needed. **Results:** MANOVA showed significant difference in group and breathing condition (Wilks' λ<.000). Older adults exhibited higher means (p<.05) in SE_x (OA:0.149±0.052; YA:0.108±0.040) and SE_y (OA:0.271±0.106; YA:0.142±0.062). A significant interaction was observed between groups and breathing conditions (Wilks' λ<.000). ANOVA showed significant interactions in SE_{Ch} and SE_{Ab} (p<.000). Post-hoc tests showed YA AB (0.013±0.004) was significantly higher than all conditions and OA AB (0.006±0.002) was significantly higher than YA CB (0.010±0.003) with respect to SE_{Ch} (p<.05); YA NB (0.011±0.005) and YA CB were significantly higher than OA NB (0.006±0.001), OA CB (0.006±0.001), OA AB, and YA AB with respect to SE_{Ab}. **Conclusion:** Breathing condition significantly affected attention on balance with significant group effect between RC and AI, OA and YA. YA group exhibited highest combined complexity for both SE_{Ch} and SE_{Ab}.

1814   Board #75   May 31 3:30 PM - 5:00 PM

Mobility And Balance Performance Is Associated With Health-related Quality Of Life In Community-dwelling Older Adults

Lauren Graham[1], Allison M. O'Halloran[1], Trishia T. Yada[1], Jane E. Freund[1], Chitra Lakshmi K. Balasubramanian[2], Srikant Vallabhajosula[1]. *[1]Elon University, Elon, NC. [2]University of North Florida, Jacksonville, FL.* (Sponsor: Stephen Bailey, FACSM)
(No relevant relationships reported)

Safe and successful mobility maybe essential to maintain quality of life in independently living community-dwelling older adults. These are high functioning individuals who may encounter precarious situations during their community ambulation increasing their risk for falling and loss of mobility. Loss of mobility in these individuals may have a dramatic impact on their quality of life. Though there are many ways to measure balance and fall-risk in older adults, the Community Balance and Mobility (CB&M) assessment is shown to alleviate the ceiling effects and suggested to be a preferred assessment for balance and mobility in independently living community-dwelling older adults. It is important from a clinical perspective to determine if performance on such a challenging assessment like CB&M is related to having a higher quality of life. **PURPOSE:** To assess how quality of life is related to mobility and balance performance in community-dwelling older adults. **METHODS:** An ongoing study of 20 older adults (mean age: 74.1±6.4 years; 10 females) who were living independently in the community participated. Health-related quality of life was measured with 36-Item Short Form Health Survey (SF-36). SF-36 is a patient-reported survey measuring health status with subscales consisting of physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health. Mobility and balance was measured with CB&M, a performance measure consisting of 13 challenging tasks evaluating mobility and balance performance. Correlation analysis was performed between SF-36 and CB&M scores. **RESULTS:** The physical function subscale (r = 0.572; p = 0.008) and general health subscale (r = 0.520; p = 0.019) showed significant moderate positive correlations with mobility and balance performance, as assessed by the CB&M. **CONCLUSIONS:** Community-dwelling older adults with a higher CB&M score attained higher scores on the SF-36 subscales, suggesting that, greater mobility and balance ability is associated with a higher quality of life in independently-living community-dwelling older adults. If dynamic balance can be improved or maintained in older adults, they are more likely to sustain a better health-related quality of life.

1815   Board #76   May 31 3:30 PM - 5:00 PM

Relationship between Cognition and Exercise Capability in Community-dwelling Older Adults

Chunmei Cao[1], Yu Liu[2], Jingmin Liu[1], Weimo Zhu, FACSM[3], Weimo Zhu, FACSM[3]. *[1]Tsinghua University, Beijing, China. [2]Peking University, Beijing, China. [3]University of Illinois at Urbana-Champaign, Urbana, IL.* (Sponsor: Weimo Zhu, FACSM)
(No relevant relationships reported)

Several studies found that both cognition and exercise capability (EC) were risk factors related to older adults' falls. However, there is limited information about the performance of cognition and EC in old adults.
Purpose: To investigate the relationship between components of cognition and EC in older adults.
Method: Sixty-six old adults (aged 65-80 yr., 31 males and 35 females) volunteered performing a battery of four physical test (Hand force, 30-s chair-stand test, Eyes closed standing and The timed "Up & Go") evaluating EC. Four psychological tasks (Stroop task, N-back task, More_oddshifting task and working memory) were used to assess EF, and 2-Choice Reaction Time (CRT) to processing speed, dual task walking to attention. Person correlation coefficient (r) was used to determine the relationship between cognition and EC.
Result: Some low-to-moderate correlations were found between cognition and EC, which are summarized in the table below:

	Stroop task	N-back task	More_oddshifting task	Working memory	CRT	Dual task
Hand force,	.11	.10	.09	.11	-.16**	-.41*
30-s chair-stand test	.20*	.22	.18*	.18	-.26**	.25
Eyes closed standing	.32**	.19*	.29**	.12	-.15**	-.40*
The timed "Up & Go"	-.27**	-.21*	-.31**	-.25*	.39**	.24*

Note: *=p<.05, **=p<.01.
Conclusion: The cognition does have low-to-moderate relationship with some EC, which means that we may promote one through training another one.

1816   Board #77   May 31 3:30 PM - 5:00 PM

Greater Stance Time Variability is Associated with Lower Step Activity in Older Adults

Trishia T. Yada[1], Lauren E. Graham[1], Allison M. O'Halloran[1], Jane E. Freund[1], Chitra Lakshmi K. Balasubramanian[2], Srikant Vallabhajosula[1]. *[1]Elon University, Elon, NC. [2]University of North Florida, Jacksonville, FL.* (Sponsor: Stephen Bailey, FACSM)
(No relevant relationships reported)

Previous research has shown that older adults with greater gait variability are at a higher risk for falling. Falls increase fear of falling and may subsequently result in mobility disability manifesting as decreased physical activity. Physical activity is commonly gauged from continuous step activity monitoring. While decreased step activity has been associated with impaired gait, the associations between gait variability and step activity are not understood. **PURPOSE:** To examine the relationship between gait variability and step activity in older adults. **METHODS:** Spatiotemporal gait parameters were recorded for 19 healthy older adults (mean age 74.5 ± 6.3 years; 9 males/ 10 females) walking at a normal walking speed across a GAITRite walkway for 5 trials. Step activity (# of steps) was collected using a research-grade step activity monitor for 7 consecutive days. Average number of steps for the 7 days was used. Coefficient of variation (defined as % of SD over mean) of gait speed, stride length, step width, swing time, stance time and double support time were calculated. Pearson's and Spearman's correlation coefficients were used based on normality to determine the relationship between gait variability and step activity. **RESULTS:** Stance time variability showed significant moderate inverse correlation with step activity (rho = -0.482, p = 0.036). Swing time variability showed moderate inverse correlation with step activity with a trend towards significance (r = -0.451, p = 0.052). Variability of gait speed (rho = -0.349, p = 0.143), stride length (r =

-0.3, p = 0.212), step width (rho = -0.088, p = 0.721), and double support time (rho = -0.249, p = 0.304) showed weak inverse but not significant correlation with step activity. **CONCLUSION:** In general, gait variability seems to be inversely related to step activity in older adults meaning those with greater gait variability showed lower step activity. In particular, stance time variability has earlier shown to be critical in identifying older adults with mobility disability and those older adults at risk for future disability. Our finding of decreased step activity in those older adults with increased stance time variability suggests that step activity monitoring could provide surrogate and complimentary measures to identify mobility disability in older adults.

1817   Board #78   May 31 3:30 PM - 5:00 PM

Elevated Bmi Impairs Balance Among Older Adults With Vestibular Disorders

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(No relevant relationships reported)

Each year, more than 2.5 million geriatric patients are admitted to emergency departments for fall-related injuries. Identifying variables that predict fall risk may help manage this problem. Physical activity and body composition are potential predictors. The average elderly fall risk patient walks <2,200 steps per day and is commonly advised to minimize physical activity owing to elevated risk of injury. Limiting exposure can be effective in the short term but the chronic anthropometric consequences may exacerbate risk in the future. **PURPOSE:** To evaluate the effect of body mass index (BMI) on balance in geriatric patients who are at risk of falling. **METHODS:** We enrolled 24 patients (12 men, 12 women) with a diagnosed vestibular disorder who were ≥65 years of age. Patients were excluded if they had a history of injury precluding participation or currently participated in an exercise program. We collected demographic, anthropometric, and balance data at baseline. Balance was assessed using a CSMi HUMAC System Balance Board. After baseline testing, subjects were randomized to either a fatigue intervention (modified Bruce treadmill protocol) or a mild walking intervention (2 mph, 0% incline, 4 minutes). Following exercise, patients repeated the balance assessment. Linear regression tested the effects of age, sex, obesity, and group assignment on the change in balance score. **RESULTS:** The regression model explained 78% of the variance in the change in balance score (p<0.001). Holding all other predictors constant, performing the fatigue protocol associated with a greater loss of balance (3.9 percentage points; p=0.044); for each 1-point increase in BMI, patients experienced an additional loss of 0.7 percentage points. When evaluating obesity as a binary variable, being classified as obese associated with a loss in balance of 5.0 percentage points (p=0.011). **CONCLUSIONS:** The relationship between fall risk and level of activity is complex. In our sample, obesity associated with a greater deterioration of balance following physical activity. When patients who are at risk of falling are advised to avoid physical activity, that advice may result in chronic compromise of balance, elevating the risk of future falls. Conversely, exercise performed in a safe, controlled environment may have therapeutic potential.

1818   Board #79   May 31 3:30 PM - 5:00 PM

The Effect of Mental Fatigue on Postural Stability in Young and Older Women

Amanda J. Morris, Garrett Lindsey, Anita D. Christie. *University of Oregon, Eugene, OR.* (Sponsor: David Gabriel, FACSM)
(No relevant relationships reported)

Allocation of attentional resources is required for maintaining postural stability. Fewer attentional resources are available for balance control when individuals perform a dual task paradigm involving concurrent performance of a cognitive task. However, these effects have not been studied under conditions of mental fatigue. **PURPOSE** To determine if mental fatigue influences postural stability and if there are age differences in stability in response to mental fatigue. **METHODS** Center of pressure (COP) displacement in response to standing platform perturbations was recorded at the beginning and end of 20 minutes of the psychomotor vigilance task (PVT; mental fatigue condition) and 20 minutes of watching a nature video (control condition) in 16 young (22.4 ± 3.72 years) and 16 older females (72.6 ± 6.50 years). The PVT is a sustained attention task that induces mental fatigue, as indicated by increases in reaction time (RT) to visual stimuli. **RESULTS** Older adults had a significantly longer RT (325.17 ± 30.90 ms) than young (287.95 ± 29.53 ms) at baseline (p=0.002). Both groups had significantly longer RTs by the end of the PVT task (young 11% increase, p=0.002; older 7% increase, p=0.03), indicating the presence of mental fatigue in the mental fatigue condition. Older adults had a significantly larger anterior-posterior (AP) COP displacement (7.37 ± 0.75 cm) than young adults (5.77± 1.67 cm) at baseline (p =0.001). Nine young and 8 old adults had increases of 0.7-54% in AP COP displacement after the mental fatigue condition. However, there was no significant main effect of condition (p=0.12) nor an interaction of age and condition (p = 0.85) for the percent change in AP COP from the beginning to the end of the session.

CONCLUSION These results indicate that although postural control and reaction time performance was worse in older than young at baseline, there was no significant effect of mental fatigue on postural stability in either group.

1819   Board #80   May 31 3:30 PM - 5:00 PM

Electrical Nerve Stimulation Elicits Intensity-dependent Changes in Force Steadiness in Young and Older Adults

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(No relevant relationships reported)

When individuals attempt to match a submaximal target force by performing a steady isometric contraction, the fluctuations in force are often quantified as force steadiness (coefficient of variation [CV] for force) to provide an index of the neural drive to muscle. **PURPOSE:** To compare force steadiness of the wrist extensors during evoked and voluntary submaximal contractions in young and older adults. **METHODS:** Thirteen young (5 men, 25 ± 4 yrs) and 12 older (7 men, 78 ± 5 yrs) adults participated in a 1-hr protocol that involved maximal voluntary contractions (MVCs) and voluntary and evoked isometric contractions to match a 10% MVC target force. Force steadiness during the voluntary contraction was compared with that evoked by wide, high-frequency (1 ms pulses at 100 Hz) and narrow, low-frequency (0.2 ms pulses at 50 Hz) neuromuscular electrical stimulation (NMES), and a voluntary contraction with superimposed submotor transcutaneous electrical stimulation (TENS). CV for force was compared between age groups with unpaired t-tests and within age groups by paired t-tests. **RESULTS:** CV for force was less for young adults (1.82 ± 0.43%) than older adults (2.80 ± 1.08%) during the voluntary contraction with the wrist extensors (p<0.03). Force steadiness did not differ between age groups during the evoked contractions. However, older adults were steadier during both types of NMES (wide: 2.01 ± 0.67%, p<0.04; narrow: 1.69 ± 0.62%, p<0.02) than during the voluntary contractions (2.80 ± 1.08%). Concurrent TENS did not influence force steadiness for older adults, but young adults were less steady during TENS (2.41 ± 1.02%, p<0.03) than during the voluntary contraction by itself (1.82 ± 0.43%). **CONCLUSION:** The improvement in force steadiness for older adults during the NMES-evoked contractions indicates that the age-associated decline in force steadiness is attributable to changes in the neural drive to muscle, rather than the mechanical properties of muscle. In contrast, the decline in force steadiness for young adults during concurrent TENS suggests that heightened sensory feedback compromised the neural drive to muscle during the steady contraction.

1820   Board #81   May 31 3:30 PM - 5:00 PM

Effects Of Resistance Training On Maximal Motor Unit Firing Rates In Young And Older Males

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(No relevant relationships reported)

It is unknown if resistance training (RT) has differential effects on maximum firing rates (MAX_{FR}) of motor units (MUs) across the recruitment threshold (REC_T), and whether or not age has an influence. **PURPOSE:** To examine the effects of short-term RT on MAX_{FR} of MUs in young and older males. **METHODS:** Thirteen young and seventeen older males were randomly assigned to either a training (young group [YTG]: n = 8, age = 21 ± 1.6 yrs; old group [OTG]: n = 10, age = 64.1 ± 7.4 yrs) or control (young group [YCG]: n = 5, age = 22 ± 3.1 yrs; old group [OCG]: n = 7, age = 64 ± 9.3 yrs) group. RT involved knee extensions for 4 sets of 10 repetitions for 2 weeks. Before (PRE) and after (POST) RT subjects performed 2 maximum isometric ramp contractions (MVCs) of the knee extensors while 4 surface electromyography (sEMG) signals were recorded from the vastus lateralis. The raw sEMG signals were then decomposed into their constituent MU action potential trains. REC_T, defined as the relative force level (%MVC) when the MU began firing, and MAX_{FR} were calculated for each MU. The highest 500 ms average for torque was considered peak torque (PT). Linear regression was used on the pooled and individual data for the groups separately, to examine the relationship between REC_T and MAX_{FR}. Two-way (group [young vs. old] × time [PRE vs. POST]) repeated measures analyses of variance were used to compare individual slope coefficients (SLP_c) and PT across time. **RESULTS:** A total of 1,403 (PRE = 713; POST = 690) MUs were detected. SLP_c (p = 0.136) and PT (p = 0.781) remained unaltered in the control groups at POST. No significant group × time interactions were observed for SLP_c (p = 0.678) or PT (p = 0.100), but a main effect for time was demonstrated for SLP_c (-44.1%; p = 0.001) and PT (+12.5%; p = 0.001). **CONCLUSION:** These findings, in addition to a qualitative, visual inspection of the pooled regression lines (figure below), indicate RT induced a slightly more negative relationship between REC_T and MAX_{FR} and this effect was not influenced by age.

YOUNG TRAINING GROUP

OLD TRAINING GROUP
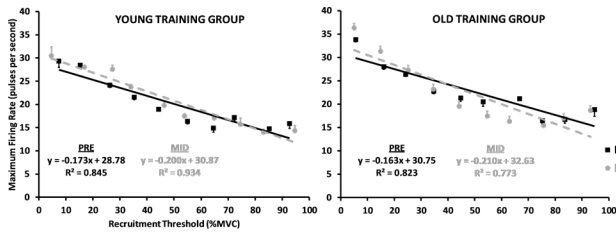
1821   Board #82   May 31 3:30 PM - 5:00 PM

Dynamic Balance Changes in Older Adults Following 12-Weeks of a Self-Managed Exercise Program

Michele Nofal, Saad Alhammad, Lisa MK Chin, Jeffrey E. Herrick, Clinton J. Wutzke. *George Mason University, Fairfax, VA.* (Sponsor: Randall E. Keyser, FACSM)
(No relevant relationships reported)

INTRODUCTION: Static and dynamic balance declines with age. A training program including aerobic (AT), resistance (RT) or balance training (BT) may improve dynamic and static balance in older adults. **PURPOSE:** To determine the influence of a 12-week self-managed exercise program combining AT, RT, and BT on static and dynamic balance measures in unimpaired older adults. **METHODS:** 17 participants attended three educational seminars on AT, RT, and BT prior to beginning exercise, consulting with their physician, and selecting exercises including AT, RT, or BT. Based on activities chosen, participants were organized into three groups; G1 (AT only): n=8, age:73.0±2.4yrs, BMI: 26.1±3.5kg/m2; G2 (AT+RT): n=5 age:68.2±3.1yrs, BMI: 25.5±6.0kg/m²; and G3 (AT+RT+BT): n=4 age:70.0±1.4yrs, BMI: 27.8±6.8kg/m². Exercises were based on National Institute of Aging guidelines. Assessments were conducted prior to the start (PRE) and completion (POST) of the program. An ANOVA was used to analyze dynamic (Timed Up and Go, TUG; Four Square Step Test, 4S) and static (Sway area: 95% confidence ellipse during 30 seconds of standing balance with eyes open, SA) measures of balance between groups. T-tests were used to analyze within-group differences and Cohen's d was used to analyze effect size within groups. **RESULTS:** No differences were found between groups in the TUG, 4S, or SA following the program at POST. T-tests showed improved TUG scores (all participants p=0.0019, G1: p=0.0049, G2 p= 0.413, G3: p=0.0242) and 4S times (all participants p=0.0365, G1 p=0.0224, G2 p=.522, G3 p=0.0172) from PRE to POST. Cohen's d values for the TUG (all participants=0.832, G1=.917, G2=.145, G3=1.75) and the 4S (all participants=0.383, G1=.517, G2=-.037, G3=.505) suggest a large effect for the TUG for all participants, G1, and G3. A small effect was found for all participants for the 4S and a medium effect was found for G1 and G3. **CONCLUSION:** The exercise mode did not influence dynamic or static balance between groups of older adults after a 12-week self-managed exercise program. However, measures of dynamic balance improved in the TUG and 4S for all participants as well as some individual groups. Additional investigation is necessary to identify community-based exercises that appropriately challenge and improve static balance in older adults.

D-61   Free Communication/Poster - Biomechanics of Resistance Training

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1822   Board #83   May 31 3:30 PM - 5:00 PM

An Analysis of Squat Mechanics Between Individuals With High and Low Strength Levels

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(No relevant relationships reported)

Individuals with weak hip musculature may have compensatory hip and knee motion during common strengthening exercises, such as the back squat (BS), that elevate frontal plane joint loading.
PURPOSE: The purpose of this study was to compare frontal plane squat mechanic.0s between strong and weak individuals during the BS. **METHODS:** Twenty-eight individuals (17 males and 11 females, 23.42±3.34 yrs., 1.72±0.09 m, 73.20±11.41 kg) who consistently performed the BS were recruited for this study, and were

categorized into strong (n=14, 23.00±0.08yrs, 1.69±0.09m, 71.97±11.80kg) and weak (n=14, 23.86±3.86yrs, 1.76±0.08m, 74.43±11.32kg) groups using a median split of BS 1-repetition-maximum (1RM) normalized to body mass. This study required two visits, with the first being 1RM testing and the second consisting of a 3-dimensional assessment of squatting mechanics. During the second visit, participants performed 2 sets of 3 repetitions of the BS at 70% and 85% 1RM in a random order. The average of the second repetitions of each set was used for analysis. Dependent variables included the peak knee abduction angle and external moment, and peak hip adduction angle and external moment. 2 (group) x 2 (load) mixed model ANOVA was used to compare peak external knee abduction moments and angles, and peak external hip adduction moments and angles at 70% and 85% 1RM. **RESULTS**: Group x load interactions were not significant for peak knee abduction angles ($F_{1,26}$=1.05, p=0.31) and moments ($F_{1,26}$=0.61, p=0.44), or for peak hip adduction angles ($F_{1,26}$=0.87, p=0.61) and moments ($F_{1,26}$=0.11, p=0.79). There were also no main effects of load or group on any dependent variable. **CONCLUSIONS:** Results suggest that strong and weak individuals have similar frontal plane hip and knee mechanics during the BS at 70% and 85% 1RM. However, these loads were relatively similar, and loads greater than 85% 1RM are frequently used in exercise programs. Differences may also become evident during repetitions closer to failure. Future research should examine if compensatory frontal plane actions are found with greater resistance. Furthermore, all participants were trained regardless of group, and training status may influence the magnitude of frontal plane hip and knee motion during the BS.

1823   Board #84   May 31 3:30 PM - 5:00 PM

Improving Posterior Chain Engagement and Forward Trunk Lean During The Front Squat

Scott Wilson, William Goodman, Christopher Casillas, Linnea Zavala, James Becker. *Montana State University, Bozeman, MT.*
(No relevant relationships reported)

Front squats are a commonly used squat variation as they place less load on the lumbar spine. However, when done incorrectly, front squats may have inefficient posterior-chain activation and reduced trunk stability, thus negating any potential benefits. Various techniques have been proposed to mitigate such consequences but, to date, few have been quantified. **PURPOSE:** This study examined the effects of an intervention designed to increase posterior chain engagement on kinematics and muscle activity during the front squat. **METHODS:** 7 physically active adults (4 male, 3 female; ages 25 +/- 4 years) performed front squats under two conditions: baseline and after instruction in a specific front squat technique emphasizing foot alignment and using EMG biofeedback to help engage the glutes. All squats were performed at 70% of a tested 1 rep max. Whole-body kinematics were recorded with a 12-camera motion capture system while ground reaction forces were measured using two force plates. Peak hip extensor moments, pelvic tilt, and forward torso lean were calculated on each repetition. Activity of the erector spinae (ES) and gluteus maximus (GM) muscles was analyzed by calculating average root mean square (RMS) amplitude across the squat. Differences from pre to post intervention were evaluated using paired *t*-tests and effect sizes. **RESULTS:** Peak pelvic tilt, forward trunk lean, and hip extensor moments were all not statistically different after the intervention and all showed small effect sizes (Table 1). While mean ES activity decreased after the intervention the effect size was small (Table 1). In contrast, while mean GM activity was not significantly different post-intervention, there was a moderate effect size (Table 1). **CONCLUSION:** The intervention technique changed activation of some posterior muscle groups, but not kinematics or kinetics. Whether this was due to the intervention itself or participants requiring more training time requires further investigation.

Table 1. Means (± standard deviations) pre and post intervention.

	Pre	Post	p	d
Peak pelvic tilt (°)	30.4 ± 10.5	28.7 ± 14.2	.341	0.134
Forward trunk lean (°)	28.9 ± 5.6	29.9 ± 6.9	.521	0.157
Peak hip extensor moment (Nm)	89.6 ± 66.9	85.8 ± 68.3	.313	0.057
Mean erector spinae RMS (mV)	6.0 ± 3.2	5.5 ± 3.0	.034	0.148
Mean gluteus maximus RMS (mV)	1.1 ± 0.7	1.5 ± 1.0	.069	0.472

1824   Board #85   May 31 3:30 PM - 5:00 PM

Effects of Squat Depth and Stance Width on Lower Extremity Frontal Plane Kinetics

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(No relevant relationships reported)

The squat is an exercise commonly used to improve lower-extremity (LE) strength and performance. Repeated frontal plane movement in the LE could have detrimental effects by contributing to certain joint pathologies. Therefore, investigating squat

technique on LE kinetics is warranted. Purpose: This study compared hip and knee frontal plane kinetics during body-weight squats with varying depths and stance widths. Methods: 11 healthy, college-aged participants (6 female, 5 male, height = 1.68 ± 0.08 m, mass = 67.4 ± 10.7 kg) performed 5 body squats at 100%, 150% and 200% of shoulder width for each of the following knee flexion angles: 55º, 90º and 125º. Trials were randomized and data were collected using Vicon Nexus and AMTI force plates. Frontal plane kinetics were processed using Visual 3D. Results: At the hip, adduction moments showed significant increases as the width (100% = 0.301 ± 0.02, 150% = 0.539 ± 0.04 and 200% = 0.736 ± 0.04; $p < 0.001$) and depth (55º = 0.306 ± 0.03 Nm/kg, 90º= 0.545 ± 0.04 Nm/kg and 125º = 0.725 ± 0.05 Nm/kg, $p < 0.001$) increased. At the knee, adduction moments significantly increased with wider stances (100% = 0.116 ± 0.02 Nm/kg, 150% = 0.178 ± 0.01 Nm/kg and 200% = 0.221 ± 0.01 Nm/kg; $p < 0.001$) while greater knee abduction moments were observed as depth of the squat increased (55º = 0.006 ± 0.02 Nm/kg, 90º = 0.147 ± 0.04 Nm/kg and 125º = 0.465 ± 0.05 Nm/kg; $p < 0.001$). Conclusion: Deep squats and larger stance widths may place greater demand on the hip and knee joints as evidenced by increased frontal plane moments. These data may benefit rehabilitation and strength training programs. For example, clinicians using squats as a rehabilitative exercise might decrease stance width when aiming to avoid LE frontal plane joint loading. Further, athletes who repeatedly stress the frontal plane stabilizing structures of the LE during dynamic movements may benefit from deeper and wider squats in training that would prepare these structures for their sport specific movements. Further research is needed to investigate other means of altering joint loading in the LE during exercise.

1825   Board #86   May 31 3:30 PM - 5:00 PM

Influence of Attentional Focus in a Weighted Barbell Back Squat Among Experienced Performers

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(No relevant relationships reported)

Previous research suggests that adopting an external attentional focus (i.e. an object) rather than an internal focus (i.e. a body part) improves motor skill performance such as jump height, and increases peak force during isokinetic elbow flexion. However, little is known about the impact of attentional focus during a barbell back squat (BBS). PURPOSE: To determine the influence of attentional focus on ground reaction force (GRF), peak power (PP), and peak moment (PM) in the sagittal, frontal, and transverse planes at the knee, hip, and ankle joints in weight-lifters performing a BBS. METHODS: Male weight-lifters (age 23.1 ± 2.4; >3 years strength training experience) performed 8 BBS repetitions at 50% of their 1RM. Repetitions were performed under 3 conditions: Control (CON) followed by counterbalanced internal (INT; putting pressure on the heels and lateral aspect of the feet) and external (EXT; pushing the ground away from the body) focus conditions. PP (W) and PM (Nm) were measured using the software Motion Monitor; GRF (N) was measured using Bertec force plates. Participants also completed an attentional focus adherence questionnaire. RESULTS: For inversion PP at the ankle (i.e., negative power in the frontal plane), the absolute value for EXT (-59.5 W ±6.6; 0.021, 0.016) was significantly greater than CON (-42.3 W ±4.1) and INT (-42.2 W ±4.8). For valgus PP at the knee (i.e. negative power in the frontal plane), the absolute values for EXT (-231.8 W ±18.8; 0.016) and INT (-227.3 W ±23; 0.033) were significantly greater than CON (-187.4 W ±15.9). For abduction ankle PM (i.e. positive moment in the transverse plane), the EXT (39.4 Nm ±4.6; 0.016) was significantly greater than INT (30.7 Nm ±3.7). With an EXT focus, participants focused on pushing the ground away in significantly more repetitions (6.3 ±0.72; 0.03) than the INT focus (5.2 ±1.9). Focus conditions elicited no significant differences in the other variables. CONCLUSION: Results indicate attentional focus has little influence on hip, knee, and ankle joint kinetics during a BBS among experienced weightlifters. Instructing experienced weightlifters to shift their attentional focus may have little effect on BBS performance. Future studies should investigate the impact of attentional focus on novice weightlifters performing lower body multi-joint movements.

1826   Board #87   May 31 3:30 PM - 5:00 PM

Load-dependent Relative Muscular Effort of the Knee Extensor Muscles During Back and Front Squats

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(No relevant relationships reported)

Introduction: The back squat (BS) and the front squat (FS) are mainstay exercises of strength training programs. However, not much is known about joint-specific kinematic and kinetic changes during the execution these two exercises as the external load is varied. In addition, the Relative Muscular Effort (RME), which quantifies a muscle groups operating level with respect to its maximum capacity, of the knee extensor muscle group during both exercises is not well characterized.

PURPOSE: To investigate load-dependent RME of the knee extensor muscles during the BS and FS.
METHODS: Seven collegiate athletes (4 male, 3 female) participate in this study. Each athlete completed motion analysis and isometric muscle strength testing. During motion analysis testing each athlete performed, in counterbalanced order, both the BS and FS at loads of 40, 60, and 80% of their FS one-repetition maximum (1-RM). Kinematic and kinetic data were captured from markers placed on anatomical landmarks (Plug-in Gait marker set) and from two force plates underneath the athletes' feet. These data were used to calculate the net joint moments (NJM) during each exercise and at each load. During the isometric strength testing sessions each athlete performed maximal voluntary isometric contractions (MVIC) at 30, 60, and 90 degrees of knee flexion. A moment-angle curve was fitted to the MVIC data and used to calculate the theoretical peak NJM during the squats, which was then compared against the actual NJM during the execution of the BS and FS to calculate the RME. A 2x3 ANOVA ([Exercise: Front, Back] x [Load: 40, 60, 80]) was used to determine the effects of exercise and load on RME.
RESULTS: : The interaction ($p = 0.025$) and load main effect were significant ($p = 0.004$). Post-hoc testing, however, indicated that only the exercise-pooled RME differed across loads (40% RME: 51.6±0.05, 60% RME: 61.3±0.06, 80% RME: 69.3±0.06). Specifically, the RME differed significantly between 40% and 60% ($p = 0.049$), 40% and 80% ($p = 0.015$), and 60% and 80% ($p = 0.008$).
CONCLUSIONS: : RME did not differ between BS and FS at any load, but increased linearly from 40% through to 80% of FS 1-RM. These results suggest that at the same absolute load both exercises impose similar demands upon the knee extensor muscle groups, and that greater loads increase that demand.

1827   Board #88   May 31 3:30 PM - 5:00 PM

Development and Validation of Efficient Assessment Tool to Quantify Strength Training Technical Expertise

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(No relevant relationships reported)

The ability to assess, prescribe, and modify exercises based on biomechanical characteristics of the movement is an essential skill that personal trainers, strength and conditioning coaches, physical therapists or other fitness/exercise practitioners must possess. Currently no tool exists that assesses this overall perceptual-cognitive skill.
PURPOSE: To gain item level feedback and begin to evaluate an efficient instrument to accurately and reliably assess strength training technique expertise. METHODS: Fifteen exercise science students (Mean age: 22.6 +/- 2.4 SD; 27% with B.S.) and 15 experienced academics in the strength training field (Mean age: 42.2 +/- 10.7 SD; 67% with Ph.D.) completed a 26-item test with various questions eliciting knowledge of strength training technique skill. Additional questions relative to perceived importance, confidence, and education preparations of various skill applications (e.g., modifying exercises, optimizing muscle activation, selecting exercises, and identifying poor technique) were also characterized. Item level metrics such as discrimination and difficulty were calculated. RESULTS: Overall, academics performed better than students with a medium to large effect size ($d = 0.78$, $p = .041$). Four items displayed poor discrimination (item-total correlation <0.1) and two items were relatively easy (overall percent answered correctly >85%). Qualitative item level feedback was helpful to further modify/refine wording of questions. Almost all individuals (93%) indicated they wanted to learn more about techniques to assess strength training exercises. CONCLUSIONS: Initial evidence indicates this tool demonstrates sufficient difficulty and discriminability to characterize strength training technique expertise. In addition, individuals perceive this evaluative skill of strength training technical performance as very important for practical application and desire further training/education to improve this skill (even in high level academic individuals). Larger sample - factor analytic, reliability, and predictive/discriminant validity evidence should be gathered to further assess and refine this assessment tool.

THURSDAY, MAY 31, 2018

1828   Board #89   May 31 3:30 PM - 5:00 PM

Dynamic Resistance Training Promotes Better Neuromuscular Benefits And Reduces Oxidative Stress In Healthy Wistar Rats

Michel Souza[1], Rodrigo Neves[2], Thiago Rosa[2], Alexsander Oliveira[2], Gustavo Gomes[2], Rafael Costa[2], Bernardo Brixi[2], Luiz Souza[2], Rafael Olher[2], Lysleine Deus[2], Milton Moraes[2]. [1]Universidade Católica de Brasília, São Paulo, Brazil. [2]Universidade Católica de Brasília, Brasília, Brazil.
(No relevant relationships reported)

PURPOSE: Resistance training (RT) is used as a non-pharmacological tool in the prevention and treatment of various diseases. However, few studies have evaluated the different neuromuscular adaptations promoted by dynamic (DRT) and isometric (IRT), and their impact on redox status.This study aimed to compare the different adaptations on muscle strength and oxidative stress in healthy Wistar male rats.
METHODS: Fifteen male Wistar rats at 12 weeks of age were randomized into 3 groups: control group (CTL; n = 5), DRT (n = 5) and IRT (n = 5). All animals were adapted for 2 weeks on the vertical ladder. After the animals were submitted to dynamic strength muscle (DSM) (test performed every 15 days) and maximum isometric resistance (MIR) (pre and post-training) tests. Both DRT and IRT were performed 5 times a week on non-consecutive days for 12 weeks, with a duration of ~ 22 min per session, consisting of 1 set of 8 uninterrupted climbs for 1 min, with a 30% overload of DSM. The animals of the IRT group remained in isometry for 1 minute. The level of significance was set at $P<0.05$.
RESULTS: The DRT group presented a greater gain of the DSM (390±86 and 686±66 g, pre and post-training, $P<0.05$) compared to the groups CTL (339±65 and 427±39 g, pre and post-training, $P<0.05$) and IRT (369±31 and 393±41 g, pre and post-training, $P<0.05$). The DRT (6.9±3.4 and 24.7±5.3 min, pre and post-training) and IRT (9.6±4.6 and 39.1±15.9 min, pre and post-training) groups showed the same gain in MIR ($P>0.05$). The DRT group presented reduction of lipid peroxidation (17±4 and 9±3 μM, pre and post-training, $P<0.05$) (TBARS), with increased bioavailability of nitric oxide (NO) (122±28 and 177±14 μM, pre and post-training, $P<0.05$) and total antioxidant capacity (627±32 and 715±45 μM, pre and post-training, $P<0.05$) (TAC). These redox status indicators did not change between CTL; TBARS (15±5 and 17±7 μM, pre and post-training), NO (118±15 and 125±32 μM, pre and post-training) and TAC (636±29 and 660±10 μM, pre and post-training) and IRT; TBARS (16±3 and 15±3 μM, pre and post-training), NO (126±18 and 133±14 μM, pre and post-training) and TAC (631±8 and 647±20 μM, pre and post-training) groups ($P>0.05$).
CONCLUSIONS: These results suggest that DRT promotes better neuromuscular benefits with improved oxidative stress in healthy Wistar male rats.

1829   Board #90   May 31 3:30 PM - 5:00 PM

Mechanomyographic Amplitude Is Sensitive To Neuromuscular Adaptations Following High- Versus Low-load Resistance Training

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(No relevant relationships reported)

PURPOSE: To examine the changes in mechanomyographic (MMG) amplitude following 3 and 6 weeks of 80% vs. 30% one repetition maximum (1RM) resistance training in the leg extensors. **METHODS**: Twenty-six healthy men (23.1 ± 4.7 years; height = 180.6 ± 6.0 cm; weight = 80.0 ± 14.1 kg) participated in this randomized, repeated measures, between-group design. Participants were assigned to either an 80% 1RM (n = 13) or a 30% 1RM (n = 13) group and completed leg extension training to failure 3 times per week for 6 weeks. MMG amplitude was recorded and averaged from the three superficial quadriceps femoris muscles (MMG_{QAMP}) during randomly ordered, isometric step-muscle actions at the absolute torques associated with 10 - 100% of each subject's baseline maximal voluntary isometric strength (MVIC) at baseline, 3, and 6 weeks of training, and expressed relative to the baseline MVIC. **RESULTS**: There were no significant interactions for time × torque × group (p = 0.08; $\eta 2p$ = 0.06) or torque × group (p = 0.14; $\eta 2p$ = 0.06), but there were for time × group (p = 0.02; $\eta 2p$ = 0.15) and time × torque (p < 0.001; $\eta 2p$ = 0.12). We further evaluated the time × group interaction by collapsing across torque and using ANCOVAs with baseline MMG_{QAMP} as the covariate to examine between group differences at week 3 and 6, and one-way ANOVAs to examine the change in MMG_{QAMP} across time within groups. The adjusted mean for MMG_{QAMP} during the submaximal isometric step muscle actions was lower in the 80% than 30% 1RM group at week 3 (mean ± SE; 67.8 ± 4.5% vs. 83.2 ± 4.7%) and 6 (65.9 ± 4.5% vs. 80.5 ± 4.6%). In the 80% group, MMG_{QAMP} decreased from baseline to week 3 (77.7 ± 4.3% to 66.8 ± 4.5%; p < 0.01), and from baseline to week 6 (77.7 ± 4.3% to 65.2 ± 3.8%; p < 0.05), but did not change from week 3 to 6 (p = 0.93). There were no changes in MMG_{QAMP} for the

30% 1RM group (p = 0.69; $\eta 2p$ = 0.03). **CONCLUSION**: We observed a decrease in MMG_{QAMP} during submaximal isometric contractions performed at the same absolute torques following 3 and 6 weeks of 80% 1RM, but not 30% 1RM resistance training. These decreases are similar to the reductions in voluntary activation that we observed previously at submaximal torques following 3 and 6 weeks of high-, but not low-load training. Therefore, we suggest that MMG amplitude is sensitive to training-induced changes in motor unit activation during high- versus low-load training.

1830   Board #91   May 31 3:30 PM - 5:00 PM

Prediction of Ground Reaction Forces of Flexible Barbells using their Bar End Displacement

Mehmood Mallick, Sunyeop Lee, Randolph E. Hutchison, Anthony Caterisano, FACSM. Furman University, Greenville, SC. (Sponsor: Anthony Caterisano, FACSM)
(No relevant relationships reported)

PURPOSE: The Flexible Barbell (FB) has been used in various strength and conditioning programs at levels from high school athletics to professional programs such as the National Football League. Yet, fundamental characteristics of the various models of the barbell are unknown. The purpose of this study was to investigate if flexible bar end displacement could predict peak ground reaction forces (GRFs) to aid in training applications.
METHODS: Six models of flexible barbells at nine different loading conditions were lifted by a machine set atop a force platform with barbell motion recorded by an eight-camera 3-D motion capture system. Typical exercises such as the bench press and squat were simulated lifting the barbell a total displacement of 30.5 cm up and 30.5 cm down per repetition at a range of lifting velocities from 0.15 m/s to 1.55 m/s. Linear regression models were run to predict measured GRFs from FB bar end displacements.
RESULTS: Significant linear regression models predicted peak GRFs for all models of the FB and the associated loading conditions based upon maximal bar end displacements (Table 1).
CONCLUSIONS: Although these results will require follow-up confirmation studies with human subjects, coaches in training programs can use bar end displacement to predict peak external loading from lifting the FB. These predictions are useful among a large range of physiologically relevant lifting velocities typically seen in athletic training programs.

Prediction of peak ground reaction force based on bar end displacement linear regression model at ea		
Bar Type	Loading (kg)	R^{2*}
Ultra Light	6.56	0.938
Golf SS	10	0.922
Light	15	0.899
Light	28.6	0.988
Light Plus	28.6	0.915
Level 1	28.6	0.976
Level 1	46.7	0.944
Level 3	28.6	0.954
Level 3	46.7	0.942
*denotes statistical significance (p<0.005)		

1831   Board #92   May 31 3:30 PM - 5:00 PM

Comparison of Peak Ground Reaction Forces at Natural Frequencies of a Flexible Barbell

Randolph E. Hutchison, Sunyeop Lee, Anthony Caterisano, FACSM. Furman University, Greenville, SC. (Sponsor: Anthony Caterisano, FACSM)
(No relevant relationships reported)

PURPOSE: The Flexible Barbell (FB) has been used in various strength and conditioning programs at levels from high school athletics to professional programs such as the National Football League. Yet, fundamental characteristics of the various models of the barbell are unknown. The purpose of this study was to compare peak ground reaction force (GRF) response at natural frequencies (NF) of various models of the FB at typical loading conditions.
METHODS: Six models of FBs and a steel Olympic barbell (SB) at nine different loading conditions were lifted by a machine set atop a force platform with barbell motion recorded by an eight-camera 3-D motion capture system. Typical exercises such as the bench press and squat were simulated lifting the barbell a total displacement of 30.5 cm up and 30.5 cm down per repetition at a range of lifting velocities from 0.15 m/s to 1.55 m/s. Two NFs were identified at the lifting velocity in which both the previous and following lifting velocities showed a decrease in bar end displacement. Independent-samples t-tests were used to compare the FB to a similarly loaded and lifted SB at the FB's NFs. Effect sizes were calculated using Cohen's d.

RESULTS: All models and loading conditions of the FB had significantly higher peak GRFs than the SB at all NFs (Table 1).
CONCLUSIONS: Although these results will require follow-up confirmation studies with human subjects, coaches in training programs can use bar end displacement to predict peak external loading from lifting the FB. These predictions are useful among a large range of physiologically relevant lifting velocities typically seen in athletic training programs.

Comparison of ground reaction forces at first two fundamental frequencies of flexible barbell (FB)					
FB Type (Loading)	Fundamental Frequency	Lifting Velocity (m/s)	Peak GRF (N)	Peak GRF (N) of Equivalently loaded Steel Bar	Effect Size, d
Ultra Light (6.56 kg)	1st	0.62	190±2*	167±2	11.5
Light (6.56 kg)	2nd	1.01	527±6*	337±5	34.4
Golf SS (10.0 kg)	1st	0.54	262±2*	191±4	22.5
Golf SS (10.0 kg)	2nd	0.91	418±3*	355±6	13.3
Light (15.0 kg)	1st	0.67	858±4*	310±4	137
Light (15.0 kg)	2nd	1.14	889±6*	651±8	33.7
Light (28.0 kg)	1st	0.49	680±12*	396±8	27.8
Light (28.0 kg)	2nd	0.78	1033±2*	666±5	96.4
Light Plus (28.6 kg)	1st	0.52	963±36*	402±6	21.7
Light Plus (28.6 kg)	2nd	0.83	1020±3*	723±5	72
Level 1 (28.6 kg)	1st	0.67	1232±5*	513±6	130.2
Level 1 (28.6)	2nd	1.09	1754±18*	1006±32	28.8
*Significance at p<0.05					

1832　　Board #93　　　　May 31 3:30 PM - 5:00 PM

Relationship between Mechanical & Neuromuscular indices of Fatigue during Resistance Exercise

Andrew Renggli, Jarod Vance, Randal Claytor. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)
(No relevant relationships reported)

Methods for monitoring resistance exercise (RE) loads have been popularized through new technologies. However, little is known about the use of these technologies to explore the relationship between mechanical & neuromuscular indices of muscle fatigue during RE. Purpose: (1) To examine the relationship between changes in external mechanical variables such as Work (W), Power (P) & Velocity (V) & EMG of the quadriceps muscles during 1 set of 1-leg knee extension (RE) to failure. (2) To determine if external mechanical variables can be used as a proxy to predict EMG-based acute muscle fatigue during RE. Methods: 28 males familiar with resistance training volunteered. Body composition (air plethysmography) & 1-RM for a 1-leg knee extension RE was completed. After at least 96 hours, subjects performed as many reps (5.4+/-1.1) as possible at 90% 1-RM until failure. EMG was collected from the vastus medialis (VM), vastus lateralis (VL), and rectus femoris (RF) of the exercise leg & VM of the non-exercise leg. Total Power (TP), Mean frequency (MF) & Area (A) spectral/amplitude data were used for EMG analysis. Mechanical data was collected via an ultrasound sensor & custom-built software to measure weight-stack movement (time & distance). 1 X 4(Reps) ANOVA & 3(Muscle) X 5(Reps) MANOVA with Repeated Measures, and a-priori contrasts were used to make specific pairwise comparisons. Results: V & P for Reps1&2 (V=23.6+/-15.5 cm/s; P=182.5+/-125.4 J/s) was significantly greater than Reps3-5 (V=14.3+/-9.4 cm/s; P=107.3+/-77.8 J/s); p<0.05. W was not statistically different across Reps1-5. EMG for VM, VL & RF exhibited similar patterns of activation (no between muscle differences or interactions). TP, M & A during Reps1&2 (TP=118758+/-18066mV2/Hz; MF=254.0+/-20.7 Hz; A=571.2+/-84.5 uV/s) were significantly less than Rep3-5 (TP=229874+/-66374 mV2/Hz; MF=318.8+/-21.2 Hz; A=994.0+/-155.5 uV/s); p<0.05). Conclusion: Quadriceps EMG responses representative of local neuromuscular fatigue begins to occur after Rep2 during 90% of 1-RM RE. Similarly, V & P during the concentric phase of the muscles' action significantly decrease after Rep2, without a decrease in W. These data suggest that measures of V & P can be used as proxy measures of local neuromuscular fatigue during localized high-intensity knee extension RE.

1833　　Board #94　　　　May 31 3:30 PM - 5:00 PM

Relationship Between Mechanical Work and Metabolic Cost of Multiple Sets of Resistance Exercise to Failure

Eric W. Slattery, Andrew Renggli, Jarod Vance, Randal Claytor. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)
(No relevant relationships reported)

Resistance Exercise (RE), due to its short high intensity nature, primarily uses glycolysis; producing more CO_2 than utilizing O_2. The relationship between Mechanical Work, O_2, CO_2, and acute muscular fatigue during RE is not well understood. **PURPOSE**: To investigate the relationship between volume of O_2 (VO_2), volume of CO_2 (VCO_2), and total mechanical work (TMW) in response to multiple sets of high intensity (90% 1-RM) 1-Leg Leg Extension (LE) RE completed to failure. **METHODS**: 25 males, Age=20.3±1.1yrs, BMI=24.2±2.1, BodyFat%=13.7±6.1, volunteered: Day1 included body composition (air-plethysmography) and 1-RM assessment of dominant 1-leg LE; Day2: (≥96 hours later) subjects' completed multiple sets of 90%1-RM LE Each set was completed to failure; 15-20 seconds later another set to failure was completed. This sequence (sets to failure) continued until a set was composed of < 1 repetition; subjects' then completed 10 minutes of sitting rest (Post-RE R). Metabolic measures were recorded on a breath-by-breath basis. VO_2 and VCO_2 were calculated as the sum totals, in ml/min, for the total RE time period (all reps & sets) & Post-RE R. TMW was measured with an ultrasound sensor (distance & time of weight stack movement) and custom-built software. Correlations, Linear Regression, and Min-Max Accuracy were used to assess the relationship between TMW, VO_2, and VCO_2. **RESULTS**: Averages and standard deviations for comparison variables of interest: TMW=3491.1±2127.9Nm, VO_2=13210.9±2858.5ml/min, VCO_2=15407.4±4136.1ml/min, and failure-set=3.1±1.2. Insignificant correlations were found between TMW and VO_2 (r=0.28) & TMW and VCO_2 (r=0.21). Linear Regressions suggested TMW had little explanatory power for VO_2(p=0.18, AdjR^2 = 0.04), and VCO_2(p=0.31, AdjR^2 = 0.01). Min-Max Accuracy measures, comparing in-sample predictions (TMW data plugged into Linear Regression Models) to observed values, were 84.5% for VO_2, and 79.1% for VCO_2. **CONCLUSIONS**: Weak Correlations and low AdjR^2 values suggest very little relationship between TMW and metabolic measures during and following RE. Min-Max Accuracy measures suggest TMW does not predict VO_2 & VCO_2 well. These results are not unexpected as the work of RE is primarily governed by anaerobic processes and O_2 is not the primary energy source for this type and intensity of activity.

1834　　Board #95　　　　May 31 3:30 PM - 5:00 PM

Influence Of Anthropometric Factors On Balance In Masters Olympic Weightlifters

Mara A. Mercado, Kayleigh R. Erickson, Robert J. Burke, Bryan L. Riemann. *Armstrong State University, Savannah, GA.*
(No relevant relationships reported)

Whether participating in Olympic Weightlifting prompts balance adaptations to reduce age-related decrements is unknown. Previous research has examined the relationship between anthropometric factors and balance performance in the general population. It is likely that adults participating in Olympic Weightlifting possess different anthropometric characteristics. Thus, prior to comparing balance abilities of Olympic Weightlifters to other groups, the relationship between various anthropometric factors and balance needs to be established. **PURPOSE**: To determine if age and sex related balance differences exist in Masters Olympic Weightlifters and to examine the relationship between balance performance and anthropometrics, body composition, and strength. **METHODS**: 26 men (35-65yrs) and 22 women (35-61yrs) competitors from the Masters Olympic Weightlifting Championship volunteered to undergo 30s balance testing trials on firm (FI) and foam (FO) surfaces with eyes open (EO) and eyes closed (EC) while average medial-lateral center of pressure velocity was recorded. Body weight, height and body mass index were measured while lean mass (LM), and percent body fat were determined using dual energy X-ray absorptiometry. Strength was defined as the meet clean and jerk to body mass ratio. **RESULTS**: There were no significant (p>.05) relationships between age and balance performance (r: -.068 to .265). Except for LM and FI EO and EC performance in the women, there were no significant (p>.05) relationships between anthropometrics (r: -.277 to .267), body composition (r: -.304 to .271) and strength (r: -.341 to .016) with balance performance. No sex differences (p>.05) were identified. Complex post hoc comparison of a significant surface by vision interaction (p<.001) demonstrated the EO-EC difference for the FO surface as significantly greater than the FI (p<.001, d=3.4). **CONCLUSIONS**: In contrast to the general population, except for LM and FI EO and EC performance for the women, balance performance in Masters Olympic Weightlifters was not related to anthropometrics or body composition. The lack of age-related differences suggests the need for further study comparing this group to age-matched individuals participating in other modes of physical activity.

THURSDAY, MAY 31, 2018

1835 Board #96 May 31 3:30 PM - 5:00 PM

Support Moment Distribution While Squatting With Different Depths and Percentages One Rep Max

William Goodman[1], Scott Wilson[1], Linnea Zavala[1], Victoria Flores[2], Joshua Cotter[2], James Becker[1]. [1]*Montana State University, Bozeman, MT.* [2]*California State University, Long Beach, Long Beach, CA.*

(No relevant relationships reported)

Squatting to different depths or with different loads changes the demands on the neuromuscular system, thus potentially altering training effects. Previous studies have used EMG to assess joint contributions with various depths or loads. Another method for assessing this is to examine how each joint contributes to the total support moment (M_s) during the squat. **PURPOSE:** Examine how hip, knee, and ankle contributions to M_s change with increasing squat loads and depths. **METHODS:** 19 females (age: 25.1 ± 5.8 year; squatting experience: 3.8 ± 2.6 years) participated in this study. Participants performed squats at above parallel (AP), parallel (P), and below parallel (BP) depths with 0%, 50%, and 85% of a measured 1 rep max. Kinematics were recorded using a 12-camera motion capture system while ground reaction forces were measured with two force plates. Joint moments at the ankle, knee, and hip were summed to calculate M_s. Differences between depths and loads in peak M_s and the percent each joint contributed to peak M_s were evaluated using a 3x3 repeated measures ANOVA. **RESULTS:** Peak M_s increased as load increased (0%: 2.2 ± 0.3 Nm/kg, 50%: 3.1 ± 0.2 Nm/kg, 85%: 3.8 ± 0.1 Nm/kg, $p<.001$), but not as depth increased ($p=.149$). There was a significant depth*load interaction for hip contributions to M_s ($p=.013$), with hip contributions increasing with heavier loads for AP and P depths, but not BP (Figure 1A). There was also a depth*load interaction for knee contributions to M_s ($p=.046$). However the opposite pattern was displayed. As load increased, knee contributions to M_s decreased for the AP and P depths, but not BP (Figure 1B). Ankle contributions to M_s did not change with depth ($p=.483$) or load ($p=.581$). **CONCLUSION:** Total demand on lower extremity joints increases with increasing load but not depth in the back squat. At AP and P depths, increasing load involves the hip musculature more and the knee musculature less. At deep depths changing load does not impact how much each joint contributes to M_s.
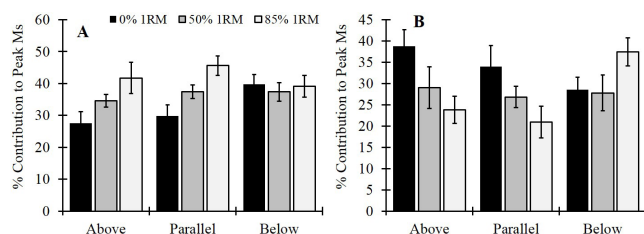
Figure 1. Percent contributions to total support moment at different depths and loads for the hip (A) and knee (B).

D-62 Free Communication/Poster - Mobile Monitoring

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1836 Board #97 May 31 3:30 PM - 5:00 PM

Reliability and Validity of a Wireless Inertial Sensor for Assessing Vertical Jump Biomechanics

Joseph J. DeVita, Ian J. Kremenic, Karl F. Orishimo, Malachy P. McHugh, FACSM. *Nicholas Institute of Sports Medicine and Athletic Trauma, Lenox Hill Hospital, New York, NY.* (Sponsor: Malachy P McHugh, FACSM)

(No relevant relationships reported)

Title: Reliability and Validity of a Wireless Inertial Sensor for Assessing Vertical Jump Biomechanics
Authors: Joseph J DeVita, Malachy P McHugh FACSM, Karl F Orishimo, Ian J Kremenic
Purpose: Compare vertical jump metrics measured using force plates (FP) versus a wireless inertial sensor (IS).

Methods: 9 men (age 35 ± 14 yr, height 178 ± 8 cm, mass 84 ± 9 kg) performed 3 vertical countermovement jumps with arms akimbo (CMJ) and with arm thrust (CMJAT) while standing on force plates (BTS 6000D, BTS Bioengineering, Brooklyn, NY) and wearing a wireless inertial sensor (BTS G-Sensor 2, Brooklyn, NY) placed on the lumbar spine. CMJ and CMJAT biomechanical metrics were compared between FP and IS using paired t-tests, with reliability assessed using Pearson correlation coefficients. The following metrics were assessed: flight height, jump height (flight height + difference between standing height and takeoff height), low force (unweighting during initiation of countermovement), countermovement distance dropped, force at low point (end of countermovement), rate of force development, eccentric power, peak propulsive force, peak and takeoff velocity, maximum power, and peak landing force. Results: For CMJ there was good agreement between FP and IS for most parameters (Table 1); all metrics were significantly correlated between the FP and IS, but the IS significantly underestimated flight height, low force and force at low point. For CMJAT there was poor agreement for most jump parameters.

Table 1	CMJ			CMJAT		
Performance Metrics	FP	IS	r-Value	FP	IS	r-Value
Flight Height (cm)	30.9	29.6*	0.987	37.1	34.6*	0.989
Jump Height (cm)	40.4	38.0	0.916	48.2	46.4	0.885
Countermovement Metrics						
Low Force (N)	408	375*	0.986	423	351*	0.750
Countermovement (cm)	33.5	36.5	0.778	33.8	29.9	0.205#
Force at Low point (N)	1648	1517*	0.908	1574	1562	0.418#
Rate of Force Development (N/s)	3303	3056	0.879	3000	3956	0.275#
Eccentric Power (W)	-1019	-962	0.691	-1039	-1125	0.405#
Propulsive Metrics						
Peak Propulsive Force (N)	1766	1726	0.778	2721	2467	0.750
Peak Velocity (m/s)	2.54	2.61	0.836	2.78	2.92	0.713
Takeoff Velocity (m/s)	2.41	2.50	0.814	2.65	2.81	0.743
Maximum Power (W)	3687	3895	0.851	4350	5613*	0.850
Landing Metrics						
Peak Landing Force (N)	3690	1969*	0.626#	3489	2245*	0.332#

*sig. dif. (bias/fixed error) P<0.05; #nonsig. correlation P>0.05
Conclusions: This wireless inertial sensor was effective for quantifying the countermovement and propulsive phases of a CMJ, but was not effective for quantifying landing force. The sensor was not effective for quantifying CMJAT parameters.

1837 Board #98 May 31 3:30 PM - 5:00 PM

Validity of a Commercially Available Inertial Measurement Unit for Vertical Jump Height Measurement

Gregory A. Crisafulli, Jeffrey B. Taylor, Anh-Dung Nguyen, Kevin R. Ford, FACSM. *High Point University, High Point, NC.* (Sponsor: Kevin R. Ford, FACSM)

(No relevant relationships reported)

3D motion capture (3D) systems are the gold standard for assessing displacement during movements such as a drop vertical jump (DVJ) and a countermovement jump (CMJ). However, it is not feasible to use 3D in the field during game or practice situations. **PURPOSE:** To examine validity of vertical jump height measured by inertial measurement units (IMU). **METHODS:** Eleven male (15.4 ± 0.9yrs, 178.0 ± 6.5cm, 80.5 ± 13.04kg) high school football players participated. A small IMU placed in an elastic belt was worn around the waist of each subject during 3 CMJ and DVJ trials. Maximum vertical jump height was recorded as the vertical displacement of the pelvis using standard 3D techniques. A 2X2 repeated measures ANOVA (p<0.05) was used to determine differences in vertical displacement between measurement methods and movement type. 95% limits of agreement (LOA) and Bland Altman plots were utilized to determine the level of agreement between IMU and 3D during each task. **RESULTS:** A significant interaction between measurement and movement was found in vertical displacement (p<0.05). During the CMJ, the displacement measurement was not different (3D: 46.9 ± 5.4cm, IMU: 45.9 ± 3.8cm p=0.36). However, during the DVJ, the IMU measurement was statistically underestimated (45.0 ± 3.7cm p=0.001) compared to 3D (48.7 ± 5.7cm). Bland Altman plots and 95% LOA (Figure) illustrate a systematic error between the IMU and 3D during the DVJ where jump height was underestimated by the IMU. Interestingly, during both tasks, agreement between measurement methods seem to increase at higher jump heights. **CONCLUSIONS:** IMU technology is advancing with potential utility for on-field and in-game use. However, the algorithms which calculate vertical jump height may need to be adapted for varying types of complex movements.

Countermovement Jump / Drop Vertical Jump

submaximal running, the runners were paced by a cyclist maintaining a constant speed using a speedometer. Interclass correlations were run between Power Meter 1 and Power Meter 2 on all surfaces including treadmill, track, and grass.
RESULTS: Running power values were reliable between the two power meters on trials 1 and 2 for the three different surfaces (Power: R=0.998).
CONCLUSIONS: The results support that the Stryd running power meter can reliably measure power of submaximal running on three different surfaces including treadmill, grass, and track.

1840   Board #101   May 31 3:30 PM - 5:00 PM

Differences In Wearable Running Power On Three Different Surfaces During Submaximal Running

Mason Coppi, Lee Shearer, Nicholas Hayden, Jake Ogden, Frank Lara, Scott Murr, Eric Sobolewski, Randolph Hutchison. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)

(No relevant relationships reported)

Running pace is one of the primary measures of running intensity, however, variations in grade and surface limit quantifying intensity solely based on pace. With the advent of wearable running power meters, runners can assess the external work stimulus inclusive of pace, grade, and surface.
PURPOSE: To assess differences in running power (RP) on different surfaces, a Stryd running power meter was evaluated based on submaximal running on three different surfaces.
METHODS: Eight collegiate cross country runners (male n=4, age=21.25±0.50 yrs, weight=63.45±9.73 kg, height=178.5±10.82 cm; female n=4, age=20±1.41 yrs, weight=56.45±4.95 kg, height=169.5±7.97 cm) participated in two trials of submaximal running at 85% of lactate threshold (LT) on each of three different surfaces: treadmill, grass, and track. All subjects completed a VO2max and LT running test. For this investigation, sub-maximal running speed/pace was determined from the maximal effort / LT test. During subsequent submaximal running trials, ventilatory and metabolic measures and heart rate (HR) were collected with a portable breath by breath analyzer (COSMED K4B2) and HR monitor (Polar). For the track and grass submaximal running, the runners were paced by a cyclist maintaining a constant speed using a speedometer. ANOVAs were run between trials on all surfaces including treadmill, track and grass.
RESULTS: The running power for the treadmill surface was significantly lower than both the grass and track (Mean±SE: RPtreadmill = 237±12.7 W*, RPgrass = 244±13.4 W, RPtrack = 242±13.0 W). There were no significant differences between grass and track surfaces (*p<0.05).
CONCLUSIONS: This investigation found that running power (Stryd) is less when running on a treadmill compared to running on grass and a track which may indicate a different training stimulus when training on a treadmill versus other surfaces.

1838   Board #99   May 31 3:30 PM - 5:00 PM

Reliability Of A Running Power Meter Between Trials Of Submaximal Running On Three Different Surfaces

Frank Lara, Lee Shearer, Mason Coppi, Nicholas Hayden, Jake Ogden, Scott Murr, Randolph Hutchison, Eric Sobolewski. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)

(No relevant relationships reported)

Running pace is one of the primary measures of running intensity, however, variations in grade and surface limit quantifying intensity solely based on pace. With the advent of wearable running power meters, runners can assess the external work stimulus inclusive of pace, grade, and surface. **Purpose**: To assess reliability, a running power meter was evaluated based on two trials of submaximal running on three different surfaces.
METHODS: Eight collegiate cross country runners (male n=4, age=21.25±0.50 yrs, weight=63.45±9.73 kg, height=178.5±10.82 cm; female n=4, age=20±1.41 yrs, weight=56.45±4.95 kg, height=169.5±7.97 cm) participated in two trials of submaximal running at 85% of lactate threshold (LT) on each of three different surfaces: treadmill, grass, and track. All subjects completed a a VO2max and LT running test. For this investigation, sub-maximal running speed/pace was determined from the maximal effort / LT test. During subsequent submaximal running trials, ventilatory and metabolic measures and heart rate (HR) were collected with a portable breath by breath analyzer (COSMED K4B2) and HR monitor (Polar). For the track and grass submaximal running, the runners were paced by a cyclist maintaining a constant speed using a speedometer. Intraclass correlations were run between trials 1 and 2 on all surfaces including treadmill, track and grass.
RESULTS: VO$_2$, HR, and running power were all reliable between trials 1 and 2 on the 3 different surfaces (VO$_2$: r$_{treadmill}$ = 0.980, r$_{grass}$ = 0.876, r$_{track}$ = 0.977; HR: r$_{treadmill}$ = 0.938, r$_{grass}$ = 0.978, r$_{track}$ = 0.981; Power$_1$: r$_{treadmill}$ = 0.995, r$_{grass}$ = 0.999, r$_{track}$ = 1.00; Power$_2$: r$_{treadmill}$= 1.00, r$_{grass}$ = 1.00, r$_{track}$ = 1.00)
CONCLUSIONS: The results support that the Stryd running power meter can reliably measure power of submaximal running on three different surfaces including treadmill, grass, and track.

1839   Board #100   May 31 3:30 PM - 5:00 PM

Reliability Between Running Power Meter Footpods During Trials Of Submaximal Running On Three Different Surfaces

Lee Shearer, Nicholas Hayden, Frank Lara, Mason Coppi, Jake Ogden, Scott Murr, Eric Sobolewski, Randolph E. Hutchison. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)

(No relevant relationships reported)

Running pace is one of the primary measures of running intensity, however, variations in grade and surface limit quantifying intensity solely based on pace. With the advent of wearable running power meters, runners can assess the external work stimulus inclusive of pace, grade, and surface. **PURPOSE**: To assess reliability, two Stryd running power meters were evaluated based on submaximal running on three different surfaces.
METHODS: Eight collegiate cross country runners (male n=4, age=21.25±0.50 yrs, weight=63.45±9.73 kg, height=178.5±10.82 cm; female n=4, age=20±1.41 yrs, weight=56.45±4.95 kg, height=169.5±7.97 cm) participated in two trials of submaximal running at 85% of lactate threshold (LT) on each of three different surfaces: treadmill, grass, and track. All subjects completed a VO2max and LT running test. For this investigation, sub-maximal running speed/pace was determined from the maximal effort / LT test. During subsequent submaximal running trials, ventilatory and metabolic measures and heart rate (HR) were collected with a portable breath by breath analyzer (COSMED K4B2) and HR monitor (Polar). For the track and grass

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D-63   Free Communication/Poster - **Sports Performance and Injury**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1841   Board #102   May 31 3:30 PM - 5:00 PM

Comparisons of Ankle and Knee Kinetics during Demi-Plié Ballet Movements

Morris Levy[1], Darren Dutto[2], LilaAnn White[1]. [1]*University of Minnesota, Duluth, MN.* [2]*Eastern Oregon University, La Grande, OR.*

(No relevant relationships reported)

The Demi-Plié (DP) and Demi-Plié Relevé (DP-R) movements are foundational to performance in Ballet. The DP and DP-R have similar downward phases with the main difference consisting of an upward phase in the DP-R when the dancer goes up on her/his toes, while extending ankle and knees.PURPOSE: The purpose of this study was to compare ankle and knee motion (kinetics) during the downward phase of the Demi-Plié and Demi-Plié Relevé, with a hypothesis that peak moments would increase during the DP-R. METHODS: Ten college ballet students (mass = 70 ± 14 kg) performed three sets of eight Demi-Plié and Demi-Plié Relevé movements. Full body kinematics were collected using a 12-camera Vicon motion capture system (Oxford, UK). Two Force plates (AMTI) were used to isolate the Ground Reaction Forces (GRF) of each foot. For each individual, average peak ankle/foot and knee moments in the sagittal and frontal planes were determined for each leg, using the average of values determined for each cycle of movement. Beginning of each movement was identified as initiation of knee flexion during the downward phase. Peak moments were compared between the two movements using t-tests. RESULTS: Ankle extension moments were greater in the DP-R (Left: DP = 0.60 ± 0.11, DP-R: 0.76 ± 0.13 Nm/

kg, p<0.05). In the frontal plane, knee abduction moments were smaller for the DP-R (Left: DP = 0.31 ± 0.10, DP-R = 0.23 ± 0.12 Nm/kg, p=0.11), while ankle eversion moments tended to be larger (Left: DP = 0.19 ± 0.12, DP-R= 0.28 ± 0.12 Nm/kg, p=0.10). Knee extension moments were not different (Left: DP=0.66 ± 0.30, DP-R= 0.69 ± 0.31 Nm/kg, p=0.73) between the two movements, although there was an additional 4° knee flexion during DP-R. CONCLUSION: During the DP-R, ankle moments are greater in the sagittal and frontal planes. While the movement during the downward phase is similar, the DP-R has the intervening upward phase consisting of ankle extension. This intervening upward motion of the DP-R appears to alter ankle control during the downward phase requiring greater sagittal and frontal plane moments. However, knee varus stress was reduced.

1842   Board #103   May 31 3:30 PM - 5:00 PM

Technical Note: Measuring Muscle Activity During Plyometric Exercise In Shallow Water

Cordero Duvon Roche, Leland Barker, John A. Mercer, FACSM. *University of Nevada, Las Vegas, Las Vegas, NV.* (Sponsor: John A Mercer, FACSM)

(No relevant relationships reported)

Plyometric exercise in water is used by a variety of people. Recently, a water proof system to measure muscle activity has become available but the procedures for analyzing muscle activity during water plyometrics are not established. **PURPOSE:** The aim of this study was to describe the procedures for collecting and analyzing muscle activity data during plyometrics in the water and on land. **METHODS:** A single subject (male, 29 yr, 170 cm, 81.8 kg) completed all conditions. The subject completed two plyometric exercises (countermovement jump (CMJ), drop jump (DJ)) during the two environmental conditions (on land, water). Electromyography (EMG) signals were recorded using a water proof EMG system (Cometa Miniwave Infinity, 2000 Hz). Each sensor measured EMG as well as accelerations along 3 orthogonal axes. EMG was recorded from four muscles (rectus femoris (RF), bicep femoris (BF), gastrocnemius (GA) and tibialis anterior (TA)) during CMJ and DJ while on land and in water. The subject then performed three trials of CMJ then three trials of DJ (from 30.5 cm platform) on land. The subject stood still for at least 1-sec between each trial. After completion on land the subject preformed the same conditions in the same order in the water. Depth of water was set to about navel high. EMG data were processed by removing zero offset and full wave rectifying with percent difference (%diff) calculated between on land and in water for each movement. The start and end of each movement was identified using acceleration in the z direction (a_z). Start of movement was first a_z 5% greater than baseline corresponding with burst of EMG and end of movement (standing still after landing from jump) was a_z 5% less than baseline after landing. EMG data were then averaged between start and end times. %Diff data were averaged across trials. **RESULTS:** The CMJ movement duration was similar on land (2.1±0.08 s) and in water (2.4±0.20 s) but different during DJ on land (1.9±0.13 s) vs. in water (3.0±0.86 s). During CMJ, %diff for RF (-0.6%) and TA (6.5%) was similar but BF (55.9%) and GA (70.9%) were more active during water. During DJ, BF (55.9%), GA (70.9%), and TA (34.4%) were more active but RF (-9.5%) less active during water vs. on land. **CONCLUSION:** Using sensors that incorporated EMG and accelerometers allowed for analysis of muscle activity during plyometrics.

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Kinematic Comparison of Dolphin Kicking Performed in a Prone and Supine Body Position

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(No relevant relationships reported)

Despite an increasing emphasis on underwater dolphin kicking in competitive swimming, little objective research exists to explain its preference over flutter kicking. PURPOSE: To examine kinematic characteristics of flutter and dolphin kicking performed in prone and supine body positions. METHODS: Ten collegiate swimmers (1.77±0.07 m, 72.4±7.6 kg, 19.8±1.0 yrs) experienced with dolphin and flutter kicking completed eight 10 m maximal effort underwater kicking trials. Body position and kicking style were randomly varied between trials such that half of all trials were performed using each kicking style and each body position. A calibrated underwater camera was used to record each trial at 60 Hz. Six body landmarks were digitized for three complete kicking cycles to determine linear and angular kinematic measurements. Whole body speed was defined as horizontal hip velocity. Kicking amplitude and frequency were determined using vertical toe movements. The Strouhal number, a dimensionless index related to the efficiency of underwater undulatory movement, was computed using the kicking amplitude, frequency and velocity. Kinematic data were filtered using a fourth order Butterworth low-pass digital filter with cutoff frequencies individually determined for each coordinate. Linear velocities were computed using the first central difference method. Kinematic measures were compared between kicking style and body positions using a 2x2 (kick x position) repeated measures ANOVA. RESULTS: Dolphin kicking velocity (1.22±0.18 m/s)

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was faster (p<0.001, η^2=0.88) than flutter kicking velocity (0.99±0.12 m/s). Dolphin kicking amplitude (0.58±0.10 m) was larger (p<0.001, η^2=0.93) than flutter kicking amplitude (0.48±0.08 m). Dolphin kicking frequency (1.85±0.34 Hz) was lower (p=0.002, η^2=0.68) than flutter kicking frequency (2.33±0.33 Hz). Dolphin kicking (0.88±0.12) was more efficient as indicated by a lower Strouhal number (p=0.001, η^2=0.71) than flutter kicking (1.11±0.21). Body position had no effect on any measure of kicking performance (p>0.05). CONCLUSION: For these participants, dolphin kicking was a faster, more efficient form of underwater kicking. However, body position had little effect on the ability of these participants to perform the respective kicking style.

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Higher Vertical Stiffness Is Related To Greater Fifth Metatarsal Bone Mineral Density In Football Players

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(No relevant relationships reported)

Lower-extremity stiffness is suggested to contribute to lower-extremity injury risk. Specifically, lower stiffness is believed to lead to excessive joint motion and contribute to soft tissue injuries. Alternately, higher stiffness is thought to enhance overall joint stability, reduce ligament loading, and potentially increase bone loading. Though beneficial in the short-term, long-term bone loading and the reduced ability to attenuate lower extremity forces may also increase injury risk. Thus, it may be important to elucidate the relationship between stiffness and bone mineral density (BMD). **PURPOSE**: To identify differences in BMD between athletes with relatively higher and lower levels of vertical stiffness (K_{Vert}). **METHODS**: BMD of the whole body (BMD_{WB}), dominant limb (BMD_{DL}) and second and fifth metatarsals (BMD_{Met2} and BMD_{Met5}, respectively) of the dominant leg, was assessed in 41 male American football players (age: 16.1±1.4 yrs, height: 176.5±6.8 cm, mass: 80.6±18.3 kg) via dual-energy x-ray absorptiometry. Additionally, vertical stiffness (K_{Vert}) of the dominant leg was assessed via a repetitive single-leg vertical hopping task at a set hopping frequency of 2.2 Hz. Participants were divided into tertiles based on their body mass normalized K_{Vert} values. Differences in BMD-related variables between the low- and high-stiffness groups were evaluated using independent t-tests. **RESULTS**: Athletes in the high-stiffness group displayed significantly greater K_{Vert} than the low-stiffness group (0.28±0.01 vs. 0.20±0.02 kN·m⁻¹·kg⁻¹, $p<0.001$); however, there were no between-group differences identified in terms of age, height, or mass ($p>0.05$). Athletes in the high-stiffness group were found to possess significantly greater BMD_{Met5} compared to the low-stiffness group (0.44±0.11 vs. 0.34±0.11 g/cm², p=0.029). Similar between-group differences in BMD_{WB}, BMD_{DL}, and BMD_{Met2} were not observed ($p>0.05$). **CONCLUSIONS**: Athletes with relatively high K_{Vert} also had greater BMD_{Met5}, indicating that relatively higher stiffness may impose stress on the bone that results in favorable adaptation (increased BMD). Continued work investigating the relationship between K_{Vert}, BMD, and training load may elucidate the risk of bony injury in these athletes is warranted.

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The Influence Of Load On Preferred Countermovement Depth During Jump Squats

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(No relevant relationships reported)

ABSTRACT
The jump squat exercise is used in training to provide increased stress to the countermovement jump. However, it is not clear how load influences preferred countermovement depth during the jump squat.
PURPOSE
Compare preferred countermovement depth (PREF) to full and quarter depths (FULL, QTR) during the jump squat across a range of loads.
METHODS
On day one, participants (Male, n=12; 25.2 ± 3.9 yrs, 1.77 ± 0.7 m, 88.3 ± 15.7 kg) performed a 3 repetition maximum (3 RM) back squat, which was used to estimate the 1 RM back squat (1 RM = 3 RM/0.9). On the second collection 2-10 days later, jump squats were performed with barbell loads of 0%, 15%, 30%, 45%, 60%, and a return to 0% of 1 RM. Three trials at each load were performed with instructions being to jump as high as possible. Order between conditions was counterbalanced. Vertical ground reaction force (vGRF) was measured from a dual force platform setup (fs=1000 Hz). Verbal cues were given for each depth. Acceleration was calculated from vGRF (∑F=m*a), velocity was integrated from acceleration, and position was integrated from velocity. Countermovement depth was calculated as the minimum position during the jump squat. Jump height was calculated as: (takeoff velocity)²/(2*9.81). 3 (technique)

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x 5 (load) repeated measures ANOVAs were performed on depth and jump height, followed by planned comparisons (1x5 and 1x3 ANOVAs) if an interaction was present (α=0.05). A paired-samples t-test was used to compare first and last 0% loads to assess possible fatigue and/or potentiation.
RESULTS
Neither depth nor jump height were influenced by an interaction (p>0.05). Countermovement depth was influenced by technique (p<0.05). Countermovement depth was significantly different among PREF (-0.33 m ± 0.09 m), FULL (-0.44 m ± 0.08), and QTR (-0.24 m ± 0.06) regardless of load (p<0.05). Jump height was not influenced by technique (p>0.05), but there was a main effect for load (p<0.05) with jump height decreasing with load regardless of technique. Jump height was not different between the first and last 0% 1RM jump squat trials (p>0.05).
CONCLUSION
Countermovement depth was different among PREF, FULL, and QTR across loads, but jump height was not influenced by PREF, FULL, or QTR. These results demonstrate that verbal cues can elicit three distinct countermovement depths during jump squats.

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The Relationship Between 2D and 3D Biomechanics Data in a Single Leg Hurdle Task

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(No relevant relationships reported)

Three-dimensional (3D) motion analysis has been regarded as the gold standard for measuring landing mechanics. However, motion analysis is limited in clinical settings due to the time and expertise requirements. The amount of knee flexion during a single leg landing task is commonly assessed and has been found to be related to a number of injuries. However, to date there have been few studies investigating the relationship between a simple two dimensional (2D) measure to 3D measurements. Establishing this relationship would be important to provide better tools for clinicians to use.
Purpose: To determine if there is there is a relationship between 2 and 3 dimensional knee flexion angle during a single leg hurdle task.
Methods: 20 Healthy Subjects (11 M, Age 22.4± 3.14, BMI 22.96 ± 3.06). Subjects performed instrumented single leg jumps over a series of 30.5 cm hurdles. The landing over the final hurdle was recorded with both a video camera and motion capture equipment. 2D knee flexion angles were measured using National Institute of Health image J program at the point of initial contact and peak knee flexion. An angle was determined by bisecting the knee along the mid shaft of the femur and tibia for the 2D motion. Peak knee flexion was determined in both the 2D video and 3D motion capture data with the association between the two assessed with a Pearson product moment correlation coefficient.
Results: Mean values for knee flexion in 3D were 24.8±9.0° at initial contact and 59.8±9.2° at peak knee flexion. Mean values for the 2D data were 28.0±6.8° at initial contact and 66.0±8.9° at peak knee flexion. There was a significant correlation at initial contact (r=0.717, p=.001) as well as for peak knee flexion angle (r=0.617, p=.006) between the 2D method and 3D motion capture.
Conclusion: At both initial contact and peak knee flexion, there was a strong relationship between the 2D and 3D angle values. Both measurements trended similarly but were different in magnitude. This suggests a simple 2D technique may be applicable in the clinical setting providing similar precision but different accuracy to the 3D motion capture data.

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Effects And Interactions Of Ncaa Di Basketball Participation On Measures Of Reactive Strength

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(No relevant relationships reported)

Measures of reactive strength attempt to model the neuromuscular regulation of muscle tissue stress and strain. The specificity of neuromuscular training is important for maximizing the effectiveness of neuromuscular regulation of stress and strain within muscle and tendon tissue. Additionally, failure to regulate stress and strain within the muscle may lead to stresses placed on supporting structures of the body, including ligaments and bones. It is important to understand how sport participation effects neuromuscular reactivity and to develop strategies that maximize neuromuscular reactivity through specific training foci.
PURPOSE: The purpose of this study was to evaluate the effects and interactions of sport participation on the Coefficient of Reactivity (CoR), Reactive Strength Index (RSI), and Reactive Strength Kinetic (RSK).
METHODS: Fifty-nine young adults from the general community and 21 NCAA Division I basketball players performed five repetitive countermovement jumps (RCM) and a single depth jump from heights of 0.51 m, 0.66 m, and 0.81 m. The CoR, RSI, and the RSK were computed using tri-axial force platform data and two-dimensional

videography. A Multivariate General Linear Model Analysis of Variance (GLM ANOVA) was performed on RCM data and another on depth jump data. Condition, sport participation, sex, and age were included as factors in each model.
RESULTS: The CoR, RSI, and RSK were 30%, 22%, and 28% greater in males performing depth jumps versus females (*p*<0.05). The RSI and RSK were 23%, and 21% greater in males performing RCM jumping versus females (*p*<0.05). Main effects for sport participation were observed for the CoR, RSI, and RSK in depth jumping and for the RSI and RSK in RCM jumping (*p*<0.05). Sex by sport participation interactions were observed for the RSI and RSK, but not for the CoR.
CONCLUSION: All three measures of reactive strength were sensitive to sex. Sex by sport interactions on the RSI and RSK suggest that involvement in NCAA Division I basketball may lead to a divergence in lower extremity neuromuscular reactivity between male and female athletes (males>females). This result makes sense from the perspective that female athletes tend to sustain higher incidence of lower extremity injuries when participating in sport.

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Identifying the Effects of Sex on Reactive Strength Scores using Receiver Operating Characteristic (ROC) Curves

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(No relevant relationships reported)

Receiver operating characteristic curves are used as a technique to evaluate the sensitivity and specificity of a continuous variable to discrete, categorical variables. It is known that post-pubescent females tend to diverge from males in neuromuscular performance. Measures of reactive strength attempt to model lower extremity neuromuscular reactivity in agile movement tasks. It is likely that constructing ROC curves would reveal that reactive strength scores are sensitive and specific to the effects of sex on neuromuscular reactivity.
PURPOSE: The purpose of this study was to construct ROC curves to evaluate the sensitivity and specificity of the Reactive Strength Kinetic (RSK), Reactive Strength Index (RSI), and the Coefficient of Reactivity (CoR) to the effects of sex on neuromuscular reactivity.
METHODS: Fifty-nine young adults from the general community and 21 NCAA Division I basketball players performed depth jumps from heights of 0.51 m, 0.66 m, and 0.81 m. The RSK, RSI, and CoR were computed using tri-axial force platform data and two-dimensional videography. Multiple paired *t*-tests, Cohen's *d* effect sizes, and ROC curve analysis were used evaluate sex differences and the extent that reactive strength scores are sensitive and specific to sex (α=0.05).
RESULTS: RSK, RSI, and CoR scores were greater in males versus females across all depth jump conditions (*p* < 0.000 - 0.002). ROC areas under the curve were larger for CoR (0.78 - 0.87) versus RSI (0.73 - 0.77) and RSK (0.69 - 0.77) across all three depth jump heights. Average sensitivity of all measures was largest in the 0.81 m condition (0.80 versus 0.73 (0.66 m) and 0.76 (0.51 m)).
CONCLUSION: Results suggest that all measures evaluated in this study were sensitive to differences in neuromuscular reactivity across sexes. ROC analyses suggested that the CoR may be the most sensitive measure of sex effects on lower extremity neuromuscular reactivity in depth jumping. Additional research using higher depth heights may confirm this. Additionally, the CoR is a field-test that may be easy to implement by strength and conditioning and clinical professionals.

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Evaluating A Kinetic-based Assessment Of Reactive Strength

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(No relevant relationships reported)

The Reactive Strength Index (RSI) is the most commonly used reactive strength assessment and its assumed validity among researchers and practitioners is strong. The RSI is a spatiotemporal ratio that used to model a characteristic of strength. In addition, the RSI is computed using theoretical assumptions that are likely variable and inaccurate. There is a need to address the theoretical validity of the RSI, and consider adopting a kinetic-based assessment of reactive strength
PURPOSE: The purpose of this study was to evaluate the validity of a new kinetic-based assessment of reactive strength, the Reactive Strength Kinetic.
METHODS: Eighty young adults (22.9±2.2years, 76.1±14.9kg, 175.9±12.0cm) completed one maximal effort depth jump from three incremental drop heights (0.51m, 0.66m, and 0.81m) and a single trial of five repetitive countermovement jumps (RCM). Using two-dimensional videography and tri-axial force platform dynamometry, the Coefficient of Reactivity (CoR), RSI, RSK, and RSKa (a=kinematic-adjusted) were computed for all jumping trials. Linear regressions were performed to assess the statistical association between the CoR, RSI, RSK, and RSKa.

RESULTS: Linear regressions detected the strongest association in the RSK v. RSI (R^2=0.599,p<0.001) and RSKa v. RSI (R^2=0.636,p<0.001) comparisons. Additionally, a linear regression performed on drop height v. measured impact velocity revealed marginal statistical association (R^2=0.346,p<0.001).

CONCLUSION: The proportion of explained variance in the comparisons of RSK v. RSI and RSKa v. RSI suggest that the RSI, RSK, and RSKa all attempt to model the construct of reactive strength. The CoR, RSI, and RSK all assume that drop height in depth jumping and flight time in RCM jumping perfectly predict impact velocity. Results suggest that using theoretical assumptions to compute reactive strength scores is invalid. The RSKa is kinetic-based and kinematic-adjusted to eliminate theoretical assumptions known to introduce measurement error in the RSI, CoR, and RSK.

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Previous Injury History and Landing Error Scoring System and Single-Leg Squat Scores in Collegiate Athletes

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(No relevant relationships reported)

The Landing Error Scoring System (LESS) and Single Leg Squat (SLS) are two clinical assessments that can be used to identify faulty lower extremity biomechanics for screening injury risk in athletic populations. To date, few studies have examined the effect of prior injury on these tests or the relationship between LESS and SLS scores. **PURPOSE:** Determine if prior history of lower extremity injury affected LESS and SLS scores and examine the association between LESS and SLS performance. **METHODS:** Thirty-eight collegiate female athletes (n=26 field hockey, n=12 basketball; 19.4 ±1.4y; 167.5± 9.4cm; 67.2±11.3kg) underwent LESS and SLS testing. Participants completed 3 jump landing tasks followed by 3 consecutive SLSs on each leg. A Microsoft Kinect sensor using Athletic Movement Assessment software (PhysiMax®) was used to automatically score the LESS and SLS. The LESS consisted of 22 items while the SLS was comprised of 14 items; both were adjusted to omit the overall impression item. The highest scores possible for the LESS and SLS were 22 and 10, respectively. The lowest score of the 2 sides for the SLS was used for analyses. An injury history survey was completed to identify previous history of injury. Independent *t*-tests were used to compare mean LESS and SLS scores between participants with and without a history of injury. A Pearson correlation coefficient was used to examine the association between LESS and SLS total scores while chi-square statistics were used evaluate relationships between scores for medial knee displacement (MKD R/L side errors) across tests. **RESULTS:** No differences were found between participants with and without a history of injury in LESS (5.3±1.9 vs. 6.0±1.7; p=0.375) or SLS (4.6±0.9 vs. 4.3±1.3; p=0.403) total scores. No correlation was found between LESS and SLS total scores (r=0.127; p=0.453). Although not statistically significant, players displaying an error for MKD during a right-legged SLS were 3 times more likely to also display this error (right MKD) on the LESS (χ^2=1.97; p=0.160, OR=3.3, 95%CI=0.59-18.31). **CONCLUSION:** Prior injury history did not affect LESS or SLS scores. More research is necessary to determine potential associations between scores on similar items across tests and their clinical implications for injury risk screening and corrective exercise programming.

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Fatigability of Plantar Flexor Muscles After Remote Ischemic Preconditioning

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(No relevant relationships reported)

Exposure to brief periods of circulatory occlusion and reperfusion before an exercise (i.e. ischemic preconditioning - IPC) has been suggested to decrease exercise-induced fatigability, but placebo effects are yet to be fully determined. It is also not known if IPC can alter perceived pain and effort during isometric contractions performed with the lower extremity muscles. **PURPOSE:** To determine if IPC can decrease fatigability, perceived effort and pain of the lower extremity muscles during isometric contractions. **METHODS:** 12 individuals (27± 4 years) were submitted to cycles of ischemia and reperfusion by inflating a cuff to the non-dominant leg and arm in 3 separate and randomized sessions: A) IPC that consisted of 3 cycles of ischemia and reperfusion of 5 minutes each; B) SHAM session where cuffs were inflated for only 1 minute (not sufficient to induce ischemia), but reperfusion and total times of intervention were similar to those of the IPC session; C) Control session with no cuffs involved. Placebo induction was performed by saying that both IPC and SHAM would improve performance compared to control. Nocebo avoidance was accomplished by telling individuals that IPC would be harmless despite circulatory occlusion sensations. In each session, isometric contraction of the plantar flexor muscle was performed at 20% of maximal voluntary contraction (MVC), with the dominant leg, until task failure. Pain and ratings of perceived exertion were assessed during contractions with a Visual Analogue Scale (0-10). **RESULTS:** Time to task failure was greater in the

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IPC compared with SHAM and control sessions (25.1 ± 4 vs. 19.2 ± 2 vs. 20.3 ± 3 min respectively, session effect: P = 0.04). MVC at task failure was 60 ± 2 % lower than baseline (time effect: P < 0.001) for all test sessions (session × time: P = 0.31). At 25 % of time to task failure, exercise-induced pain was lower in IPC compared with SHAM and control sessions (1.3 ± 1 vs. 1.9 ± 1 vs. 2.6 ± 2 respectively, P = 0.03). Ratings of perceived exertion were similar between test sessions (session effect and session × time: P > 0.05). **CONCLUSIONS**: Compared with the control session, IPC increased time to task failure and decreased exercise-induced pain during fatiguing contraction of the plantar flexor muscles. Placebo effects induced in the SHAM session had minimal effects in these variables.

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Laboratory Assessment of Pristine and Used Soft-Shell Headgear for Girls' High School Lacrosse

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(No relevant relationships reported)

Increased participation in high school girls' lacrosse has coincided with higher rates of game related head and facial injury. In response, rules allowing for the use of headgear following American Society for Testing and Materials (ASTM) performance standards has been adopted. However, due to the novelty of this equipment it remains unknown how lacrosse headgear responds to blunt impacts after repeated use. **PURPOSE:** To compare the resultant peak linear acceleration (RPLA) between used and pristine girls' lacrosse headgear during blunt impacts. **METHODS**: 10 pristine and 10 used Cascade LX Women's Lacrosse Headgear were tested. Pristine headgear were tested in their original condition and were not worn or exposed to external elements or impacts prior to testing. Used headgear were worn for an entire competitive season (15 games, 51 practices). A Cadex Monorail Impactor impacted all headgear fitted to a EN 960 size J headform following ASTM standards (F1446-15b, F2220-15, and F3137-15) in the front, side, rear, rear and front boss, crown and one random locations. The resultant tri-axial acceleration of the EN 960 J headform was measured with Cadex Software. A factorial ANOVA was employed to compare RPLA among headgear conditions (pristine and used) and impact locations. **RESULTS**: A significant main effect for position was observed (p<0.001). With the exception of random location with side location, all other pairwise comparisons denoted statistically significant differences among them for RPLA (front = 50.6 ± 3.5, side = 37.1 ± 1.8, rear = 23.4 ± 2.1, rear boss = 56.5 ± 4.3, front boss = 63.1 ± 4.9, crown = 58.7 ± 3.5, random = 38.5 ± 5.2 RPLA). There was no significant difference between headgear conditions for RPLA. **CONCLUSIONS**: All headgear regardless of condition, met the ASTM performance standard. No differences existed in RPLA between pristine and used headgear. No differences existed among the pristine and used headgear. This indicates that the headgear is capable of being used beyond a single season. Our findings are comparable to those that investigate the RPLA of verified head impacts in high school girls' lacrosse games. Further field research is necessary to evaluate if headgear improves the safety of girls' lacrosse, including changes in behavior subsequent to the additional safety standard.

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Do Compression Socks Influence Muscle Activity of the Lower Extremities?

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(No relevant relationships reported)

Compression clothing is commonly worn by athletes and anecdotally believed to elicit beneficial responses both physiologically and biomechanically during a performance. PURPOSE To determine if compression socks influence muscle activity of the lower extremities while running. A secondary purpose was to assess whether compression socks had an effect on heart rate (HR) or rating of perceived exertion (RPE) during running. METHODS Recreational runners (n=5; 1.65 ± 0.07m; 67.48 ± 8.9kg; 21.8 ± 3.25yr) completed three running conditions: wearing graduated compression socks (CS), regular socks (RS), and placebo socks (PS). Each run was 10 minutes at a self-selected pace with speed controlled between conditions. CS were knee-high socks that had graduated compression moving proximally up the leg. Sock size used was based on shoe size as per manufacture instructions. RS were determined by the type of sock each subject was wearing on the day of testing. PS were regular soccer socks in which we fitted all subjects with L/XL to minimize any compression and instructed each subject they were a different brand of compression socks. Subjects were blind to conditions. HR was recorded during the last 30s of all trials telemetrically (Polar, Lake Success, NY). Muscle activity of the lower extremity was measured through electromyography (EMG; Delsys, Natick, MA). RPE was recorded at 3 minute intervals. EMG data were processed by removing any zero offset, rectifying, and averaging over 30 seconds of minutes 4, 7, and 10 of each trial. Dependent variables (EMG, HR, RPE) were each compared between conditions using repeated measure

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ANOVAs (α=0.05). RESULTS HR and RPE were not significantly different between conditions (p>.05). Muscle activity for the Rectus Femoris (RF), Biceps Femoris (BF), and Gastrocnemius (GA) were not significantly different between conditions (p>.05). Muscle activity for the Tibialis Anterior (TA) was significantly different (p=0.042) during CS condition (47.8±2.2μv) compared to RS condition (63.0±2.0μv). This accounts for ~24% reduction in muscle activity while wearing compression socks. CONCLUSION Compression socks significantly decrease muscle activity of the TA during running but had no effect on the RF, BF, or GA.

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Effects of Lumbar Spine Position on Hamstring Flexibility During Passive Straight Leg Raise

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(No relevant relationships reported)

The straight leg raise test and its variations are ubiquitous in clinical sports medicine practice to assess hamstring flexibility. According to the available literature, testing techniques such as the straight leg raise test may not provide an accurate measurement of hamstring flexibility due to the many confounding variables including lumbar spine motion, lumbar spine positioning and femoro-acetabular motion. **PURPOSE.** The current study contrasted the difference in the measurement of supine, passive straight leg raise with lumbar spine blocked in slight extension to replicate a neutral lumbar spine and normal contra-directional lumbo-pelvic rhythm and a non constrained lumbar spine during a passive straight leg raise via goniometric measurements of hamstring flexibility. **METHODS.** Utilizing 25 collegiate male and female cross country runners, goniometric measurements of the passive straight leg raise with and without a blocked lumbar spine were taken on both the right and left leg. **RESULTS.** A correlation between the average straight leg raise with and without at blocked lumbar spine was found to have a moderate to high correlation (r= 0.693, p value < .001). A dependent t-test revealed that that there was a significant difference between straight leg raise measurements with and without a blocked lumbar spine; M (SLR) =66.3, M (Blocked SLR) = 39.54, SD= 9.4418, t (24) =-14.71, p<.001. **CONCLUSION.** Maintaining neutral lumbar spine position, replicating normal contra-directional lumbo-pelvic rhythm during a passive straight leg raise significantly decreased goniometric measurements of hamstring flexibility. The results of this study indicate that consideration must be given to lumbar spine position and normal, functional, contra-directional lumbo-pelvic rhythm during the measurement of hamstring flexibility. Changes in testing procedures need to be made in the clinical setting to ensure that athletes are being correctly identified as demonstrating normal hamstring flexibility before being cleared to return to activity after hamstring injury.

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Impact Control in High-Intensity Interval Training Can Be Improved by Creatine Supplementation

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(No relevant relationships reported)

High-intensity interval training (HIIT) is an exercise mode designed to repeatedly stress the body with intense stimulus. Intense running can increase impact forces and alter muscle activation intensity. As skeletal muscles have an important role in shock attenuation, the depletion of muscle phosphorylcreatine (PCr) stores and the diminished energy sources could lead to exhaustion and impairments in the protective functions of muscle during running. We hypothesize creatine supplementation could avoid peripheral fatigue during intense exercise and reduce impairments on shock attenuation. **PURPOSE:** This study investigated the effects of creatine supplementation on biomechanical parameters related to shock attenuation during a session of HIIT. **METHODS:** A single-blind, placebo-controlled, crossover design was adopted to test 8 elite soccer players (males; 16.3± 0.5 years; 70.7 ± 4.16 kg; 1.78± 0.06 m) during HITT sessions under two conditions: after placebo supplementation (Pl) and after creatine supplementation (Cr). HITT test sessions consisted of an intermittent test (5 bouts of running) with constant load applied until exhaustion was reached. The vertical component of Ground Reaction Force (VGRF) and Electromyography (EMG) data were recorded by Gaitway and Lynx-EMG Systems, respectively. Heart rate (HR), Rated Perceived Exertion (RPE – Borg's Scale) and lactate concentration were also obtained. **RESULTS:** Creatine supplementation did not affect HR, RPE and lactate concentration. Decreased values (p<0.05) of magnitude of first peak (Fy1) of VGRF and impulse of first 50 ms (Imp50) were observed for Cr (about 16.2 – 24.2% and 34.3% of decrease, respectively), whereas higher values (p<0.05) of time to reach first

peak (tFy1) were detected for Cr as compared to Pl (28.9 % of increase). Significant modifications (p<0.05) in muscle activation were also observed. Changes occurred in intermediary bouts, mainly in bout 2. **CONCLUSION:** Creatine supplementation has potential to influence biomechanical parameters related to impact control during a single session of HIIT based on running.
Results indicate possible improvements in shock attenuation under creatine supplementation.

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Predictors of Meet Performance in Masters Weightlifters

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(No relevant relationships reported)

The snatch is a high-speed lift that is performed by many weightlifters ranging from recreational to Olympic athletes across a wide spectrum of ages. Despite the regular use of the snatch by athletes, limited research exists on the components of the movement that produce the greatest success. Research on competitive weightlifters is even more limited, particularly those individuals competing at the Masters level. **Purpose:** To determine the extent to which several second pull components relate to snatch performance, and the relation between age, sex, and success in a high-level Masters competition. **Methods:** 42 competitors, 23 women (35 to 64yrs) and 19 men (36 to 76yrs), from the 2017 National Masters Championship completed four snatch lifts using 85% of their most recent 1RM. Simultaneously, three-dimensional barbell kinematics were collected and used to compute several characteristics describing the second pull, including peak (relative to body weight) and time (relative to full snatch time) to peak vertical force and power, and second pull time. Additionally, the barbell distance to displacement trajectory ratio across the entire snatch was computed as an indicator of mechanical efficiency. Backward multiple regression analysis was conducted to determine the factors that could predict each lifter's championship meet performance, defined as their final snatch to body mass ratio. **RESULTS:** The final set of variables which were significant predictors (P<.001, R^2_{adj}=.84) of meet performance included second pull time (β=-.175, P=.013), peak vertical second pull force (β=.503, P<.001), sex (β=.326, P=.001), and age (β=-.412, P<.001). **CONCLUSION:** When comparing sex and age, men and younger competitors lifted more weight relative to their body mass while performing the snatch. Even when shorter second pull times were accounted for in the model, peak vertical force remained the most potent predictor for meet performance. Therefore, for optimal competitive success, Masters weightlifters should consider training that maximizes their capacity to exert high-speed force against the bar in the second pull. Such training might focus on vertical explosion utilizing shrug and triple-extension techniques while minimizing curvature in their second pull trajectory.

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Stand And Deliver: Muscle Activity And Mechanical Energetics Of The Lower Limb During Cycling

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(No relevant relationships reported)

Cyclists tend to spontaneously switch from a seated to standing (non-seated) position when they need to produce high pedal torque and power (i.e. during steep climbs, accelerations and sprinting). Existing evidence shows that adopting a non-seated position can result in better economy at high power outputs and an increased level of peak power, yet the mechanisms underpinning these performance advantages remain unclear. **PURPOSE:** To compare lower limb muscle activity, joint moments and joint mechanical energetics between seated and non-seated cycling at varying cadences. **METHODS:** Sixteen, male participants rode on an instrumented ergometer at 50% of peak power (above the reported threshold for sit to stand transition) under different position (seated: S and non-seated: NS), and cadence (70 rpm and 120 rpm) conditions, whilst we recorded electromyography from lower limb muscles, full body motion capture and crank radial and tangential forces. A scaled full-body OpenSim model was used to calculate joint kinematics, moments and mechanical energetics. Statistical comparisons were made using a repeated measures, two-way ANOVA (position x cadence). **RESULTS:** There was a main effect of position on the distribution of total work across the joints in comparing seated to non-seated conditions. This was demonstrated by a decrease in knee work (S=1.74±0.01 vs. NS=1.38±0.01 W.kg⁻¹, p<0.05) and an increase in hip (S=2.33±0.52 vs. NS=2.57±0.53 W.kg⁻¹, p<0.05) and ankle work (S=0.85±0.15 vs. NS=0.97±0.17 W.kg⁻¹, p<0.05) in the non-seated relative to the seated position. At 70rpm, the mean knee joint moment was reduced and ankle power increased in the non-seated condition. In contrast, at 120 rpm knee power was reduced in the non-seated position, while there was only a moderate increase in ankle power (S=0.75±0.24 vs. NS=0.85±0.29 W.kg⁻¹, p<0.05). **CONCLUSION:** These

results provide evidence for the theory that the non-seated position can decrease the mechanical requirements of the knee when cycling at high power output, but the benefits may be cadence dependent.

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Relationship Between Neurocognitive Testing and Saccadic Eye Movements in Symptom Free Division I Athletes

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(No relevant relationships reported)

Saccadic eye movements are produced from several frontal and parietal cortical regions of the brain that also aid in the execution of cognitive functions. However, no known research has examined the relationship between a sport-like antisaccade task and standard neurocognitive exams. **Purpose:** To evaluate the relationship between the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) cognitive domains and a sport-like antisaccade task (SLT) of Division I athletes on symptom free-day of post-sport like concussion. **Methods:** 10 concussed individuals (8 males; 2 females; age: 20 ± 2 years) were assessed on the ImPACT test and the SLT on a symptom free day post-sport related concussion. A monocular eye tracker (240Hz, Argus Science) synced with the Vicon Motion Capture System (Vicon Motion Ltd., Version 1.85, Oxford, England) was employed to track raw ocular coordinates and further analyzed to obtain resultant distance (RD), mean horizontal velocity (MHV), and prosaccade errors (PE) during the athlete's participation in the SLT. ImPACT variables included verbal and visual memory composite, visual motor speed, reaction time composite (RT), and impulse control. All eye variables were run through a custom MatLab code (MATLAB 2017, Mathworks, Inc., Matick, MA). Spearman rho correlations were used to assess the relationship between ImPACT variables and ocular metrics. **Results:** Significant negative moderate relationships ($r = -0.70$, $p = 0.02$) between MHV (5.78 ± 1.28 pixels/second) and reaction time composite score (0.57 ± 0.07) were observed. Similarly, there was a significant negative moderate relationship ($r = -0.65$, $p = 0.03$) between RD (2.73 ± 1.03 pixels) and Impulse control composite score (6.4 ± 3.75). No other significant relationships were noted. **Conclusion:** These significant relationships suggest that as eye velocities increase, RT decreases which is possibly due to a decrease in accuracy on overall cognitive efficiency. As impulse control decreases, the eye movement resultant distances are minimal. This may be due to more cognitive errors that lead to an inability to properly control antisaccadic eye movements. Due to the relationships exhibited between the ImPACT and SLT, it can be suggested that antisaccade eye movements contain a neurocognitive component.

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The Influence of Directional Compression Tights onMuscle Activity and Performance in Recreational Alpine Skiers

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(No relevant relationships reported)

INTRODUCTION Recent studies reported reduced muscle activity in competitive alpine skiers using directional compression (DC). It is not known whether the effects of DC are limited to competitive skiers, or if similar changes would be observed in recreational skiers. The purpose of this study was to examine changes in hip and leg muscle EMG patterns in recreational alpine skiers when skiing with and without a lower body DC garment. **METHODS** 11 intermediate and expert skiers volunteered for this study. Subjects skied 2 days, 2 weeks apart, with DC and non-compressive (TNC) base layer in a randomized order. EMG of the gluteus medius (GMED), rectus femoris (RF), and adductor longus (ADL) were recorded using surface EMG during measurement runs. Two measurement runs with standardized turns were taken on each visit. Subjects free skied for 1.75 hrs between measurement runs. This sequence of ski runs was replicated on the second testing day. Standardized turns were normalized to 100% turn duration and averaged together for each trial in each condition. A 2x2 ANOVA with repeated measures was used to compare turn time, edge angle, RMS, and MF within trials. Paired t-tests were used to compare percent change (%Δ) RMS, MF and self-paced skiing between trials. **RESULTS** Subjects skied more runs (8.0 ± 1.5 vs. 5.6 ± 1.8; p<0.05) and vertical (1969 ± 489 m vs. 1382 ± 304 m; p<0.05) during free skiing with DC than TNC. No differences were observed between trials for turn duration or edge angle. Although no statistical differences in %Δ RMS or MF were found, there was a trend towards smaller magnitude %Δ MF with DC (Table 1). **CONCLUSIONS** Although there were no differences in muscle activity between trials in either condition, subjects improved their self-paced skiing performance in the DC condition. There was also a trend towards smaller %Δ MF the DC condition. Further research should investigate the biomechanical influence of DC on skiing performance.

Table 1 % Δ RMS & MF	DC-RMS	TNC - RMS	DC-MF	TNC-MF
GMED	55.0 ± 126.7	-17.0±75.3	11.9±37.0	8.9±36.5
RF	12.9±88.6	-36.6±48.0	-1.3±16.9	-6.8±23.6
ADL	12.7±65.2	-2.9±55.45	-2.5±22.0	10.3±36.1

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Narrowing The Gap In Movement Ability from the Perspective of the Female Athlete

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to assess movement ability from the female athlete's perspective before and after a novel field-based training program. **METHODS**: Twenty-five, elite female soccer athletes (13.3 ± 0.6 y; 161.9 ± 5.3 cm; 50.9 ± 4.9 kg) participated in a 7-week, training program performed with a wearable neuromuscular device. Movement ability was measured with a computer-adaptive test version of the Movement Ability Measure (MAM-CAT) at the start (pre) and end (post) of the training program. The MAM-CAT has 18 items, three for each of the six movement dimension of strength, flexibility, speed, accuracy, endurance and adaptability. Each item contains six statements representing six increasing movement ability levels addressing how they currently move and how they would prefer to move during activities of daily life and sports participation. The MAM-CAT software computes standardized current and preferred movement ability scores on a scale from 0 (cannot move) to 6 (moves competitively). Changes in summed current movement ability and current-preferred differentials (movement gap) were compared pre and post training with paired t-tests (p=.05). A self-assessment transition item of pre versus post movement ability with five Likert response options ("much better", "slightly better", "about the same", "slightly worse", and "much worse") was used to determine the minimal important difference (MID) by the mean change method between "slightly better" and "about the same" subgroups. **RESULTS**: Twenty-one athletes completed pre and post MAM-CAT testing. At the end of the training program, 62% of the athletes reported "slightly better" movement ability and 33% reported "about the same." The MID for narrowing the movement gap was calculated to be 1.1. Group mean current movement ability scores increased 7% (pre, 29.2 ± 4.2; post, 31.8 ± 2.8; t=2.926, p=.008). The current-preferred differentials decreased on average by 25% (pre, -6.0 ± 3.6; post, -4.5 ± 3.0; t=2.267, p=.035) and exceeded the MID metric. **CONCLUSIONS**: The novel field-based training program enhanced movement ability from the female athlete's point of view. Future studies are recommended to use the MAM-CAT as a tool to modify individual or group training programs by emphasizing the movement dimension with the largest current-preferred gap.

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Biomechanical And Physiological Differences Between Two Rowing Ergometers

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(No relevant relationships reported)

PURPOSE: To compare the biomechanical (force, handle velocity) and physiological (oxygen consumption, EMG) responses to rowing at equivalent power outputs on two rowing ergometers, Skillrow (TechnoGym, Italy) and Concept II (Model D, Concept II, UK). The hypothesis was that at the same power output peak force will be lower, and handle velocity more consistent, for the SkillRow than Concept II. **METHODS**: Seven young, competitive on-water male rowers (age 24 + 3 y; BW 89.5 + 6.8 kg) volunteered to participate in this study. Participants performed a discontinuous submaximal incremental rowing protocol of two 5 min periods (one on each ergometer) at each power output (150, 180 and 210W; drag factor 130), in a counterbalanced order between participants. Handle displacement and velocity was measured with a calibrated linear draw wire displacement transducer and force with a calibrated high resolution strain gauge and force with a calibrated linear draw wire displacement transducer. These recordings were used to derive stroke kinematics (stroke rate, stroke length, drive phase duration, peak velocity) and kinetics measures during the drive phase of the stroke (peak force, average force, impulse) as well as plots of force, displacement and velocity over time during the rowing stroke. Surface EMG was recorded continuously from the bicep femoris long head, vastus lateralis,

rectus abdominis, erector spinae longissimus, and biceps brachii long head using a wireless EMG system (Trigno, Delsys, USA). Breath-by-breath pulmonary gas exchange data were measured continuously throughout (Vyntus, Carefusion, USA). **RESULTS:** There were no differences between the two ergometers in energy cost or neuromuscular activation (peak EMG amplitude) of 5 muscles. However, mean handle force and impulse during the drive phase were greater on the Skillrow than Concept II (P=0.002), also with a tendancy for higher peak force (P=0.087). Skillrow involved a lower peak handle velocity (P=0.006) and longer drive phase (P=0.003) than Concept II. **CONCLUSIONS:**The two ergometers were similar in terms of energy cost and neuromuscular activation. In term of biomechanical parameters rowing with the Skillrow required a higher average force and impulse, a lower peak velocity and a longer drive phase.

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Differences in Ground Reaction Forces When Collegiate Quarterbacks Throw Using Different Drop Patterns

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(No relevant relationships reported)

While there is limited research examining the kinematics of the quarterback passing throw, to date there have not been any studies reporting on ground reaction forces (GRF) during this type of throwing motion. Additionally, there have been no studies reporting how foot positions or drop patterns used by quarterbacks might change GRF parameters. This information would useful to both coaches and sports medicine professionals as it provides both performance and injury related insights. **PURPOSE:** Compare GRF parameters between three commonly used quarterback drop patterns: a one step (1S), a three step (3S), and a three plus one step (3P1) when performed with the rearfoot angled 90° relative to the throwing direction and 45° relative to the throwing direction. **METHODS:** Three NCAA Division I quarterbacks participated in this study. Participants performed three throws using each type of drop and each foot position. Two force plates were used to record GRF data at 1000 Hz. Trials were considered valid if both the front (FF) and rear (RF) feet landed on their respective force plates, with the RF foot in the appropriate orientation. For both the RF and FF, peak horizontal and vertical forces, and horizontal and vertical impulses were calculated. Differences between foot positions and drop patterns were evaluated using a 2x3 repeated measures ANOVA. **RESULTS:** There were no differences in any force metrics for the FF. For the RF, peak horizontal GRFs showed a main effect of drop ($F_{2,4}$=43.9, p=.002), with peak forces being lower in the 3P1 (210.7 ± 13.5 N) than the 3S (476.7 ± 50.5 N) or 1S(378.7 ± 2.6 N) conditions. Peak vertical forces in the RF also showed a main effect of drop ($F_{2,4}$=20.3, p=.008), with peak forces being lower in the 3P1 (1201.7 ± 39.8 N) than the 3S (1359.9 ± 105.8 N). Lastly, there was a main effect of drop for RF horizontal impulse ($F_{2,4}$=55.7, p=.001), with impulses being lower in the 3P1 (58.2 ± 9.12 Ns) than the 3S(150.7 ± 4.5 Ns) or 1S (150.8 ± 5.1 Ns) conditions. **CONCLUSION:** A 3P1 drop pattern makes use of horizontal momentum, thus requiring the athlete to generate less force and smaller impulses with the RF during the throw. As such, coaches should emphasize pushing with the RF when using a 1S or 3S drop pattern. Changing foot positions does not appear to influence force parameters.

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Hip Joint Torques During the Golf Swing of Young and Senior Healthy Females

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(No relevant relationships reported)

Hip joint torques during the golf swing of young and senior healthy females Female participation in golf has increased throughout the past few decades and now comprises approximately 20% of all golf participants. However, little is known regarding the biomechanics of the golf swing for women, and even less is known about hip torques. **PURPOSE:** To describe and compare the hip torques associated with the golf swing of healthy young and senior female golfers. **METHODS:** 21 right-handed, female golfers, aged from 18-70 years old volunteered. Age groups were divided into young (18 – 39) and senior (40 – 70). Subjects completed 10 swings with a standardized driver. A high speed motion capture system and force plates were used to collect kinematic and kinetic data. . 3-D hip torques for trail and lead legs were calculated using inverse dynamic analyses. 2-way mixed model ANOVAs (group by leg) were calculated, with club head velocity as a covariate. **RESULTS:** There were no differences between the groups for BMI (24.6 ± 3.5), handicap (22 ± 7), or club head velocity (30.1 ± 4.2 m/s). The trail hip extensor torque was the largest torque produced by both groups. A main effect for leg was found for hip internal rotator torque (p=.024) with the largest torques produced by the trail leg. There was an interaction between the legs by groups for hip abductor torque (p=.043); the young group had larger torques for the lead leg, while the senior group had no difference between legs. Club head

velocity was significantly (p<.05) correlated with hip internal rotator torques of both the lead and trail leg (r=.7 and .56, respectively), however, when separated by group, these correlations were only significant for the young group (r-.8; p=.001).

Peak Hip Torque	Young (n=12)	Senior (n=10)
Trail - Extensor	10.13 ± 1.95	8.7 ± 1.28
Lead - Extensor	4.70 ± 1.76	3.32 ± 1.14
Trail - Adductor	3.23 ± 1.96	2.42 ± 1.03
Lead- Adductor	.68 ± .87	.7 ± .81
Trail -IR	2.17 ± .68	1.97 ± .50*
Lead-IR	1.90 ± 1.17	1.86 ± .84*
Trail - Flexor	4.70 ± 1.34	4.33 ± 1.10
Lead - Flexor	6.38 ± 1.96	5.85 ± .98
Trail - ER	2.76 ±.52	2.77 ± .7
Lead - ER	2.52 ± .94	2.21 ± .74
Trail - Abductor	4.61 ± 1.21	4.78 ± 1.23
Lead - Abductor	6.39 ± 1.68**	5.02 ± 1.34

Units in N*m/(BW*BH); * = between legs; ** = leg by group
CONCLUSIONS: Overall, hip torques in the trail leg were larger, which suggests their important contribution to the golf swing. These findings are similar to previous literature for healthy male golfers.

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Effects of Metronome Training on Timing of the Golf Putt and Neural Connectivity in Professional Golf Players

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(No relevant relationships reported)

During putting in golf, the direction of movement and force of the club head should be consistent among each swing. In order to maintain consistency in swing timing, the cerebellum provides temporal information, motor timing, control of rhythm, and timing of movements. We utilized a brain training neurotechnology that combines the concept of a musical metronome with a computer-based program that facilitates the improvement of an individual's rhythm and timing. **PURPOSE:** To determine if metronome training(MT) activates neural networks involved in the putt swing and decreases variation in the swing speed. **METHODS:** Twenty professional female golfers (KLPGA) were randomly assigned to either MT training group (n=10, 35-40 min per session, twice a week for 6 weeks) or a control group (n=10). The putting performance and brain activity were analyzed using kinematic software and resting state functional MRI. Consistency was measured as the standard deviation of the mean swing speed (SSD) during three sections of the swing: backswing(AD-BS), backswing-impact (BS-IMP), impact-finish (IMP-FIS) **RESULTS:** The MT group improved consistency in the time between the back swing and ball impact in a 2 meter putt compared to the control group (pre: .09±.07 vs .04±.02, post: .05±.03 vs .05±.02, F=5.27, p=0.03). In addition, the MT group showed greater consistency (measured as a lower SSD) in the duration of the full swing of the 5 meter putt compared to the control group (pre: .21±.09 vs .16±.07, post: .14±.09 vs .11±.06, F=5.59, p=0.02) and in swing time in the 5AD-BS section of the 5 m putt compared to the control group (pre: .07±.04 vs .05±.02, post: .04±.03 vs .04±.02, F=9.24, p<0.01). After the training period, the MT group showed increased functional connectivity from the superior cerebellar vermis to the right medial frontal gyrus, left superior temporal gyrus, right middle occipital gyrus, right middle temporal gyrus, right cingulate gyrus, and right supramarginal gyrus (uncorrected p<0.001, voxels>40). **CONCLUSION:** MT training in professional female golf players may improve the consistency and reduce variability in putt timing. In addition, MT training may increase brain connectivity from the cerebellum to the frontal cortex which plays an important role in the timing process. Support : Korea reative Content Agency (R2014040055).

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Reducing Lower Back Injury in Golf: Cross-sectional Assessment of Novel Swing Technique

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Reported Relationships: R. Weedon: *Intellectual Property; Author and*

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conceptor of The Lower Body Golf Swing.

Lower back pain (LBP) in golf has been associated with repeated swing performance and high-speed spinal loads/rotations. While different swing techniques exist, no studies have examined the "traditional" or modern swing with the lower body swing. The lower body swing, a novel technique, is believed to reduce the risk of LBP, as it does not require extensive lateral axis tilt of the upper body as rotations are achieved through increased motion at the knees and hips. **PURPOSE:** To analyze, the modern and lower body swing with respect to the risk of developing LBP. **METHODS:** Nine athletes performed the modern swing (Age 48.0+/-13.6 yrs, Height 176.8+/4.4 cm, Mass 82.1+/5.3 kg) and seven lower body swing (Age 53.9+/12.1 yrs, Height 182.9+/6.1 cm, Mass 92.5+/14.8 kg), all free from LBP. Whole-body kinematics were recorded using a motion analysis system and a continuous t-test (point by point) was performed to identify differences in examined kinematic measures associated with LBP (high crunch factor and thorax to pelvis abduction velocity and acceleration, flexion velocity, thorax rotational velocity and acceleration). Cohen's d was calculated to determine the magnitude of effects. **RESULTS:** Significant differences with strong effects ($p < .05$; $d > .80$) were observed for: thorax to pelvis abduction acceleration (lower$=358+/334°/s^2$, modern$=1024+/464°/s^2$), thorax to pelvis abduction velocity (lower$=53+/25°/s$, modern $107+/24°/s$), thorax to pelvis flexion velocity (lower$=-38+/60°/s$, modern $-113+/42°/s$), thorax rotation velocity (lower$=428+/63°/s$, modern $550+/68°/s$) and thorax rotation acceleration (lower$=2432+/535°/s^2$, modern$=3681±712°/s^2$). **CONCLUSION:** The lower body swing displayed favorable kinematics in comparison to the modern swing in relation to LBP risk in healthy golfers. Future work should include larger sample sizes and prospective or intervention-based approaches to explore injury prevention efficacy of this novel swing technique.

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Trunk Flexibility, Balance, Muscle Endurance, And Contralateral Lean In Collegiate Baseball Pitchers

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(No relevant relationships reported)

Excessive contralateral trunk lean at maximal shoulder external rotation has been linked with increased pitching velocity and increased joint forces. Pitchers with a less efficient transmission of the generated force from the lower limbs to the upper extremities consistent with less forward trunk flexion, less upper torso rotation, and greater upper torso contralateral flexion at maximal shoulder external rotation demonstrated excessive contralateral lean; however the physical characteristics contributing towards excessive contralateral trunk lean during the pitching kinetic chain have not been well described in collegiate level pitchers. **PURPOSE**: To examine the relationship between trunk muscle fatigue, trunk flexibility, and balance in relation to maximum contralateral lean at maximal shoulder external rotation in collegiate baseball pitchers during fastball pitches. **METHODS**: Anthropometric measurements, isometric holds in trunk flexion, extension, lateral planks, flexibility, and STAR Excursion Balance Test assessments were performed on 10 Division I Collegiate baseball pitchers ages 18-21 (mean 19.6, SD=1.04) with an average of 7.36 years of pitching experience (SD=3.23). Pitching kinematic analysis of fastball pitches was performed using 3-dimensional motion analysis techniques. **RESULTS**: Pearson correlations were performed to assess the association between functional assessments with trunk contralateral lean. The average degree of contralateral lean was 2.33 (SD=3.66). The average pitch speed was 80.3 (SD=5.40). No statistically significant correlations were found between any of the assessments and degree of contralateral lean. However, there was a moderate negative correlation between contralateral trunk lean and pitch speed ($r = -.494$, $p=.146$). **CONCLUSION**: The negative correlation between contralateral trunk lean and fastball pitch velocity and trunk assessments and contralateral trunk lean mean be a result of the small sample size (10 subjects) as previous studies of approximately 100 subjects have shown a positive correlation of contralateral trunk tilt of 10 degrees from neutral with an increase of only 0.5-1mph in pitch velocity.

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Sparta Testing and Vertical Jump Co-Predict Fastball Speed in Collegiate Pitchers

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(No relevant relationships reported)

In competitive baseball, the most common pitch is the fastball; its velocity associates with strikeout rate and fielding-independent pitching values. The most effective predictors of pitch velocity are currently debated. Coaches and trainers are increasingly relying on advanced systems of assessment, such as Sparta Performance Science (SPS); fewer are relying on simple assessments, such as the vertical jump (VJ). Data supporting the added value of complex assessments are limited. **PURPOSE:** To test the effect of VJ and SPS performances on fastball velocity among collegiate pitchers.

METHODS: We enrolled 30 pitchers at a Division 1 athletics program in Northern California. Every pitcher on the team's roster between 2014 and 2017 was tested. During collection, heights and body weights were documented; an SPS force plate measured Load, Explode, and Drive data; and VJ height was recorded as the best of 3 performances. Fastball velocity was quantified as the mean mph of the fastest 3 in-game pitches at the time of testing. Multiple linear regression tested the effect of VJ and SPS data on pitch speed, controlling for appropriate confounders. **RESULTS:** Players were evenly distributed throughout year in school. Average VJ was $19.8 ± 2.5$ inches, fastball velocity was $87.4 ± 4.0$ mph, SPS Load was $54.2 ± 8.6$, Explode was $51.5 ± 8.4$, and Drive was $54.2 ± 8.8$. Multiple linear regression, holding the players' height and grade constant, found each additional inch of VJ predicted a 0.5 mph increase in pitch velocity ($p<0.001$; 95% CI: 0.21-0.70). The collection of predictors explained 56% of the variance in speed ($p<0.001$). In this model, each additional unit of Load predicted a 0.2 mph decrease in speed ($p<0.001$) while each additional unit of Explode predicted a 0.2 mph increase ($p<0.001$). The most powerful predictor was year in school: for each additional year, fastball velocity increased by 2.1 mph ($p<0.001$). SPS Drive was not a significant predictor ($p=0.491$). **CONCLUSION:** In the age of sophisticated analytics equipment, the VJ remains a compelling predictor of fastball velocity, but it predicts in tandem with the SPS technology. The information gathered from a comprehensive athletic evaluation can help coaches evaluate the athleticism of their athletes and inform decisions regarding individualized conditioning programs.

D-64   Free Communication/Poster - Disabilities

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1868   Board #129   May 31 2:00 PM - 3:30 PM

Influence of Therapeutic Horseback Riding on Motor Proficiency in Youth with Sensory Processing Dysfunction

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(No relevant relationships reported)

Individuals with sensory-integration delays may have some deficit in motor planning, or difficulty interacting with and influencing their surroundings. The demonstration of age-appropriate motor skills is therefore a primary outcome measure in this population. Therapeutic horseback riding may provide the necessary physical adaptations to improve motor skill proficiency. **Purpose**: To characterize motor skill proficiency following 8 weeks of therapeutic horseback riding with sensory integration therapy in children with sensory processing dysfunction. **Methods**: Twenty-seven children, ages 5 to 18 years, were recruited. All participants completed the same 32-week protocol that was separated into 4, 8-week blocks: a) a control period (no riding); b) a riding only period; c) a washout period (no riding); d) riding with additional sensory integration therapy (combination). Before and after each period, motor skills were assessed using the *Bruininks-Oseretsky Test for Motor Proficiency (2ⁿᵈ edition)*. A one-way repeated-measures ANOVA was used to determine any differences between testing periods. A significance level of 0.05 was used. **Results**: All subtest scores were statistically similar ($p > 0.05$), with the exception of manual dexterity, which was different between pre-control and post-washout ($p = 0.018$), post-control and post-washout ($p = 0.024$), and pre-control and post-combination ($p = 0.037$). Overall scores were different between pre-control and post-combination ($p = 0.003$) and post-control and post-combination ($p = 0.009$). **Conclusion:** Therapeutic riding may have a latent effect of improving overall motor skills in children with sensory processing dysfunction. Table 1: Average and overall scores on the *BOT-2* subtests at different time points

Subtest	Max	Pre-control	Post-control	Post-riding	Post-washout	Post-combination
Fine motor precision	14	6.0±4.9[a]	6.0±4.7[a]	6.1±4.9[a]	6.2±4.5[a]	6.4±5.2[a]
Fine motor integration	10	4.4±3.2[a]	4.2±3.0[a]	4.4±2.9[a]	5.0±3.3[a]	4.8±3.1[a]
Manual dexterity	9	2.2±2.1[a]	2.6±2.0[ab]	2.9±2.0[ac]	3.3±2.4[c]	3.2±2.4[bc]
Bilateral coordination	7	3.4±3.0[a]	3.7±2.7[a]	4.0±3.2[a]	4.0±3.0[a]	4.7±2.9[a]
Balance	8	4.0±3.1[a]	3.9±2.9[a]	3.4±2.8[a]	4.1±2.7[a]	4.3±2.7[a]
Running speed and agility	10	4.0±3.6[a]	4.0±3.4[a]	3.9±3.3[a]	4.0±3.4[a]	4.8±3.2[a]
Upper-limb coordination	12	4.7±4.4[a]	3.9±3.8[a]	5.2±4.2[a]	4.7±4.1[a]	6.0±4.1[a]
Strength	18	3.6±3.3[a]	4.4±3.3[a]	5.1±3.6[a]	4.7±3.3[a]	5.2±3.0[a]
Overall	88	32.4±21.6[a]	32.5±21.9[a]	35.4±22.9[ab]	36.1±22.6[ab]	39.1±22.2[b]

Values are mean±s.d. Means with the same superscript are statistically similar (p > 0.05). *BOT-2 = Bruininks-Oseretsky Test for Motor Proficiency (2nd edition)*; Max = maximum possible score.

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Adherence and Continued Participation In A Student-led Wellness Program For Individuals With Disabilities

Megan E. Ware, Kathleen P. Demarrais, Kevin K. McCully, FACSM. *University of Georgia, Athens, GA.*

(No relevant relationships reported)

Adherence and Continued Participation in a Wellness Class for Individuals with Disabilities

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Adherence and continued participation are areas of concern in wellness interventions and programming. For individuals with disabilities, this can be an even larger challenge because of barriers like transportation and decrease in overall health. However, the factors that could increase participation and adherence in this population group remains unclear. Adherence and continued participation were explored in a wellness class at the University of Georgia for people in the surrounding community with disabilities. This class is driven by students under the supervision of a graduate student and a faculty member. **PURPOSE:** To understand what factors impact participant adherence and participation in the unique environment of the wellness class. **METHODS:** Eight wellness class participants, with a wide range of physical and mild intellectual disabilities who had been in the class for 6-36 months, were chosen for in-depth qualitative interviews. Interview responses across participants were coded and analyzed for overarching themes. **RESULTS:** 71 codes were obtained from the interview data, with 7 categories from these codes. The primary theme identified was that adherence in the class was related to personal interaction with the student trainers. The personal interaction could be divided into subthemes of social accountability, motivation, supporting classroom environment, and student interaction. The overwhelming majority of these codes were positive, indicating satisfaction with the wellness class on the part of participants. Duration in the class did not influence the subthemes, other than longer durations were associated with a greater appreciation of the role of the participants educating the students. **CONCLUSION:** The primary factor that influences adherence and continued participation was related to personal interaction with the student trainers. These results suggest that encouraging positive social interactions related to social accountability and a positive environment can play a powerful role in maintaining exercise adherence in people with physical and intellectual disabilities.

1870   Board #131   May 31 2:00 PM - 3:30 PM

Static Standing Balance Before And After A Maximal Treadmill Test In Adults With Intellectual Disabilities

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(No relevant relationships reported)

Introduction: Static standing balance (SSB) is essential for upright posture and for most functional activities. It has been shown that fatigue worsens SSB in general population. Adults with intellectual disability (ID) may have delayed responses to postural perturbations, especially with concurrence of fatigue. Little is known about SSB in individuals with ID. **Purpose:** To study the effects on SSB before and after a maximal treadmill test (MTT) in adults with ID. **Methods:** 92 adults (49 men) with mild to severe ID including Down syndrome (age: 43.6 ±12.0 y; weight: 72.45±15.0 kg; height: 159.8±11.1 cm) were recruited from an occupational day center. Participants performed a MTT until exhaustion. Immediately before and after the MTT, the center of pressure (COP) radial area, total travel distance (TTD), mean medium-lateral (MLD) and mean anterior-posterior (APD) displacements, and mean velocity sway (MVS) of the COP were measured with a pressure platform for 52sec at 100Hz, with open and closed eyes. Paired t-tests were applied to analyze differences between tests (p<.05). **Results:** After a MTT, a significant increase in APD with OE (3.7 vs 4.4mm; p = 0.020) was observed. Also, a significant improvement in the X axe position of the COP (MCOP X) with CE (9.9 vs 7.1mm; p = 0.039) was observed. The other variables showed no significant changes. **Conclusions:** Regular exercise may improve balance in persons with ID, but if fatigue appears, their postural motor system may be impaired. More research is needed, as balance is important to prevent falls.

Descriptive values of the studies parameters of the COP				
Variables	Pre-Treadmill test		Post-Treadmill test	
	OE	CE	OE	CE
TTD (mm)	225.0 (25.4)	264.1 (34.2)	236.5 (14.5)	242.1 (19.1)
COP radial area (mm²)	608.4 (1419)	520.1 (156.5)	495.0 (79.3)	546.7 (130.0)
MVS (mm/s)	3.9 (0.4)	4.6 (0.6)	4.1 (0.3)	4.2 (0.3)
MLD (mm)	4.2 (0.6)	3.9 (0.6)	3.9 (0.3)	3.7 (0.3)
APD (mm)	3.7 (0.4)	3.6 (0.3)	4.4 (0.4)*	3.5 (0.3)
MCOP X (mm)	8.7 (1.8)	9.9 (1.8)	7.4 (1.8)	7.1 (1.7)**
MCOP Y (mm)	-9.4 (1.6)	-10.9 (1.5)	-11.8 (1.5)	-11.5 (1.5)

Note: values are means (Standard Mean Error)
Abbreviations: OE: Open Eyes; CE: Closed Eyes, COP area: Center of Pressure area; TTD: total travel distance; MLD: mean medium-lateral displacement; APD: anterior-posterior displacements; MVS: mean velocity sway length; MCOPX: mean COP-X position; MCOPY: mean COP-Y position
* Significant difference (p < 0.05) between APD with OE
** Significant difference (p < 0.05) between MCOP X with CE

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A Multilevel Patient Engagement Model for Recruiting Hard-to-Reach Populations into Exercise Training Studies

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(No relevant relationships reported)

Many of the current studies today involving exercise science research never reach their target sample sizes. This is particularly true for studies that include people with disabilities, as this population typically faces issues such as lack of transportation, exercise not individualized to their functional level, or intervention not targeting primary symptoms of their disabilities. Strategies for enhancing participant recruitment are needed to guide future exercise training studies in the disability population. PURPOSE: The purpose of this qualitative study is to describe a multilevel, patient-centered model for recruiting people with multiple sclerosis (MS) for a cluster-randomized controlled study named Tele-Exercise and Multiple Sclerosis (TEAMS), which involves a 12-week complementary and alternative medicine intervention consisting of neurorehabilitative exercise, yoga and Pilates. METHODS: A multilevel model that consists of three elements: 1) stakeholder engagement throughout the entire research process, 2) clearly defined research team effort shaping the study design based on stakeholder feedback, and 3) external support systems. The three elements of this model work together to disseminate research evidence that can be easily translated and

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Abstracts were prepared by the authors and printed as submitted.

replicated in real world settings. RESULTS: The TEAMS study, which aims to enroll 820 individuals with MS across Alabama, Mississippi, and Tennessee over 24 months, has already garnered a list of 300 interested participants since active recruitment began for 8 of the 38 clinic sites in September 2017. Anticipated results include successfully reaching recruitment goals and participants demonstrating adherence to the study. CONCLUSION: Although this study was focused on MS, this multilevel recruitment model, starting with stakeholders at the center of the model in helping to design the study, is generalizable to other underserved, difficult-to-reach study populations. Exercise Physiologists can use this model as a framework for increasing their enrollment into various types of training studies.

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1872   Board #133   May 31 2:00 PM - 3:30 PM

Changes in Physical Activity during a Pilot Weight Loss Program Before and After Knee Replacement

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(No relevant relationships reported)

PURPOSE: Although knee replacement (KR) surgery typically results in pain reductions and functional improvement, most patients do not increase their physical activity. This study examined changes in objectively measured physical activity in KR patients who were participating in a weight loss program that started either before or after surgery.

METHODS: Consented patients scheduled for KR were randomized to a 14 session pilot weight loss program starting ≤6 weeks before surgery (PACE) or 12 weeks post-op (Delayed PACE). Participants were encouraged to increase activity, set weekly activity goals, and self-monitor using paper, website, app, or Fitbit. Coaching sessions took place weekly or biweekly based on patient preference. Activity (moderate-to-vigorous activity [MVPA] bouts of ≥10 min of ≥2020 cpm and daily steps) was assessed using Actigraph GT3X monitors. PROMIS was used to assess pain intensity and function. Assessments were completed at baseline (pre-op), 12, and 26 weeks after surgery. Intent-to-treat was used with the last observation carried forward. Repeated measures ANOVAs examined changes in activity across time and group. **RESULTS**: Thirteen participants (mean±SD 63.5±7.9 years, 69% female, 69% White, BMI 35.7±5.1 kg/m2) provided physical activity data at baseline. Physical activity data was obtained for 77% of the sample at 12 and 26 weeks. Pain intensity decreased (P≤0.001) and function improved (P≤0.001) significantly, but no significant changes were observed in physical activity (Table 1). **CONCLUSIONS**: On average, KR patients participating in a weight loss program did not increase physical activity (weekly bouted MVPA and daily steps) after surgery. The lack of changes in activity, even in the presence of an intensive behavioral intervention and improvements in pain and function, highlight the challenges of altering behavior in this population. Future studies are needed to explore methods to increase activity after knee replacement.

Physical Activity Pre- and Post-Surgery in PACE (n=6) & Delayed PACE (n=7)			
	Baseline	12 Weeks	26 Weeks
Bouted MVPA, min/week			
PACE	81.2±141.8	3.5±5.4	33.3±76.4
Delayed PACE	37.6±85.7	62.1±135.8	78.1±108.0
Steps/day			
PACE	5715.7±3098.0	4255.6±1687.8	4991.8±2910.2
Delayed PACE	6062.4±2817.6	4943.6±1653.2	6324.4±2201.3

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Use of Video Modeling to Teach Weight Lifting Techniques to Adults with Down Syndrome

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(No relevant relationships reported)

As adults with Down syndrome (DS) age strength decreases resulting in difficulty performing activities of daily living. Research suggests that progressive resistance training for adults with DS may lead to improvements in their functional ability. PRT requires minimal equipment, which may be important for individuals with DS, as they may have limited disposable income for gym memberships, and reduced access to transportation to and from training facilities. Video modeling (VM) involves the demonstration of a target behavior through the video recording of that behavior. PURPOSE: The purpose of this study was to determine whether the use of video modeling is appropriate for teaching adults with DS to perform weight lifting

techniques. METHODS: Three adult males with Down syndrome, ages 24 to 34 years, participated in this study. A single subject multiple probe design across behaviors (i.e. lifts) was used to evaluate the effectiveness of VM. A certified U.S. weight lifting coach completed a task analysis for split squat (SS), punch-out squat (POS), and overhead press (OP). For baseline measures participants watched a demonstration of each lift and were then recorded performing the lift. Once baseline measures became stable, participants viewed a video of a model using correct lifting technique three times. They were then video recorded performing the lift. No verbal prompts or corrections were given. Participants performances were scored by taking the number of steps performed correctly, dividing that number by the total number of steps in the task, then multiplied by 100. RESULTS: Participants were least successful with the SS averaging 16% correct at baseline and 36% correct after viewing the videos. POS went from 50% correct to 87%; OP started at 42% and increased to 80% correct movement. Our video-modeling intervention, alone was not sufficient to produce an effective outcome across all lifts,

but did help participants acquire more components of each lift. CONCLUSION: This study suggests that VM might serve as a useful component of a larger intervention; one that includes VM, rehearsal with feedback, and programmed reinforcement contingencies. It is our hope that future research with provide a path forward in this critical area.

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Changes of Physical Activity Patterns among Down Syndrome Youth In a Weight-loss Randomized Control Trial

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(No relevant relationships reported)

Children with intellectual and development disabilities (IDD) engage in lower levels of moderate to vigorous intensity physical activity (MVPA) than do typically developing children. In addition, research suggests that light intensity physical activity (LPA) might have health benefits independent of those recognized for MVPA in people in general. To our knowledge, there is no recommendation for LPA, and the recommendation for all people with disabilities is to simply encourage them to do "as much physical activity (PA) as they can". **PURPOSE:** The purpose of this study was to analyze the baseline PA patterns of adolescents and young adults with Down syndrome (DS) who participated in a 12-month weight loss intervention, and to assess whether the intervention would change PA patterns. **METHODS:** A total of 21 adolescents and young adults with DS aged 13 to 26 years were enrolled and randomized to either a 6-month nutrition and activity education intervention (NAE) or a nutrition and activity education+ behavioral intervention (NAE+BI), with a 6-month follow-up. Accelerometers were used to assess the PA levels of participants at baseline, 10-weeks, 6-months, and 12-months. **RESULTS:** Results indicated that at baseline participants spent a high proportion of their time in SB (68.2%), and lower proportions in LPA (28.5%) and MVPA (3.2%). At the same time, a strong negative linear correlation was found between SB and LPA (r= -0.938, p<0.001); and a weak negative linear correlation was found between SB and MVPA (r= -0.468, p=0.038). Linear trend analysis showed that SB decreased more in the NAE+BI group than in NAE at 6-months, and the trajectory of LPA increased more steeply at 10-week, 6-month, and 12-month in NAE+BI than in NAE. **CONCLUSIONS:** LPA was found to have a stronger inverse association to SB than did MVPA to SB. We conclude that decreasing SB and promoting healthy outcomes may be achieved more effectively by increasing LPA, as compared to increasing MVPA, among this population. The implications could be used to fill in the gap of PA guidelines to include promoting LPA among adolescents and young adults with IDD, a step that could bring health benefits.

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Influence of Pain and Mood on Physical Activity after Knee Replacement

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(No relevant relationships reported)

Many patients undergoing knee replacement do not increase physical activity levels after surgery.

PURPOSE: The proposed study aimed to use ecological momentary assessment (EMA) and accelerometry to examine the time-varying associations between mood, pain, and physical activity following knee replacement to determine if mood is influencing activity.

METHODS: : Over one week, knee replacements patients ≤12 months of surgery rated their mood (1 negative to 9 positive) and pain (1 none to 9 extreme) after 6 random prompts during waking hours. Physical activity was assessed during the same week using an Actigraph GT3X worn on the waist. Only valid days of ≥10 hours/day were included. Average steps/day and the time spent in sedentary (<100 cpm)

and moderate-vigorous physical activity (≥ 2020 cpm) were calculated across all participants. Pearson or Spearman correlations were used to examine the relationship between pain, mood, the time from surgery, and physical activity counts. **RESULTS**: Fourteen participants (mean±SD 64.7±6.4yrs, 57% female, 79% white, 70.3±75.9 days after surgery) completed the study. One participant had less than four accelerometer valid wear days and was excluded from analyses. Participants spent 74.1±10.4% of the day in sedentary behavior, took 3352.1±1861.9 steps/day, and engaged in 36.8±53.5 min/week of MVPA. Over one week, participants provided 35.5±6.5 responses, 73% were in response to random prompts, with the remaining responses being self-initiated. Pain ranged from 1-4 (m±SD 2.9±1.2) and mood ranged from 1-9 (m±SD 6.9±1.5). A higher number of days since surgery was associated with less pain (r=-0.28, p<0.001) and better mood (r=0.58, p<0.001); however, neither pain nor mood influenced current or subsequent physical activity. The time since surgery was associated with subsequent physical activity 30 minutes later (r=0.17, p=0.002), but not current or activity 60 minutes later. **CONCLUSIONS**: Knee replacement patients who had surgery within the last 12 months spend the majority of the day engaged in sedentary behavior. Participants who were further out from surgery experienced less pain and better mood; however pain and mood did not influence current or subsequent physical activity. Future studies are needed to explore alternative factors that may be influencing activity after surgery.

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Noncompliance Patterns In Accelerometer-based Research For Children And Adolescents With A Developmental Disability

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(No relevant relationships reported)

An accelerometer is widely used to objectively assess physical activity (PA) levels in field-based research. Accelerometer-wearing compliance has been one of critical issues for a successful data collection because it directly affects the quality of accelerometer data. However, the noncompliance patterns are unknown in children and adolescents with a developmental disability (DD). **PURPOSE**: To assess the noncompliance patterns of children and adolescents with DD in accelerometer-based research. **METHODS**: Forty-eight children and adolescents with DD who could independently walk were recruited from 6 schools in the U.S. (30 from 4 schools) and Korea (18 from 2 schools). Participants were asked to wear a GT3X+ accelerometer (Actigraph, Pensacola, FL) from the time they wake up until going to bed for the next six consecutive days, except for water activities. Data inclusion criteria were >10 hours wear time from 8am to 10pm a day, and 20 consecutive minutes of zero counts as was considered non-wear time (Belton et al., 2013). Time of day was broken into four segments: (a) morning (8am-noon), (b) afternoon (noon-5pm), (c) evening (5pm-8pm), and (d) night (8pm-10pm). **RESULTS**: Seventeen participants met the inclusion criteria on all 6 days, followed by 25 participants on 5 days and 28 participants on 4 days. For further analysis, 3 weekdays/1 weekend day criteria (n=27) was added. A Wilcoxon Signed-ranks test indicated weekend non-wear time (Mdn = 167.50) was significantly higher than weekdays (Mdn = 98.75), Z=-2.28, p =.02. Mean non-wear time in each time segment over 6 days was 49.88, 23.91, 42.74, and 140.07 minutes in order. A repeated measures ANOVA with a Greenhose-Geisser correction showed a significant difference of non-wear time between four time segments, F(1.41, 36.72)=17.56, p < .001, and post-hoc analysis using Bonferroni correction found a significant difference between night non-wear time and all other time segments (morning p< .01; afternoon, evening p<.001). One-way ANOVA and independent t-test revealed no difference of mean non-wear time between schools and between two countries. **CONCLUSIONS**: Future research efforts may be necessary to develop accelerometer wearing compliance strategies, particularly to improve wearing time on a weekend and a night period, for children and adolescents with DD.

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Feasibility of Underwater Treadmill Training to Improve Mobility: A Case Study of a Transtibial Amputee

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(No relevant relationships reported)

Underwater treadmill training (UTT) has been shown to be successful in improving health related fitness in inactive populations with reduced mobility. Walking on a treadmill submerged in a self-contained tank of water allows for precise control of walking speed, water depth, and water temperature while unloading one's body weight. **PURPOSE** The purpose of this study was to determine the feasibility and efficacy of an 8-week (3d·wk^{-1}) UTT program in a unilateral, transtibial amputee with limited ambulation potential. The hypothesis was that the participant's post-UTT and three month scores relative to pre-UTT scores would improve in mobility (Amputee Mobility Predictor [AMP]), walking speed (10-M Walk Test), balance (single leg

stance and Romberg test), and fall risk (Timed-Up-And-Go [TUG]). **METHODS** The patient was a 72 year-old male who underwent transtibial amputation for the development of an infection coupled with Charcot neuroarthropathy. He has used a prosthetic device two years. He walks with a cane in the community and uses a wheelchair while at home. Mobility is defined by the Medicare Functional Class K-Level system with stages ranging from K-0 to K-4 and is determined by the score of the AMP. Prior to UTT, a prosthetist administered the AMP and classified the patient as a K-2 with a total score of 32. The patient had a secondary prosthetic limb which was fitted by the prosthetist for use in the underwater treadmill. **RESULTS** After UTT, the patient was classified as a K-3 with a total score of 37. Time to complete the 10 M Test was 12.8 s before, 11.4 s after, and 11.1 s at 3-months. TUG test times pre, post, and 3 months post-UTT were 15.6 s, 13.5 s, and 13.3 s, respectively. The patient was unable to balance for 30 s with eyes closed before UTT and was able to complete this task after UTT and 3-months post-UTT. He was unable to perform a single leg balance test without assistance for 30 s on either limb at any time-point. Total underwater treadmill walking time increased from 26 min to 48 min and walking speed increased from 1.1 mph to 1.6 mph. **CONCLUSION:** Following UTT, the patient achieved a higher K-level. Patients classified as a K-3 or higher are eligible for health care coverage for higher level componentry for the prosthetic device. His walking speed improved and fall risk decreased following UTT with only minor improvements in balance.

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Qualitative Assessment Of The Implementation Of A 12-week Game-based At-home Intervention For Young Children

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(No relevant relationships reported)

PURPOSE: A 12-week game-based physical activity (PA) curriculum was developed for children ages 4-7 with and without Prader-Willi Syndrome (PWS), a rare genetic neurodevelopmental disorder leading to medical, motor, and behavioral challenges. This study evaluated preliminary findings on intervention completion and adherence and parent reflections on their participation**.
METHODS**: Parents (N=25) of children with (n=6) or without PWS (n=19) and their children were enrolled. At baseline parents received the curriculum training and the equipment and materials. During the 12-week intervention, parents reported the number of days/week they used the curriculum (two day minimum required) on-line or using paper logs (n=19). In the post visit, parents participated in a semi-structured interview reflecting on their experiences with the curriculum implementation and any changes perceived in their child. Each interview was transcribed and analyzed for common themes using hierarchical content analysis (preliminary analyses n= 15). **RESULTS**: 19 families completed the baseline and post visits (76% retention), with 52.6% of participants adhering to completing twice a week sessions (PWS=80%, without PWS=42.9%). The challenges of implementation included: time management (e.g., challenges with scheduling), lack of motivation by the parent and the child (e.g., unmotivated, sick). Facilitators of implementation included: incorporating the program into their lives (e.g., making it a routine and scheduling it), making a commitment, fostering their child's motivation (e.g., children actively making choices, tailoring to their child's interests), social support and the equipment and curriculum (e.g., easy to use and child-friendly). Parent perceived outcomes included: improvement in child's motor skills, confidence, and motivation, improvement in parents' ability to teach motor skills as well as enjoyment and quality time with their child. **CONCLUSIONS**: Implementation of an at home PA intervention with young children is challenging. Parent strategies such as scheduling, building a routine and engaging their child may help overcome difficulties. Nonetheless, parents perceived the PA routine implementation led to building motor skills and self-confidence in their children.

1879   Board #140   May 31 2:00 PM - 3:30 PM

A Survey Of Parents Of Children With Mild Developmental Disabilities: Perspectives On Digital Health

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(No relevant relationships reported)

Youth with developmental disabilities have an equal if not higher prevalence of obesity than their typically developing peers, but little is known about parents' views on this issue in the context of digital health.

PURPOSE: The aim of this study was to assess concerns about obesity-related topics, as well as interest in and delivery medium preferences for digital programs focused on these areas, among parents of children with mild developmental disabilities. **METHODS:** A survey of digital health perspectives was administered to parents of children who attended a special summer camp (i.e., campers) focused in part on health behaviors. Parents (N=28) responded to items about themselves and their camper(s) (N=28 campers; there were 31 total parent responses for select survey items about campers [3/28 parent responders had 2 campers, reflecting 6 campers and 6 responses; 6/28 parent responders comprised 3 pairs of parents, and each pair had 1 camper, reflecting 3 campers and 6 responses; 19/28 parent responders had 1 camper, reflecting 19 campers and 19 responses]). Data on health-related concerns and associated interest in digital programs targeting these concerns, as well as preferred program delivery medium and technology use were analyzed using descriptive statistics. **RESULTS:** Most parents (M_{BMI} = 27.2 $\pm$ 4.4 kg/m^2, 82% female, 93% White) expressed concern about weight control (75%) and related topics (e.g., stress: 79%, diet: 75%, physical activity: 61%). Parent responses also highlighted concern about anxiety and depression (74%), diet (71%), and stress (71%) for their children (M_{age} = 10.6 $\pm$ 3.3 yr, 68% male). Interest in a tailored, digital-delivered program targeting assessed topics was also high (ranging from 54% for sleep to 75% for anxiety and depression). Email and YouTube were the top electronic platforms used by parents (100%) and children (87%), respectively, and 42% of children had a tablet. Email was the top cited preferred digital health-delivery platform for parents and children. **CONCLUSION:** These findings suggest most parents of children with developmental disabilities have concerns about obesity-related topics and are interested in receiving digital programs targeting these areas, with opportunities to leverage various mediums. Future studies should verify these findings in larger samples.

1880   Board #141   May 31 2:00 PM - 3:30 PM

The Efficacy of Dynamic Cycling in an Individual with ALS: A Pilot Study

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(No relevant relationships reported)

Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease that is characterized by muscular atrophy which leads to increased fatigue, loss of balance, and spasticity. Currently, there is no cure for ALS and limited medical treatments are available. Weak muscles make it challenging for these individuals to exercise although physical activity is important to prevent deconditioning. However, dynamic cycling, which utilizes a motor to assist rapid movement of the legs, may be an effective mode of exercise for individuals with muscle weakness and has yet to be investigated in this population. **PURPOSE:** The purpose of this case study was to determine the efficacy of two weeks (6 sessions) of dynamic cycling at a high cadence on gait function and daily activity function in an individual with ALS. **METHODS:** One male individual with ALS (67 years old) completed an amyotrophic lateral sclerosis functional rating scale revised (ALSFRS-R) assessment and a 6-minute walk test (6MWT) on a treadmill before and after the two week intervention. After the baseline visit, the six subsequent visits consisted of the dynamic cycling intervention and 6MWT. The dynamic cycling sessions consisted of repeated bouts of cycling at 75-85 revolutions per minute for 5 minutes with 5 minutes of rest for a duration of 30 minutes. **RESULTS:** The 6MWT showed progressive improvement from baseline to after the last cycling session. The subject walked 306 m, 338 m, 370 m, 354 m, 354 m, 386 m, and 386 m respectively (a 21% improvement). The subject's ALSFRS-R score slightly improved from 41 to 42. **CONCLUSION:** The dynamic cycling paradigm proved to be effective in improving mobility and gait in our subject. The individual was able to successfully complete the intervention despite muscle weakness. The promising results of dynamic cycling in our subject warrants the need for further studies within the ALS population.

1881   Board #142   May 31 2:00 PM - 3:30 PM

Cardiovascular Fitness and Body Composition in Spinal Cord Injured after a 36-session Exoskeleton Program

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(No relevant relationships reported)

Background: Spinal cord injury (SCI) disrupts motor recruitment patterns at or below the injury site resulting in diminution or loss of ambulatory function. Individuals with SCI exhibit reduced daily physical activity levels and an increased sedentary lifestyle. Cardiovascular risk factors are prevalent post-injury with increased adiposity, elevated triglyceride concentrations, insulin insensitivity, and reduced cardiovascular fitness. Technologic advancements have emerged to provide individuals with SCI an opportunity to ambulate in the community and increase daily activity level using exoskeletal robotic assist devices. **Purpose:** To examine cardiovascular fitness (as measured by peak VO$_2$) and body composition (as measured by DXA) in non-ambulatory individuals with SCI before and after a 36-sesssion exoskeleton walking program. **Methods:** Four males with a spinal cord injury greater than six months prior all requiring wheelchair use for community mobility, agreed to participate in a randomized six-month study (with a three month 36 session exoskeleton intervention phase) designed to examine multiple outcome measures. As part of the collected dataset, pre and post exoskeletal intervention assessments were determined for peak VO$_2$ (arm ergometry) and body composition (DXA). **Results:** Participants experienced the following changes after the 36-session exoskeleton intervention: **Participant 1**, peak VO$_2$ (20.73 to 20.89 ml·kg^{-1}·min^{-1}), body mass (64.5 to 68.1 kg), %body fat (13.3 to 17.6%); **Participant 2**, peak VO$_2$ (15.60 to 16.63 ml·kg^{-1}·min^{-1}), body mass (79.6 to 80.6 kg), % body fat (31.1 to 32.7%); **Participant 3**, peak VO$_2$ (26.11 to 27.19 ml·kg^{-1}·min^{-1}), body mass (60.5 to 61.9 kg), %body fat (5.2 to 5.7%); **Participant 4**, peak VO$_2$ (23.06 to 20.70 ml·kg^{-1}·min^{-1}), body mass (57.2 to 56.3 kg), %body fat (6.5 to 4.7%). **Conclusion**: In this preliminary group of four non-ambulatory chronic SCI individuals, a 36 session exoskeleton walking intervention failed to consistently improve cardiovascular fitness, body mass, and body composition (percent fat). Exoskeletal ambulation may not provide an adequate cardiometabolic stimulus to alter standard measures of cardiovascular health in this population.

1882   Board #143   May 31 2:00 PM - 3:30 PM

Getfit: An Interdisciplinary Approach To Exercise And Nutrition For Individuals With Autism Spectrum Disorder

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(No relevant relationships reported)

PURPOSE: GetFIT for All is an interdisciplinary exercise and nutrition program designed for individuals with a diagnosis of Autism Spectrum Disorder (ASD) and other developmental disabilities. The purpose of the GetFIT program is to improve participants' health and wellness, quality of life and socialization. OT, PT, Nursing, and Health Science students collaborate to educate and enhance the healthy habits of participants. Together these disciplines create a client-centered nutrition and fitness program. Get FIT for All addressed behaviors associated with ASD: restrictive eating habits, poor nutritional intake, and gross motor skill deficits that may lead to an unhealthy lifestyle and lack of participation and exercise. Adolescents diagnosed with ASD were two times more likely to be obese than adolescents without developmental disabilities. Young adults diagnosed with ASD were found to have a higher incidence of developing type 2 diabetes when compared to those without ASD. METHODS: Participants included 8 individuals with ASD who completed the pre-test; age range 16-42 with a mean age of 24 y.o. One participant dropped out, 2 others did not come to the final data collection session. Pre and post data were collected the first and last day of a 12 week session. The Sensory Profile 2 was used to identify sensory issues so that modifications could be made to the program. Social skills were measured using the Social Responsiveness Scale, 2nd ed. Data collected included anthropometric measures, vital signs, cardiovascular endurance, strength, flexibility, a nutritional screen, and a QOL measure. Summary of RESULTS: Percent change was used to assess data due to the sample size. Positive changes in health indicators including strength (plank +85%) (push-ups +35%), cardiovascular endurance (step test +49%), and balance (Stork +26%, right and +64%, left). Results indicated decreased waist (-8%) and hip (-5%) circumference and Timed up and Go (-13%). CONCLUSION: These results indicated improvement in overall fitness measures for participants with ASD involved in a 12 week client-centered fitness and nutrition education program. In addition, participants expressed their enjoyment in attending GetFIT and the social interaction with university students. Funded by a Doug Flutie Jr. Foundation Grant

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Accuracy Of Parent And Child Self-Reported Physical Activity In Children With Special Needs: A Pilot Study

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(No relevant relationships reported)

Physical activity (PA) is an essential component of health that necessitates accurate measurement. Parents of children with special needs (SN) have an increased involvement in their child's daily life; therefore, it would seem plausible that they could provide an accurate assessment of their child's PA. The accuracy of self-report measures in children with SN has not been established. **PURPOSE:** Determined the accuracy of self-reported PA as compared to doubly labeled water (DLW) for children with SN. Furthermore, we assessed if child's age or diagnosis was related to the accuracy.

METHODS: This prospective cross-sectional study, included 36 child/parent dyads stratified by child's age (4-7; 8-12; and 13-18 years), diagnosis and ambulatory status (spina bifida-ambulatory n= 9; spina bifida-wheelchair n= 9; Down syndrome n= 9, and control n= 9). PA energy expenditure by weight (kcal·kg^{-1}·day^{-1}) was calculated from total energy expenditure, measured via DLW, by subtracting an estimated resting metabolic rate and thermic effect of food and then dividing by the child's weight. Self-reported PA (MET·min^{-1} day^{-1}) was measured by an activity journal completed by parents and children ≥13 years for four weekdays and two weekend days. T-tests compared MET·min·day^{-1} reported between the parents and children. Pearson correlations assessed relationships between journals and DLW.
RESULTS: No significant differences between activity levels reported by parents and children (25.05 vs. 27.32 MET·hrs·day^{-1}; $p = 0.29$). Parent and child self-reported activity levels were moderately correlated to DLW (r=0.63, $p<0.001$; r=0.74, $p<0.05$, respectively). When examined by age, parent reported activity and DLW were significantly related all age groups. No significant relationship between self-reported activity levels and DLW based on diagnosis.
CONCLUSION: With their increased involvement, parents of children with SN were able to report activity levels of their child similar to the child's self-reported activity. Both parent and child reporting had moderate relationships to the criterion. Self-report methods while cost-effective, have been minimally tested in children with SN. Therefore, further examination in larger samples is recommended along with utilizing objective measures of PA.

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Guardian Perception Of Self-esteem And Mastery In A Special Needs Population

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(No relevant relationships reported)

Self-esteem and mastery are psychological factors that may be affected by learning a new physical skill. The primary objective of iCan Bike (ICB) is to instruct individuals with special needs and/or disabilities on how to ride a two-wheeled bicycle. Very few studies have assessed the effects of learning a new physical skill on self-esteem and mastery in special needs and/or disabled populations. **PURPOSE:** To assess guardian perceived self-esteem and mastery scores, of the ICB participant, as measured by the Rosenberg Self-Esteem Scale (RSES) and Pearlin Mastery Scale (PMS). **METHODS:** The RSES (10 items; 5 positive and 5 negatively worded items) and PMS (7 items) questionnaires were completed by the guardian of the participant in the ICB camp. A one-way repeated measures Analysis of Variance, with a Bonferroni *post-hoc* test, was conducted to compare questionnaire results across pre-, post-, and 30 days post-camp. All data was analyzed using SPSS (v24.0) with significance set at $p<0.05$.
RESULTS: A total of 141 questionnaires were completed on an ICB participant sample consisting of 63.8% (n=90) males and 36.2% (n=51) females. A total of 63.1% (male=65.6%; female=58.8%) of participants learned to independently ride a bicycle. A significant increase in mastery was observed [F(2,280)=23.699, ($p<0.001$)], with significant increases observed pre- (23.03±4.64) to post-camp (25.44±4.60) ($p<0.01$), and post- to 30-days post-camp (26.61±5.24) ($p<0.001$). No significant RSES effect was observed. **CONCLUSIONS:** A significant increase in mastery may be related to the daily observable progress associated with watching the participant learn to ride a bicycle. The success rate of this study (63.1%) was lower than the ICB advertised rate of 80%, which may be a primary reason for the lack of change in self-esteem scores. More research needs to be completed on the psychological effects that learning to ride a bicycle has on self-esteem and/or mastery in the special needs population.

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Replacing Sedentary Time with Light Physical Activity Reduces Mobility Limitation in Older Adults: NHANES 2003-2006

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(No relevant relationships reported)

PURPOSE: Increased time spent in sedentary behavior (SB) and reductions in total physical activity (PA) are linked to functional limitations in aging populations. The purpose of this study is to examine the relationship of replacing SB time with light-intensity PA (LPA) and/or moderate-vigorous-intensity PA (MVPA) on physical function in a nationally representative sample of older adults.
METHODS: A cross-sectional analysis using isotemporal substitution models with multinomial regression was performed in older adult participants from the 2003-2006 National Health and Nutrition Examination Survey. A hip-worn accelerometer with counts per minute (cts/min) cut-points for SB (<100 cts/min), LPA (100-1951 cts/min), and MVPA (≥1952 cts/min) were used to estimate the odds of reporting 0, 1, or 2+ self-reported functional limitations when replacing SB with LPA and/or MVPA. Covariates included age, sex, race/ethnicity, body mass index, smoking, education, income, and marital status.
RESULTS: The analysis included a sample of 1971 older adults (60-85 years) averaging 583 ± 166 min·d-1 (mean ± SD) in SB, 287 ± 102 min·d-1 in LPA, and 11 ± 15 min·d-1 in MVPA. Within the sample 39.8% reported no limitation, 16.7% with one limitation, and 43.5% with 2+ limitations. The odds of having one functional limitation was significantly reduced when replacing 60 min of SB with 60 min MVPA (odds ratio 0.303, 95% CI 0.116-0.791), but not with 60 min of LPA (0.926, 0.832-1.031). However, replacing 60 min of SB with a combination of 55 min of LPA and as little as 5 min of MVPA significantly reduced the odds of having one limitation (0.844, 0.746-0.955). The odds of having 2+ limitations was significantly reduced when replacing 60 min of SB with LPA (0.736, 0.679-0.798) or MVPA (0.074, 0.018-0.293). Lastly, the odds of transitioning from one to 2+ limitations was significantly reduced when replacing 60 min of SB with LPA (0.794, 0.716-0.881) or MVPA (0.245, 0.070-0.858).
CONCLUSION: While the functional benefits of MVPA are well-established, altering the daily balance between LPA and SB is shown to be protective against developing functional limitations. Further, replacing SB with LPA and complimentary doses of MVPA may be a more practical approach to effectively prevent or reduce functional limitations among older adults.

D-65 Free Communication/Poster - **Physical Activity and Exercise in Children and Youth**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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Participation In Physical Education Classes And Physical Activity And Sedentary Behavior In Children

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(No relevant relationships reported)

PURPOSE: To examine the associations between participation in Physical Education (PE) classes and objective measures of physical activity (PA) and sedentary behavior (SB) in children from 12 countries at different levels of human and socioeconomic development. **METHODS:** This multinational, cross-sectional study included 5874 children aged 9-11 years from sites in Australia, Brazil, Canada, China, Colombia, Finland, India, Kenya, Portugal, South Africa, the United Kingdom, and the United States. PA and SB were measured over 7 consecutive days using a waist-worn accelerometer. Participation in PE classes was determined by questionnaire. Multilevel modeling analyses were used to account for the hierarchical nature of the data.
RESULTS: PE classes were not attended by 6.6% of the total sample, and in low- and middle-income countries this prevalence was higher than in high-income countries (8.4% vs. 4.7%, respectively, p<0.01). After adjusting for age, sex, parental education, and BMI z-score, results showed that children from low- and middle-income countries who participated in PE classes at least once a week were more likely to meet the moderate-to-vigorous physical activity (MVPA) recommendations (male - OR: 1.80; 95%CI: 1.17-2.77; female - OR: 2.17; 95%CI: 1.44-3.27), to spend more time at different PA intensities, and to have shorter SB time (male - OR: 1.61; 95%CI: 1.01-2.60; female - OR: 2.20; 95%CI: 1.38-3.50) than those who did not attend PE classes. In high-income countries, boys that participated in PE classes were more likely to meet the recommendations for PA (OR: 2.20; 95%CI: 1.29-3.76) and to have shorter SB time (OR: 2.42; 95%CI: 1.22-4.81). For girls in high-income countries, attending PE classes increased the likelihood of spending more time in MVPA, especially if they attended three or more classes per week (OR: 2.42; 95%CI: 1.22-4.80).
CONCLUSION: Attending PE classes is associated with a higher level of PA and lower level of SB in children from countries at various levels of human and socioeconomic development. PE classes should be compulsory in all countries as an important contributor to healthy movement behaviors of children.

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Difference In Physical Activity Between Children Without Siblings And With Siblings

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(No relevant relationships reported)

Children without siblings, singletons, have higher rates of obesity than children with siblings, non-singletons. Physical activity, such as increased moderate-to-vigorous physical activity (MVPA) and decreased sedentary behavior, can curb excess weight gain early in life. **PURPOSE**: The purpose of this study is to examine the differences in physical activity and sedentary behavior between singleton and non-singleton children. **METHODS**: Mothers of singleton children ages 5.0-7.9 years old and mothers of non-singleton children ages 5.0-7.9 years old with a sibling between the ages of 2.0-4.9 years old in their primary household were recruited. Height, weight, and waist circumference (WC) of child were objectively measured. Mothers reported demographic characteristics of the child and self, and completed a questionnaire on their physical activity. Children wore an accelerometer at the ankle for at least 5 full days while parents recorded daily activities and time spent in away from home care (such as child care or kindergarten). Body mass index (BMI) was calculated, and BMI and WC percentiles were calculated for age and sex. MVPA and sedentary behavior per hour were calculated using accelerometer cut points and total wear time. **RESULTS**:43 mother-child dyads (10 singletons and 33 non-singletons) participated. On average mothers were 34.7 years old, employed full time (69%), married (77%), and the child's biological mothers (97%); while children were 5.81 years old and predominantly white (62%). Singletons had a higher BMI percentile (80.1±21.3) and waist circumference percentile (77.6±21.7) compared to non-singletons (55.7±29.0, *p*=0.02; 53.4±21.3, *p*<0.01). In individual models, singletons did not differ in time away from home care (*p*=0.60) or in their mother's average MET minutes per week compared to non-singleton children (*p*=0.90). After adjusting for child BMI percentile and month of wear, singletons spent 2.96 less minutes per hour in MVPA (*p*<0.01) and 5.18 more minutes per hour in sedentary behavior compared to non-singletons (*p*=0.01). **CONCLUSIONS**: In this sample, singletons had a higher BMI percentile and were less active compared to non-singletons. Investigation into differences in singleton/non-singleton families, including family health behaviors, may support understanding of the mechanism.

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Parent Physical Activity Practices and Associations with Physical Activity and Sedentary Time in Preschool-Age Children

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(No relevant relationships reported)

Preschool-age children have the potential to be influenced by parent physical activity (PA) practices more than older children as preschool-age children are more reliant on parents for PA opportunities. Previous research with this focus has relied predominantly on various subjective assessments of child activity which often results in an overestimation of PA and an underestimation of sedentary time (ST). **PURPOSE**: The purpose of this study was to explore associations among parenting PA practices and child PA and ST by utilizing objective measures of activity and the full range of PA intensities in a cross-sectional sample of preschool-age children. **METHODS**: Child PA was assessed for 7 days via accelerometer (ActiGraph GT3X+) using age-appropriate cut-points. Parent PA practices were assessed via parent completion of the Activity Support Scale for Multiple Groups (ACTS-MG). A total of 169 parent (34.5 ± 8.1 yrs.; 30 males, 134 females, 5 unreported)/child (3.6 ± 0.7 yrs.; 80 boys, 89 girls) dyads had compliant PA and survey data and were used for analyses. Multiple multilevel mixed-effects linear regression analyses were utilized to identify parent PA practices that were significantly associated with PA intensities, including total PA (TPA). ACTS-MG individual item analyses were also completed by rescaling ACTS-MG item responses. Statistical significance was set at p≤0.05. **RESULTS:** Vigorous PA (VPA) (p=0.02) and moderate-to-vigorous PA (MVPA) (p=0.04) in boys was positively associated with the parent PA practice of using community resources and negatively associated with parents that reported "I take my child to places where he can be active (p=0.01; p=0.05, respectively). VPA in boys was positively associated with parents that reported "I enroll my child in community-based programs (such as Girls and Boys Club, YMCA) where he can be active" (p=0.05). VPA in girls was positively associated with parents that reported "I limit how long my child plays video games" (p=0.03). **CONCLUSION**: Parent utilization of community resources and restricting sedentary activity, especially video game use, have been found to be

significantly associated with preschool-age child activity. However, there is a need to help parents understand other strategies to promote PA and discourage ST in young children.

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The Relationship Between Screen Time and Sleep Duration in Children

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(No relevant relationships reported)

Excess screen time (ST), low sleep duration (SLD), and physical inactivity, are risk factors for childhood obesity. Also, excess ST has been associated with poorer sleep quality and shorter SLD. The American Sleep Foundation recommends 9-11 hours of sleep per night for school aged children. **PURPOSE**: To determine the relationship between ST and SLD among children who participated in a school based nutrition and physical activity intervention.
METHODS: Cross sectional analysis of 5th grade public school students (N =742, mean age 10.5 years, range 9-13 years). Participants self-reported their ST, SLD, and wake time.
RESULTS: A Pearson correlation coefficient indicated a small but significant negative correlation between ST and SLD (r = -0.13, p < 0.01). A one-way ANOVA comparison between three groups categorized into "low", "medium", and "high" ST levels showed a significant difference in SLD between groups (F 2,739) = 6.82, p < 0.001). Post hoc comparisons using the Tukey HSD test indicated the mean SLD for the low ST group (M =10.17, SD =1.20) was significantly higher compared to the SLD in the high ST group (M = 9.77, SD =1.29), but the Cohen's effect size value (d = 0.34) indicated a small difference in magnitude.
CONCLUSIONS: The results suggest an inverse relationship between ST and SLD. The children categorized with low ST had significantly higher SLD versus children with high ST, though the mean hours of sleep for all groups met current recommendations. Intervention studies in youth should consider incorporating strategies to decrease ST in youth not only increase physical activity, but also to improve SLP duration. Funding Sources: -Blue Cross Blue Shield Foundation of Michigan; -Michigan State University Extension USDA Supplemental Nutrition Assistance Program; -Superior Health Foundation, Marquette MI.

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Lipoprotein Subclasses And Their Associations With Physical Activity, Cardiorespiratory Fitness And Adiposity In Norwegian Schoolchildren

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(No relevant relationships reported)

Physical activity (PA), cardiorespiratory fitness (CRF) and adiposity are associated with certain lipoproteins. Research in adults has shown that these associations are not consistent across lipoprotein subclasses.
Purpose: To examine cross-sectional associations in children between objectively measured PA and sedentary time (SED), CRF and adiposity with a number of biomarkers of lipoprotein metabolism.
Methods: We included 1056 healthy fifth-grade (mean age 10.2 yrs) Norwegian children (47.3% females). Total PA (tPA), PA intensity (light (LPA); moderate (MPA); vigorous (VPA)), and SED were assessed using triaxial accelerometry. We used the Andersen test to measure CRF, and waist circumference to measure abdominal adiposity. We quantified 31 measurements of lipoprotein metabolism including concentrations of 15 subclasses and particle size of three major classes (VLDL, LDL, HDL) using nuclear magnetic resonance spectroscopy. We used multiple linear regression models adjusted for age, sex, pubertal development and socioeconomic status (standard model). Additional tPA, PA intensity and CRF models were adjusted for adiposity, and additional adiposity models were adjusted for moderate-vigorous PA (MVPA) and CRF separately. We applied a false discovery rate (FDR) correction to *p*-values of each regression model.
Results: Adiposity was associated with all 31 biomarkers in the standard and PA-adjusted models, and 30 biomarkers having adjusted for CRF. CRF was associated with 29 of the biomarker measures in the standard model and 22 having adjusted for adiposity. Total PA, VPA, MPA, LPA and SED were associated with 13, 21, 14, 0 and 9 of the 31 biomarker measures, respectively in the standard model. After adjusting for adiposity, there were 8, 7, 7, 0, and 4 biomarker associations, respectively. All FDR-corrected *p*-values < 0.05.
Conclusion: CRF is associated with the majority of markers of lipoprotein metabolism independent of adiposity. Physical activity, especially of higher intensity, is associated

with some of these biomarkers independent of adiposity, whereas LPA and sedentary time appear associated with a small number of biomarkers. This suggests that improving CRF and increasing physical activity of at least moderate intensity may favourably affect lipoprotein metabolism in healthy children.

1891   Board #152   May 31 2:00 PM - 3:30 PM

Physical Activity does not Modify the Relationship between Asthma and Obesity in African American Youth

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(No relevant relationships reported)

Asthma is an important health issue in adolescents, particularly among African Americans (AA). Previous research has identified obesity as a risk factor for childhood asthma, however, less research has examined whether asthma predicts obesity. It is plausible that the presence of asthma symptoms may contribute to inactivity and subsequent obesity risk in AA youth.
PURPOSE: The purpose of this study was to assess the cross-sectional relationships between the presence of asthma symptoms, weight status, moderate-vigorous physical activity (MVPA) and sedentary time (SED) among AA adolescents.
METHODS: A community-based sample of 163 AA youth (55% female, 31% obese, ages 11-18 years), recruited from southeast Michigan were included in this analysis. Asthma symptoms were evaluated and given a single score from 0 (no symptoms ever) to 11 (all symptoms often) using the International Study of Asthma and Allergies in Children's Phase Three questionnaire. MVPA and SED were measured via accelerometry. Weight status was assessed via body mass index (BMI) where weight and height were measured via an electronic scale and stadiometer, respectively.
RESULTS: Of the 163 adolescents included in the analysis, 68 reported no symptoms of asthma (54% female, 22% obese). T-tests revealed those with no symptoms of asthma engaged in less MVPA (no symptom: 12.5±0.1min; $\geq$ one symptom: 13.6±0.1min, p<0.001) and more SED (no symptom: 758.3±1.2min; $\geq$ one symptom: 753.8±1.0min, p=0.004) compared to adolescents with one or more symptoms of asthma. After accounting for the confounding effects of sex, parental education, and pubertal development; asthma symptom score was positively associated with BMI (β=0.6±0.2, p=0.004). When MVPA and SED were included in the model, the relationship between asthma symptom score and BMI remained significant (β=0.5±0.2, p=0.007).
CONCLUSION: A higher presence of asthma symptoms predicted increased weight status in AA adolescents. Physical activity participation and sedentary time did not modify this relationship, suggesting that other factors contribute to the increased obesity risk in children exhibiting asthma symptoms. Longitudinal studies are needed to better understand the relationship between asthma and obesity in AA adolescents.

1892   Board #153   May 31 2:00 PM - 3:30 PM

Cardiovascular Fitness, Body Composition, And ADHD Diagnosis Among Youth In NHANES1-2004

Lundon C. Burton. *University of Illinois at Chicago, CHICAGO, IL.* (Sponsor: Dr. Eduardo Bustamante, FACSM)
(No relevant relationships reported)

Abstract
Purpose: The study investigated the relationship between cardiovascular fitness, body composition, and ADHD diagnosis. Obesity and ADHD are highly comorbid—ADHD children are twice as likely to become obese adults than typically developing peers. However, the role of physical fitness in this relationship remains unexplored.
Methods: Youth age 12-19 years old (N=4,790) participating in the National Health and Nutrition Examinations Survey (NHANES) 2001-2004 were included. Parents reported demographics and whether their child had ever been diagnosed with ADHD. Children underwent examinations of body fat percentage via bioelectrical impedance and estimated VO2 max via a submaximal treadmill test. *Chi-square* analyses and *t*-tests assessed differences between ADHD and typically developing (TD) youth on fitness and composition. Significant differences variables entered a logistic regression analysis with ADHD diagnosis as the dependent variable and estimated VO2 max, percent body fat, age, race/ethnicity, gender, and household income as predictors.
Results: Males were 3 times more likely to be diagnosed with ADHD than females (12% vs. 4%) (β=1.109, Exp(B)=3.03, p < .001). Non-Hispanic Whites were more likely to have been diagnosed with ADHD (13%) compared to Mexican Americans (4%) and Non-Hispanic Blacks (7%); they were also more likely to have seen a mental health professional in the last year (13%), compared to Blacks (8%) and Mexican Americans (6%). Children diagnosed with ADHD evidenced significantly higher VO2 max than typically developing peers (45.3 ml/kg/min vs. 42.0 ml/kg/min; t= -5.00, p<.001) and lower % body fat (26% vs. 29%; t=4.83, p<.001). In regression analyses age, gender, and estimated VO2 Max were related to ADHD, while body fat %, race/ethnicity, and household income were not. For each 1ml/kg/min increase in VO2 max odds of ADHD diagnosis increased by 2% (β=.017, Exp(B)=1.02, *p*< .01).
Conclusion: The associations between ADHD, physical fitness and percent body fat

were in the opposite direction of hypotheses and previous literature. This may be a function of ADHD diagnosis as the outcome, rather than symptoms. Unfortunately low-income and racial/ethnic minority children are less likely to be diagnosed and more likely to be obese and unfit. Future studies should directly assess ADHD.

1893   Board #154   May 31 2:00 PM - 3:30 PM

Youth Participation in Competitive Sports Associates with Midlife Lean Body Mass and Physical Activity

Eija Laakkonen[1], Janne Kulmala[2], Tuija Tammelin[2], Harto Hakonen[2], Mirja Hirvensalo[1], Urho Kujala[1], Vuokko Kovanen[1], Sarianna Sipilä[1], Urho Kujala[1]. *[1]University of Jyväskylä, Jyväskylä, Finland. [2]LIKES Research Center for Physical Activity and Health, Jyväskylä, Finland.*
(No relevant relationships reported)

Benefits of life-long physical activity (PA) are widely recognized. Fewer studies have investigated how being young competing athlete reflects to later life body composition and PA. **PURPOSE:** To investigate the impact of participation in competitive sports in youth on the body composition and subjectively and objectively measured PA at middle-age. **METHODS:** The study participants are 47-to-55-year old Finnish women (n=985) attending to the Estrogenic Regulation of Muscle Apoptosis study (ERMA). Their participation in competitive sports at the age of 13-to-16 was assessed with retrospective self-report. Midlife lean body mass (LBM), skeletal muscle mass (SMM) and fat mass (FM) were measured with bioimpedance (Inbody 720) after overnight fast (n=866). Midlife PA included *7-scaled self-estimate* that was reclassified to form sedentary, light, moderate and vigorous PA categories (n=985), *a detailed assessment of leisure-time PA* volume, duration and intensity (a modified Kuopio Ischemic Heart Disease Risk Factor Study Questionnaire, n=982) enabling calculation of mean daily metabolic equivalent (MET-h/day) index as a proxy of the previous 12 months PA and *objectively measured total PA* over seven-days by hip-worn accelerometer (Actigraph GT3X+ or wGT3X+, n=734). Statistical differences were tested using chi-squared test, independent samples t-test or Mann-Whitney U test. **RESULTS:** Participants were assigned into youth athlete (n=136) or non-athlete (n=849) groups based on their participation in competitive sports at the age of 13-to-16. Youth athlete group had 1.5 kg higher LBM (p=0.002) and 1.0 kg higher SMM (p=0.001) at middle-age, but no statistically significant difference in FM. Youth athletes reported more vigorous PA (32.4% vs. 20.3%, p=0.007) and higher leisure-time MET index (4.3 vs. 3.4 h/day, p<0.001) than non-athletes. No difference was observed in accelerometer-measured sedentary time, light PA, moderate-to-vigorous PA or total PA (counts) between groups. **CONCLUSION:** Participation in sport competitions as a teenager has long lasting health benefits that associates with healthier body composition and higher leisure-time PA later in life. However, the discrepancy between self-reports and objective measures needs further studies to delineate the benefits of different components of PA.

1894   Board #155   May 31 2:00 PM - 3:30 PM

Differences and Agreements in Physical Activity of Older Adolescents and Young Adults

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(No relevant relationships reported)

PURPOSE: To examine the differences in physical activity (PA) from older adolescence to young adulthood and the likelihood of meeting the aerobic component of the 2008 Physical Activity Guidelines (PAG) at both times.
METHODS: This study analyzed the Iowa Bone Development Study participants' moderate- and vigorous PA (MVPA) and vigorous PA (VPA) measured with accelerometers at ages 17 and 21 (N = 303). Questionnaire estimated living status (LS, with parents vs not), and student status (SS, enrolled in college/tech/junior college vs not) at age 21. Spearman correlation compared PA of age 17 and 21. Fisher's exact test identified the odds of meeting PAG at both ages. Wilcoxon test examined the effects of LS and SS on PA at age 21. Alpha was set at 0.05.
RESULTS: MVPA at age 17 was associated with MVPA at age 21 (males r = 0.31, females r = 0.22). VPA at age 17 was associated with VPA at age 21 (males r = 0.29, females r = 0.18). Table 1 shows participants' PA characteristics. Ninety-five percent of males and seventy-one percent of females who met PAG at age 17 also met corresponding PAG at age 21. Living with parents at age 21 decreased MVPA minutes in males by 17.7 and in females by 5.92; and VPA minutes in males by 2.48 and in females by 1.85 compared to living elsewhere. Being a student at age 21 increased MVPA minutes in males by 10.52 and in females by 11.46; and VPA minutes in males by 2.56 and in females by 3 compared to not being a student.
CONCLUSION: PA association between ages 17 and 21 were low but statistically significant.
Most participants who met PAG at age 17 also met PAG at age 21. The weak association between older adolescent and young adult PA suggests that PA is not an intractable behavior and that intervening during this transition time may successfully increase young adult PA.

Abstracts were prepared by the authors and printed as submitted.

1895   Board #156   May 31 2:00 PM - 3:30 PM

Associations of Short Bout Sedentary Behavior and Physical Activity with Adiposity and Fitness in Children

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(No relevant relationships reported)

PURPOSE: Total duration of sedentary behavior (SB) is not consistently associated with adiposity and fitness in children. In adults, SB accumulated in long bouts has been positively associated with adiposity while short bouts are inversely related. We studied the effect of displacing long bout SB with short bout SB and physical activity in children.
METHODS: This cross-sectional study included 450 children aged 9-11 from New Zealand. Objective SB and activity were measured via wrist-worn accelerometer for ≥ 3 days. Activity was classified as long (≥10 min) and short (<10 min) bout SB, light, and moderate-to-vigorous physical activity (MVPA). Estimated cardiorespiratory fitness (mL/kg·min) was assessed using the 20 metre shuttle run test. Adiposity measures were World Health Organization BMI z-score (zBMI), waist circumference (WC) and Fat Mass Index (FMI). Isotemporal substitution estimated the effect of displacing long bout SB with short bout SB, light and MVPA (per SD) on adiposity and fitness in adjusted linear mixed models.
RESULTS: Children accumulated the following mean (SD) in min/day: 32 (17) long bout SB, 302 (42) short bout SB, 235 (27) light activity, and 131 (29) MVPA. Overall and in boys only, substituting long bout SB with short bout SB and physical activity was not associated with adiposity. Among girls, substituting with short bout SB (std. coef. = -0.84, p=0.038) and MVPA (std. coef. = -0.78, p=0.017) were inversely associated with FMI. Overall and by sex, substituting with MVPA was associated with higher fitness (std. coef.=2.08 mL/kg·min, p≤ 0.001). Substituting with short bout SB was associated with higher fitness in girls (std. coef. = 1.44 mL/kg·min, p=0.036). (Table 1)
CONCLUSIONS: As compared to long bouts, short bout SB (<10 min) was not adversely associated with outcomes and, in some cases, was related to more favorable f adiposity and fitness. SB pattern (long vs. short bout) may be important for clarifying health risks related to SB in children.

Table 1. Associations between Sedentary Behavior (SB), Light, and Moderate-to-Vigorous Intensity Physical Activity (MVPA), Adiposity, and Fitness among Children aged 9-11

		Boys (n=220)		Girls (n=230)		Overall (n=450)	
		std. coef.	P-value	std. coef.	P-value	std. coef.	P-value
zBMI	Short bout SB	0.08	0.717	-0.17	0.376	-0.05	0.749
	Light	0.13	0.294	-0.14	0.214	-0.02	0.843
	MVPA	-0.02	0.910	-0.13	0.375	-0.07	0.546
FMI	Short bout SB	0.25	0.540	**-0.84**	**0.038**	-0.31	0.285
	Light	0.28	0.248	-0.20	0.398	-0.01	0.985
	MVPA	-0.13	0.687	**-0.78**	**0.017**	-0.40	0.076
WC (cm)	Short bout SB	-0.02	0.988	-1.81	0.234	-0.84	0.437
	Light	0.35	0.706	-1.07	0.238	-0.46	0.490
	MVPA	-0.73	0.537	-1.65	0.168	-0.93	0.268
VO₂ Max (mL/kg·min)	Short bout SB	0.15	0.864	**1.44**	**0.036**	1.09	0.052
	Light	-0.85	0.390	-0.33	0.416	-0.50	0.151
	MVPA	**2.24**	**0.001**	**2.08**	**0.000**	**2.42**	**0.000**

Standard coefficients (std. coef.) present change in dependent variable per 1 SD change in activity metric and are adjusted for accelerometer wear time, age, socioeconomic status, gender, and school.

1896   Board #157   May 31 2:00 PM - 3:30 PM

Associations Between School Transport And Obesity By Gender, Grade, Physical Activity, Ethnicity, And Economic Disadvantage

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(No relevant relationships reported)

PURPOSE: To examine the prevalence of school transport modes and obesity by gender, grade, physical activity, race/ethnicity, and economic disadvantage in a representative sample of Texas school children.

METHODS: Cross-sectional data on reported sociodemographic characteristics, school transport mode, and physical activity behavior were collected from the Texas School Physical Activity and Nutrition (SPAN) Survey, 2015-2016. Measured height and weight were used to calculate BMI and classify 4th, 8th, and 11th grade students by obesity status. The sampling frame had 14,976 students from 452 schools to provide weighted state-level estimates by grade. Descriptive statistics and associations were conducted between school transport modes and obesity. Interaction terms were included to test if school transport mode-obesity associations differed by gender, grade, physical activity, race/ethnicity, or economic disadvantage.
RESULTS: Participants were predominately Hispanic (69.8%), normal weight (55.8%), used passive school transport modes (90.9%), and did not meet physical activity guidelines (82.4%). Active and passive school transport modes were not significantly associated with obesity (all *p*s>0.05). Gender, race/ethnicity, physical activity, and economic disadvantage were significantly associated with obesity (all *p*s<0.05). Bike to school by race/ethnicity and walk to school by grade were significantly associated with obesity (all *p*s<0.05). Hispanic/AA students who biked to school were significantly more likely to have obesity compared to White/Other students who did not bike to school (OR=5.48, *p*<0.05, 95% CI: 1.25, 24.00). Students in 8th grade who walked to school were significantly less likely to have obesity than 4th/11th grade students who did not walk to school (OR=0.42, p<0.05, 95% CI: 0.19, 0.91).
CONCLUSIONS: These findings suggest that associations between active school transport modes and obesity differ by sociodemographic characteristics, including race/ethnicity and grade. Population-based approaches to childhood obesity prevention may benefit from understanding disparities in opportunities for school transport modes. Supported by the Texas DSHS with funds from the Title V MCH Block Grant to Texas, the CDC HHS Block Grant, and the Michael & Susan Dell Foundation.

1897   Board #158   May 31 2:00 PM - 3:30 PM

Freestyle Swimming Performance From Childhood To Adolescence Of Japanese Top-Class Swimmers.

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(No relevant relationships reported)

Various studies, including genetic studies, to find elite athletes have been carried out. Childhood records may be a good index for finding elite athletes. However, limited data are available on this topic. **PURPOSE:** The purpose of this study was to evaluate the relationship of freestyle swimming performance between childhood and adolescence of Japanese top-class swimmers. **METHODS:** Subjects were male and female swimmers who participated in official competition accredited by the Japan Swimming Federation held from April 2007 to April 2017. The records of 100 m freestyle short-course performances of 22 year olds during 2016 to 2017 (latest TIME), and 12 to 21 year olds during 2006 to 2016 were analyzed. We evaluated the relationship between the latest TIME and the record of each age using Pearson's correlation coefficient. Also, we compared the average value of the records of the 2 groups, divided into the upper group and the lower group using the median of the fastest records of each individual by independent t-test for each age group. **RESULTS:** The table shows the matrix of correlation coefficient of male swimmers. In males, the correlation between the latest TIME and each age record for 10 years gradually became stronger from 16 years old, but there was not a clear tendency from the previous record. In females, a clear tendency was not observed. The difference between the records of the upper group and the lower group was statistically significant (P <0.05) before the record at 17 years old in males and 16 years old in females. **CONCLUSION:** These results suggest that there isn't a strong relationship between early childhood performance and latest TIME of Japanese top-class swimmers.

1898   Board #159   May 31 2:00 PM - 3:30 PM

Dose Response of Cardiorespiratory Fitness Interventions in Adolescents: A Systematic Review

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(No relevant relationships reported)

PURPOSE: The decline of cardiovascular fitness (CRF) in adolescents has become a major concern. Efforts have been to improve adolescents' CRF through exercise interventions, but the dose response of the interventions has not been summarized. This study was to determine the exercise dose response needed for increasing CRF in adolescents (12-19 yr. old).
METHODS: Google scholar, Web of Science, PsycINFO, Scopus, SPORTDiscus, and Cochrane databases were searched. In addition, the listed studies' methodological quality was assessed. The standardized mean differences and 95 % confidence intervals (95 % CIs) were calculated as the effect size measures (ES).

RESULTS: The search yielded 50 studies, a total of 15 studies were included in the review. Most of the included studies employed a randomized control trial study design (12/15, 67%). Samples sizes ranged from 20 to 60. Intervention length ranged from 6-60 weeks. The major indicator of CRF was VO_{2max}, measured by laps (20-m shuttle run) or minutes (1-mile run). Aerobic exercise was utilized in most of the interventions (73%), followed by resistance training (20%), and a combination of aerobic and resistance training (6.7%). Interventions with intensity of "> 60% maximal heart rate (HRmax)" were found statistically significant for improving CRF (ES =0.87, 95% CI 0.23 to 1.11, p=0.04). Frequency of "3 times weekly" was found to be statistically significant for improving CRF (ES =1.07, 95% CI 0.37 to 1.77, p=0.003). Duration of an intervention that was "10-15 weeks" yielded statistically significance in improving CRF (ES =1.02, 95% CI 0.27 to 1.27, p=0.002). The effects of CRF interventions were moderate to significant (ES = 0.59, 95 % CI 0.55-0.88), with high heterogeneity (I^2 = 94 %). There was no sex difference (p=0.07) in terms of the interventions.
CONCLUSIONS: Exercise interventions achieving at least 60% of HRmax, meeting 3 times weekly for 10-15 weeks seem to have a positive effect on CRF among adolescents, but there is a high heterogeneity among those studies.

1899   Board #160   May 31 2:00 PM - 3:30 PM
Dose-response Effects Of Exercises In Children With Asthma: A Review

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(No relevant relationships reported)

PURPOSE: Exercise is shown to improve pulmonary function of asthmatic children, reduce asthma-related symptoms, and reduce physician office visits. Exercise can also improve physical fitness and quality of life for both children and their parents. This systematic review provides a summary of the dose-response effects of various exercise interventions for children with asthma, specifically pulmonary function, asthma-related symptoms and quality of life.
METHODS: A systematic search in several databases was performed. Fourteen randomized controlled studies of exercise interventions for children with asthma (aged 7-14 yrs.) were identified and compared. The effect size (ES) and 95 % confidence intervals (CIs) were computed and summarized.
RESULTS: Fourteen studies were included in this review. Most of the studies performed a randomized controlled study design (93%), with 19 to 61 participants. Length of interventions ranged from 4 to 15 weeks. Aerobic exercises like swimming and Tai-Chi, were employed in 12 of 14 studies (86%). Anaerobic training was employed in 1 of 14 studies (7.1%). Exercise interventions with moderate to vigorous intensity, 50%~75% VO_{2max}, were shown to most effectively improve cardiovascular fitness as well as pulmonary function for asthma control. Interventions with a duration from 8 to 12 weeks with a frequency of 2 to 4 times a week showed statistically significant improvements in pulmonary function. Pulmonary function was indicated by forced expiratory volume (ES=0.77, 95% CI, 0.56 to 0.99, p=0.002), peak expiratory flow rate (ES=0.50, 95% CI 0.25 to 0.97, p=0.007) and maximal inspiratory/expiratory pressure (ES=0.80, 95% CI 0.36 to 1.21, p=0.008). Most of the studies demonstrated reduced symptoms and physician visits, along with increase in self- reported quality of life.
CONCLUSIONS: Exercise interventions are safe and beneficial to asthmatic children. Effective interventions are suggested to have a duration of three months, with 3 training sessions per week consisting of 40-50 min of aerobic exercise. Moderate to vigorous intensity is recommended with resting period during each session.

1900   Board #161   May 31 2:00 PM - 3:30 PM
Exercise Interventions for Children with Autism: A Review

Samuel Streeter, Zezhao Chen, Weimo Zhu, FACSM. *University of Illinois at Urbana-Champaign, Champaign-Urbana, IL.*
(No relevant relationships reported)

Samuel Streeter, Zezhao Chen, and Weimo Zhu
University of Illinois at Urbana- Champaign

PURPOSE: Autism is a spectrum of closely-related disorders with a collective core of symptoms. Research has been conducted to determine what the best exercise intervention for autism would be. However, the dose response of an exercise intervention for autism is unknown. The purpose of this study was to determine the dose response of exercise interventions for children (aged <12 yr. old), with autism spectrum disorder (ASD). **Method:** A systematic review of research, published from 1985 to 2017, was conducted using a number of criteria, including application of an exercise intervention for individuals diagnosed with ASD and utilization of an experimental/quasi experimental, correlational, single–subject, or qualitative research design. The standardized mean differences and 95 % confidence intervals (95 % CIs) were calculated as the effect size measures (ES). **Results:** 25 articles were identified using Google Scholar, Web of Science, and Ovid MEDLINE, but only 10 met the criterion for the review. 4 of the 10 were randomized control trials, 3 were repeated measure trials, 2 were multiple-baseline studies, and 1 was a pilot study. Eight (80%) included aerobic types of exercises. Nine (90%) employed moderate intensity (64%-76% %HRmax). The intervention length and duration that had the largest ES would be 20-45 minutes at 3-4 days per week for 10-12 weeks. Seven (70%) included results that showed improvement in "social and behavioral issues" and "motor skill development" from pre-to post trial. One (10%) showed an effect size that was statistically significant (ES=0.8, 95 % CI =-0.17- 2.04, p<0.00). **Conclusion:** The exercise interventions with moderate intensity, 20-45 minutes, 3-4 days per week, and lasting 10-12 weeks seemed helpful for children with autism.

1901   Board #162   May 31 2:00 PM - 3:30 PM
Differences in CVD Risk Factor Status and Micronutrient Intakes by Physical Activity Level in Youth

Jeanette M. Ricci, Joseph J. Carlson, Erich Petushek, Karin A. Pfeiffer, FACSM. *Michigan State University, East Lansing, MI.*
(No relevant relationships reported)

Physical inactivity is an independent CVD risk factor. In 5th graders few reports show associations between moderate to vigorous physical activity (MVPA) and multiple CVD risk factors, or between MVPA and micronutrient intakes that contribute to cardiovascular health. **PURPOSE:** To determine if high PA youth have a better CVD risk factor status and higher intakes of micronutrients linked to cardiovascular health, compared to low PA youth. **METHODS:** In a cross-sectional analysis of data from 5th grade students (N=947, 11 ± 0.5 y; 58.2% females; 58.4% white), trained research assistants collected height, weight, percent body fat (%BF) via bioelectrical impedance, resting blood pressure (SBP,DBP), and non-fasting blood samples by finger prick for total cholesterol (TC), low density lipoprotein (LDL), high-density lipoprotein cholesterol (HDL-C) and TC:HDL levels. Micronutrient intakes were derived from the Block Kids Food Frequency Questionnaire. MVPA groups were determined by median split (High PA≥5days, Low PA<5days). One-way ANCOVAs were used to determine if CVD risk factors and micronutrients differed between High- and Low PA- groups, when controlling for age and gender. **RESULTS:** High PA youth had lower %BF (23.1 vs. 25.3, F(1,926)=14.98, p<0.05) and higher HDL-C (49.7 vs. 46.5, F(1,667)=9.12, p<0.05) compared to Low PA, with no differences in TC, TC:HDL, or BP measures. Micro-nutrient intakes were assessed per 1000 kcals. High PA youth reported higher intakes of K+ (1.38 g vs. 1.29 g, F(1,890)=19.98, p<0.05), Mg+ (136 mg vs. 128 mg, F(1,890)=26.27, p<0.05), vitamin A (353 mcg vs. 332 mcg, F(1,890)=5.04, p<0.05), vitamin C (79 mg vs. 67 mg, F(1,890)=12.37, p<0.05), vitamin E (3.6 mg vs. 3.3 mg, F(1,890)=6.64, p<0.05) and lower Na+ (1.48 g vs. 1.52 g, F(1,890)=4.19, p<0.05) compared to Low PA, with no differences in calcium or vitamin D. **CONCLUSIONS:** The better CVD risk factor status in High PA compared to Low PA youth parallels previous cross-sectional findings. The higher intakes of cardioprotective micronutrients in High PA youth may have contributed to better CVD risk status.

D-66   Free Communication/Poster - **Population-Based Surveillance**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1902   Board #163   May 31 2:00 PM - 3:30 PM
Research on Relationship between Chinese Female Students' Height and Geographical Meteorological Indexes

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(No relevant relationships reported)

PURPOSE: This study explores the trend and relationship of Chinese 7-17 year old female students'height and major geographical meteorological indicators in the six Chinese major geographical regions from 1979 to 2014.Then, uses the map visualization method to show the visualization characteristics of the students' Height change trend.
METHODS: Using the principal component analysis method and the spatial interpolation technique in the geographic information system,the spatial structure of the Chinese students' physique has been reflected. Based on the mathematical statistics method and the regional comparison method, the height data of urban girls aged 7-17 years in China from 1979 to 2014 were divided and the height maps were mapped. The horizontal and vertical comparative analysis about meteorological indexes and the height was carried out according to the geographical division.

Abstracts were prepared by the authors and printed as submitted.

RESULTS: (1) regional characteristics: the overall trend of urban girls aged 7-17 in China showed an upward trend, from east to west, from coastal to inland gradient decreasing trend. 5 provinces in North , 4 provinces in northeast, 6 coastal provinces in southeast and Xinjiang Uygur Autonomous Region, higher than the central and northwest provinces.(2) characteristics of the times: With the increase of he year, the differences between provinces and cities gradually reduced . Untile 2014, short students in all provinces had been eliminated. This feture is most significant change in Inner Mongolia from 1991-2000.(3)There was a significant positive correlation between the temperature and the height of the urban girls in China. The temperature was positively correlated with the height of the female. The precipitation had a negative correlation with the height of the urban girls.
CONCLUSIONS:Air pressure and sunshine make a positive influence of girl's height, while a negative influence on temperature. The general trend of Chinese Female Students' height presented a trend of declining from east to west and decreasing from coastal to inland. GIS strong data management analysis and display function is the good way to explore the quality of students physical fitness database. It will serve and apply to student physique promotion and intervention.

1903   Board #164   May 31 2:00 PM - 3:30 PM

Thirty Years Secular Trend Of Rest Heart Rate In An Epidemiological Transtition Society

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(No relevant relationships reported)

PURPOSE: to analyze the rest heart rate secular trend among schoolchildren from Ilhabela, a city in a marked epidemiologial shift. Methods: the study is part of the Mixed-Longitudinal Project on Growth and Development from Ilhabela, organized by CELAFISCS since 1978. Sample consisted of 197 boys, aged 12 to 14 years-old, divided into 4 decades: 1978 (n=41), 1988 (n=43), 1998 (n=61), and 2008 (n=52). Measures included body weight and height, and rest heart rate (RHR) measured right before a bycicle ergometer test. Statistic analysis included an ANOVA one way to determine eventual differences among RHR from diferent decades. A post hoc Scheffé test was used to localize these differences. A level of p<,01 was taken as significant. Results: Mean RHR was 81.3 bpm in the 1978 decade, of 85.2 bpm in 1988 decade, of 89.4 bpm in 1998 decade, and of 91.7 bpm in the 2008 decade, confirming a positive secular trend with a significant increase of RHR between 1998 and 2008 in comparison to 1978 velues. It represented an increase of 9.1% and 11.3%, respectively, when compared 1998 and 2008 values to 1978 ones. It was also noted a increase of 11.4 kg in body weight, and an increase of BMI from 17.1 to 18.1, suggesting an important change in level of physical activity and/or diet. Conclusion: This positive secular trend in RHR values between 1978 and 1998 and 2008 represents a signal of cardio-vascular health deterioration in that community under marked epidemiological shift, as consequence of a decline in active life standards.

1904   Board #165   May 31 2:00 PM - 3:30 PM

Knowledge of the Adult and Youth 2008 Physical Activity Guidelines for Americans

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(No relevant relationships reported)

PURPOSE: The *2008 Physical Activity Guidelines for Americans* recommends adults engage in at least 150 minutes/week of moderate-intensity aerobic equivalent physical activity to achieve substantial health benefits. Youth should engage in 60 minutes of physical activity daily to receive overall health benefits. This study estimated the proportion of U.S. adults knowledgeable of the adult aerobic guideline and the proportion of parents knowledgeable of the youth aerobic guideline. **METHODS**: Data from a nationwide sample of U.S. adults who completed the 2017 *Summer ConsumerStyles* survey were analyzed. Participants were asked to identify the government recommended amount of physical activity needed for adults and youth to gain health benefits. Knowledge was defined as a response of "150 minutes spread out over a week" for the adult guideline, and "60 minutes, 7 days a week" for the youth guideline. Prevalence of knowledge of the adult guideline was estimated among all respondents (n=3,910), and of the youth guideline among respondents with school aged children (n=1,288). Differences by demographic characteristics, body mass index (BMI) categories, and physical activity levels were tested using adjusted chi-square tests. **RESULTS**: Overall, 2.4% (95% confidence interval (CI): 1.9, 3.1) of adults were knowledgeable of the adult guideline and 22.9% (95% CI: 20.5, 25.7) of parents were knowledgeable of the youth guideline. Knowledge of the adult guideline differed significantly by sex, education, income, physical activity level, and BMI category, while knowledge of the youth guideline differed by parental education and physical activity level. For example, knowledge of the adult and youth guideline was lowest among those with a high school degree or less compared to those with a college degree or higher (adult: 1.9% (95% CI: 1.2, 3.0) versus 4.0% (95% CI: 2.9, 5.3); youth: 16.1%

(95% CI: 12.3, 20.8) versus 24.9% (95% CI: 21.1, 29.2)). **CONCLUSIONS**: Despite the release of the *2008 Physical Activity Guidelines for Americans* nearly a decade ago, most U.S. adults and parents lack knowledge of the adult and youth aerobic physical activity guidelines. Effective communication strategies may help raise awareness of current and future editions of national guidelines for physical activity.

1905   Board #166   May 31 2:00 PM - 3:30 PM

Member Movement Rates Of Fitness Facilities In England

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(No relevant relationships reported)

PURPOSE: Low retention rates of fitness centre customers have previously been reported in the UK. To understand the scale of this problem, data were collected from fitness centres across England with respect to acquisition and attrition rates, or 'rate of movement'. **METHODS**: Data were obtained from 481 fitness facilities throughout England during 2016 (private 22%; public 73%; university <1%; council operated 4%) , resulting in a representative sample of the UK fitness sector. Movement rates, which are defined as the net gain or loss of members from the beginning to the end of each month, are the main outcome measure, and are analysed using Friedman's Two-Way ANOVA, Wilcoxon Signed tests, and linear regression, with significance set at p=0.05. **RESULTS**: An average annual movement rate of 0.12±0.01% was reported across all centres. A comparison of the data provided for each quartile resulted in significant differences between all quartiles (p<0.001). The highest movement rate was observed during the first quartile of the year (2.29±0.04%), with a continuous decrease until quartile four (-1.38±0.02%). The rate reversed in quartile three from a net gain towards a loss of members. Regression analysis demonstrated a significant correlation between calendar month and movement rate (R=-0.816, p<0.001), where calendar month explained over 60% of the variation (adjusted R^2=0.632). On average, movement rates decreased by 0.4% each month (B=-0.404, 95% CI (-0.606 to -0.202)).
CONCLUSIONS: Fitness centres in the UK only report a net increase of members during the first six months of the year, with a constant decrease in rates for each quartile. This indicates the need for interventions aiming to increase retention rates of members of fitness facilities. More information is needed to correlate attrition rates with member characteristics to identify high risk customers and develop suitable interventions.

1906   Board #167   May 31 2:00 PM - 3:30 PM

Improving the Operationalization of Neighborhood Built Environment Exposures in Physical Activity Research: Houston TRAIN Study

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(No relevant relationships reported)

Although evidence links the built environment (BE) to physical activity, findings remain inconsistent. Baseline Houston TRAIN study data were used to examine how geographic scale affects the relation between neighborhood BE measures (NBEMs) and physical activity.
PURPOSE: Determine if model fit and statistical significance of the associations between NBEMs and physical activity vary by participant-centric buffer sizes and identify an optimal geographic scale for operationalizing NBEMs.
METHODS: Using Geographic Information Systems, participant addresses were geocoded and a series of street-network, participant-centric buffers were built, with radii 250m-2500m (250m increments). NBEMs studied were park access and transit stop access (counts/buffer). Physical activity was measured with wGT3X-BT Actigraph monitors, and weekly minutes of moderate to vigorous physical activity (MVPA) were estimated using Freedson cut-points. Linear regressions were run estimating the association between NBEMs and MVPA per buffer size. Optimal geographic scale was determined based on model fit (R^2) and statistical significance. Models were adjusted for sex, age, education, marital status and race/ethnicity.
RESULTS: Data were available for 337 adults. For park access, significant (p<0.05) associations were observed at buffer sizes 2250m and 2500m. The 2500m scale had the best fit (R^2=0.15). Each additional park in the 2500m buffer was associated with 1.0 additional minutes of weekly MVPA. The interquartile range for number of parks within 2500m was 13. For transit access, significant associations with MVPA were observed at all scales. The highest R^2 (0.16) was at 2000m. Each additional transit

stop within 2000m was associated with 1.1 additional minutes of weekly MVPA. Those living in the highest quartile of transit access had 79 more transit stops within 2000m than those in the lowest quartile.
CONCLUSIONS: Larger scales (≥2000m, i.e. ≥24 min walk) than those commonly used in physical activity research (400-1000m) may be better suited for studying the relation of the BE with physical activity. Despite low effect sizes per unit increase, the geospatial variability of park and transit access is large, and could account for substantial differences in physical activity across Houston.
Supported by NIH R01 DK101593.

1907   Board #168   May 31 2:00 PM - 3:30 PM
Objectively Measured Physical Activity and Self-Reported Screen Time Behaviors in Omani Children: A Cross-Sectional Study

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(No relevant relationships reported)

World health organization recommends that children engage in at least 60 minutes of moderate- and vigorous-intensity PA (MVPA) per day, with at least 30 minutes of MVPA being achieved afterschool hours. Worldwide, the evidence shows that the prevalence of meeting PA recommendation in children is low. But the majority are from the Western and Asian countries and there is little data available from a country in the Middle-East that have different ethnic and cultural backgrounds. **PURPOSE**: This study examined the levels and patterns of objectively measured MVPA during afterschool hours in Omani children and to relate them with the self-reported PA and screen time behaviors. **METHODS**: 4th-grade children attending public elementary schools in Oman during October 2017 participated in the cross-sectional survey. A stratified, two-stage cluster sampling method resulted in a total of 324 children (boys=144; mean age=9.16 yrs old) completing all measures. Children were asked to wear the Polar Active watch across the three consecutive school days and to complete a questionnaire on PA and screen time behaviors. 30-sec epoch, metabolic equivalent (MET) data obtained from the device were used to estimate time spent in sedentary (<2) and MVPA (≥4) during 7-hour of afterschool period. **RESULTS**: On average, boys were less sedentary (251.3 mins/d) and more active, with greater MVPA (35.9 mins/day) and vigorous-intensity PA (VPA; 11.5 mins/d) than girls (251.3 mins/d, 26.0 mins/d, and 7.3 mins/d, for sedentary, MVPA, and VPA, respectively). Boys (69.9%) were more likely meeting 30-min MVPA guideline than girls (30.9%; Odds Ratio = 0.3). Most children reported one or less hours of watching TV (76.6%) and using computer/video games (85.5%) during school days, with girls being more likely to report No-TV watching (20.0%) or using computers (62.8%) than boys (13.2% and 41.67%, respectively). Girls are less likely participating in at least one sport team outside of school (45.0%) than boys (62.5%); yet PA and screen time behaviors were not associated with a likelihood of meeting 30-min MVPA guideline. **CONCLUSIONS**: The results showed that objectively measured PA levels of Omani children during afterschool hours are similar with those from the western countries. However, gender-disparities shown in the results should receive further attention.

1908   Board #169   May 31 2:00 PM - 3:30 PM
Prevalence And Characteristics Of Us State-level Physical Activity And Public Health Planning

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(No relevant relationships reported)

PURPOSE. The prevalence and attributable risk of disease due to physical inactivity requires it be made a public health priority. Public health planning allows for prioritization and resource allocation, particularly at the state and local level. The extent to which state planning efforts for physical activity exist in the US is unknown. **METHODS**. We developed and conducted a standardized internet search audit of each of 50 US states and the District of Columbia to determine the prevalence and characteristics of health planning documents that include physical activity. Data regarding prevalence and characteristics and degree of alignment with existing physical activity guidelines were abstracted for analyses.
RESULTS. Overall, physical activity was part of 215 health planning documents in 50 states. These documents ranged from those addressing various chronic diseases in adults, physical education in children and/or adolescents, or specifically stand-alone physical activity physical activity plans (n=2). Only 9.8% of documents specifically mentioned older adults as a priority population. For children and adolescents, 28.5% of documents aligned correctly with current aerobic physical activity guidelines, 6.6% with current muscle strengthening guidelines and 5.3% with current bone-strengthening guidelines. For adults, 28.5% of health planning documents aligned

with current aerobic activity guidelines and 11.6% aligned with muscle strengthening guidelines. Only 22 (11%) of state planning documents aligned entirely with the US National Physical Activity Plan sector-based approach to physical activity promotion.
CONCLUSION. Efforts to improve state-level physical activity planning in the US are needed.

1909   Board #170   May 31 2:00 PM - 3:30 PM
Global Physical Inactivity

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(No relevant relationships reported)

The World Health Organization (WHO) labelled physical inactivity the fourth leading risk factor for global mortality. The rate of physical inactivity is increasing globally. Participating regularly in physical activity reduces risk for many non-communicable diseases. **PURPOSE:** To investigate the extent of physical inactivity, causative factors, and common obstacles. **METHODS:** A descriptive analysis of data generated by the WHO, governmental, and non-governmental organizations was conducted to discern the extent of physical inactivity, causative factors, and common obstacles. Percentages were calculated and analyzed to provide global, regional, and individual country profiles of physical inactivity. **RESULTS:** Data are not available from all countries equally. Wide variability exists between countries as to the prevalence of, and obstacles causing physical inactivity. Almost one-third of adults are physically inactive globally (15.0% in Southeast Asia to 43% in the Region of the Americas and the Eastern Mediterranean Region). The prevalence was lowest in South-East Asia (15%) and Africa (21%). Women were less active then men with differences of 10% and greater in some areas and greatest in the Eastern Mediterranean Region and Region of the Americas. Physical inactivity was highest in countries with technological advancement. **CONCLUSIONS:** Physical inactivity is a global issue affected by regional factors. It is also a universal problem world-wide and a leading cause of non-communicable diseases. Common factors: age, health, sex, socio-economic status, and urbanization are associated with the level of physical activity/inactivity. Cultural and religious factors limit opportunities for women in many places. Countries with high levels of physical activity rely on human powered transportation and physical labor. Leisure-time physical activity is low in all countries and does not make up for the lost activity associated with access to technology.

1910   Board #171   May 31 2:00 PM - 3:30 PM
Differences in Park Plans and Policies Across US Municipalities

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(No relevant relationships reported)

Purpose: Park use has been positively associated with physical activity, and people are more likely to use parks they perceive to be safe and attractive. Park planning documents and municipality policy or budget provisions that address park safety and maintenance can play an important role in promoting park use. This study examines differences in the presence of park plans, policies, or budget provisions by municipality characteristics and examines the association between presence of park plans and municipal policy or budget provisions to provide safe and well-maintained parks.
Methods: Data from a survey of local officials from the 2014 National Survey of Community-Based Policy and Environmental Supports for Healthy Eating and Active Living (CBS HEAL) were analyzed for a nationally representative sample of US municipalities (n=2005, response rate: 45%). Data were merged with Census data to determine municipality characteristics, and ESRI Street Map Premium's HERE GIS database to determine number of local parks in respondent municipalities. Prevalence of a parks and recreation plan, and policies or budget provisions (related to lighting, patrols by police or security, maintenance of green space and equipment) were analyzed using survey weights to create national estimates.
Results: Overall, 68% of US municipalities had a parks and recreation plan. A higher prevalence of plans was observed among municipalities that had more parks (>2 compared with 0 or 1), had a larger population size, were classified as urban, were located in the West, and had a higher median municipal education level. Prevalence of specific policies or budget provisions in parks or outdoor recreation areas was 78% for lighting, 85% for patrols by
police and security, and 87% for maintenance of green space and equipment. The presence of each policy or budget provision had a positive association with presence of a parks and recreation plan (p < 0.05) and population size (p < 0.05), controlling for other municipality characteristics.
Conclusions: About 7 out of every 10 US municipalities have a parks and recreation plan. Addressing differences across municipalities in plan prevalence can be an important step toward improving access to safe and well-maintained parks.

THURSDAY, MAY 31, 2018

D-67   Free Communication/Poster - **Energy Availability and Expenditure**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1911   Board #172   May 31 2:00 PM - 3:30 PM

Lower Energy Availability Is Associated With Low Resting Enrgy Expenditure In Japanese Female Athletes.

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(No relevant relationships reported)

Adequate energy availability (EA) is important for the health of female athletes. EA is calculated by subtracting exercise energy expenditure from total energy intake, and normalizing by fat-free mass (FFM). The international consensus statement indicates that reproductive function, energy metabolism, endocrine function, and bone health are affected by the threshold of EA, which falls below 30 kcal/kg FFM/day. However, several previous studies have reported that low EA is not associated with menstrual function or metabolism. Further, these data have been based on active women of Caucasian, European, or European-American descent. There are no published scientific studies regarding EA in Asian athletes. **PURPOSE:** To investigate the relationship between EA and resting energy expenditure (REE) in Japanese female athletes. **METHODS:** Fifteen collegiate athletes participated in this study. Menstrual status was based on self-reported menstrual history and confirmed by the ovulation test kit. Energy intake was determined by 3-day weighed food records. Exercising energy expenditure was assessed by the HR-VO$_2$ method. REE was measured by indirect calorimetry using the Douglas bag technique during the early follicular phase. Body composition was measured by dual-energy X-ray absorptiometry (DXA). **RESULTS:** Subjects with lower EA (<25 kcal/kg FFM/day) had lower REE/FFM than those with normal EA (23.2±3.1 vs. 27.0±2.4 kcal/kg FFM/day, $p<0.05$), and had lower triiodothyronine (T$_3$) levels (80±8 vs. 101±9 ng/dl, $p<0.01$). In addition, energy intake level was significantly lower (1615±317 kcal/day vs. 2102±364 kcal/day, $p<0.05$) in subjects with lower EA. However, the levels of estradiol, insulin-like growth factor 1, luteal hormone, follicle stimulating hormone, and progesterone were not significantly different between the two groups. **CONCLUSIONS:** In Japanese female athletes, energy metabolism was suppressed in subjects with lower EA, which was under 25 kcal/kg FFM/day, and was associated with lower REE due to lower T$_3$ levels. Thus, lower EA may influence energy metabolism in Japanese female athletes.

1912   Board #173   May 31 2:00 PM - 3:30 PM

Predicting Energy expenditure in Males And Females During High-intensity Functional Training

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(No relevant relationships reported)

PURPOSE: Researchers report improved body composition after high-intensity functional training (HIFT), which may result from high energy expenditure (EE) during training sessions. Incorporating predictive models for EE during HIFT may benefit practitioners, yet no investigation has attempted to predict EE during HIFT; which is likely different between sexes. Our study aimed to compare EE between sexes and predict EE using anthropometric, physical fitness and performance characteristics during a HIFT session. **METHODS:** Participants with ≥ 4 weeks of HIFT were recruited (n = 98; age = 31.3 ± 7.2 years; 41% female). Height (HT) and weight (WT) were determined using a stadiometer and electronic physicians scale, respectively. Level of experience (LVL) was assessed via self-reported time on a popular HIFT workout. Dual Energy X-Ray Absorptiometry (DEXA) was used to determine percent body fat (%BF). Participants completed a graded exercise test to determine peak oxygen consumption (VO$_{2peak}$). Participants returned after one week to perform a HIFT session while wearing a portable calorimetry system to determine EE. Participants completed as many rounds as possible of a 250-meter row, 20 kettlebell swings, and 15 thrusters in 15 minutes. Independent-samples t-test was used to compare EE between females and males, and multiple linear regression with stepwise selection was used to predict EE for females and males based on age, HT, WT, LVL, VO$_{2peak}$, and %BF. **RESULTS:** Mean EE was significantly different between females (48.9±18.2 kcals/min) and males (71.2±20.0 kcals/min; p < .001). For females, greater LVL (β = 9.92) and WT (β = 0.94), and lower %BF (β = -1.03) predicted 67% of the variance in EE, $f(3, 40) = 24.9$, p < .001. For males, greater LVL (β = 15.50) and height (β = 0.96), and lower %BF (β = -0.69) predicted 70% of the variance in EE, $f(3, 58) = 43.3$, p < .001. **CONCLUSIONS:** During a HIFT session, males exhibit higher EE than females, and anthropometric and experience measures predicted EE. It is promising for

practitioners that greater experience along with decreased %BF are related to increased EE. However, since HIFT utilizes different exercises in each session, EE likely varies. Future research could assess EE across a variety of HIFT sessions and continue to translate findings to practical applications for practitioners.

1913   Board #174   May 31 2:00 PM - 3:30 PM

Effect Of Training Periods On Energy Deficiency And Physical Activity Level In Male Runners

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(No relevant relationships reported)

PURPOSE: Relative energy deficiency affects the health and performance of both female and male athletes. It is important to understand the total energy expenditure (TEE) and physical activity level (PAL) required by each sport to prevent energy deficiency. The purpose of this study was to examine energy deficiency and PAL in Japanese male runners, with a particular focus on the different training periods and characteristics of the sports**.** **METHODS:** The subjects were 4 Japanese male sprint runners (SP group: age, 19.9±0.8 yr; height, 174.4±2.7 cm; body weight, 64.5±2.7 kg; body mass index (BMI), 21.2±0.3 kg/m^2) and 5 Japanese male endurance runners (EN group: age 19.8±0.9 yr; height, 172.2±6.3 cm; body weight, 59.1±4.9 kg; BMI, 19.9±0.8 kg/m^2). The evaluation index for energy deficiency was energy balance (EB), which was calculated by subtracting the TEE from energy intake (EI) during normal training (NT) and tapering training (TT) periods. TEE was determined using the double-labeled water method. The PAL was defined as TEE divided by resting energy expenditure (REE), which was measured using a gas analyzer. Physical activity energy expenditure (PAEE) was determined by subtracting REE and diet-induced thermogenesis from TEE. EI was determined through self-reported dietary records. **RESULTS:** The PAL and PAEE values in the SP group during the NT period were significantly higher than those during the TT period (p<0.05 for both parameters), which was due to decreased training volume during the tapering period. Meanwhile, no significant differences between the NT and TT periods were observed in the EN group. Furthermore, the EI in the SP and EN groups did not change during the NT and TT periods, and the EI for all athletes was found to be insufficient, as a negative EB was observed in both groups. **CONCLUSIONS:** Our results identified severe energy deficiency in Japanese runners because the EB in both groups was negative. In particular, the PAL in the SP group changed during the training seasons, whereas the EI did not change. EI cannot be adjusted according to PAL, which may be the cause of energy deficiency. Therefore, EI for athletes can be managed by adjusting the PAL based on the type of sport and training period.

1914   Board #175   May 31 2:00 PM - 3:30 PM

Water Induced Thermogenesis

Robert M. Otto, FACSM, John Petrizzo, Melhaney Reichelt, Jessica Machaby, Glen Reid, Lauren Yanni, Abigail LeBlanc, Daniel Hagan, John Wygand, FACSM. *Adelphi University, Garden City, NY.*
(No relevant relationships reported)

The ingestion of water is purported to enhance resting metabolic rate (RMR) and because of the absence of calories in water, it may be considered part of a weight loss intervention. This premise is not without controversy. Boschmann, et al. report a 30% increase in RMR following the ingestion of 500 mL of 22ºC water at 40 min post ingestion, while Brown, et al. report no difference following ingestion of 480 mL of either distilled water or saline. **PURPOSE:** The purpose of this study was to determine the thermogenic effect of consuming two temperatures (4º [C] and 37º [H] C) and two volumes of distilled water (7 and 21 mL H$_2$O/kg body mass) on metabolism. **METHODS:** 10 subjects (age 22.3 ± 1.3 yr, ht. 1.74 ± 15.2 m., body mass 75.1 ± 18.5 kg, 4σ) reported to the lab in a euhydrated state and refrained from ingestion of food and beverage (other than water) for 10 hrs and abstained from water for 2 hours prior to each trial. Subjects rested for 30 minutes on an examination table, in a quiet, dimly lit, 23° C lab. RMR was obtained by open circuit spirometry for ten minutes at the conclusion of the 30 minutes of rest (PRE), as well as four additional 10 min samples at 20 minute intervals following water ingestion (T1, T2, T3 & T4). Immediately following the PRE RMR, subjects ingested C7, C21, H7 or H21 with the volume calculated from individual bm at a mean of 526 and 1577 mL for 7 and 21 trials, respectively. Subjects served as their own control in the randomized assignment of trials. **RESULTS:** Statistical analysis by factorial ANOVA revealed NSD (p>.05) among trials for energy cost. The greatest deviation from baseline RMR was a NSD of 4.4%, 6%, -4.2%, and 4.3% for C7, C21, H7, and H21, respectively.

VO$_2$ mL/min	PRE	T1	T2	T3	T4
C7	252 ± 46	263 ± 47	248 ± 50	260 ± 52	249 ± 50
C21	266 ± 67	262 ± 55	272 ± 66	282 ± 66	272 ± 62
H7	260 ± 58	257 ± 66	257 ± 74	249 ± 69	258 ± 62
H21	258 ± 67	269 ± 67	264 ± 67	264 ± 66	267 ± 58

CONCLUSION: Despite the ingestion of water in the range of common temperatures and volumes that are suggested to alter metabolic rate, none of these four conditions elicited a significant change in RMR. Although water ingestion can maintain euhydration, water does not enhance caloric expenditure in a significant manner.

1915   Board #176   May 31 2:00 PM - 3:30 PM

Lessons Learned From Tennis Coaches' Limited Disordered Weight Control Behaviors And Disordered Eating Knowledge

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(No relevant relationships reported)

Irrational fears of food and weight gain are the foundation for Disordered Weight Control Behaviors, (DWCB), methods of weight control deemed unhealthy (e.g. severe Caloric restriction). Those extreme behaviors serve as clinical diagnostic criteria for Eating Disorders (ED). Adolescence is the time when DWCB and ED are likely to originate, especially in athletes. DWCB is linked to nutrition misinformation. The most frequently athlete cited source of nutrition information is equally misinformed coaches. **PURPOSE:** To assess high school tennis coaches' knowledge in 5 domains: (1) Macronutrients/Energy, (2), ED Etiology (3) Symptoms (4) Scope of Practice, and (5) ED Treatment. **METHODS:** The Nutrition & Eating Disorders in Tennis Survey (NETS) was created through modification of Turk et al.'s survey as no survey specific to all of the domains existed. An expert panel confirmed the Face and Construct Validity of the NETS before it was piloted. A link to Qualtrics survey and informed consent form was emailed to Indiana High School coaches. The criterion for "Adequate Knowledge" (AK) was set at 80%. Mean knowledge scores were calculated for each question and the 5 domains. A three - way ANOVA tested for any significant differences (p < 0.05) between means of total knowledge scores and demographic variables. **RESULTS:** Seventy-nine coaches (male = 61, female = 18) ages 24 to 71 (43.97, ± 11.97) completed every question, which corresponds to a 23% rate of return, 90% statistical power according to Insel, G.D. The most cited source of nutrition knowledge was "experience as an athlete" (48.1% or 38 of 79) and the least was a Registered Dietitian (1.3% or 1 of 79). Data analysis revealed that the coaches lacked knowledge: the mean total score was 17.65 correct out of 25 or 70.6% (± 10.9%), falling below the established AK criterion. The lowest mean scores were 57.0% (± 22.4%), 60.0% (± 21.7%), 63.6% (± 22.9%), for domains 1, 3, and 5, respectively. There was no significant differences between knowledge scores and education. **CONCLUSION:** The low knowledge scores suggest that the coached athletes are at a higher risk of DWCB. Likewise, they are likely to be misinformed about the importance of correct energy intake. The common notion that experience as an athlete or taking a nutrition course makes one a qualified nutrition educator, must be questioned.

1916   Board #177   May 31 2:00 PM - 3:30 PM

Macronutrient Intake and Resting Metabolic Rate in Middle and Long Distance Recreational Female Runners

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(No relevant relationships reported)

Energy deficit due to caloric restriction and increased expenditure has been shown to decrease resting metabolic rate (RMR). However, it is unclear how much of this deficit creates the reduced RMR. **PURPOSE:** To examine macronutrient intake on resting metabolic rate and body composition in recreational female middle distance runners compared with long distance female runners. **METHODS:** Twenty-one female runners were recruited; 12 middle distance (age 23.6±1.19) and 9 long distance (age 24.4±1.3), who completed a 3- day dietary food recall on non-consecutive days. Subjects were grouped by weekly mileage; middle distance averaged 9.5±6.1 miles weekly and long distance runners averaged 30.5±7.4 miles weekly. Subjects completed a morning fasting 15- minute indirect calorimetry resting metabolic rate (RMR) and a body composition assessment using dual-energy

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X-ray absorptiometry. Kilocalorie and macronutrient intake were assessed utilizing an online application. Subjects were also given the BSQ-16A self-report questionnaire of body shape preoccupation typical of eating disorders.
RESULTS: There was a significant difference in body fat % between the middle distance and long distance runners (31±4.3 vs 25.1±3.73, p=0.004) and in lean body mass % (63.8±4.2 vs 71.2±3.8). There were no significant differences in body mass index (21.4±2.0 vs 23.6 ±3.3, p=0.11). RMR was approaching a significance difference between groups with the long distance runners having a lower RMR and the middle distance runners demonstrating a higher RMR (1242.4 kcal±190.4 vs 1462.8 kcal± 281.2, p=0.06). Energy intake was similar between both long distance runners and middle distance runners, with both groups only eating minimally above their RMR (284.5±120.7 kcal above RMR vs 121±281.2 kcal above RMR). Results from the BSQ-16A revealed neither group suffered from body shape concern.
CONCLUSIONS: Both middle distance runners and long distance runners demonstrated caloric restriction. Despite having significantly more lean body mass, long distance recreational runners had a lower RMR. This may have been due to the greater energy deficit and increased energy expenditure found in the long distance runners.

1917   Board #178   May 31 2:00 PM - 3:30 PM

Current Energy Availability Is Not Associated With The Menstrual Status Among Japanese Female Athletes

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(No relevant relationships reported)

PURPOSE: Energy availability (EA) is defined as dietary total energy intake (TEI) minus exercise energy expenditure (EEE) normalized to fat-free mass (FFM). It is well known that chronic reduction in EA, below 30 kcal/kg FFM/day, is associated with impairments of a variety of body function such as menstrual disorder, endocrine dysfunction and decreased bone mineral density (BMD). Little is known regarding EA and the physiological parameters of Japanese female athletes classified according to menstrual status. Therefore, this study aimed to determine the current EA status, hormonal status and BMD in Japanese female athletes.
METHODS: Eighteen female collegiate athletes were classified into two groups; the eumenorrheic group (EU, 22±1 years, n = 7) and the menstrual disorder group (MD, 20±1 years, n = 11). The ovulation status was checked before the experimental period using an ovulation test kit, and the date were collected during the early follicular phase in EU group. TEI was assessed using 7-days dietary records, EEE was measured via HR-VO$_2$ methods, and hormonal status was measured from a fasting blood sample. Body composition and BMD were measured by dual energy X-ray absorptiometry. The eating attitude test (EAT-26) was used to assess susceptibility to eating disorders.
RESULTS: EA was not significantly different between EU and MD groups (32.2±9.6 kcal/kg FFM/day vs 32.6±8.1 kcal/kg FFM/day). Further, no significant differences were observed in terms of body composition, BMD, and EAT-26 score between the two groups. However, triiodothyronine (T$_3$; 84±14 ng/dL vs 114±21 ng/dL, p<0.01) and progesterone (P$_4$; 0.2±0.1 ng/mL vs 0.4±0.1 ng/mL, p<0.05) were significantly lower in MD group than those in EU group.
CONCLUSIONS: The results of the present study suggested that the menstrual status is not associated with current EA, but may be related to chronic energy deficiency among Japanese female athletes.

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Effect Of Low Energy Availability During Three Consecutive Days Of Endurance Training On Muscle Glycogen Contents And Serum Hepcidin Levels In Male Long Distance Runners.

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(No relevant relationships reported)

PURPOSE: Hepcidin is a crucial mediator of iron homeostasis and may be associated with iron deficiency in response to exercise training. Exercise-induced interleukin-6 (IL-6) elevation stimulates hepcidin synthesis after exercise. Low energy availability induced by insufficient dietary energy intake during strenuous endurance training period in athletes, and it may elicit depletion of muscle glycogen contents. Moreover, lowered muscle glycogen content augments exercise-induced IL-6 elevation probably leading to increase in hepcidin levels. We investigated that effect of low energy availability during three consecutive days of endurance training on muscle glycogen contents and hepcidin levels.
METHODS: Seven male long distance runners participated in the present study (mean ± standard error, age : 19.8 ± 0.4 yrs ; height : 1.75 ± 0.02 m ; body mass: 61.4 ± 2.0 kg). The present study was a repeated-measures crossover design. All subjects completed two exercise trials consisting of low energy availability (LEA) trial or neutral energy

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Abstracts were prepared by the authors and printed as submitted.

availability (NEA) trial. Energy availability was manipulated to set as 20 kcal / kg FFM / day for LEA trial and 45 kcal / kg FFM / day for NEA trial, respectively. The subjects completed three consecutive days of endurance training (75 min of treadmill running at 70 % of VO_{2max}) during days 1-3. Venous blood samples were collected in early morning on days1-4 and 3 h after exercise completion on day 3. Serum hepcidin, ferritin, iron, myoglobin and plasma IL-6 levels were evaluated. Muscle glycogen contents were evaluated in early morning on days 1-4 by ^{13}C-MRS.
RESULTS: Average energy intake was 2,081 ± 61 kcal / day in LEA trial and 3,967 ± 90 kcal / day in NEA trial ($p < 0.001$). Muscle glycogen content were decreased in LEA trial during days 2-4 ($p < 0.05$, vs. day1) whereas no significant change was observed in NEA trial. Area under the curve of serum hepcidin levels during days 1-4 was significantly higher in LEA trial (40.2 ± 11.8 ng/mL in LEA trial) than in the NEA trial (17.0 ± 7.0 ng/mL, $p = 0.04$).
CONCLUSIONS: Three consecutive days of endurance training under LEA decreased muscle glycogen content and increased serum hepcidin levels in male long distance runners.

1919   Board #180   May 31 2:00 PM - 3:30 PM
Development Of A Validated Energy Expenditure Prediction Equation In Asian Adults

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(No relevant relationships reported)

Knowledge of energy expenditure (EE) is an important factor for weight management and helps fitness professionals more appropriately design exercise programs for obesity reduction in the obesity prevalence of Asian.
PURPOSE: The aim of this study was to develop a regression equation to predict EE during walking or running corrected for one mile in normal weight and overweight Asian adults and to cross-validate the equation. **METHODS**: Eighty-five subjects, including normal weight walkers (NWW) (fat percentage≤25 for males, ≤30 for females), overweight walkers (OW) (fat percentage>25 for males, >30 for females) and runners (R), participated to test EE through indirect calorimetry. Analysis of variance was used to test overall significance with post hoc Scheffe test employed to compare energy expenditure in three groups (NWW, OW, and R). Multiple regression analysis was employed for EE prediction and differences between the measured and predicted EE in the cross-validation group was compared by a dependent t-test. Also, regression coefficients generated from cross-validation group were compared to the original equation's coefficients using the Chow statistical test. **RESULTS**: There was not significantly different absolute EE among three groups (p>0.05). When EE was expressed relative to body weight, R group (1.7±0.03 kcal·mile^{-1}kgBW^{-1}) was found to expend significantly more energy than the other two groups (NWW: 1.5±0.04 kcal·mile^{-1}kgBW^{-1}; OW: 1.4±0.03 kcal·mile^{-1}kgBW^{-1}, p<0.05). However, when EE was expressed relative to fat free mass, there was significant difference between NWW (2.0±0.05 kcal·mile^{-1}kgFFM^{-1}) and R groups (2.3±0.05 kcal·mile^{-1}kgFFM^{-1}, p<0.05). Predicting EE (kcal) during walking or running corrected for one mile yielded the following equation: EE=0.933body weight–4.127Gender (M=1, F=2)+47.256 (standard error of estimate, SEE=12.1 kcal·mile^{-1}). The dependent t-test revealed no significant difference between measured EE (101.4±4.3 kcal) and predicted EE (100.0±2.8) (p>0.05). Also, the coefficients for body weight and gender between the original equation and the predicted equation in the cross-validation group were not significantly different (p>0.05). **CONCLUSION**: These results provide a validated equation for predicting EE in Asian adults during walking or running.

1920   Board #181   May 31 2:00 PM - 3:30 PM
The Effects of Wearing Cold Garments on Energy Expenditure

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(No relevant relationships reported)

Stimulation of brown adipose tissue (BAT) by cold exposure purportedly upregulates energy expenditure and has been suggested as a method to reduce adiposity. BAT in humans is located primarily in the upper torso. Manufacturers have developed garments that contain ice packs and are designed to be worn over these areas. Two such products are the Cool Fat Burner and the Cool Gut Buster. The Cool Fat Burner places ice packs against the shoulders and neck, while the Cool Gut Buster targets BAT around the abdomen. **Purpose:** This study was designed to determine changes in energy expenditure and heart rate when wearing the Cool Fat Burner and the Cool Gut Buster. Twenty subjects (12 males; 8 females) sat quietly for a total of 90 minutes while heart rate and VO_2 were recorded. Data collection was separated into three 30-minute phases: rest, low-intensity, and high-intensity. Subjects sat quietly during the rest phase, wore both the Cool Fat Burner and the Cool Gut Buster during the low-intensity phase, and wore both garments and drank cold water during the high-intensity phase. **Results:** Average VO_2 increased significantly across all three phases

(rest: 295.6 ± 69.1 ml/min; low intensity: 333.0 ± 83.2 ml/min; high intensity: 372.8 ± 87.5 ml/min). Average heart rate decreased significantly across all three phases (rest: 67 ± 8.2 bpm; low intensity: 65 ± 7.1 bpm; high intensity: 59 ± 6.8 bpm). When VO_2 was converted to caloric expenditure, it was found that 11.2 additional kcals were burned in the 30-min low-intensity phase compared to rest, and that 23.1 additional kcals were burned during the 30-min high-intensity phase compared to resting values. **Conclusion:** Wearing cold garments resulted in a significant increase in energy expenditure. However, the magnitude of the increase may not be practically useful as a weight loss tool.

1921   Board #182   May 31 2:00 PM - 3:30 PM
Test of Two Distinct Protocols in Indirect Calorimetry

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(No relevant relationships reported)

Andressa F de Abreu; Anderson Santana; Domingos R Pandeló Jr.. High Performance Center (CAP). Federal University of São Paulo/UNIFESP
Indirect calorimetry is an interesting tool for establishing diets. Through this test we can calculate the resting metabolic rate and the percentage of carbohydrate and fat oxidation in the energy metabolism.
Purpose: Although it is an important exam, in clinical practice, it is observed that there is no standardization in relation to the protocols used to perform the exam. Some are done with the patient in the sitting position while others are done with the patient in the lying position. The objective of this research was to verify the existence, or not of differences, in practical terms, in relation to such protocols.
Methods: To perform the tests, 10 volunteers, all male, and physically active were selected. The mean height of the volunteers was 1.75m (SD 12.18 cm) and the mean weight was 74.78 kg (SD of 11.32 kg). A properly calibrated gas analyzer was used, as recommended by the manufacturer. Gas collection was established with a 30-minute duration and was performed on the same day. Each volunteer did a sit-down and lay-down. The interval between one evaluation and another was recorded within 15 minutes. To verify the existence or not of differences between the groups (sitting) and (lying down) the Hedges g was used as a measure of effect size. The purpose of such a measure was to assess practical significance.
Results: As can be seen in Table 1, there was no difference in the resting metabolic rate, and even in the case of oxidation of energetic substrates (fat and carbohydrate), the difference was not significant, considering the mean, since the effect size (hedges g) was 0.012.
Conclusions: For clinical purposes, the use of the sitting or lying position does not present differences in terms of resting metabolic rate, as well as energetic substrate oxidation.

Table 1: RMR and Oxidation of FAT and CHO

	RMR (sitting and lying)	% Fat Sitting	Lying	% CHO Sitting	Lying
1	1885,0	48,82	41,03	51,18	58,97
2	1777,3	16,83	15,38	83,17	84,62
3	1279,8	73,25	71,28	26,75	71,25
4	1332,8	5,09	12,81	94,91	87,19
5	1502,6	21,47	20,40	78,53	79,60
6	1526,0	43,22	46,31	56,78	53,69
7	1958,8	24,63	28,59	75,37	71,41
8	1958,7	34,78	36,80	65,22	63,20
9	1516,6	74,83	72,00	25,17	28,00
10	1311,6	42,23	37,82	57,77	62,18
Mean	1604,9	38,52	38,24	61,14	61,76
SD	268,5	22,98	20,78	22,98	20,78

1922   Board #183   May 31 2:00 PM - 3:30 PM
Extending Traceable Validation To Metabolic Carts

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(No relevant relationships reported)

PURPOSE: Metabolic carts (MC) measure O_2 consumed (VO_2) and CO_2 produced (VCO_2) to estimate energy expended. There is little information on the absolute accuracy of MC. We adapted NIST traceable gas infusions used widely for "Room" calorimeter (RC) systems to MC.

METHODS: Blended CO_2 and N_2 simulated VO_2 by displacing O_2, and added CO_2 represented VCO_2. Traceability to NIST was maintained by calibrating the infusion system to a primary standard. Three MC were tested (Max II, AEI Technologies, Pittsburgh, PA; and two TrueOne 2400, Parvo Medics, Sandy, UT). MC were prepared and flow set as recommended by the manufacturer. High and low infusions (Low: VO_2 = 230, VCO_2 = 170 ml/min, EE = 1.1 kCal/min, RQ = 0.74; High: VO_2 = 330, VCO_2 = 287, EE = 1.6, RQ= 0.87) were made for 10 min followed by a null test. Gases were delivered into tubing connected to the MC mixing chamber. VO_2 and VCO_2 calculated by MC were averaged for 7 min. Average errors were differences between simulated and measured VO_2 and VCO_2.

RESULTS: Infusions were made without leaks despite differences in MC design. 57 infusions were run on the TrueOne 2400. High infusion error was 2.6% (Range: 1.7 to 3.9%) for VO_2 and 1.8% (Range: -0.3 to 2.3%) for VCO_2. Low infusion error was 6.5% (Range: 4.3 to 8.6%) for VO_2 and 1.7% (Range: -1.7 to 2.9%) for VCO_2. 104 infusions were run on the Max II: High infusion error was 7.4% (Range: 0.5 to 13.4%) for VO_2 and -3.2% (Range: -8.9 to 3.0%) for VCO_2. Low infusion was 8.9% (Range: -6.2 to 17.8%) for VO_2 and -3.2% (Range: -15.4 to 5.7%) for VCO_2. Variations were seen in baseline O_2 and CO_2 readings taken at the beginning of the test then every 5 min: O_2 (20.85 - 20.94 vol%); CO_2 (0.037 - 0.12 vol%).

CONCLUSIONS: Gas infusions are an independently traceable standard providing calibration and validation for most RC across a wide range of VO_2 and VCO_2. Traceability also establishes a standard between labs independent of model and manufacturer. Extending the same techniques to MC provides essential assurance to users, allows data to be analyzed between locations, and enables manufacturers to improve performance. More testing will determine best practices for MC, and possibly reduce the effects of environmental changes on MC.

1923   Board #184   May 31 2:00 PM - 3:30 PM

Comparison of Predicted and Measured Resting Metabolic Rate Methods Among CrossFit-Trained Athletes.

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(No relevant relationships reported)

The use of prediction equations and machinery estimation for the assessment of resting metabolic rate (RMR) has grown in popularity. While RMR is crucial when assessing dietary intakes, the accuracy may be dependent on the distinct characteristics of the individual. **PURPOSE**: To compare RMR assessed by indirect calorimetry with estimates obtained from three predictive equations for a group of advanced CrossFit-trained athletes. **METHODS**: RMR was estimated for six-experienced CrossFit-trained athletes [3 men (27.5 ± 6.5 yrs.; 87.5 ± 5.9 kg; 179.2 ± 2.2 cm), and 3 women (27.7 ± 1.5 yrs.; 67.8 ± 3.3 kg; 168.1 ± 5.3 cm)] using the ParvoMedics 2400 metabolic system (PV) following established protocols. Additionally, RMR was calculated using the Harris-Benedict (HB), Mifflin-St. Jeor (ME) and Nelson (NE) prediction equations. All data is presented as mean ± standard deviation (M ± SD). **RESULTS:** Repeated measures analysis of variance revealed significant differences among the four models (F(3) = 7.1, $p = 0.003$, $\eta^2 = 0.59$), where a greater (p = 0.01) predicted RMR was observed in ME (1646 ± 241 Kcals) was lower compared to HB (1733 ± 271 Kcals, p = 0.01) and ME & NE (1839 ± 322, p = 0.04). No differences were observed between the equations and PV. Moderate intra-class correlations were found PV and HB (ICC = 0.63, 95%CI = -0.10 - 0.94), ME (ICC = 0.52, 95% CI = -0.14 - 0.91), and NE (ICC = 0.73, 95%CI = 0.07 - 0.96). **CONCLUSION:** These results suggest that even though significant differences exist between each of the predictive equations, individually, each equation has good agreement with the values measured by indirect colorimetry.

1924   Board #185   May 31 2:00 PM - 3:30 PM

Priming Whole-room Calorimeters With Co2 To Improve Performance And Reduce Test Time

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(No relevant relationships reported)

PURPOSE: Studies using whole-room calorimetry to quantify resting and/or long-term metabolic rate often exclude initial data from analysis. Controlled gas infusions to simulate metabolic rate also show higher error in these initial measurements. This study examined if infusing CO_2 into the chamber prior to measurement reduced the time before measurements are within error specifications. We hypothesized that priming the chamber to 0.2% CO_2 will significantly reduce the time to get valid measurements of VO_2 and VCO_2.

METHODS: We used a precision gas blender to infuse pure gases (N_2 and CO_2) into a 32,500 L metabolic chamber (MEI Research Ltd, Edina, MN). Five different infusion profiles constructed to mimic VO_2 and VCO_2 associated with 1.1 METS in 50, 70, 90, 110, and 130 kg individuals with an RQ of 0.74, with and without infusing CO_2 to

bring the chamber to 0.2% CO_2 prior to infusion. Ambient inflow rate to the chamber was held constant at 45 L•min^{-1}. Additionally, an 88 kg male individual completed a resting metabolic rate study and the time it took to for the chamber to reach 0.2% CO_2, i.e. enter the validated range, was found experimentally. A pairwise t-test was used to compare the time before both VO_2 and VCO_2 to exhibit error of less than 4% in CO_2 primed vs. ambient (~0.04% CO_2) conditions, α=0.05. For the human data, the time it took for the chamber to reach 0.2% CO_2 is reported. No statistical comparison was made for the human data.

RESULTS: Priming the chamber to 0.2% CO_2 significantly (p=0.02) reduced the time it took for the chamber to be brought into the calibrated range. Specifically, when the chamber was primed to 0.2% CO_2 it took 101, 91, 62, 75, and 31 min before the infusion data came within the chamber specification compared to greater than 120 min in every condition when the chamber was not primed. It took 190 min before the chamber reached the 0.2% CO_2 when the participant entered a chamber with ambient CO_2 levels.

CONCLUSIONS: Priming a metabolic chamber to a CO_2 level that brings the chamber into its validated range could significantly reduce the time after a participant enters a whole-room calorimeter before valid data is observed. This could improve experimental efficiency and reduce participant burden by 80 min on average.

D-68   Free Communication/Poster - Energy Balance and Weight Management

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1925   Board #186   May 31 2:00 PM - 3:30 PM

The Effects Of Aerobic, Concurrent, And Resistance Exercise On Compensatory Eating Behaviors

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(No relevant relationships reported)

Obesity is a worldwide epidemic and can be defined as a disorder of positive energy balance, which occurs when the amount of energy consumed is greater than the amount of energy expended. **Purpose:** To observe the differences in compensatory eating behaviors between four groups (aerobic training, concurrent training, resistance training, and a non-exercise control) in recreationally active, resistance trained, college-aged subjects. **Methods:** Ten recreationally active college-aged (21.7 ± 1.3yrs) males and females participated in this study. A 5-week, randomized, crossover design with one full week between each session. Preliminary assessments consisted of a PAR-Q, informed consent, body composition, rep-set best, and VO_{2max}. Aerobic exercise (AE) consisted of 30-minutes of cycling at 70% HR$_{max}$. Resistance exercise (RE) consisted of seven, full-body circuit of three sets of 12 repetitions at 70% set-rep best. Concurrent exercise (CE) consisted of four resistance exercises at the same intensity with 15-minutes of cycling at 70% HR$_{max}$. The control (CON) consisted of 30-minutes of sitting. Food logs via MyFitnessPal were required for the 24-hour period following each session. SPSS 24.0 was used for data analysis using one-way and two-way ANOVAS and deltas. Level of significance was set at $p \leq 0.05$. **Results:** There were no significant difference in total caloric (CON: 2,145 ± 807.9kcal, AE: 2,040 ± 657.2kcal, CE: 1,973 ± 764.8kcal, RE: 2,354 ± 1,077.0kcal, p = 0.743), carbohydrate (CON: 219 ± 66.4g, AE: 244 ± 87.3g, CE: 204 ± 55.4g, RE: 237 ± 94.9g, p = 0.657), fat (CON: 57 ± 21.9g, AE: 58 ± 24.0g, CE: 59 ± 31.3g, RE: 63 ± 23.8g, p = 0.964), or protein intake (CON: 97 ± 48.6g, AE: 101 ± 48.0g, CE: 89 ± 53.4g, RE: 99 ± 46.4g, p = 0.942), HR (CON: 77 ± 10.3bpm, AE: 151 ± 21.9bpm, CE: 153 ± 16.2bpm, RE: 136 ± 15.8bpm, p = 0.122), or RPE (CON: 6 ± 0.0, AE: 11 ± 2.1, CE: 12 ± 1.9, RE: 10 ± 2.7, p = 0.147) between the four sessions. **Conclusion:** These findings demonstrate that the exercise-induced caloric deficit was not compensated via an increase in caloric and/or macronutrient intake, therefore, resulting in a negative energy balance. Further, the aforementioned findings provide evidence that exercise is a viable mechanism to create an energy deficit, which can ideally lead to successful weight loss.

1926   Board #187   May 31 2:00 PM - 3:30 PM

Leptin And Ghrelin Concentrations Differ At Fasting, Post-prandial, And Post-exercise In Active And Inactive Females

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(No relevant relationships reported)

Leptin and ghrelin are counterregulatory hormones that control food intake and energy expenditure to maintain energy balance. **PURPOSE:** To determine changes in leptin and ghrelin between collegiate female runners (n=12; age 22.2±3.3 years) and inactive females (n=14; age 25.3±1.9 years) across time.

Abstracts were prepared by the authors and printed as submitted.

METHODS: Using a cross-sectional design, blood was collected at three different time points: fasting, immediately following plain bagel consumption (T1), and immediately following a 30-minute steady-state submaximal VO_2 treadmill test (T2) in both groups. Leptin and ghrelin were measured using enzyme-linked immunosorbant assay. Fat mass (FM) was determined by dual-energy X-ray absorptiometry. Repeated measures ANCOVA (time x group) compared differences in leptin and ghrelin across time.
RESULTS: Body mass index differed between runners (19. ±1.4 kg/m²) and inactive females (22.6±2.8 kg/m²; p = .004). FM also differed between groups (runners: 10.76 kg; inactive: 18.32 kg, p ≤ .001). Baseline fasting leptin was lower in runners (3.3±1.5 ng/mL) than the inactive females (11.1±6.7 ng/mL; p = .003). Therefore, FM and baseline leptin levels were used as covariates. The time by group interaction was significant (p = .035; F = 4.598) with no differences between groups. In both groups, fasting leptin (7.4±4.08 ng/mL; p) was higher at baseline (fasting) than T1 (6.2±3.5 ng/mL; p ≤ .001) and T2 (6.1±3.2 ng/mL; p ≤ .001). Ghrelin also differed across time (p ≤ .001) with no interaction between groups. In both groups combined, fasting ghrelin (744.2±303.6 pg/mL) did not differ from baseline to T1 (708.9±243.8 pg/mL). However, following the treadmill test (T2) ghrelin (452.4±111.6 pg/mL; p ≤ .001) was lower than fasting and following bagel consumption.
CONCLUSION: Fasting leptin was lower in collegiate runners than inactive females due to lower levels of FM. Leptin concentrations decreased across time in both groups following food intake and exercise. Ghrelin was highest at fasting and immediately following food intake, and decreased only after exercise. Leptin and ghrelin concentrations change in a similar manner between female runners and inactive females.

1927   Board #188   May 31 2:00 PM - 3:30 PM

The Effect Of Resistance Training On Morphology Of Rat Skeletal Muscle During Food Restriction

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(No relevant relationships reported)

PURPOSE: Skeletal muscle is critical for muscle strength and exercise performance. Severe food restriction observed among athletes for rapid weight loss (i.e. fasting or skipping meals) activates autophagy-lysosomal pathway and protein breakdown and that causes muscle atrophy. It is well known that resistance exercise stimulates protein synthesis and muscle hypertrophy. Resistance exercise also attenuates skeletal muscle protein breakdown via the autophagy-lysosomal pathway, hence it may prevent the food restriction-induced muscle atrophy. To investigate the effect of resistance training (RT) on skeletal muscle mass and muscle fiber cross sectional area during muscle atrophy-inducing food restriction in rats. **METHODS:** Eleven weeks old male Sprague-Dawley rats were divided into four groups: normal fed group (C), normal fed and resistance training group (TR), 7 days of 70% food restriction group (FR) and 7days of 70% food restriction and resistance training group (FR-TR). In training group (TR and FR-TR), rats were subjected to 6 exercise sessions and then were killed 72 hours after final exercise session. Resistance exercise was conducted by percutaneous electrical stimulation in right gastrocnemius muscle three times per week. Hematoxylin-eosin staining was used to measure the gastrocnemius muscle fiber cross-sectional area (CSA).**RESULTS:** Body weight, gastrocnemius muscle wet weight, liver wet weight, epididymal fat weight and fiber CSA were significantly reduced by 70 percent with food restriction (p<0.05). Although no significant difference in fiber CSA among normal fed groups (C and TR), FR-RTgroup tended to show a reduced fiber CSA compared with FR group (p<0.09).**CONCLUSIONS:**This study suggests that resistance training during atrophy-inducing food restriction did not attenuate muscle atrophy in rat skeletal muscle.

1928   Board #189   May 31 2:00 PM - 3:30 PM

Post-exercise Whole Body Cryotherapy Treatment Increases Energy Intake Among Well-trained Athletes

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(Sponsor: Robert R Kraemer, FACSM)
(No relevant relationships reported)

PURPOSE: Exercise-induced loss of energy intake during post-exercise period may delay recovery and impair exercise performance among athletes. However, the efficient procedures which can attenuate post-exercise reductions of appetite and energy intake have not been investigated. Previous studies demonstrated that cold environment was likely to promote appetite and energy intake. The aim of the present study was to investigate the effect of whole body cryotherapy (WBC) after exercise on appetite regulations.
METHODS: Thirteen male athletes (20.5 ± 0.2 years, 174.8 ± 5.2 cm, 66.6 ± 1.4 kg) were recruited in the present study. They conducted two trials on different days; consisting of WBC trial and CON trial. Subjects performed repeated sprint exercise initially in both trials. In WBC trial, WBC treatment for 3 min (about -140℃) was

applied from 10 min after completing the exercise. In CON trial, subjects kept resting for identical periods of WBC trial after exercise. At 30 min following exercise, ad-libitum buffet meal test was conducted to evaluate energy intake and macronutrient intake ratio. Blood samples were obtained to measure plasma acylated ghrelin, PYY3-36, serum leptin and other metabolic hormonal concentrations before and after exercise. Subjective feeling parameters, respiratory gas samples and skin temperature were also measured after exercise.
RESULTS: Skin temperature was decreased rapidly after WBC (pre: 31.6 ± 0.2 ℃, immediately after WBC: 7.1 ± 4.1 ℃), and the temperature remained significantly lower until the onset of buffet meal test (P < 0.001). Although plasma ghrelin, PYY3-36 and serum leptin concentrations were significantly changed after exercise (P < 0.05), no significant differences between trials were observed at any points for these hormones. During post-exercise period, minute ventilation and heart rate were significantly lower in WBC trial than those in CON trial (P < 0.05). Energy intake during buffet meal test was significantly higher in WBC trial (1371 ± 139 kcal) than that in CON trial (1106 ± 130 kcal, P = 0.007).
CONCLUSIONS: Cold exposure using WBC following strenuous exercise increased energy intake in male athletes.

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MCT1 Gene Function on Percentage Fat Responses in Overweight and Obese Humans

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(No relevant relationships reported)

Transgenic mouse for the Monocarboxylate Transporter 1 (MCT1) gene (*SLC16A1*) with one invalidated allele presented resistance to diet-induced obesity. In humans a single-nucleotide polymorphism (SNP), T1470A (rs1049434), for this gene has been related with an impaired lactate transport in T male carriers. Therefore, this SNP could have an influence in body composition changes, simulating the results seen in transgenic mice.**PURPOSE:** To investigate the influence of the T1470A SNP of the MCT1 gene on percentage fat (%fat) changes after a 6-month weight loss program in obese and overweight healthy people.
METHODS: 91 women (39.1±8.3 years, 80.7±10.5 kg) and 84 men (39.6±8.2 years, 96± 10.7 kg) followed a 24-week weight loss intervention including a controlled training program (supervised exercise group, S: 3 times/week, 38-60 min/session; strength, endurance and combined training; N=134) or exercise recommendations (non-supervised exercise group, NS; N=39). All groups had caloric restriction of 25-30% of their energy expenditure. Genotyping was done using PCR and direct sequencing or Real Time PCR. Three-way (genotype x exercise group x sex) ANCOVA was conducted for compare the final values of %fat, adjusting by the initial values. Effects sizes (ES) and their 90% confidence intervals (CI) were calculated to show the magnitude of the effect (standardized differences in means: Cohen's units) of carrying the A allele.
RESULTS: A genotype x exercise group x sex interaction was observed (p=0.017). TT women had less final %fat in the whole group (p=0.025, 1.94%) as well as within the NS group (p=0.002, 4.49%) than A carriers. The ES associated indicate that the A allele has a moderate (ES=1.15, CI=1.88, 0.42) and very likely positive effect only in women within the NS group. For men the A carriers ended with less %fat than TT subjects (p=0.037, 1.87%), with small and possibly negative ES in the S group (ES=-0.25, CI=-0.02, 0.52) and small and likely negative in NS (ES=-0.46, CI=0.01, 0.91).
CONCLUSIONS: The T1470A SNP might have an influence on %fat changes after a weight loss program. The effect seems to be different depending on sex and type of exercise intervention. Further studies are necessary to confirm this association and to clarify the underlying mechanisms.

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Effects Of Exhaustive Exercise On PHB1 Expression And Mitochondrial Function In Rats

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(No relevant relationships reported)

F0F1-ATP synthase is the key enzyme of mitochondrial oxydative phosphorylation, which largely determines the exercise endurance. PHB1 participates in mitochondrial oxidative phosphorylation. The content of PHB1 predicts that of F0F1-ATP synthase in many biological conditions.
PURPOSE: To observe the changes of PHB1 content in mitochondria and its relationship with mitochondrial function and energy metabolism in response to an acute bout of exhaustive exercise. **METHODS:** Male Sprague-Dawley rats were subjected to an acute bout of exhaustive exercise on treadmill at 20 m/min, at which

0% grade. Mitochondria of heart, brain and gastrocnemius were isolated to detect the changes of RCR and ROS. The content of PHB1 protein in mitochondria was detected by Western blot. ATP content in the organs and F0F1-ATP synthase activity were measured by spectrophotometer. **RESULTS**: 1. Compared with resting control group, ATP content decreased in the brain(-76%, $p<0.05$), heart(-77%, $p<0.01$) and skeletal muscle (-55%, $p<0.05$) after exercise. 2. F0F1-ATP synthase activity declined significantly in the brain(-26%, $p<0.05$), heart(-58%, $p<0.01$) and skeletal muscle(-55%, $p<0.01$) after exercise. 3. Mitochondrial respiratory control ratio (RCR) was reduced in the brain(-52%, $p<0.05$), heart(-43%, $p<0.05$) and muscle (-39%, $p<0.05$) in response to exercise. 4. ROS generation in mitochondria of brain(-64%, $p<0.01$), heart(-42%, $p<0.05$) and muscle (-44%, $p<0.05$) decreased significantly after exhaustive exercise. 5. Exercise decreased PHB1 content in the mitochondria of muscle(-30%, $p<0.01$) and brain(-37%, $p<0.05$) but had no effect on PHB1 in the heart. 6. ATP content was positively correlated with PHB1 level in the brain(r=0.836, $p<0.05$), heart (r=0.909, $p<0.05$) and muscle(r=0.913, $p<0.05$) after exercise, whereas F0F1-ATP synthase activity was positively correlated with PHB1 in the brain(r=0.896, $p<0.05$), heart (r=0.909, $p<0.05$) and muscle(r=0.955, $p<0.05$). 7. ROS generation was positively correlated with muscle PHB1 level (r=0.874, $p<0.05$) but there was no such correlation in the heart or brain. **CONCLUSIONS**: An acute bout of exhaustive exercise reduced the expression of PHB1 in the mitochondria of organs examined and decreased mitochondrial bioenergetics.
Supported by NSFC(No. 31470061).

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Effects Of A Ketogenic Or A Whey Protein Supplement On Metabolism, Appetite And Energy Intake

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(No relevant relationships reported)

The satiating effects of protein and its role in energy expenditure have been compared to carbohydrates and fats. Less data exists on the effects of a high fat ketogenic supplement consumed as part of a breakfast smoothie on metabolism, ratings of appetite and energy intake when compared to a protein based breakfast smoothie. **PURPOSE:** To determine the effects of whey protein (WP) vs. a ketogenic supplement (KS), added to a breakfast smoothie on energy expenditure (EE), appetite and energy intake. **METHODS:** Fifteen women (age, 3011 yrs; body fat 29.3±5.7%) participated in this randomized, double blind, crossover study. After a 12-hr fast, resting oxygen consumption (VO_2) and respiratory quotient (RQ) were assessed via indirect calorimetry. Ratings of appetite (hunger (H), fullness (F), desire to eat (DE) and prospective food consumption (PC)) were assessed via visual analog scales (VAS). After consuming the isocaloric (450 kcals) test meal containing either 54g WP (40% kcals protein) or 52g KS (40% kcals fat), VAS on appetite were administered every 30 min for the 3-hr post-prandial period. The thermic effect of the meal (VO_2) and RQ were assessed at 45, 105 and 165 min after meal completion. An ad libitum lunch meal was provided to assess subsequent energy intake. Repeated measures ANOVA were used to analyze data. **RESULTS:** There was a significant group by time effect for VO_2 ($p<0.001$) and RQ ($p=0.001$). WP elicited a greater VO_2 compared to KS at 45, 105 and 165 min (WP: 4.05±0.59, 3.86±0.53, 3.57±0.55 vs. KS: 3.66±0.59, 3.43±0.60, 3.26±0.45 ml/kg/min). RQ was significantly lower after WP compared to KS at all three time points (WP: 0.79±0.03, 0.79±0.04, 0.77±0.03 vs. KS: 0.84±0.04, 0.80±0.06, 0.77±0.08). Significant group by time interactions were observed for H ($p=0.022$), F ($p<0.001$) and DE ($p=0.02$) but not PC ($p=0.107$). Perceived H and DE were significantly lower, and perceived F was greater in the WP condition compared to KS. Energy intake (WP: 578±282 vs. KS: 625±220 kcals) did not differ between conditions ($p=0.197$). **CONCLUSION:** WP appeared to have a marked improvement in increasing both fat oxidation and energy expenditure during the post-prandial period. As such, WP would seem to be more advantageous than KS in promoting overall fullness, however it did not elicit lower subsequent energy intake at an ad libitum lunch meal.

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Changes In 6-Minute Walk Performance Is Associated With Weight Loss Following A 6-Month Weight Loss Program

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(No relevant relationships reported)

There is evidence of a relationship between obesity and decrements in mobility and function, making these important targets for weight loss interventions. Within commercial weight loss programs, there is limited data to quantify changes in functional outcomes such as walking performance and whether weight loss contributes to improvements in this important health outcome.
PURPOSE: To examine change in body weight and walking performance in participants enrolled in a commercial weight loss program, and to examine the association between weight loss and walking performance.
METHODS: Participants (N=140; 93.3% of enrolled participants, age: 46.9±12.6 years; body mass index: 32.6±4.5 kg/m²) who enrolled and provided complete data following a 6-month commercial weight loss program (Weight Watchers). The intervention was delivered by trained Weight Watchers staff and outcomes were evaluated by independent research staff who were not engaged in the delivery of the weight loss intervention. The intervention included weekly group sessions, instruction on behavioral strategies for weight control, and the use of a mobile app to self-monitor weight loss behaviors. Assessment of body weight and walking distance and gait speed using the 6-minute walk test occurred at baseline and 6 months.
RESULTS: Weight decreased from 88.0±16.2 at baseline to 81.0±15.6 kg at 6 months (weight loss = 7.0±5.6 kg) ($p<0.001$). Walking distance increased from 526.6±15.7 meters at baseline to 553.4±63.9 meters at 6 months ($p<0.001$). Gait speed during the 6-minute walk test increased from 1.46±0.17 meters per second to 1.54±0.18 meters per second from baseline to 6 months ($p<0.001$). Weight loss was significantly associated with improved walking distance (r=0.312, $p<0.001$) and gait speed (r=0.312, $p<0.001$) during the 6-minute walk test.
CONCLUSION: These findings indicate that this commercial weight loss program resulted in significant weight loss, and the magnitude of weight loss was associated with improved walking distance and gait speed. Thus, this type of commercial weight loss program appears to be effective for individuals seeking weight loss, which may also result in additional function benefits in adults with obesity.

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Dietary Fat and Carbohydrate Intake and Physical Activity Independently Predict Android Fat in College Women

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(No relevant relationships reported)

PURPOSE: It is well established that abdominal or android obesity is a risk factor for numerous metabolic diseases. Dietary intake, expressed as both energy intake and quality of the diet, and physical activity (PA) are known to influence risk for android obesity. Specifically, the role that relative macronutrient intake (% energy intake) plays in risk for android obesity is of interest. Although college students are relatively healthy, their dietary and PA habits can predispose them to an increased risk for abdominal obesity. These health behaviors are of special interest given the transition to college and the establishment of health behaviors at this time of life. The aim of this study was to examine the contributions of energy intake, relative macronutrient intake (i.e., % of energy intake), and moderate-vigorous PA (MVPA) relative to android fat (%AFat) in female college students. **METHODS**: Female college students (n = 336; 18.7 ± 1.2 yo; BMI = 24.4 ± 4.7 kg/m²; %AFat = 38.6 ± 11.7%) were assessed for dietary intake using 3-day dietary records. Outcomes of interest included daily energy intake (KCAL), and relative daily energy intake of carbohydrate (%CARB), fat (%FAT) and protein (%PRO). MVPA was measured using accelerometry (NL-1000; 4 valid, 10-h days of wear). %AFat was determined via DXA using standard software designations (iDXA, Lunar, GE). A multiple linear regression model was utilized to predict %AFat from the dietary and MVPA variables. **RESULTS**: Daily MVPA (β = -0.25, $p < 0.001$), %CARB (β = 0.57, $p < 0.001$), %FAT (β = 0.64, $p < 0.001$) significantly predicted %AFat**,** explaining 92.1% of the variance ($p < 0.001$). Neither KCAL (β = -0.07, $p = 0.21$) nor %PRO were significant predictors of %AFat (β = 0.05, $p = 0.41$). **CONCLUSIONS**: Our results suggest that carbohydrate and fat content of the diet along with MVPA independently contribute to the risk for abdominal obesity whereas total caloric intake and protein content of the diet is less important in college-aged women.

THURSDAY, MAY 31, 2018

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Weight Gain and Changes in Cardiovascular and Metabolic Risk Factors Throughout the First Year of College

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(No relevant relationships reported)

PURPOSE: It is well documented that the first year of college is associated with many physical changes. Of these, it is common for students to gain weight, which is often times referred to as the "Freshman 15." Although most "Freshman 15" studies report weigh gain, it is typically much less than 15 lbs. Despite some weight gain it is not well know if these changes in body weight are also associated with changes in both cardiovascular and metabolic risk factors. Thus, the purpose of this study was to evaluate morphological and physiological changes in students throughout their first year of college. METHODS: Twenty-seven Freshman college students (female n = 15, males n = 12) were recruited for this repeated measures design study. Throughout the 10 month study participants logged their eating and exercise habits and were tested on four separate occasions (each approximately 2.5 months apart). Each testing session consisted of body composition screening, oxygen consumption test (VO2max), fasting blood analysis, and an oral glucose tolerance test (OGTT). Repeated measure ANOVA was used on all data sets. All values were expressed as the mean + SE and p < .05 set for statistical significance.RESULTS: There was no difference in exercise (118 + 101 min/wk) over the 10 months, but there was a non-significant decrease (2.5 + 2.2 ml/kg/min) in VO2max by the end of the study. Compared to the start of their Freshman year, weekly caloric intake was significantly increased each testing session thereafter (1,268 + 677, 1,702 + 972, and 1,091 + 608 kcals respectively). At the conclusion of the study there was a significant increase in body weight (2.5 + 2.1 kg) which translated to an increase in percent body fat (1.5 + 2.4%) but not muscle mass (0.2 + 2.1%). In addition, the blood glucose and plasma insulin response to an oral glucose challenge did not change throughout the study, nor did fasting triglycerides, total cholesterol, and high density lipoprotein (HDL cholesterol). CONCLUSION: Although participants gained weight throughout their first year of college it was less than that predicted by the "Freshman 15". This added body weight was also not associated with increased risk of cardiovascular or metabolic diseases. Further research is needed to evaluate weigh gain and the development of risk factors in college students.

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Weight Loss, Physical Activity, And Conception In Obese Infertile Women

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(No relevant relationships reported)

PURPOSE: To compare weight loss and physical activity in obese infertile women who did or did not become pregnant following completion of a weight loss program. METHODS: Obese infertile women, referred by a reproductive endocrinologist, completed the University of Kansas Weight Management Program (KWMP). This program included reduced energy intake (portion controlled entrees, low calorie shakes), increased moderate-to- vigorous physical activity (MVPA) targeting 300 min•wk. and lifestyle strategies were provided. Participants were asked to monitor weekly MVPA (self-report) and pedometer step counts. Height and weight were assessed by trained staff in the clinic. The cumulative average of MVPA and steps over the last 3-wks. of participation were used in the analysis. Pregnancy outcomes were obtained from a review of medical records. The Kruskal-Wallis nonparametric test was used to compare differences in percent weight loss, physical activity (MVPA min•wk.[-1], steps•wk.[-1]), and time in the KWMP between women who did, or did not become pregnant.
RESULTS: Obese infertile women (n = 14, BMI=40.0 $\pm$ 5.9 kg•m[2], age = 33.4$\pm$ 4.5 yrs.) completed an average of 17 wks. of the KWMP. Eight of 14 women (57%) became pregnant. Weight loss was greater in women who became (-15.4 $\pm$ 7.7 %) compared with those who did not become pregnant (-10.9 $\pm$ 11.3 %); however, the differences were not statistically significant (p= 0.17). Physical activity assessed by pedometer was significantly higher in women who became pregnant (64,774 $\pm$ 13,798 steps•wk.[-1]) compare with those who did not (51,207 $\pm$ 5,060 steps•wk.[-1], p =0.02). Self-reported MVPA was not significantly higher in women who became pregnant (212 $\pm$ 89 min•wk.[-1]) compared with those who did not (175 $\pm$ 106 min•wk.[-1], p = 0.37. Women who became pregnant participated in the KWMP 11 wks. longer than those who did not (p = 0.016).
CONCLUSION: Length of treatment and reported step counts were associated with increased pregnancy rates. Additional investigation with larger samples is warranted to evaluate the magnitude of weight loss and the potential independent contributions of weight loss and physical activity to improve conception.

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The Affect Of Exercise On Hypothalamic Kiss-1 And Gpr54 In The Puberty Development Of Male Rats

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(No relevant relationships reported)

The affect of exercise on hypothalamic kiss-1 and GPR54 in the puberty development of male rats

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Abstract:
Kisspeptin ,in addition to reflects its ability to inhibit cancer metastasis, which have been implicated in the regulation of GnRH secretion with its receptor GPR54, play an essential role in normal reproduction and pubertal development. PURPOSE: To explore the moderate-intensity treadmill training (MIT) in modulating the hypothalamic expression of kiss-1 and its G protein coupled receptor -GPR54 mRNA relative expression in the different time of puberty.
Methods: 3 weeks male Sprague-Dawley rats (weight:62.03±3.13) were randomly assigned to two experimental groups (n=36): control group (n=18) and the MIT group (n=18). MIT group did the 60%-70%V(·)O2max treadmill training (5 days/week,1 hour/day). All the rats were used to detect the hypothalamic expressions of kiss-1 and GPR54 mRNA, animals in the both groups were sacrificed , which on the week of 5 weeks, 6 weeks, and 8 weeks.
Result: Compared with C group, every weeks of the rats' MIT group had lower hypothalamic expression of kiss-1 mRNA and GPR54 mRNA. Especially the kiss-1 mRNA, After moderate-intensity treadmill training, compare with the control groups , the 5 weeks(0.22±0.09 vs 2.28±0.49, p<0.01), 6 weeks(1.09±0.13 vs 1.73±0.18,p<0.01), 8 weeks(0.69±0.21 vs 2.82±0.79) kiss-1 mRNA had significant reduced. All the MIT groups' hypothalamic expression of GPR54 mRNA had lower than C groups, especially at the age of 6 weeks(0.58±0.1 vs 0.79±0.23,p<0.05).
Conclusions:MIT could reduce the hypothalamic expression of kiss-1 and its receptor GPR54mRNA in the puberty development of male rats, and kiss-1mRNA are more affected.

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Patient Experience on Weight Management Advice Prior to Pregnancy from Physicians andDietitians

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(No relevant relationships reported)

PURPOSE: More women are entering pregnancy with a pre-pregnancy body mass index (BMI) $\geq$30 kg/m^{2}, increasing the risk of pregnancy complications. Many women, however, will seek support from healthcare professionals pre-conceptually to try to lose weight. Using a mixed-methods approach, we determined if women seek support from physicians and/or dietitians for weight related issues and whether they found this experience helpful. METHODS: Data were reviewed from a Weight and Health History Questionnaire (n=206) completed by pregnant women with BMI of $\geq$30 kg/m^{2} on intake for obstetrical care. This questionnaire included information regarding the type of health provider (physician or dietitian) accessed for weight loss advice pre-pregnancy and whether that experience was helpful (with explanation). A thematic analysis was conducted to determine the underlying reasons for these experiences. RESULTS: Of 206 women, 147 saw a physician (n=80) or dietitian (n=67). The number of women that found their experience helpful was significantly greater with a dietitian (51/67) than with a physician (34/80; p<0.05). Women who rated their experience with a physician as helpful noted referral to a dietitian or exercise professional (n=25) and receiving nutritional information (n=6) as important factors. The top helpful experiences with dietitians included new information being provided (n=21) and realistic goal setting (n=16). CONCLUSION: Women receiving weight loss support from physicians pre-pregnancy found their experience helpful when the physician offered support from dietitians and exercise professionals and when the physician provided nutritional information. Initiatives and resources like 'Exercise is Medicine', www.eatrightontario.ca or the Society of Obstetricians & Gynecologists of Canada's 'Nutrition is hard' can help bridge the gap between physicians and allied health care professionals and educate physicians on addressing lifestyle behavior, especially for obese women seeking weight management advice before pregnancy. Funding sources: CIHR and CHRI

D-69   Free Communication/Poster - **Exercise Psychology- Cancer**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1938   Board #199   May 31 3:30 PM - 5:00 PM

The Relationship Of Cognitive Scores With Muscle Power, Strength, And 6-minute Walk In Breast Cancer Survivors

Rachael Hunt, Ashley Artese, Jeong-Su Kim, Lynn Panton, FACSM. *Florida State University, Tallahassee, FL.* (Sponsor: Lynn Panton, PhD, FACSM)

(No relevant relationships reported)

The relationship between cognition and aerobic fitness is well studied in breast cancer survivors (BCS); however, there is a lack of research evaluating the relationships between cognition and anaerobic fitness. **PURPOSE:** This study examined the relationship between cognition, muscle power, strength, and the 6-min walk (6MW) in BCS. **METHODS:** Forty-four BCS (60±8 yrs; BMI: 29.9±6.5 kg/m^2) completed Trail-Making Test A and B [TMTA (processing speed), TMTB (executive function)], Digit Span Forward (attention) and Backward (working memory), and Controlled Oral Word Association Test [COWAT (executive function)] to assess cognitive domains. Lower body isokinetic (ISK) power and strength were assessed by the Biodex™. Endurance was assessed by the 6MW. Pearson product-moment correlations were used to evaluate relationships between cognition and anaerobic fitness. Significance was accepted at p≤0.05. **RESULTS:** Faster TMTA and TMTB scores were correlated with greater ISK average power for extension at 60 degrees/sec (TMTA: r=-0.40; TMTB: r=-0.31) and 180 degrees/sec (TMTA: r=-0.45; TMTB: r=-0.30) while TMTA was correlated with greater ISK average power for extension at 120 degrees/sec (r=-0.34). A subcategory of the COWAT was correlated with greater 6MW distance (r=0.31) and greater ISK average power for extension at 180 degrees/sec (r=0.30). **CONCLUSION:** Higher cognitive functioning, specifically processing speed and executive function domains, may be correlated to greater average power. These findings warrant more research on the benefits of power and strength training on cognition in BCS.

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Perceptions on Exercise is Associated with Self-Reported Physical Activity in Hematopoietic Stem Cell Transplant Patients

Melanie Potiaumpai, Tamia Medina, Stacy E. Cutrono, Denise Pereira, William F. Pirl, Krishna V. Komanduri, Joseph F. Signorile. *University of Miami, Miami, FL.* (Sponsor: Kevin Allen Jacobs, FACSM)

(No relevant relationships reported)

Hematopoietic stem cell transplant (HSCT) treatment, used to treat an array of hematological cancers, significantly impacts patients' physical, psychological, and psychosocial stress before, during, and after treatment. HSCT is associated with severe symptomology, including nausea, pain, and fatigue, which may discourage movement and significantly increase sedentary behavior. Patients are advised of the benefits of increased physical activity during HSCT, including attenuation of the severity of their symptoms. However, there is a paucity of research on patients' perceptions of the benefits of exercise and how that translates to their participation in physical activity. **Purpose:** To evaluate the relationship between perceived benefits and barriers of exercise and self-reported physical activity levels in patients undergoing HSCT. **Methods:** Twenty-three subjects (13M, 10F; 58.1 ± 8.4 years), enrolled in an in-patient physical activity intervention, were administered the Exercise Barriers and Benefits Survey (EBBS), and the International Physical Activity Questionnaire- Short Form (IPAQ) prior to their admission for HSCT. The benefits and barriers scale were scored separately. Higher scores on the Benefits Scale indicate a more positive perception of exercise while a higher score on the Barriers Scale indicates greater perception of barriers to exercise. Time spent walking (WALK) and time spent sitting (SIT), recounted in minutes, were reported on the IPAQ for the seven days prior to admission. A Pearson correlation coefficient was computed to assess: the relationship between the EBBS Benefits scale, WALK, and SIT, and the relationship between the EBBS Barriers scale, WALK, and SIT. **Results:** Results of the Pearson correlation indicated that there was a significant positive correlation between the benefits score and patient-reported WALK (r(21)= .44, p= .04). There was also a significant negative correlation between the benefits score and patient-reported SIT (r(21)= -.49, p= .02). There was no significant correlation between the Barriers scale and WALK (r(21)= .23, p=.30) or SIT (r(21)= -.18, p=.42). **Conclusion:** These preliminary results indicate that HSCT patients who report higher benefits to exercise are more likely to spend more time walking and less time sitting.

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Structured Exercise in the Cancer Patient Improves Insomnia and Fatigue, but Not Depression

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(No relevant relationships reported)

There are over 12 million cancer survivors in the United States. Nearly all of them have experienced physical, emotional, and psychological symptoms including fatigue, insomnia, and depression. This can contribute to the erosion of overall quality of life. While exercise is commonly prescribed to mitigate these symptoms, the optimal dose and characteristics of its prescription require further investigation. **PURPOSE:** To evaluate the effect of structured exercise on fatigue, insomnia, and depression in cancer survivors. **METHODS:** We enrolled 157 cancer survivors in a 10-week exercise intervention that included aerobic, resistance, and flexibility training. At baseline, patients completed the Fatigue Symptom Index, Athens Insomnia Instrument, and Zung-Self Rating Depression Scale to assess fatigue, insomnia, and depression respectively. Upon conclusion of the program, follow-up data were collected. Paired-samples t tests were conducted on patients who completed the intervention. Logistic regression tested the effect of fatigue, insomnia, and depression on odds of completion. Linear regression evaluated predictors of fatigue, insomnia, and depression. **RESULTS:** Among patients who completed the intervention (n=58), fatigue decreased (p<0.001); insomnia (p=0.673) and depression (p=0.675) were unchanged. Fatigue (p=0.432), insomnia (p=0.759), and depression (p=0.932) did not predict program completion. Patients who were more fatigued at baseline experienced greater reductions in fatigue at follow-up, assessed by score (r= -0.677; p<0.001) and category (r=-0.685; p<0.001). Patients with worse insomnia at baseline reported greater improvements at follow-up (r=-0.761; p=0.079); elevated depression did not facilitate greater improvement (p=0.228). **CONCLUSIONS:** Fatigue, insomnia, and depression are often indissoluble from the daily experience of a cancer survivor. A biweekly exercise intervention improved fatigue and insomnia after 10 weeks, with greater improvements among the more severely affected; however, we did not find significant alleviation of depression symptoms. These findings suggest exercise is a safe, effective strategy to relieve some symptoms associated with cancer. Further research is required to address potential bias owing to the high rate of attrition in our study.

D-70   Free Communication/Poster - **Perception of Effort, Pain and Fatigue**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1941   Board #202   May 31 3:30 PM - 5:00 PM

Perceived Exertion Responses While Wearing Tight- and Loose-Fitting Powered Air-Purifying Respirators

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(No relevant relationships reported)

PURPOSE: This study compared ratings of perceived exertion (RPE) among participants performing the same energy expenditures while wearing NIOSH-approved powered air-purifying respirators (PAPRs) from different manufacturers: one tight-fitting (PAPR-T) and three different models of loose-fitting PAPRs (small hood (PAPR-S), medium hood (PAPR-M), and large hood (PAPR-L)). **METHODS:** The study consisted of six trials: Initial exercise evaluation to determine treadmill speed and elevation to achieve three absolute energy expenditures, labeled LOW (VO$_2$ 1.0 L/min, STPD), MODERATE (VO$_2$ 2.0 L/min, STPD), and HIGH (VO$_2$ 3.0 L/min or maximum, STPD); a baseline evaluation wearing no respirator; and four PAPR evaluations randomly assigned between two visits. Eleven men and 11 women provided informed consent approved by the NIOSH IRB (#12-NPPTL-01). Baseline and PAPR evaluations consisted of four minutes each during standing rest and the three energy expenditures. All PAPRs used HEPA filters. RPE using the 6-20 Borg scale were obtained during the last 15 seconds of each energy expenditure. **RESULTS:** RPE results for the men and women were not statistically different. Table 1 provides the average RPE for men and women by experimental trial:

Table 1. Average RPE for each study trial by energy expenditure (n=22).

Abstracts were prepared by the authors and printed as submitted.

THURSDAY, MAY 31, 2018

	Exer Eval	Baseline	PAPR-T	PAPR-S	PAPR-M	PAPR-L
LOW	8.0	7.1	7.2	7.5	7.5	7.8*
MODERATE	11.5	11.0	11.7	11.9*	12.3*	12.5*
HIGH	15.3	14.4	15.9*	15.9*	16.5*	16.5*

* $P < 0.01$ compared to Baseline

CONCLUSIONS: RPE while using PAPRs were greater compared to the same energy expenditures while not using a PAPR at baseline. Compared to baseline, RPE using a tight-fitting PAPR were lower compared to loose-fitting PAPRs. The lower RPE for baseline results compared to the exercise evaluation may be attributed to a learning effect where outliers were observed from the exercise evaluation. Trends in the RPE difference between loose-fitting PAPRs at the same energy expenditure appear to be related to hood size or dead space.

1942 Board #203 May 31 3:30 PM - 5:00 PM

Moderate-vigorous Intensity Run Vs. Walk On Hemodynamics, Metabolism And Perception Of Effort

Patrick M. Davitt, Troy Hartman, Steven Estremera, Phil Barone, Jillian Grassano, Gregory Muy, Olivia Akers-Goodwin, Andrew Marrero, Astrid Mel. *Mercy College, Dobbs Ferry, NY.* (Sponsor: M. Allison Williams, FACSM)

(No relevant relationships reported)

The ability to use an alternative (i.e., walking) to running would provide great benefit to those who are uncomfortable running or can't run, in order to meet minimum activity recommendations**. PURPOSE**: We compared two exercise modalities (Run, Walk) matched for VO2, on HR, RPE, and a visual analog scale (VAS). **METHODS**: Active, college-aged males (n=7; weight = 72.5 $\pm$ 3.9 kg; Bf% = 17.9 $\pm$ 1.2; VO_{2max} = 51.5 $\pm$ 1.36 mL/kg/min) participated in a crossover-designed study, and studied on each of 2 occasions: Walk (W) and Run (R). Subjects completed a body composition and VO_2max test. (R) = 60-min on a treadmill at 0%grade and speed equal to 65% VO_{2max} (694.4 $\pm$ 26.1 kcal). (W) = 60-min at 3.3mph and a steep incline equal to 65% VO_{2max} (677.9 $\pm$ 20.9 kcal). Pulmonary gas exchange (VO2, RER, respiratory rate (RR)) was assessed within the first 10 min of exercise, with HR and RPE recorded every 15 min. A VAS was used to assess overall perceived effort (0-100mm). RM ANOVAs were used for statistical analysis. Values were calculated as mean $\pm$ SE. **RESULTS:** There was no significant difference in VO2 (Run, 33.2 $\pm$ 1.1; Walk, 32.7 $\pm$ 1.1 mL/kg/min; Con, p=0.59), RPE (Run, 11.1 $\pm$ 0.8; Walk, 11.7 $\pm$ 0.8, p=0.28), VAS (Run, 51.2 $\pm$ 5; Walk, 48 $\pm$ 5mm, p=0.54), or %VO_{2max} (Run, 64.6 $\pm$ 1.2; Walk, 63.5 $\pm$ 1.2%, p=0.56) between the groups. There was a significant difference in HR (Run, 167.0 $\pm$ 4.9; Walk, 157.3 $\pm$ 4.9 BPM), RR (Run, 35.1 $\pm$ 2.3; Walk, 30.5 $\pm$ 2.3 BPM), and RER (Run, 0.86 $\pm$ 0.02; Walk, 0.9 $\pm$ 0.02) between the groups. There was no significant difference in the amount of sleep (R, 6.6; W, 6.8hr) between the two groups (p=0.68). 5 out of 7 subjects complained about their legs "burning" or "hurting" during the W trial. **CONCLUSION**: Walking and Running, even when matched for intensity, via VO_2, led to the R having a significantly higher HR and breathing rate for 60-min in active males, but a significantly lower RER. Despite the subjects complaining of their legs being sore (W), RPE did not reflect a difference in perception, nor did the VAS post-exercise. These results indicate that a walk can be recommended for a moderate-vigorous intensity, and elicit a similar metabolic and hemodynamic response, without causing a significant increase in perceived effort. This promotes the use of "steep" walking as energetically beneficial for those not able or desiring to run at higher intensities.

1943 Board #204 May 31 3:30 PM - 5:00 PM

Music With and Without Lyrics Improves Motivation, Affect, And Arousal During Moderate-intensity Cycling

Daniel Marshall, Scott B. Martin, FACSM, Ryan L. Olson. *University of North Texas, Denton, TX.* (Sponsor: Scott Martin, FACSM)

(No relevant relationships reported)

Music is used to distract, energize, and entertain during exercise by producing positive psychological and physiological responses. Previous investigations suggest that listening to music during exercise enhances performance, increases motivation, improves affect, and optimizes arousal. Researchers have identified several elements of music that may moderate the music-performance relationship, including lyrics. However, few studies to date have examined the influence of motivational lyrics on psychological and physiological responses during exercise. **PURPOSE:** The primary purpose of this study was to investigate the effects of lyrics in music on motivation, affect, arousal, and perceived exertion during moderate intensity cycling. **METHODS:** Thirty (Mage = 21.0 $\pm$ 2.9 years old) college-aged individuals performed three, 8-min acute bouts of moderate-intensity exercise on a cycle ergometer during music with lyrics (ML), music without lyrics (MNL), and no music control (MC) conditions. Measures of motivation, affect, arousal, and perceived exertion were taken before and after a 6-min warm-up, every 2-min during the exercise bout, and following a 2-min

cool-down. **RESULTS:** For ML and MNL conditions, participants reported higher motivation (ML: 5.11 $\pm$ 0.35; MNL: 5.14 $\pm$ 0.36), affect (ML: 2.51 $\pm$ 0.23; MNL: 2.47 $\pm$ 0.23), and arousal (ML: 3.32 $\pm$ 0.19; MNL: 3.23 $\pm$ 0.18) during exercise relative to the MC (motivation: 4.10 $\pm$ 0.43; affect: 1.94 $\pm$ 0.27; arousal: 2.84 $\pm$ 0.23) condition. As expected, RPE increased throughout the exercise period, $F(6,24) = 42.24$, $p < .001$, with no between condition differences observed. Additionally, there were no differences in primary outcome variables between the ML and MNL conditions ($ps > .05$). **CONCLUSION:** The results suggest that music, regardless of whether lyrics are included, can enhance psychological responses during exercise. The current findings may help address common exercise barriers and inform exercise practitioners on music selection to improve exercise adherence.

1944 Board #205 May 31 3:30 PM - 5:00 PM

Does Body-weight Circuit Training Have The Ability To Induce Hypoalgesia?

Panagiotis Koutakis[1], Kelsey Uno[2], Emily Pritchett[2], Timothy Michael[2], Nicholas Hanson[2], Michael Miller[2]. *[1]Baylor University, Waco, TX. [2]Western Michigan University, Kalamazoo, MI.*

(No relevant relationships reported)

PURPOSE: Exercise-induced hypoalgesia (EIH) is a phenomenon that often occurs following exercise. It is believed to be related to the endogenous opioids that are released during physical exercise that affect pain perception. Many of the studies investigating EIH have used either aerobic, isometric or resistance training protocols. It is not currently known if circuit training, using bodyweight exercises, can lead to EIH. Therefore, the purpose of this study was to determine if EIH can be elicited through bodyweight exercise circuit training. **METHODS**: Thirty (11 men, 19 women; age 22.8±3.3 years, height 169.71±10.44 cm, mass 75.74±21.56 kg) healthy recreationally active individuals volunteered for this study. Subjects were asked to come to the laboratory, in a randomly assigned order, for two visits: once for a control condition and once for a circuit training condition. In the control condition, subjects were asked to simply rest quietly for 20 minutes. In the experimental condition, they were guided through a series of bodyweight exercises such as squats, lunges, push-ups and chair dips. Pre/post, and at various points during recovery, pain pressure threshold (PPT) was assessed with a strain algometer. Four sites were tested: upper trapezius, index finger, patellar tendon and the dorsal foot. A repeated-measures 2 (condition) by 7 (time: pre/post, and 10, 15, 20, 25 and 30 min post) ANOVA was performed for each site. **RESULTS**: There was only a significant main effect of condition seen in the upper trapezius (p<.05). A significant increase was seen in PPT for the index finger immediately after exercise (2.87±0.15 kg/cm^2 at pre and 3.24±0.19 post; (mean±SD)) and the dorsal foot (2.63±0.14 pre and 2.94±0.15 post). While the index finger PPT returned to baseline quickly, the patellar tendon PPT reached significance at the 10 min post exercise point, and remained elevated. **CONCLUSIONS**: Three out of the four sites showed increased PPT following exercise, suggesting that EIH can be elicited through circuit training implementing bodyweight exercises. Further research is needed but there is a possibility for certain populations such as the elderly or individuals with chronic pain that could benefit from EIH, especially those that cannot perform traditional training methods.

1945 Board #206 May 31 3:30 PM - 5:00 PM

Concurrent Validity Of The Children's Omni Scale Of Perceived Exertion In A Field Setting

Timothy J. Michael, FACSM, Erin Berner, Carol Weideman, Nicholas Hanson, Sangwoo Lee, Michael Miller. *Western Michigan University, Kalamazoo, MI.*

(No relevant relationships reported)

The children's OMNI RPE Scale was developed because of a need and want to measure perceptions of physical exertion in children and adolescents. The term OMNI is from the word omnibus, referring to its wide encompassing properties. The OMNI RPE Scale contains pictorial, numerical and verbal descriptors positioned along an inclined line. Previous research with children and the OMNI RPE Scale was validated in controlled lab settings using exercise equipment. **PURPOSE:** The purpose of this study was to determine if the Children's OMNI RPE Scale is valid in a field setting (at school during recess and Physical Education Class (PE)). **METHODS:** 93 healthy children (male (n=44) and female (n=49)) age 8.5±1.4 years volunteered as subjects. Subjects were recruited from a local public elementary school with parental consent. All subjects demonstrated sufficient ability to read out loud and understand each verbal descriptor on the OMNI RPE Scale. The instruments that were used during this study consisted of a Polar Heart Rate Monitor and a copy of the Children's OMNI-walk/run Scale. A definition of perceived exertion specifically written for children and a standard set of instructions regarding the use of the OMNI-walk/run Scale to rate perceptions of exertion were explained to the subjects immediately before the testing. Data was collected during 30-minute testing sessions, one week apart, during recess and PE class. Heart rate was recorded every 5-minutes for a thirty-minute period, along with perceived exertion. **RESULTS:** Repeated measure ANOVA procedure identified

that Heart Rate and RPE each had a significant (p<0.01) change over time during both recess and PE. Recess: HR±SE (157.9±2.8; 170.1±2.2; 173.8±2.2; 173.9±2.4; 179.7±2.1; 185.6±2.2). RPE±SE (4.3±0.2; 5.2±0.2; 5.8±0.2; 6.3±0.2; 6.8±0.2; 7.4±0.2). PE: HR±SE (148.8±2.4: 153.9±1.8; 160.3±1.7; 164.9±1.9; 167.3±1.9; 168.3±1.9). RPE±SE (3.6±0.2; 4.2±0.2; 4.9±0.2; 5.2±0.2; 5.3±0.2; 5.6±0.2). Pearson correlational analysis indicates a significant relation between Heart Rate and RPE during recess (r=.38l; p<0.001) and PE (r=.552; p<0.001). **CONCLUSION:** Data from the present study suggests that the Children's OMNI RPE Scale is a valid indicator of children's physical effort during structured and unstructured physical activity.

1946   Board #207   May 31 3:30 PM - 5:00 PM
The Effect of Movement Speed on Mental Workload During a Simple Visually Guided Task
E. Daniel Syrett, Matthew E. Holman, Tanu Bhargava, Benjamin J. Darter. *Virginia Commonwealth University, Richmond, VA.*
(No relevant relationships reported)

Mental workload (MW) is a subjective measure of the cognitive effort required to complete a task. Factors such as task speed and the use of feedback can affect the perceived MW and ability to correctly perform an activity. **PURPOSE**: 1) Determine the effect of task speed on perceived MW during a wrist movement pattern guided by visual feedback (VF); and 2) Determine if MW is different for those who correctly perform the task (Performer: *P*) compared to those who do not (Non-performer: *NP*). **METHODS**: Twelve healthy young subjects were recruited and asked to flex and extend their wrist to match two different speeds of a target sine wave: 0.7 Hz (*FAST*) or 1.0 Hz (*SLOW*). VF of wrist movement and the target pattern were provided concurrently on a screen. Five 20-second trials with two-minute rest intervals were completed at each speed. During rest periods the Raw NASA-TLX (RTLX), a tool used to assess perceived workload, was administered. RTLX categories representing purely MW include: mental demand (MD), temporal demand (TD), and frustration (FR). Cross-correlation analysis of task performance was computed for each subject's 5th trial at both speed conditions in order to categorize individuals as either *P* (r ≥ 0.8) or *NP* (r < 0.8). 2x2 mixed model ANOVAs compared the change in perceived MD, TD, and FR from trial one to five between speed conditions (*FAST* vs. *SLOW*) and the two groups (*P* vs. *NP*). Post hoc Tukey HSD tests were used to compare differences. Positive changes in MD, TD, and FR denote improvements in MW. **RESULTS**: Significant speed x group interactions were observed for MD (p=0.008) and TD (p=0.005). No significant interaction or main effects were found for FR (p=0.204). Post hoc tests revealed significant differences in changes in MW between *FAST* and *SLOW* speeds among P (MD *FAST*: 31.4, *SLOW*: 11.4, p=0.027; TD *FAST*: 30.0, *SLOW*: -0.71, p=0.022) and between *P* and *NP* during the *FAST* speed (MD *P*: 31.4, *NP*: -2.0, p=0.044; TD *P*: 30.0, *NP*: -8.0, p=0.031). **CONCLUSIONS**: *P* and *NP* showed similar changes in MW from trial one to five during the *SLOW* speed, whereas only *P* experienced improved MW during the *FAST* speed. These results suggest MW is affected by movement speed in accordance with subject performance.

1947   Board #208   May 31 3:30 PM - 5:00 PM
Compression Sleeve Does Not Speed DOMS Recovery When Compared to Placebo Garment
Molly R. Winke, Celeste Harris. *Hanover College, Hanover, IN.* (Sponsor: Bryant Stamford, FACSM)
(No relevant relationships reported)

Wearing compression garments during recovery from delayed onset muscle soreness (DOMS) is known to attenuate decreased range of motion (ROM) and muscular performance and lessen muscle swelling and pain perception. However, whether a placebo effect is present when wearing compressive clothing, and to what extent recovery may be influenced by this effect, is poorly understood. **PURPOSE:** To determine the effects of a placebo sleeve (PLA) compared to a compression sleeve (CS) during a 5-day recovery period from DOMS of the elbow flexors. **METHODS:** Eight untrained female college students participated in this crossover design study. Upper and lower arm circumference was measured to determine muscle swelling; pain during elbow flexion and elbow extension was measured using a 0 - 100mm visual analog scale to determine muscle soreness; flexion and extension ROM were measured to determine joint mobility; elbow flexion torque production 60° and 180° per second was measured to determine muscular performance. A brief questionnaire measured perceived effectiveness of the garments. The muscle-damage protocol consisted of 4 sets of 25 repetitions of isokinetic concentric elbow flexion followed by eccentric elbow extension. Immediately following the protocol, subjects wore either the PLA (cooling sleeve) or the CS continually for five days. Swelling, ROM, pain, and torque production were measured pre- and post-exercise, and daily during the recovery period. Subjects rested for 7 days before completing another muscle-damage protocol and the remaining treatment. Repeated measures ANOVA was used to determine differences between treatments. **RESULTS:** There were no significant differences between trials in any measured variables indicating that recovery from DOMS was similar in both treatments (*p* > 0.05). Thus, the "true" compressive garment was no more effective at reducing pain, swelling, ROM losses, or strength losses that

accompany DOMS. Subjects preferred PLA or rated the sleeves equally 62% of the time. **CONCLUSION:** These findings suggest that PLA was just as effective as CS at alleviating the symptoms of DOMS in untrained subjects. Subjects indicated a preference for PLA despite the higher compression provided by the CS (15-20mmHg CS vs 5 mmHg PLA).

1948   Board #209   May 31 3:30 PM - 5:00 PM
Relationship Between Perceived and Actual Hydration Levels in Recreationally Active College Students
Seth M. Sievers, Jason D. Wagganer, Jeremy T. Barnes, Thomas J. Pujol, FACSM. *Southeast Missouri State University, Cape GIrardeau, MO.* (Sponsor: Dr. Thomas J. Pujol, FACSM)
(No relevant relationships reported)

Maintaining adequate hydration status is important to safely maintaining a physically active lifestyle. Most individuals are unable to accurately predict internal (i.e., perceived) hydration status. Urine Specific Gravity (USG) is a criterion measure (i.e., actual) of hydration status, and can be used to accurately and objectively gauge the hydration status of an individual. PURPOSE: To examine the relationship between perceived and actual hydration status in recreationally active college students. METHODS: A total of 58 participants (20 Male, 38 Female, Age=22.8+4.2yr, Ht=1.72+.22m, Wt=73.40+14.25kg) were assessed for various hydration-related indicators. Perceived hydration was assessed via a survey upon arrival at the laboratory. Participants provided a mid-stream urine sample in a sterile, clear container. Self-perceived hydration was assessed using the urine color (UC) eight-point scale. Actual hydration status was assessed utilizing using a pen refractometer (Atago model 3749, Bellevue, WA) and UC. A Pearson Product Moment Correlation was used to analyze relationships between perceived and actual hydration values using Statistical Package for the Social Sciences (v24.0). RESULTS: A weak but significant correlation was shown between perceived hydration status and USG (r= 0.284; p<0.05). Perceived hydration status and UC had a strong correlation (r= 0.776; p<0.01). CONCLUSIONS: The relationship between USG, urine color, and perceived hydration indicate a strong sense of internal hydration status in participants. The findings of this study are supported by past research on competitive athletes, suggesting that a high level of physical activity (and the associated high hydration demands) correlates with a strong sense of hydration status. Future research should assess the relationship between activity level and perceived compared to actual hydration status.

1949   Board #210   May 31 3:30 PM - 5:00 PM
Setting, Age, & Intensity Influence Psychological and Physiological Processes in Young Female Endurance Runners
Elizabeth Queathem, Kayla Morrissey. *Grinnell College, Grinnell, IA.*
(No relevant relationships reported)

Exercise has tremendously beneficial effects on human psychological and physical health, yet many people still choose not to exercise. PURPOSE: Our study investigated how girls' responses to exercise intensity and exercise environment as they age through adolescence. METHODS: We recruited female runners of different ages (middle school, high school, college) to perform running sessions on a treadmill and in an outdoor environment. Each participant ran at three different intensities, 6 minutes per intensity, for both the treadmill and outdoor environment. Data were collected on what the runners thought about while running (Thoughts During Running Inventory), how they felt (Feeling Scale), how their bodies physiologically responded to the running (blood lactate, heart rate), and how fast they ran (speed). RESULTS: Participants ran faster and harder, indicated by speed (ANOVA, p < 0.0001), blood lactate levels (ANOVA, p = 0.008), and heart rate (ANOVA, p = 0.004), in the outdoor environments, and younger participants were more likely to feel worse after exercise (ANOVA, p < 0.0001). CONCLUSIONS: We extended the work of Reich and Queathem (in review) to females, demonstrating that despite their very different hormonal milieu as they age through adolescence, female endurance runners respond to environment and exercise intensity in much the same way as male endurance runners of similar ages. Our study suggests that outdoor running may confer greater health benefits than treadmill running because exercisers push themselves harder in outdoor conditions. In addition, we surmise that either girls acquire more positive affective response to exercise as they mature, or only those girls who respond positively to exercise continue to run competitively as they age.

1950   Board #211   May 31 3:30 PM - 5:00 PM

Affective States of Active and Inactive Individuals While Sitting

Tia M. Dupont[1], Luke M. Krynski[1], Sean Thomez[1], Mark E. Hartman[2], Laura D. Ellingson[2], Robert W. Pettitt, FACSM[3], Cherie D. Pettitt[3]. [1]Minnesota State University, Mankato, Mankato, MN. [2]Iowa State University, Ames, IA. [3]Rocky Mountain University of Health Professions, Provo, UT. (Sponsor: Robert W. Pettitt, FACSM)

(No relevant relationships reported)

Arousal levels are affected by activity levels such that increased sedentary behavior is associated with lower levels of vigor and higher levels of fatigue. Individuals who meet minimum physical activity guidelines have higher levels of vigor and vitality regardless of prolonged sedentary behaviors; however, the assessment of feeling states during prolonged sitting have not been explored. PURPOSE: To determine if there is a difference in affective states of fit vs unfit individuals and if fitness influences affective states during prolonged periods of sitting. METHODS: A total of 9 females and 5 males (age = 19.9±1.9 y; body mass index 23.2±2.7 kg·m^2) underwent submaximal exercise testing to determine maximum oxygen uptake (VO$_{2max}$) and to include a heterogeneous group relative to fitness (range: 30.7 to 55.9 ml·kg^{-1}·min^{-1}). Affective states were assessed hourly using the Activation Deactivation Adjective Check List (ADACL) which subscales of energy, tired, tension, and calmness. Each group completed two separate 4-h sitting bouts whereas one bout was continuous and the other was interrupted by 13 min·h^{-1} of standing. RESULTS: In both conditions, a decline in energy levels occurred from baseline (~2.0±1.0) to 2 h (~1.4±0.8) (main effect for time, p<0.05), whereby the metrics of tiredness, tension, or calmness were neither altered by time nor by allowing subjects to interrupt sitting (p > 0.05). With no standing permitted, significant inverse correlations were observed between energy and VO$_{2max}$ the second (tau = -0.56, p = 0.009) and third hour of sitting (tau = -0.49, p = 0.028). With fitter participants, decline in energy occurred over time regardless of the interruption. CONCLUSION: Fit compared to less fit individuals experience greater declines in energy levels as a result of prolonged sitting. Standing 13 min·h^{-1} is insufficient to attenuate the declines in energy levels associated with bout of sitting 2 h and beyond.

1951   Board #212   May 31 3:30 PM - 5:00 PM

Exercise Performance and Perception of Breathlessness after Caffeine Ingestion in Trained Cyclists

Erica M. Larson, Jayvaughn T. Oliver, Jonathon L. Stickford, Kimberly S. Fasczewski, R. Andrew Shanely. *Appalachian State University, Boone, NC.* (Sponsor: David C. Nieman, FACSM)

(No relevant relationships reported)

Caffeine (CAF) is commonly ingested as an ergogenic aid among cyclists, in part, due to its effect on pain perception. CAF also may improve exercise performance by altering the perceptions related to ventilatory work and dyspnea. **PURPOSE:** The purpose of this study was to compare exercise performance and the rating of perceived breathlessness (RPB; Likert Scale) after ingestion of a moderate dose of CAF or placebo (PLA) in trained cyclists. **METHODS:** Six male cyclists completed pulmonary function testing and a peak aerobic capacity test (age: 31.8±10.4 y; VO$_{2max}$: 61.2±6.1 ml·kg^{-1}·min^{-1}). During the second visit, cyclists completed a fixed-work familiarization time trial (TT) equivalent to a distance of 20km. Subsequently, and on separate days, subjects completed in a randomized, counterbalanced order, TTs with ingestion of a placebo (TT$_{PLA}$) or caffeine (TT$_{CAF}$; 5 mg·kg^{-1}) 60 min prior. Elapsed time, power output, perceptual responses, and ventilatory parameters were measured every 2 km during each TT. **RESULTS:** Subjects displayed normal pulmonary function during baseline testing. Elapsed time did not significantly differ between TT$_{CAF}$ and TT$_{PLA}$ trials (33.4±4.3 vs. 34.3±4.23 min, p=0.095). Ventilation and mouth pressure did not differ at 50% (133±31.8 vs. 123±22.0 L·min^{-1}, p=0.190; -107±26.5 vs -100±18.4 cmH$_2$O·min^{-1}, p=0.237) and 100% (175±42.3 vs. 176±48.8 L·min^{-1} p=0.901; -149±45.5 vs -133±78.3 cmH$_2$O·min^{-1}, p=0.506) of TT$_{CAF}$ compared with TT$_{PLA}$. RPB did not differ at 50% (4.5±2.1 vs. 3.2±2.5, p=0.017) and did not differ at 100% (7.3±2.4 vs. 6.6±2.2, p=0.250) of TT$_{CAF}$ compared with TT$_{PLA}$. Rating of perceived exertion (RPE) did not differ at 50% (13.1±2.9 vs. 12.1±2.4, p=0.266) and 100% (17.5±1.8 vs. 17.8±1.8, p=0.380) of TT$_{CAF}$ compared with TT$_{PLA}$. **CONCLUSIONS:** Exercise performance, ventilation, and RPB did not differ in trained cyclists during 20km time trials after ingestion of CAF or PLA. Supported by the Office of Student Research and Graduate Student Association Senate at Appalachian State University.

1952   Board #213   May 31 3:30 PM - 5:00 PM

Attitude toward and Perceived Discomfort from Neuromuscular Electrical Stimulation

Jennifer A. Jasso, Lindsay E. Kipp, Joni A. Mettler. *Texas State University, San Marcos, TX.* (Sponsor: Tinker Murray, PhD, FACSM)

(No relevant relationships reported)

Neuromuscular electrical stimulation (NMES) is commonly used to improve muscle function in physical rehabilitation settings. However, reasons for limited use as an alternative to voluntary exercise may be due to lack of familiarity and perceived discomfort during treatment. **PURPOSE:** The purpose of this study was to determine attitude toward NMES exercise and perceived pain and muscle soreness experienced from NMES exercise with increasing stimulation intensity. **METHODS:** Thirty healthy adults (age: 23.6 ± 0.5 years) who had not experienced electrical stimulation within the last year completed the study. Repetitive, intermittent stimulation of 10 seconds on and 15 seconds off was applied to the quadriceps muscles for 60 minutes with the stimulation frequency set at 60 Hz. Stimulation intensity was increased every 5 min throughout the course of the intervention to achieve a target torque of 15% maximal voluntary contraction as measured by an isokinetic dynamometer. During the NMES application, participants rated the pain they experienced using a standard pain scale (0-10 scale: 0 = no pain; 10 = most pain possible) at minute 0, 15, 30, 45, and 55 of the treatment. Participants were also asked to rate muscle soreness felt 48 hours after exercise (0-10 scale: 0 = no soreness; 10 = greatest soreness possible). A survey on attitude toward NMES exercise (e.g., useful, pleasant, beneficial) was administered pre and post NMES on a 1-7 scale (e.g., 1 = useless; 7 = useful). Repeated measures analysis of variance (ANOVA) was used to test statistical differences between scores over time. Data are reported as mean ± SE. **RESULTS:** Attitude toward NMES exercise was high and did not change pre-post exercise (pre: 6.2 ± 0.1, post: 6.1 ± 0.2, $p = 0.21$). Reported pain during NMES was low and was not different across time points (0 min: 2.1 ± 0.4, 15 min: 2.7 ± 0.4, 30 min: 2.6 ± 0.4, 45 min: 2.9 ± 0.4, 55 min: 2.5 ± 0.4, $p = 0.126$). Muscle soreness remained elevated 48-hours post-NMES (3.5 ± 0.593, $p < 0.001$). **CONCLUSION:** Pain reported during NMES was low and did not increase as stimulation intensity increased. Attitudes toward NMES sessions were relatively high and were unchanged after exercise, indicating that any pain and soreness experienced did not change participants' attitude regarding the benefits of NMES exercise.

1953   Board #214   May 31 3:30 PM - 5:00 PM

Exercise Effects On Depressive and Anxiety Symptoms, Fatigue And Pain in Rheumatoid Arthritis: A Meta-Analysis

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(No relevant relationships reported)

Elevated anxiety and depressive symptoms, persistent fatigue, and pain are prevalent co-morbidities in Rheumatoid Arthritis (RA). Though the available evidence supports exercise effects on these outcomes, no quantitative synthesis of evidence from randomized controlled trials (RCTs) of exercise effects on these critically important symptoms in RA has been conducted. **PURPOSE:** To estimate the overall population effect of exercise on depressive and anxiety symptoms, fatigue, and pain derived from available RCTs. **METHODS:** Twelve articles published before September 2017 were located using Google Scholar, PsycINFO, PubMed, and Web of Science. Trials involved 1,031 participants and included both randomization to exercise and non-exercise control and validated measures of depression, anxiety, fatigue, and/or pain assessed at baseline and post-intervention. Hedges'*d* effect sizes (95%CI) were computed and random effects models were used for all analyses. **RESULTS:** Participants were aged 49±9 years and 83%±14% female. Exercise training consisted on average of 3±1 weekly sessions, 60±17 minutes per session, and 11±5 weeks in duration. Mean reported adherence was 87%±11%. For depression, 18 of 20 effects (90%) were >0. The mean effect size Δ was 0.20 (0.10-0.31; $p<0.001$). No significant heterogeneity was observed (Q$_{19}$=26.72; $p>0.10$), and consistency was low across effects (I^2=32.63%). For anxiety, seven of seven effects (100%) were >0. The mean effect size Δ was 0.50 (0.27-0.74; $p<0.001$). No significant heterogeneity was observed (Q$_6$=2.46; $p>0.87$), and consistency was low across effects (I^2=0%). For pain, seven of 16 effects (44%) were >0. The mean effect size Δ was 0.04 (-0.14-0.21; $p>0.69$). The effect was heterogeneous (Q$_{15}$=32.82; $p≤0.005$), and consistency was moderate across effects (I^2=57.34%). For fatigue, six of 11 effects (54.5%) were >0. The mean effect size Δ was -0.01 (-0.20-0.19; $p>0.93$). The effect was heterogeneous (Q$_{10}$=19.08; $p<0.04$), and consistency was moderate across effects (I^2=52.83%). **CONCLUSION:** Exercise resulted in significant small-to-moderate reductions in depressive and anxiety symptoms. However, pain and fatigue were not significantly changed. Further investigation of sources of variability in the effects of exercise on pain and fatigue among adults with RA is warranted.

D-71   Free Communication/Poster - **Endocrinology/ Immunology I**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1954   Board #215   May 31 3:30 PM - 5:00 PM

The Cortisol Awakening Response is Associated With Activity Level on the Preceding Day

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(No relevant relationships reported)

The cortisol awakening response (CAR) describes the initial rise in cortisol following waking, and has been suggested to be a potential biomarker for monitoring exercise training stress. However, it is currently unknown if CAR is sensitive enough to track changes in daily physical activity (PA). **PURPOSE:** Therefore, the purpose of this study was to assess the impact of daily PA on CAR and associated derived measures. **METHODS:** Male (n = 24) and female (n = 71) college-aged students (19.0±1.8y, 72.1±19.5kg) wore wrist-worn accelerometers (ActiGraph) for four consecutive days (24 hour protocol). Actigraph data were analyzed using six custom activity bands as totals (Bands) and percentage of total time (Bands$_\%$), since moderate-vigorous PA was minimal in this sample. Salivary samples were collected each morning, immediately after waking (C_0) and 30 mins later (C_{30}) and were analyzed in duplicate for cortisol (ng.ml^{-1}) using DELFIA. CAR and CAR$_\%$ were calculated as the difference between C_{30} and C_0 and the percentage increase from C_0, respectively. Only subjects with two complete days of data were included in the current analysis. Differences between PA and CAR variables between days were assessed via paired-sample t-tests. Multivariate multiple linear regression with univariate follow-up tests fit CAR variables by PA. Models were computed for each day individually, as well as ratio (Q) values between days (Day2/Day1). **RESULTS:** No differences were observed between days for CAR or derived measures, or activity bands (all p>0.05). Day 1 showed a significant model for CAR by Bands$_\%$ ($R^2 = .13$, p = 0.04), while the Day 2 CAR$_\%$ by Band model was significant ($R^2 = 0.15$, p = 0.02). Ratio models further elucidated these relations, with a significant model for Q•CAR$_\%$ by Q•Band$_\%$ ($R^2 = 0.15$, p = 0.02). **CONCLUSION:** These results suggest that CAR and its derived measures are relatively stable across days. Also, CAR does appear to be sensitive to the degree of PA or sedentary behaviors during the preceding day in college-aged persons, such that change in CAR is partially accounted for by changes in PA. Therefore, PA should be considered in future CAR research and interventions that specifically manipulate PA (i.e., exercise interventions) are needed to confirm the usefulness of CAR for tracking changes in exercise training stress.

1955   Board #216   May 31 3:30 PM - 5:00 PM

Effect Of Acute High-Intensity Interval Exercise Vs. Continuous Moderate-Intensity Exercise On The BDNF, Lactate, And Cortisol Responses In Obese Individuals

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(No relevant relationships reported)

PURPOSE: Obesity may attenuate the expression of brain-derived neurotrophic factor (BDNF), thereby increasing the risk of cognitive dysfunction. High-intensity interval exercise (HIIE) has been shown to be as or more effective than continuous moderate exercise (CME) in promoting the expression of BDNF in normal weight individuals. Therefore, the purpose of this study was to compare the effect of acute HIIE and CME on BDNF expression in obese individuals. **METHODS**: Twelve male subjects (6 obese and 6 normal-weight) participated in a randomized and caloric equated experiment: HIIE (30 minutes, 4 intervals of 4 minutes at 80% - 90% of VO$_{2max}$ with 3 minutes rest between intervals) and CME (38 minutes at 50% - 60% VO$_{2max}$). Blood samples were collected for measurements of serum BDNF, blood lactate, and plasma cortisol prior to and following exercise. **RESULTS**: The BDNF response to acute HIIE was greater than CME in obese subjects when compared to normal-weight subjects. Similarly, although acute HIIE induced greater lactate and cortisol levels than CME, obese subjects produced less lactate, but no difference in cortisol than normal-weight subjects. **CONCLUSIONS**: Acute HIIE may be an effective protocol to upregulate BDNF expression in an obese population, independent of increased lactate and cortisol levels.

1956   Board #217   May 31 3:30 PM - 5:00 PM

Hormonal, Steroidal and Inflammatory Responses in Collegiate Male Soccer Players and Female Cross-Country Runners

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(No relevant relationships reported)

PURPOSE: To examine hormonal, steroidal and inflammatory responses in collegiate male soccer players (M$_{SOC}$) and female cross-country runners (F$_{XC}$) over the course of a competitive season. **METHODS:** 22 M$_{SOC}$ (mean±SD; age, 20±1y; height, 181.2±6.5cm; body mass, 79.4±6.9kg; VO$_{2max}$, 50.9±4.4 ml•kg^{-1}•min^{-1}) and 11 F$_{XC}$ (mean±SD; age 19±1y; height 168.4±7.7cm; body mass, 58.7±9.6kg; VO$_{2max}$, 53.5±2.0 ml•kg^{-1}•min^{-1}) participated in this study. Participants provided a blood sample at 4 time points: before preseason (PS$_{PRE}$), following preseason (PS$_{POST}$), week 4 (W4, F$_{XC}$), week 8 (W8, M$_{SOC}$), and following the competitive season (RS$_{POST}$). Blood samples were assessed for the following biomarkers: testosterone (T), cortisol (C), testosterone:cortisol ratio (T:C), human growth hormone (HGH), estradiol (E), progesterone (P), insulin-like growth factor-1 (IGF-1), Interleukin-6 (IL-6) and Vitamin D (VitD). Significant differences were assessed via repeated measures ANOVA and subsequent post hoc testing (p<0.05). **RESULTS:** Compared to PS$_{PRE}$ (M$_{SOC}$, 23.71±13.16 pg•ml^{-1}; F$_{XC}$, 21.19±1.38 pg•ml^{-1}), IL-6 was significantly lower at PS$_{POST}$ (M$_{SOC}$, 20.44±11.58 pg•ml^{-1}; F$_{XC}$, 15.41±3.47 pg•ml^{-1}) and W4 (16.68±4.71 pg•ml^{-1}) (p<0.05). IL-6 was significantly greater at RS$_{POST}$ (20.27±4.97 pg•ml^{-1}) compared to PS$_{POST}$ for F$_{XC}$ only (p=0.04). In M$_{SOC}$, C was significantly greater at PS$_{POST}$ (84.76±15.70 ng•ml^{-1}) and W8 (84.34±16.68 ng•ml^{-1}) compared to PS$_{PRE}$ (74.59±14.65 ng•ml^{-1}) (p<0.05). VitD was significantly lower at RS$_{POST}$ (55.86±26.20 ng•ml^{-1}) compared to both PS$_{PRE}$ (74.30±33.28 ng•ml^{-1}) and PS$_{POST}$ (68.26±33.18 ng•ml^{-1}) for M$_{SOC}$ (p<0.05), with no significant differences in VitD in F$_{XC}$ at any time point (p>0.05). P, HGH, IGF, C (F$_{XC}$), T (M$_{SOC}$), T:C (M$_{SOC}$) and E (F$_{XC}$) were not significantly different at any time point (p>0.05). **CONCLUSION:** Our results detected a reduction in IL-6 following preseason in M$_{SOC}$ and F$_{XC}$ that returned to baseline at the conclusion of the competitive seasons. Over time, regular season training allowed for sufficient recovery from exercise stress in both male soccer and female cross-country athletes. Future research is needed to examine the relationship between changes in training volume and training intensity on changes in the anabolic and catabolic response in male and female collegiate athletes.

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Correlation Between Proinflammatory Cytokines And Cortisol In Female Soccer Players Carriers Of Premenstrual Syndrome

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(No relevant relationships reported)

PURPOSE: The aim of this study was to evaluate cytokines production and its relation with cortisol in female soccer players with premenstrual syndrome (PMS) and without premenstrual syndrome PMS (nPMS), in pre-game evaluating the two phases of the menstrual cycle: follicular and luteal. PMS causes physical and emotional discomfort to women, so that this study can be of great importance in female athletes training scheme.
METHODS: Fifty-two eumenorreic soccer players were evaluated (age: 19.8 ± 4.7 years). The PMS and phases of the menstrual cycle were determined by monitoring for 3 consecutive months, using the Daily Symptom Report (DSR). Evaluation of cortisol and cytokines IL-1β, IL-6, IL-8, IL-10, IL-15, IL-17 and TNF-α were performed in urine and quantified by Flow cytometry method. Study approved by the Ethics Committee in Research from Universidade Federal de São Paulo (Brazil) (No.1604/10). ANOVA and Pearson correlation with significance level of 5% were used for data analysis.
RESULTS: No statistical significant results were found in cortisol and cytokines IL-1β, IL-8, IL-10, IL-15, IL-17 and TNF-α between groups PMS and nPMS. The concentration of IL-6, in pre-game during the luteal phase, showed an increased in the group with PMS (p=0.04) compared to the nPMS group. The results of correlation between cortisol and the cytokines evaluated also showed positive correlations in the pre-game of the luteal phase with IL-17 (p<0.001, r= 0.77), IL-1β (p<0.001, r= 0.63) and IL-6 (p<0.001, r= 0.55).
CONCLUSIONS: Our results allow us to conclude that female soccer athletes PMS carriers, even in the pre-game period, presented an increased inflammatory status. The increase of proinflammatory cytokines is of great importance, since it is associated with an increased incidence of musculoskeletal lesions and a decrease in aerobic

capacity. Therefore, the importance of our work is to alert female athletes, coaches and team physicians about the effects of PMS on health and performance, in order to provide these athletes with adequate training in the premenstrual period.

1958   Board #219   May 31 3:30 PM - 5:00 PM

Cd28 Expression On Cd4+ T Cells Is Not Affected By Strenuous Exercise In Untrained Individuals

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(No relevant relationships reported)

Optimal T cell activation requires a two-signal process. The first signal is engagement of the TCR-CD3 complex and the second, or costimulatory, signal is the classical binding of a T cell CD28 receptor with an APC-bound CD80 or CD86. A marker of senescent T cells is a lack of CD28 expression and it has been posited that CD28 expression may decrease following strenuous exercise. **PURPOSE:** To quantify exercise induced changes in CD28 expression on CD4$^+$ cells obtained from human subjects. **METHODS:** Utilizing a cross over design, untrained subjects completed a control and exercise visit. The control visit consisted of 30 min of seated rest while the exercise session entailed 3 sets x 10 reps squat at 70% 1-RM, 3x10 leg press at 70% 1-RM, and 3x10 leg extensions at 70% 1-RM with 2 min rest between sets. Venous blood samples were obtained pre and post each visit. CD4$^+$ T cell isolation from peripheral blood was conducted through negative selection using a Human CD4$^+$ T cell enrichment kit. CD4$^+$ T cells were plated at 1.5 x 10^6 cells/ml in 200 μl of ImmunoCult T-cell expansion media directly after isolation and costimulated through CD3+CD28 or no stimulation. Cells were incubated for 1 and 3 d at 37°C in a humidified incubator with 5% CO$_2$ and then analyzed by flow cytometry. Data were analyzed using two-way RMANOVAs. **RESULTS:** There were no significant differences in CD28 expression between the exercise and control conditions in either the stimulated (p = .27) or non-stimulated (p = .62) samples. These data suggest that suppression of CD4$^+$ cell activation following strenuous exercise is likely not a result of dysfunction in CD28, a major costimulatory receptor. **CONCLUSIONS:** Changes in T cell activation following strenuous exercise are likely derived from a plurality of sources, but without direct assessment of discrete elements of the activation cascade we will be unable to understand how exercise changes immune function. Future work should focus on elements upstream of T cell clonal expansion in order to identify mechanisms for exercise induced changes in immunocompetence.

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Neutrophil Extracellular Traps Engaged in Strenuous Exercise Induced Hyperfunction of Innate Immunity System

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(No relevant relationships reported)

There is robust evidence that strenuous exercise is pro-inflammatory and inclined to impair the function of innate immunity. Neutrophil extracellular traps (NETs) is a novel cell death pathway through which neutrophils release chromatin and granule enzymes to capture and kill invaders. However, the components of NETs can also be harmful to host cells. Overproducing cell-free DNA (cf-DNA) and reactive oxygen species (ROS) through strenuous exercise are commonly proved. Much less is known about the origin of cf-DNA and whether ROS participate in strenuous exercise induced NETs formation. **Purpose:** Based on the doubt, we hypothesize that 1) strenuous exercise increase NETs formation and the high level of NETs is related to the imbalance of immunity function; 2) mitochondrial antioxidants suppress strenuous exercise induced NETs formation and reduce the adverse consequences to host. **Methods:**24 C57/bl mice were divided to three groups: Control group (C, n=8), strenuous exercise group (E, n=8) and mitoTempo+ strenuous exercise group (ME, n=8). E group and ME group were adapted to the treadmill for three days with a low speed. 30 minutes before formal experiment, ME group were injected with mitochondrial antioxidant mitoTempo (0.7mg/kg), then E group and ME group peform 90 minutes 85% VO2max speed running exercise. Immediately after exercise, 3 groups of mice were anesthetized and the circulating blood was collected into anticoagulant tube. Plasma cf-DNA, MPO-DNA complexes, IL-6, IL-10 and TNF-αwere tested according to the manufacture introduction of Elisa Kit; innate immunity cell function, such as phagocytosis and oxygen burst were test by flow cytometry. **Results:** Plasma cf-DNA and MPO-DNA complexes were two-fold increase in E group compared to C group (P<0.05), while there is no difference between C group and ME group; IL-6 and TNF-αlevel in E group were higher than C group and ME group, IL-10 level show the adverse result. Monocytes and neutrophils in E group show a stronger phagocyte and

ROS produce function than C group and ME group.**Conclusion:** An acute single bout of strenuous exercise increases NETs formation and cause hyper-function of innate immunity function.
Mitochondrial antioxidants suppress strenuous exercise induced NETs formation and balance innate immunity cells function.

1960   Board #221   May 31 3:30 PM - 5:00 PM

Effects Of Exercise On The Expansion Of Myeloid-derived Suppressor Cells

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(No relevant relationships reported)

Myeloid-derived suppressor cells (MDSCs) are a heterogeneous population of immune cells that expand in response to cancer and various other pathological conditions. MDSCs are characterized by their suppression of T-cells and their involvement in metastasis. Aerobic exercise protects against tumor growth and metastasis, yet the mechanisms behind this protection are still largely unknown. **PURPOSE**: To examine the effects of exercise on the expansion of MDSCs and suppression of immune function in a murine breast cancer model. **METHODS**: Female mice, 8 weeks of age, were randomly assigned to one of the following groups: exercise tumor (EX+TUM), sedentary tumor (SED+TUM), exercise control (EX) or sedentary control (SED). Animals in both TUM groups were inoculated with 1x10^4 4T1 murine mammary carcinoma cells in the mammary fat pad. Both EX groups were given access to running wheels for 4 weeks, beginning on the day of inoculation, and SED groups were restricted to normal cage activity. Following completion of the 4-week training period, blood and spleen samples were collected for analysis via flow cytometry. MDSC expansion was measured as the percentage of CD11b$^+$Ly6C$^+$ and CD11b$^+$Ly6G$^+$ cells in the population. Spleen cytotoxic T-cells were measured as the number of CD8$^+$ cells and expressed as a percentage of the total population. **RESULTS**: MDSCs in the blood of SED+TUM (15.3% ± 7.1%) were significantly higher (p < 0.05) than SED (0.8% ± 0.2%) indicating tumor-dependent expansion of MDSCs. EX+TUM (10.1% ± 0.7%) was not significantly different from EX (0.5% ± 0.1%) or SED (0.8% ± 0.2%) suggesting MDSC expansion did not occur to the same extent in the blood of exercised animals. The percentage of CD8$^+$ T-cells in SED+TUM (5.6% ± 1.7%) was significantly lower (p < 0.05) than EX (13.1% ± 1.1%) and SED (13.4% ± 0.9%) indicating a tumor-induced suppression of immune function. In contrast, EX+TUM (7.7% ± 1.0%) was not significantly different from EX (13.1% ± 1.1%) or SED (13.4% ± 0.9%). **CONCLUSION**: These data suggest that exercise may have a protective effect against the immunosuppression that results from expansion of MDSCs in tumor bearing animals. MDSCs have been shown to create a premetastatic niche at the site of metastasis and exercise may protect against distant metastases by attenuating increased numbers of MDSCs in the blood.

1961   Board #222   May 31 3:30 PM - 5:00 PM

Acute Effects of Exhaustive Exercise and Cardio-Respiratory Fitness on Regulatory T Cell Homeostasis.

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(No relevant relationships reported)

Regulatory T (T$_{Reg}$) cells are central anti-inflammatory regulators of the immune response and crucial for the maintenance of immune homeostasis. They exert anti-inflammatory effects and are central regulators of the immune responses to self- and foreign antigens. Increased T$_{Reg}$ cell populations can result in a state of immunosuppression, as has been shown in tumor-induced immunosuppression, whereas dysfunction of T$_{Reg}$ cells can result in autoimmune diseases. Acute physical exercise is known to have immune modulatory properties and has been previously described in professional athletes.
Purpose: The aim of this investigation was to examine the immune modulatory properties of acute exhaustive exercise on T$_{Reg}$ cell homeostasis and to examine whether there is a direct link between cardiovascular fitness status (VO$_{2\,peak}$) and T$_{Reg}$ cell population.
Methods: A total of 20 middle-aged healthy female subjects (age of 55, 2 ± 5, 7) were asked to perform a spiroergometry on a cycle ergometer. The spirometry protocol (1 minute rest measurement, 3 minutes warm-up with 50 Watts, increase of 25 Watts every 2 minutes) was performed until exhaustion of the subject. The evaluation of VO$_{2\,peak}$ served as a parameter of the healthy subjects' cardiovascular fitness. Before (T0) and after (T1) spiroergometry test, venous blood was collected. The T$_{Reg}$ cell evaluation was assessed using antibodies against CD3, CD4, CS25 and CD127 through multicolor flow cytometry.
Results: The T$_{Reg}$ cell population significantly decreased after single exercise load (T0 vs T1, p=.001). There was a positive correlation found between VO$_{2\,peak}$ and T$_{Reg}$ cell frequency (p= .005).

Conclusion/Significance: The T_{Reg} proportion decrease indicates an acute effect of intense physical exercise on T_{Reg} cell homeostasis. This could represent a rapid distribution to other tissues or a compensatory attempt to restore immune homeostasis and limit excessive damage. The correlation between peak oxygen uptake and T_{Reg} proportions could be seen as a chronic response of the anti-inflammatory capacity of healthy subjects to repeated bouts of exercise (short-term inflammatory stimuli).

D-72   Free Communication/Poster - **Concussion II**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1962   Board #223   May 31 3:30 PM - 5:00 PM
Fatigue Influence On King-devick Test

Adrian Aron, Rachel Andrews, Erica Boggs, Andrea Stanley, Olivia Willson, Brent Harper. *Radford University, Radford, VA.* (Sponsor: Trent Hargens, FACSM)
(No relevant relationships reported)

One of current sideline, post-injury assessment tools used for screening concussion include the King-Devick Test (K-D) which measures cognitive processing speed, rapid eye movement, and visual tracking. As a post-exercise test it is unclear if the K-D is truly sensitive enough to rule-out concussion in the presence of fatigue. **PURPOSE:** To examine the impact of whole-body fatigue on King-Devick test performance. **METHODS:** The test was administered to 24 subjects (age = 23.2 ± 1.7 years, BMI = 24.9 ± 2.2 kg/m^2) at baseline, after a fatigue protocol and on ensuing time at least 3 weeks later. The fatigue protocol was performed on a Concept 2 rower at an initial metronome pace of 75 bpm with an increase of one bpm every two minutes until the subject reached fatigue. Fatigue was determined when three of four criteria were met: 90% or higher of predicted MaxHR, inability to maintain metronome pace for three consecutive pulls to the abdomen, 17/20 or higher on the RPE scale, and inability to maintain proper form. **RESULTS:** Post-fatigue, 41.7% of the subjects were positive on the K-D test. Among subjects that reported a history of dizziness, 57.1 % were positive on the post-fatigue K-D test compared to 35.3% who did not reported dizziness (P = 0.2). The time spent on the rower was not different (P = 0.2) between subjects that were positive on the K-D test (14.8 ± 12.0 minutes) and the ones that were negative (44.8 ± 23.2 minutes). A positive K-D test is determination when the time to complete the test increases on a posttest or an error is recorded. Follow-up testing (3 weeks) showed that 20.8% of subjects had K-D scores indicative of further evaluation (P = 0.09). Of these, 60% K-D scores were positive by less than 1 second (0.64 sec.). If a positive K-D was defined as a score ≥ 1 second, only 8.3% of subjects will be categorized as positive for K-D (P = 0.01 compared to baseline). **CONCLUSIONS:** The present data demonstrate that whole-body fatigue may worsen the K-D scores, questioning its construct validity and limiting its use as a sideline screening for concussion. Scoring definitions can also be improved to better depict the positive results. The K-D test can show an improved validity when used in conjunction with pre-concussion symptom history.

1963   Board #224   May 31 3:30 PM - 5:00 PM
Differences in Reporting: The Concussed Student Versus the Concerned Parent

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(No relevant relationships reported)

In the last decade, incidence of sport-related concussion has doubled. Optimal care requires an accurate diagnosis of symptoms and severity. Many student-athletes attempt to disguise symptoms and downplay severity to hasten their return to play. A concerned parent is less likely to participate in the downplaying. An accurate portrayal of symptoms may require both perspectives. Data comparing the reporting by parents and students are needed and limited. **PURPOSE:** To evaluate differences in the reporting of concussion symptoms between those who suffer them and the parents who observe them. **METHODS:** Over a 7-year period, 80 students were admitted for psychiatric evaluation owing to persistent post-concussion symptoms. Our study sample consisted of 72 of patients who completed the Behavior Assessment System for Children, 2nd Edition (BASC) as a component of their evaluation. The BASC assesses emotional, social, and behavioral functioning via self-report forms that are completed by adolescents and their parents. There are 13 questions that are unique to adolescents, 18 that are unique to parents, and 7 that are asked in both. The overlapping questions address atypicality, anxiety, depression, somatization, hyperactivity, anger control, and internalizing problems. We performed paired-samples t-tests on these domains to measure equivalence in reporting between students and parents. We used multiple linear regression to identify variables that explained differences in reporting.

RESULTS: Student/parent differences were found in atypicality (p=0.002), depression (p=0.012), anger control (p=0.006), and internalizing problems (p=0.017); students reported lower scores in each category. Averaging all 7 categories, parents reported 6.7% higher scores (p=0.031). Sex did not explain this difference (p=0.184), but grade in school was a trending predictor: each additional grade associated with a 1.2-point reduction in parental overestimation (p=0.064). **CONCLUSIONS:** Following a concussion, adolescents are likely to perceive the severity of emotional, social, and behavioral symptoms more modestly than their parents. The discrepancy was widest among elementary school students, it narrowed in middle and high school, and college students reported symptoms more severely than their parents.

1964   Board #225   May 31 3:30 PM - 5:00 PM
Depression Severity in Adolescent Male and Female Athletes Following Sports-Related Concussion

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(No relevant relationships reported)

PURPOSE: Concussions are a growing concern in adolescent sports medicine. However, there is no prospective data demonstrating an association between sustaining a sports-related concussion (SRC) and depression in adolescents. This study prospectively assessed changes in depressive symptoms in high school athletes following an SRC. **METHODS**: This longitudinal cohort study consisted of 1701 adolescent athletes (grades 9-12) who were monitored for SRC. 99 athletes sustained a concussion during the study period (38 females, 61 males). Participants completed the Patient Health Questionnaire-9 (PHQ-9) survey to measure depressive symptoms at baseline (enrollment, pre-SRC), 24-72 hours post-SRC, and 7 days, 3 months, and 6 months post-SRC. Clinically relevant depressive symptoms were defined as a PHQ-9 score >4, or some depressive symptoms most days and most of each day. To evaluate changes in PHQ-9 scores from baseline, linear mixed-effect models adjusting for sex and time were used; least-square means and standard errors are reported. GEE models assuming a binomial distribution and logit link were used to model the association between depressive symptoms and time since concussion, stratified by sex. **RESULTS**: When compared to baseline, females reported PHQ-9 scores that were, on average, 1.53(0.56) points higher at 24-72 hours post-SRC and 1.62(0.57) points higher at 7 days post-concussion than at baseline (p=0.007; p=0.004). PHQ-9 scores were lower (i.e. better) than baseline for both males and females at 3 months post-SRC (M: - 1.19(0.48); p=0.01, F: -1.14(0.66); p=0.09). Females were 7.6 times more likely to have a PHQ-9 >4 at 24-72 hours post-concussion (95% CI: 1.47, 39.08) than they were at baseline (p=0.02) and 10.36 times more likely at 7 days post-concussion (95% CI: 1.90, 56.59) than at baseline (p=0.007). By 3 months, no difference from baseline is noted. There is no evidence to suggest that males experience increased depressive symptoms post-SRC. **CONCLUSIONS**: In the week following an SRC, athletes experience a transient increase in depressive symptoms, with females being more likely to experience clinically relevant depressive symptoms compared to male athletes at the same time points. We found no evidence that SRCs have a long-lasting impact on depression symptoms in adolescent athletes.

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Are Subconcussive Impacts Harmless in Youth Soccer Players?

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(No relevant relationships reported)

In United States at least 3.5 million children play soccer yearly. Head Impact (concussive and subconcussive) in youth players have a growing concern throughout their short or long-term career. A subconcussive impact may induce a traumatic alteration of function of the cerebrum without associated imaging abnormalities or loss of consciousness. Accelerometers can measure the magnitude and quantity of the subconcussive impacts in the field. The SIM-G™ accelerometer is a small portable device that measures change in velocity during an impact and provides estimates of magnitude (G) and angles. The ImPACT Pediatric® is a neurocognitive test that provide information of cognitive changes. **PURPOSE:** To evaluate if a subconcussive impact could lead to negative cognitive functions in youth soccer players. **METHODS:** A group of 30 youth soccer athletes (15 males, 15 females) between 9 to 11 years old wear a head accelerometer in a specialize headband. Each participant was encouraged to perform normally in the game. Descriptive statistics was used to assess subconcussive impacts. T-test was used for the neurocognitive pre and post-test to assess differences in sequential memory, word memory, visual memory and rapid processing. **RESULTS:** Mean age of female and male athletes (9.9 ± 0.6 years) was not different (P > 0.05). A total of 42 impacts were receive by both genders in three games. Range of acceleration was from 16g to 60g (Ave= 23.8 ± 9.1g). T-Test showed differences in sequential memory for female (p = 0.02) and rapid processing for males (p = 0.01). There were no differences between pre and post test in word

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memory for females and males (p = 0.97, p = 0.11; respectively) and visual memory (p = 0.30, p = 0.34; respectively). **CONCLUSION:** These results suggest that females that play soccer and receive a subconcussive impact can reflect changes in their education and social activities at short term in their word recognition, oral reading and reading comprehension (sequential memory) and males in their auditory processing and language skills (rapid processing). Parents, coaches, trainers, exercise physiologist, and speech-language pathologists (SLP) should receive education to take precautions after a game with children that received at least one sub concussive impact and do not perceived any notable changes.

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No Relationship Between Head Impact Kinematics and Concussion Clinical Assessment Performance

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Reported Relationships: T.A. Buckley: *Salary; Applied Cognitive Engineering.*

Repetitive head impacts (RHI), independent of concussions, are speculated to be associated with later life neurological impairments. While football has received the majority of the attention, RHIs are commonplace in ice hockey. A multifaceted concussion clinical assessment battery assesses diverse neurological systems in clinically feasible manner.
PURPOSE: To examine relationship between head impact kinematics and performance on a multifaceted concussions assessment.
METHODS: Eleven male collegiate ice hockey players (age: 20.3 ± 0.8 years, Ht: $1.79 + 0.06$m, Wt: 80.9 ± 6.6 kg) wore a triaxial accelerometer (Triax Technologies, Norwalk, CT.) for all home games and practices. Participants completed the clinical assessment battery twice: pre-season (PRE) and post-season (POST). The test battery included the Standard Assessment of Concussion (SAC), Balance Error Scoring System (BESS), Trails A and B, Tandem Gait (TG), and Dual Task Tandem Gait (DT-TG). Independent variables were the head impact outcome measures: number of impacts, mean peak linear acceleration (PLA), and mean peak rotational acceleration (PRA). Linear regression analyzed the effects of head impact kinematics on change scores (calculated as positive is improved performance) of clinical measures.
RESULTS: Participants experienced 107.6 ± 57.8 impacts over the course of the season with mean PLA of 38.9 ± 2.5 g's and PRA of 3.9 ± 0.5 krad/sec^2. There was no relationship between head impact kinematics and SAC (change: 0.7 ± 2.0, p=0.067), BESS (change: 4.9 ± 10.5 errors, p=0.607), Trails A (change: 9.2 ± 7.3 sec, p=0.951), Trails B (change: $13.7 + 12.7$ sec, p=0.370), TG (change: 2.0 ± 2.4 sec, p=0.986), and DT-TG (change: $3.1 + 2.7$ sec, p=0.990).
CONCLUSIONS: The results of this study suggest that ice hockey related RHI do not adversely affect neurological health on a multifaceted concussion assessment battery. Performance on all tests improved over the course of the season suggesting a learning effect secondary to repeat administration influenced the outcomes. While changes have been identified in neuroimaging studies, these results are consistent with previous studies in other collision sports which failed to identify differences on clinical measures of neurological health.

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Test Setting and ADHD Influence Baseline Concussion Testing Neurocognitive Performance in Collegiate Student-Athletes

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(No relevant relationships reported)

Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) is a widely used neurocognitive test for assessing and managing concussion injuries. There is inconclusive data on how test administration and environment influence baseline results for student-athletes. It has been well established that individuals with Attention Deficit Hyperactivity Disorder (ADHD) perform worse on the ImPACT, but little research has examined the effect of group test administration on neurocognitive performance and symptom reporting in student-athletes with ADHD. **PURPOSE:** To compare baseline neurocognitive performance and symptom scores in group versus individual administration settings in NCAA division 1 collegiate student-athletes. **METHODS:** 260 student-athletes completed two ImPACT baseline tests, test 1 was completed when they entered as first-year students or transfers and test 2 was completed this past summer. Of these participants, 205 athletes took test 1 individually and 55 participants took it in a group setting. All student-athletes took test 2 in a group setting. 21 of the 260 student-athletes had a diagnosis of ADHD. A 2 (time) x 2 (environment) x 2 (ADHD) Multivariate ANOVA was conducted. Time (test 1 and test 2) was within subjects and Environment at test 1 (individual and group) and ADHD (yes or no) were between subject variables. **RESULTS:** There was a significant increase in total number of symptoms reported when participants went from individual

testing to group testing (p<0.05). Time x Environment Interaction for visual memory (p<0.05) with scores increasing from test 1 to 2 if in the group setting for both, but staying the same if in the individual setting for test 1. A similar effect was found for visual motor processing speed (p<0.05). Participants with ADHD performed worse on all measures no matter the setting (p<0.05). Symptom scores significantly differed for ADHD participants depending on the setting (p<0.05). **CONCLUSIONS:** A group setting has inherent distractions and seems to influence performance on visual memory, visual motor processing speed and symptom scores. Student-athletes with ADHD may be more affected by these distractions. This should be considered in baseline concussion testing and interpreting post-injury neurocognitive performance.

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Ninds/nih And Dod Sport-related Concussion Common Data Elements: A Common Language For Clinical Research

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Reported Relationships: A.P. Kontos: *Contracted Research - Including Principle Investigator; GE-NFL Head Health Initiative, ElMindA, Ltd, Abbott Laboratories.*

Purpose: In 2016, the National Institute of Neurological Disorders and Stroke (NINDS)/National Institutes of Health (NIH) and the Department of Defense (DOD) began development of Sport-related Concussion (SRC) Common Data Elements (CDEs) to develop data standards for all funded clinical research in neuroscience with goal of increasing the effectiveness of clinical research studies and treatment by facilitating data sharing across studies. The purpose of this abstract is to report the findings from the SRC-CDEs. **Methods:** The initial NINDS Traumatic Brain Injury (TBI) CDE recommendations created in 2010 included limited sport-related brain injury recommendations. In August 2016, a new SRC-specific CDE working group (WG) began developing and identifying CDEs, template case report forms (CRFs), data dictionaries and guidelines to assist investigators initiating and conducting SRC-specific clinical research studies. Comprised of 34 experts from around the world, the WG met regularly to review current collection of SRC data. The WG was divided into three subgroups to examine SRC over time: (1) Acute Subgroup (time of injury until 72 hours); (2) Subacute Subgroup (after 72 hours to 3 months); and, (3) Persistent/Chronic Subgroup (3 months and greater post-concussion). **Results:** The SRC CDEs were released to the NINDS CDE website in June 2017. The recommendations include Core and Supplemental - Highly Recommended CDEs for cognitive measures and symptom checklists, as well as other outcomes and endpoints (e.g., vestibular, oculomotor, balance, anxiety, depression) and sample case report forms (e.g., injury reporting, demographics, history of concussion, concussion history) across acute, sub-acute and persistent/chronic. **Conclusion:** NINDS encourages the use of SRC CDEs by the clinical research community to standardize data collection and reporting. The NINDS CDEs are a continually evolving resource, and these newly developed SRC CDEs serve as valuable starting points for investigators to streamline research that informs treatments for SRC. This material is based upon work supported by the U.S Army Medical Research and Materiel Command's Combat Casualty Care Research Program and funded by NIH contracts HHSN271201700064C and HHSN271201200034C.

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Cardiovascular and Cerebrovascular Responses to Central Hypervolemia in Recently Concussed College Athletes

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(No relevant relationships reported)

Many concussion patients demonstrate exercise intolerance which has been posited to be due to dysfunctional cerebral blood flow regulation. Lower body positive pressure (LBPP) increases central blood volume and blood pressure in healthy controls and challenges cerebral blood flow regulation. **PURPOSE:** Test the hypothesis that recently concussed college athletes (CA) have exaggerated cardiovascular and cerebrovascular responses to LBPP versus healthy controls (HC). **METHODS:** Three symptomatic CA (age: 20 ± 1 years; 1 woman) within 6 days of a diagnosed concussion and three HC (age: 22 ± 3 years; 1 woman) underwent 5-min of LBPP (20 mmHg). Heart rate (HR; ECG), mean arterial pressure (MAP; photoplethysmography), end-tidal carbon dioxide tension ($PETCO_2$; capnography), and middle cerebral artery blood velocity (MCAv; transcranial Doppler) were measured continuously. Cerebral

vascular conductance (CVC) was calculated. Mean values were obtained over 60 s intervals. Data are expressed as the mean ± SD as a change from baseline. **RESULTS**: Baseline HR (CA: 54 ± 6; HC: 63 ± 10 bpm; P = 0.27), MAP (CA: 87 ± 5; HC: 90 ± 11 mmHg; P = 0.75), PETCO$_2$ (CA: 44 ± 3; HC: 47 ± 1 mmHg; P = 0.20), and CVC (CA: 0.48 ± 0.13; HC: 0.69 ± 0.09 cm/sec/mmHg; P = 0.09) did not differ between groups. Baseline MCAv was lower in CA (41 ± 11 vs. 61 ± 2 cm/sec; P = 0.04). HR did not change across time (P = 0.35) and was not different between groups (P = 0.51). MAP in CA did not increase from baseline (peak increase: 6 ± 2 mmHg; P = 0.16), whereas MAP increased in HC at the 4th (9 ± 9 mmHg; P = 0.02) and 5th min (10 ± 9 mmHg; P < 0.01) of LBPP. PETCO$_2$ did not change across time (P = 0.57) and was not different between groups (P = 0.29). MCAv was greater in CA throughout the entire LBPP protocol (peak difference at 5th min: 11 ± 3 vs. -13 ± 7 cm/sec; P < 0.01). CVC was greater in CA throughout the entire LBPP protocol (peak difference at 5th min: 0.10 ± 0.09 vs. -0.19 ± 0.04 cm/sec/mmHg; P < 0.01). CVC decreased in HC at the 3rd (-0.17 ± 0.03 cm/sec/mmHg; P = 0.05) and 5th min (-0.19 ± 0.04 cm/sec/mmHg; P = 0.02) of LBPP. **CONCLUSIONS**: Despite blunted MAP responses to LBPP, CA exhibit exaggerated increases in MCAv and CVC during LBPP. These preliminary data indicate that CA who are symptomatic demonstrate abnormal cerebral blood flow regulation during central hypervolemia.

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Concussion Knowledge and Understanding in Guardians Following Administration of Standardized Education Form.

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Reported Relationships: T.N. Hunt: *Royalty; SLACK Inc..*

Concussion legislation has established education as the cornerstone of prevention. Georgia legislation requires guardian completion and acknowledgement of concussion education via a standardized concussion information sheet. However, the effectiveness of this standardized form has not been examined. **Purpose:** Examine the knowledge and understanding in guardians of Georgia High School Association (GHSA) student-athletes that completed the GHSA concussion awareness form versus additional concussion education. **Methods:** 102 GHSA guardians completed a 34 item paper-based survey that included demographic questions, concussion knowledge questions, and scenario questions to assess concussion understanding. Participants were divided into groups based upon concussion education (GHSA form only: n=54; Additional education: n=48). Independent sample t-tests were calculated to evaluate differences in concussion knowledge, understanding, and overall score. A Pearson correlation examined the correlation between knowledge and understanding score. All statistical analyses were conducted using SPSS 23.0. Significance levels were set *a priori* at p ≤ 0.05. **Results:** No statistically significant differences were found between groups on knowledge (t(100) =1.74, p=.085), understanding (t(100)=.83, p=.41), and total scores (t(100)=1.88, p=.06).The Pearson correlation revealed a non-significant weak correlation between concussion knowledge and understanding (r = .03; p = .76). **Conclusions:** Guardians of high school student-athletes displayed moderate knowledge and understanding of concussion regardless of additional educational experiences. Despite a clinicians' desire for more comprehensive educational tools, the results of this study indicate that the state issued standardized form provides guardians with sufficient knowledge. This knowledge and understanding will help guardians in the recognition and management of a student-athlete with a concussion. Further, a multifaceted approach to concussion education could be utilized in order to most effectively reach every guardian regardless of education level.

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Differences in Serial DTI Between 72 hours and 2 Weeks Following Sports Related Concussion

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(No relevant relationships reported)

While clinical assessments may aide to identify a concussion, there is no conclusive diagnosis via these assessments alone. Moreover, the progression and recovery of SRC is difficult to quantify. This is because the pathophysiological development of the injury occurs at the cellular processes level which clinical assessments may not be sensitive to nor can they be identified through standard structural imaging. fMRI-DTI scalars such as fiber tractography, Fractional Anisotrophy (FA), and Mean Diffusivity (MD) analyses have shown promise in identifying concussion as they can quantify axonal microstructure integrity via disturbances in Brownian water diffusion. PURPOSE: The purpose of this study was to compare fMRI-DTI scalars of FA and MD taken serially between acutely (<72 hrs.) concussed individuals with healthy controls. METHODS: Male athletes (n=6) between the ages of 14 and 23 who presented with a sports-related concussion received an fMRI studying specific regions of the brain using BOLD to assess FA and MD within 72 hours of injury and at 2

weeks post-injury. RESULTS: A significant difference (p<0.05) was observed in the right cingulum projecting to the hippocampus in the MD scan. No significant results were identified in the FA scan. CONCLUSION: While whole brain analysis showed significant differences between scan 1 and scan 2, only one identified region was significantly different. Objectively measuring concussion recovery through FA and MD may be possible, but further research is needed.

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Effect of Soccer Headgear on Likelihood and Severity of Non-concussive Injuries in High School Athletes

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(No relevant relationships reported)

Purpose: In response to the rising awareness and concern over sports related concussions (SRCs) in high school soccer players, some athletes are choosing to wear protective headgear (HG) as a form of defense. One criticism of HG use is that it encourages more aggressive play, potentially increasing the incidence or severity of non-concussive injuries. The purpose of this study was to assess associations between use of HG and non-concussive injury in high school athletes. **Methods**: In a randomized control study of n=1577 Wisconsin high school soccer players, athletes were assigned to a HG group (n=925), or a control group, without the use of HG (n=652) for the 2016-2017 interscholastic seasons. Each athlete provided an SRC history and baseline survey of their concussion symptoms. Athletic trainers at each school recorded the SRCs and non-concussive injuries weekly, as well as additional information about the injuries such as days lost to play. Chi-square tests and logistic regression methods were used to assess for potential associations using intention to treat analyses. **Results**: 440 non-concussive injuries were reported, affecting 352 (22%) unique athletes. No difference in the likelihood of obtaining at least one non-concussive injury between the control group (21.9%) and the HG group (22.8%) was detected (p=0.157). Further, no difference was detected in the number of days lost between the control group (mean=11.46 days) and the HG group (14.83 days) (p=0.234). While girls were 2.53 (95% CI: 1.80, 3.55) times more likely to sustain a non-concussive injury than boys (p=0.001), after adjusting for HG use there was no significant interaction between the sex of the player and use of headgear on sustaining a non-concussive injury (p=0.21). **Conclusion**: Wearing HG designed to prevent SRCs does not influence the likelihood of obtaining a non-concussive injury, or the severity of that injury as defined by number of days lost, both of which would be expected if players with HG were competing more aggressively.

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Neuromechanical Factors Associated with Self-Reported Concussion History among Elite Athletes

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Reported Relationships: G.B. Wilkerson: *Consulting Fee; Traq Global, Ltd..*

PURPOSE: This study assessed various indices of neuromechanical responsiveness for possible identification of persisting concussion effects. METHODS: A cohort of 48 Olympic athletes (34 males: 23.8 ±4.4 years; 14 females: 25.4 ±4.5 years) performed 3 different 60-s visuomotor reaction time (VMRT) tests involving rapid manual contact with 64 randomly illuminated target buttons arranged in a pattern of 5 concentric rings on a height-adjustable board, and a whole-body reactive agility (WBRA) test requiring side-shuffle movements in response to 20 randomly presented left or right visual targets. An initial VMRT test trial was limited to manual button contacts, immediately followed by trials that involved 2 different dual-task conditions. A centrally located screen displayed scrolling text (VMRT+ST) that the athletes orally recited while also performing the basic VMRT test. The other dual-task condition displayed the Eriksen flanker test (VMRT+FT), which required the athletes to orally state the right or left direction indicated by the center arrow of a 20 5-arrow displays (10 congruent and 10 incongruent arrow sets). Measurements of WBRA reaction time, speed, acceleration, and deceleration were derived from a motion analysis system. RESULTS: Concussion occurrence was reported by 21 athletes at 2.0 ±2.3 years prior to testing (range: 2 weeks to 7.5 years). Strong univariable associations were found for VMRT+FT left minus right VMRT difference ≥15 ms (OR=7.14; 90% CI: 2.44, 20.90), VMRT+ST outermost 2-ring to innermost 3-ring average VMRT ratio ≥1.28 (OR=4.58; 90% CI: 1.51, 13.92), and WBRA speed asymmetry ≥7.7% (OR=4.67; 90% CI: 1.63, 13,36). A large VMRT+FT X VMRT+ST interaction effect was identified (OR=25.00; 90% CI: 6.00, 103.32), which had 88% positive predictive value (14/21) and 78% negative predictive value (25/32). Recursive partitioning identified a 3-way

VMRT+FT X VMRT+ST X WBRA interaction that had 100% positive predictive value (8/8) for identification of athletes with concussion history, whereas negative status on all 3 factors provided 90% negative predictive value (21/23). **CONCLUSIONS**: Metrics derived from the VMRT and WBRA tests provided clear evidence of neuromechanical responsiveness deficiencies among Olympic athletes who reported a history of at least one concussion.

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Preliminary Normative Baseline Data for the Sport Concussion Assessment Tool 5 (SCAT 5) in Adolescent Athletes

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(No relevant relationships reported)

Approximately 1.6 - 3.8 million sports related concussions (SRCs) occur annually in the United States. Current consensus statements recommend using a multifaceted assessment for sideline evaluation after SRC. Following systematic review of current research and expert panel review, the Sport Concussion Assessment Tool 5 (SCAT5) was developed from the Sport Concussion Assessment Tool 3 (SCAT3). The SCAT5 includes additional assessments and addresses limitations of the SCAT3. Given the updated edition, there is a need to examine baseline normative data for the SCAT5. **PURPOSE**: To examine preliminary normative baseline data for the SCAT5 in adolescent soccer players. **METHODS**: In this cross sectional study, adolescent soccer players were administered the SCAT5 prior to practice. The SCAT5 is a sport concussion sideline evaluation that contains observable signs, Maddocks questions, Glasgow Coma Scale, cervical spine assessment, background information, symptom evaluation, cognitive evaluation (Standardized Assessment of Concussion [SAC]), neurological screening and the modified balance error scoring system (mBESS). Means and standard deviations were evaluated for total number of symptoms (out of 22), symptom severity (out of 132), orientation (out of 5), immediate memory (out of 30), concentration (out of 5), delayed recall (out of 10), total SAC score (out of 50) and mBESS (out of 30). **RESULTS**: The final sample consisted of 91 adolescent soccer players (23 males, 68 females; 13.78 ± 1.2 years old). The average total number of symptoms reported was 1.79 ± 2.9 and the average symptom severity score was 2.93 ± 6.4. The average scores of the individual components of the SAC included an: orientation score of 4.96 ± 0.2, immediate memory score of 19.97 ± 3.4, concentration score of 3.00 ± 1.2 and delayed recall score of 6.88 ± 1.7, equaling an average total SAC score of 34.80 ± 5.2. Finally, the average mBESS score was 3.21 ± 3.0 errors. **CONCLUSIONS**: Establishing normative baseline data for the SCAT5 may help sports medicine professionals better screen and evaluate athletes for SRC on the sideline. Future researchers should continue to collect baseline data to establish normative SCAT5 values. In addition, researchers should focus on age and sex baseline and post-injury data in high school and collegiate athletes for the SCAT5.

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A Portrait of the Concussed Student-Athlete: Grade and Sex Affect Presentation of Symptoms

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(No relevant relationships reported)

It is important to appreciate the enormous diversity in the presentation and prognosis of sport-related concussions (SRC) in athletes. Duration of recovery is highly variable and partly attributable to injury severity, but a comprehensive evaluation must also include age and sex. Research on the interaction of these variables among youth athletes is limited. **PURPOSE**: To evaluate the effect of age and sex on the presentation of SRC symptoms in student-athletes undergoing prolonged recovery. **METHODS**: A sample of athletes from middle school to college (n=76) were evaluated for persistent symptoms of SRC. Cognitive function was measured using the ImPACT test; behavior and attitudes were collected via the Behavior Assessment System for Children (BASC) questionnaire. Independent-samples t tests, chi-squared tests, and multivariate analyses with a Bonferroni correction measured differences between sexes and scholastic grades on cognitive, behavioral, and functional assessments. **RESULTS**: Subjects were 16.2 ± 2.3 years of age; 56.6% of patients were male. Men and women expressed no differences in age (p=0.780), number of previous concussions (p=0.231), or duration of current symptoms (p=0.445). Men tested higher in verbal memory (p=0.036), visual motor speed (p=0.003), and cognitive efficiency (reaction time and accuracy; p=0.007). Women reported better attitudes toward school (p=0.005) and teachers (p=0.043). College athletes sustained more previous concussions (2.6) than middle school (1.0) and high school (1.0) athletes (p=0.016), but high school athletes expressed a trend for more co-occurring diagnoses (1.4) than middle school (0.9) and college (0.6) athletes (p=0.057). The difference between high school and college was significant (p=0.029). Regarding performance,

there was a difference between grade levels in the cognitive efficiency index with middle school athletes scoring significantly lower than high school and college athletes (p=0.022). **CONCLUSIONS**: When youth athletes experience SRC, the sex and age of the athlete is associated with important differences in attitudes, memory, and functional capacities. Proper evaluation of a concussed athlete must consider the role that age and sex play on the diagnosis of injury severity and the expectations of recovery.

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Single and Dual-Task Tandem Gait Performance Throughout Concussion Recovery

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(No relevant relationships reported)

Impaired postural control is common following concussion and is traditionally assessed with the Balance Error Scoring System (BESS); however, the BESS has been criticized for numerous limitations. Alternatively, tandem gait (TG) is a clinically feasible dynamic postural control assessment recommended by The Sport Concussion Assessment Tool- 3rd Edition (SCAT3). Single-task (ST) and dual-task (DT) standard gait assessments have successfully identified postural control impairments following concussion; however, there is minimal literature on the translation to ST and DT TG. **PURPOSE**: To evaluate ST and DT TG performance throughout concussion recovery. **METHODS**: Eighteen NCAA Division I student-athletes (Age: 20.3 ± 1.3 years; Height: 173.6 ± 8.9 cm; Weight: 70.1 ± 11.3 kg) participated in this study. All student-athletes were diagnosed with a concussion by an athletic trainer, and the diagnosis was confirmed by a team physician. Participants were instructed to walk heel-to-toe down a 3-meter line and back as quickly as possible. In accordance with the SCAT3, each participant completed four TG trials with the best time recorded. All participants were baseline tested prior to the season (BL), within 48 hours post-concussion (Acute), on the first symptom-free day (Asymp), and on the day he or she returned to full sports participation (RTP). A one-way ANOVA with repeated measures was utilized to examine both ST and DT TG at the four different post-concussion time points. The alpha level was set at p= 0.05. **RESULTS**: Both ST (p=0.001, F= 5.402) and DT (p=0.001, F= 8.995) TG were significant across the four time points following concussion. There were more pronounced changes in time to complete DT TG (BL: 12.9 ± 3.0 seconds; Acute: 15.4 ± 4.7 seconds; Asymp: 12.5 ± 2.8 seconds; RTP: 11.3 ± 2.0 seconds) compared to ST TG (BL: 10.3 ± 1.4 seconds; Acute: 10.9 ± 2.1 seconds; Asymp: 9.8 ± 1.9 seconds; RTP: 9.2 ± 1.4 seconds) across the four time points. **CONCLUSION**: There were significant changes in time to complete ST and DT TG from BL to RTP following concussion, with more dramatic changes seen during the DT condition. These results suggest that TG, particularly during DT, is a useful measure of post-concussion recovery.

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The Relationship Between Patient-Reported Visual Symptoms and Visual Deficits After Concussion

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(No relevant relationships reported)

Previous reports in the literature have identified that visual deficits are common yet often undetected after pediatric concussion. Few studies have evaluated tools available to detect visual dysfunction after concussion. **PURPOSE**: To investigate the association between patient-reported and physician-detected visual deficits after concussion.
METHODS: We conducted a prospective cohort study of 69 subjects, ages 5-20 years old and 64% female, who reported both pre- and post-injury vision-specific symptoms on the Convergence Insufficiency Symptom Survey (CISS), a validated 15-question instrument used to assess for changes in visual symptoms in patients with convergence insufficiency, and underwent a comprehensive visio-vestibular examination in a pediatric sports medicine clinic a median of 34 days after injury (IQR 22-48). The relationship between patient-reported symptoms on the CISS and clinical findings were examined using chi-square analysis for categorical data and Mann-Whitney analysis for nonparametric data.
RESULTS: Forty-six (67%) subjects reported an abnormal CISS score of 16 or greater. However, only 31 (44%) reported the presence of visual problems when asked as one of 21 concussion-related symptoms on the Post-Concussion Symptom Inventory (PCSI). Even fewer reported symptoms on the near point of convergence (NPC) (31%) and accommodation (15.3%) testing completed as part of the visio-vestibular exam. However, those with an abnormal CISS score were significantly more likely to have abnormal clinical measures of NPC (p=0.002) and accommodation (p=0.003). Females were significantly more likely to have abnormal CISS scores than males after injury

(p<0.001), but were not significantly more likely to have abnormal scores before injury (p=0.509) or abnormal findings on NPC (p=0.309) or accommodation testing (p=0.179).
CONCLUSIONS: Those with detectable vision deficits may not recognize that they have visual problems using standard concussion symptom scales, making physician identification even more essential. Visual symptoms may also be more prevalent and severe among females compared to males. The CISS may be a useful screening tool specific to visual symptoms that are not captured by symptom provocation on the visio-vestibular exam or commonly used concussion symptom scales.

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Reliability of Five Novel Reaction Time and Cognitive Load Protocols

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(No relevant relationships reported)

A common side effect from a concussion is slowed reaction time. When returning to play, reaction time should be at preinjury levels to ensure a safe return to activity and to prevent further injury. The Dynavision D2 system may be utilized as an assessment and rehabilitation tool to aid in the determination of reaction time following concussion. Previous research has demonstrated good intersession reliability when assessed following a 24-48 hour test-retest window. Determining reliable test-retest intervals for novel reaction time protocols is necessary for future use as a diagnostic and rehabilitation tool. **Purpose:** To investigate the test-retest (intra- and intersession) reliability of a battery of five reaction time protocols. **Methods:** A total of 28 nonclinical participants completed a battery of five protocols increasing in difficulty in terms of reaction speed requirement and cognitive load. Prior to testing, participants were instructed to stand approximately 30.5 cm from the board and allowed three familiarization opportunities. All protocols required participants to hit as many lights as quickly as possible in 60 seconds. After completing the initial testing session (Time 1), participants waited an hour before completing the second session (Time 2). Between 10-14 days later, the participant completed the same battery of tasks for the third session (Time 3). The intraclass correlation coefficient (ICC) and repeated measures ANOVA were calculated. **Results:** The ICC values for each of the five protocols illustrated good to excellent reliability between Time 1 and Time 2 (0.66- 0.90) and between Time 2 and Time 3 (0.71-0.89). There were no significant differences across time points (F<0.105, p>0.05). **Conclusion:** The one hour and two-week test-retest intervals are reliable for clinical assessment, expanding the timeframe of when assessments can be completed reliably. Although these protocols have application both as an assessment and rehabilitation tool, it is important to identify optimal intervention windows to improve reaction time post-concussion. Future research should focus attention on identifying optimal intervention windows and how effective the Dynavision D2 system is for rehabilitation purposes.

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Normative Values and Effects of Fatigue on the King Devick Test in Wheelchair Athletes

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(No relevant relationships reported)

The King-Devick (KD) test of rapid eye movement is a common assessment of concussion in able-bodied (AB) sport but data are unavailable on disability sport athletes. **PURPOSE:** The purpose of this study was to establish normative KD values for wheelchair rugby and wheelchair basketball sport participants. The secondary purpose was to examine the effect of submaximal and maximal effort on baseline values. **METHODS:** Fifty wheelchair rugby (*n* = 22) or wheelchair basketball (*n* = 28) players (47 males, 3 females) completed baseline KD assessments via an iPad application approximately 10 minutes before a scheduled practice or competition. Because some athletes had limited or impaired grip, iPads were placed on music stands at a standardized height and distance from each participant. To assess the effect of submaximal effort on baseline score, 24 athletes completed a general warm-up, a sport-specific warm-up, and a 6-set sprinting session of 30 meters (15 down, 15 back) starting every 30 sec. To assess the effect of maximal effort, 18 different participants completed sprints until an RPE of 18 was reached (level between "very hard" and "extremely hard"). Final measurements of perceived exertion using the Borg RPE scale and a final KD test completed within 30 sec of the last sprint. **RESULTS:** Mean KD baseline score was 51 sec and no significant difference on mean KD baseline score existed between sports, impairment types, or gender. Specific to submaximal effort, mean KD score decreased by 3.5% after 6 maximum effort sprints (Post-test RPE = 13; perceived between "light" and "somewhat hard" effort). Specific to maximal effort (Post-test RPE = 18), mean KD score increased by 1.7% despite the fact that 8 of 12 players demonstrated an improvement. **CONCLUSSIONS:** KD normative scores were meaningfully higher than previously reported norms in AB sport. Consistent with AB sport, exertion typically caused an improvement (decrease) in KD score time.

D-73 Free Communication/Poster - **Exercise-Clinical Populations**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1980   Board #241   May 31 3:30 PM - 5:00 PM

The Effect of Intradialytic Exercise Training on Cardiac and Arterial Health in Hemodialysis Patients

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(No relevant relationships reported)

Introduction and Aims:
Patients with kidney failure undergoing chronic hemodialysis (HD) treatment have excessively high rates of cardiovascular (CV) morbidity and mortality. Exercise training as a part of a comprehensive treatment program has been shown to reduce the risk of CV events in patients with established CV disease. However, much less is known about the CV effects of exercise training in HD patients. The aim of this study was to determine the effect of 12 months of intradialytic exercise with concomitant protein supplementation on CV health in HD patients.
Methods:
This is a secondary analysis of CV parameters measured from a subset of patients participating in the IHOPE trial (NCT#01234441). This analysis includes data from 98 HD patients (54±12 yrs; 59% male) randomized either to usual care (CON) or intradialytic exercise training + protein supplementation (EX) for 12 months. Patients in the EX group performed supervised moderate intensity exercise (RPE = 12-14) on cycle ergometers for 30-45 minutes with a concomitant oral protein supplement (30g whey) during treatment. Ultrasound exams were performed to measure cardiac systolic function (ejection fraction), diastolic function (early diastolic filling pressure; E, early diastolic tissue velocity; E') and carotid arterial wall thickness (intima-media thickness, IMT). Outcomes were assessed at baseline, 6, and 12 months.
Results:
There were no significant changes in any CV parameter between groups at 12-months (*Group x Time* interaction, p > 0.05 for all measures). However, there was a significant main effect of *Time* for EE' in the overall study population, indicating a general worsening of left ventricular filling capacity at 12-months that was larger in CON compared to EX (p< 0.05). There was a similar trend for an increase in carotid IMT at 12-months in CON (p<0.05), that was not evident in EX.
Conclusion:
These data indicates that declines in cardiac diastolic function and increases in carotid IMT that manifest over time in HD patients may be attenuated by intradialytic exercise training. Surprisingly few studies have investigated the effects of exercise on CV structure and function in HD patients, thus, these findings warrant further investigation.

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Predictors Of Performance At Anaerobic Threshold (AT) In Patients With Chronic Liver Disease (CLD)

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(No relevant relationships reported)

PURPOSE: Determine which baseline assessments are most predictive of AT performance in non-alcoholic fatty liver disease (NAFLD) and hepatitis C (HCV) subjects. **METHODS:** At baseline prior to Modified Bruce cardiopulmonary exercise testing (CPET), clinical, laboratory, and questionnaire self-report data were collected for NAFLD, HCV and non-CLD subjects participating in prospective research measuring performance (CPET), activity level (HAP), and fatigue (FSS). Data were analyzed via ANOVA, t-test, Pearson correlation, and both linear and step-wise regression. **RESULTS:** 28 subject's baseline clinical data and self-reports were analyzed (39.3% female, 57.1% Caucasian, 14.3% African American, 10.7% Hispanic, 14.3% Asian, 50.0% NAFLD, 25.0% HCV, 25.0% Non-CLD, age 40.9 ± 13.3**,** BMI 29.1 ± 5.9, 42.9% obese, 35.7% overweight, 14.3% diagnosed with hypertension (HTN), 28.6% hyperlipidemia (HYP), 7.1% diabetes mellitus, 7.1% metabolic syndrome, resting heart rate 70.0 ± 11.8, systolic blood pressure (SBP) 121.3 ± 11.5, diastolic blood pressure (DBP) 73.6 ± 10.1, liver enzymes: AST 35.1 ± 22.3 IU/L,

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ALT 46.7 ± 29.8 IU/L). Frequently at baseline, subjects had elevated SBP (57.1%), DBP (28.6%) or both SBP and DBP (14.3%). In the 14.3% of the cohort diagnosed with hypertension (3 NAFLD, 1 HCV), 100% had both SBP and DBP outside of the normal ranges. The non-CLD group was significantly younger (p=.0001), had higher VO2 (p=.019) and METs (p=.020) at AT than NAFLD, scored higher on HAP sub-measures (p=.001-.004), and had exercised longer at AT onset than both NAFLD (p=.010) and HCV (p=.027) cohorts. Per stepwise regression age (AT HR r=.816, p=.014, AT exercise duration r=.728, p=.007) and age with elevated AST (AT HR r=.971, p=.001) was most predictive of AT performance in the NAFLD cohort. In the HCV cohort, HTN was most predictive of AT performance (AT VO2 r=.857, p=.029, AT metabolic equivalents (METs) r=.864, p=.027, and AT exercise duration r=.900, p=.014). **CONCLUSION:** Regardless of formal hypertension diagnosis, elevated blood pressures were common in the HCV and NAFLD cohorts. Hypertensive blood pressures at baseline are most indicative of poorer performance at AT in HCV subjects, while elevated liver enzymes (AST) were most indicative of performance at AT in NAFLD subjects.

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Long-term Effects of Tai Chi on Muscle Strength and Physical Function in Patients with Peripheral Neuropathy

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(No relevant relationships reported)

An estimated 20 million people in the U.S. suffer from peripheral neuropathy (PN). Patients with PN develop gait abnormalities, and foot pain is one of the factors affecting walking ability. As a result, a large number of individuals with PN suffer from a reduction in daily physical activity. Tai Chi appears to be safe and effective in promoting strength and functional capacity in older patients with PN and other chronic disabilities. **PURPOSE**: To assess the long-term effects on muscle strength and physical function among patients with PN enrolled in a Tai Chi exercise program. **METHODS**: Eleven participants (men=5, women=6; age: 73 ± 6.96 years) participated in this study. These participants have been engaged in a Tai Chi exercise program over the past one and a half years. The progressive Tai Chi (i.e., Yang Style) program was offered 2 times per week, 60 minutes each time. Before and after training, muscle strength [One repetition maximum (1RM) for leg extension and leg curl], and physical function [i.e., six-minute walk test (6MW) and 8-foot up-and-go] were evaluated. **RESULTS**: After the 18 months of training, muscle strength increased significantly [leg extension: pre = 24.33±16.88; post = 34.71±18.66 kg; leg curl: pre = 29.81±16.50; post = 37.81±16.46 kg; (*p<0.05*)]. The performance of 6MW was improved significantly by 26.16% [pre = 367±118; post = 463±159 m, (*p<0.05*)]. Finally, the time of 8-foot up-and-go decreased significantly by 21% [pre = 11.98±5.52; post = 9.46±3.84 sec, (*p<0.05*)]. **CONCLUSIONS**: These findings demonstrate that long-term Tai Chi exercise program is capable of increasing lower extremity muscle strength and physical function among patients with PN. Interestingly, the exercise training program was able to reduce the risk for loss of functional mobility (i.e., decreased 8-foot up-and-go time) among the participants with PN.

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Muscular Impairment In Brazilian Adults With Neurofibromatosis Type 1

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(No relevant relationships reported)

Neurofibromatosis type 1 (NF1) is a genetic neurocutaneous disorder, autosomal dominant, with multisystemic manifestations, including a predisposition to tumor formation, bone dysplasias, neuromuscular and exercise capacity impairment and motor deficits, such as poor coordination, low muscle tone, and easy fatigability. Recent studies have illustrated a primary role for the *NF1* gene product in muscle growth, strength and metabolism.
PURPOSE: To evaluate body composition and muscle strength in Brazilian individuals with NF1.
METHODS: 26 individuals with NF1 (14 male), aged 18-45 years, were compared to 26 controls, matched by sex, age, body mass index (BMI) and physical activity level. The following anthropometric parameters were measured: weight, height and waist circumference. Body composition was assessed by dual energy X-ray absorptiometry (DXA). The muscular strength was evaluated by the handgrip test using a dynamometer and presented as maximum muscle strength (Fmax) and per unit area (Farea). The physical activity level were evaluated by IPAQ short form. Statistical analyses used: Kolmogorov-Smirnov and T of Student paired.

RESULTS: The mean age was 34.31 ± 6.05 and 32.92 ± 6.14 years old in the NF1 and control groups, respectively (p=0.316). Stature was lower in individuals with NF1 (1.61 ± 0.10 vs. 1.68 ± 0.08 meters, p=0.003). There were no differences in weight, BMI, waist circumference, fat mass, fat percentage and body fat index. Appendicular lean mass adjusted by BMI was lower in the NF1 group (0.743 ± 0.190 vs. 0.828 ± 0.161, p=0.048). Individuals with NF1 also presented reduction of Fmax (31.09 ± 12.20 vs. 37.47 ± 10.66 kg, p=0.035) and Farea (13.26 ± 4.17 vs. 15.62 ± 3.58 kg, p=0.028).
CONCLUSION: The NF1 group in this study have lower lean mass adjusted for BMI and lower maximal muscle strength. It may indicate an early sarcopenia in this population, which requires further investigation about the mechanisms of these changes and the role of nutrition and exercise on these results.

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Feasibility Of A Low Volume HIIT Intervention In HIV+ Hispanic Women With Neurocognitive Impairment

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(No relevant relationships reported)

High intensity interval training (HIIT) is safe and improves cardiorespiratory fitness and other health characteristics in people living with chronic diseases. However, the feasibility of such intervention among HIV+ women with neurocognitive impairment (NCI) have not been tested. **PURPOSE:** To determine feasibility (attendance and percent completion) of a low-volume HIIT (LV-HIIT) intervention among HIV+ Hispanic women with and without NCI compared with HIV- women. Also, to evaluate between group differences in HR response during the intervention. **METHODS:** 30 HIV+ with and without NCI (19 and 11, respectively), and 13 HIV- women volunteered for a 6-week, 3-days/week LV-HIIT intervention on a cycle ergometer. During the first 2-weeks, participants completed 8-intervals (1-min intense, 1-min active resting) of cycling at 80% of their HR reserve (HRR) determined in a maximal exercise test. During the last 4-weeks, they completed 10-intervals at 90% of their HRR. Workloads prescribed to reach target HR ranged from 60 to 115, and 40 to 135 W in HIV+ and HIV- participants, respectively (P=0.54). Each session began with a 5-min warm-up on a cycle ergometer with no resistance, and ended with a 5-10 min cool-down with stretching exercises. NCI was determined with a battery of neuro-psychological testing (7-domains). Kruskal-Wallis non-parametric test was used to determine between group differences. **RESULTS:** 14 HIV+ with NCI (74%), 5 HIV+ without NCI (45%), and 11 HIV- (85%) Hispanic women completed the intervention; all with 100% attendance. Mean workload and percent target HR achieved were not different between HIV+ and HIV- participants (94±20 vs. 92±27 W, P=0.54; 95±6 vs. 100±17 %, P=0.69). Mean HR during the first 2-weeks were: 117±21 bpm for the HIV+ with NCI, 120±9 bpm for the HIV+ without NCI, and 124±13 bpm for the HIV- (P= 0.34). During the last 4-weeks, HR was: 129±21 bpm for the HIV+ with NCI, 132±8 bpm for the HIV+ without NCI, and 142±21 bpm for the HIV- (P=0.36). **CONCLUSION:** Attendance and percent completion suggest the feasibility of the LV-HIIT intervention among HIV+ Hispanic women with NCI. Similar HR response between groups further suggest the feasibility and safety of the HIIT exercise intervention in these patients. The study was supported by NIMHD S21MD001830, R21MH095524, U54-MD007587-04, R25MD007607.

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Cardiopulmonary Profile Of Individuals With Intellectual Disabilities During Maximal Exercise

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(No relevant relationships reported)

Individuals with intellectual disabilities (ID) often live a sedentary life and present with low fitness levels. Exercise intolerance has been shown in individuals with Down syndrome, but in individuals with non-syndromic ID, the parameters derived from cardiopulmonary exercise tests (CPET) relating to exercise intolerance have not yet been thoroughly investigated. **PURPOSE:** Our purpose was to assess potential differences in the maximal oxygen uptake and full cardiopulmonary profile during CPET in individuals with non-syndromic ID and healthy controls. **METHODS:** Participants performed a treadmill CPET using an incremental protocol until exhaustion. Differences between groups in peak heart rate (HRpeak), peak oxygen uptake (VO2peak), peak minute ventilation (VEpeak), peak CO2 expired (VCO2peak), oxygen uptake efficiency slope (OUES), relationship between VE and VCO2 (VE/VCO2 slope), relationship between VO2 and HR (O2 pulse), heart rate reserve (HRR), and peak respiratory exchange ratio (RERpeak) were tested with students t-test and

Mann Whitney-U tests. **RESULTS**: Nine individuals with ID (4 male, 32.3 ± 7.7 yrs, 23.0 ± 8.7 kg/m2) and nine age and sex matched controls (24.3 ± 2.9 kg/m2) were included. Individuals with ID demonstrated significantly lower values (p<0.05) in all outcomes compared to controls, except for VE/VCO_2 slope (p=0.06) and RERpeak (p=0.34). **CONCLUSION**: Even with similar effort (RERpeak) between groups, individuals with non-syndromic ID had lower heart rate related parameters and altered integration of cardiovascular, muscular and respiratory function. This likely partially explains the lower exercise capacity compared to matched controls. This project has received funding from the Marie Curie International Outgoing Fellowship within the 7th European Community Framework Program under grant agreement No 625455-ID Physiology.

	ID	Controls	p-value
HRpeak (bpm)[a]	182.0 ± 19.50	194.6 ± 7.54	0.003[b]
VO_2peak (L/min)	1.8 ± 0.86	2.7 ± 0.50	0.014
VO_2peak (ml/kg/min)	25.7 ± 7.73	39.6 ± 7.63	0.001
VEpeak (L/min)	74.2 ± 35.29	109.3 ± 23.97	0.028
VCO_2peak (L/min)	1.9 ± 0.97	3.2 ± 0.56	0.01
OUES	1723.8 ± 875.91	2700.8 ± 516.67	0.012
VE/VCO_2 slope (L/min)	35.8 ± 3.99	31.7 ± 4.45	0.06
O_2 pulse (L/bpm)	10 ± 4.42	13.9 ± 2.38	0.003
O_2 pulse (ml/kg/bpm)	143.6 ± 39.02	202.6 ± 33.40	0.003
HRR (bpm)	111.1 ± 9.4	135.3 ±14.6	< 0.001
RERpeak (L/min)/(L/min)	1.13 ± 0.05	1.16 ± 0.08	0.34

All data are presented as mean ± SD, unless otherwise noted. [a] median ± IQR [b] Mann-Whitney U test

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Associations of Sleep Patterns with Physical Functioning and Physical Activity in Adults with Down syndrome

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(No relevant relationships reported)

People with Down syndrome (DS) have low sleep quality, physical functioning, and physical activity, and high levels of sedentariness and body mass index (BMI). It is not known, however, if sleep patterns are associated with physical activity, sedentariness, physical functioning, and BMI in adults with DS. **PURPOSE**: To examine if sleep variables are associated with physical functioning, physical activity, sedentariness, and BMI in adults with DS.
METHODS: Fifteen persons with DS (8 women and 7 men; age 29 ± 14 y; BMI 32.8 ± 8.7 kg·m^{-2}) participated in this study. Participants attended a session where time during the timed-up-and-go test and distance covered during the 6-min walk test were measured. Participants then wore for 7 days on their right wrist an accelerometer (wGT3X+, Actigraph) which provided sleep, physical activity, and sedentariness variables. We calculated descriptive statistics and we used Spearman's rho to examine associations of sleep with physical functioning and physical activity variables, and BMI.
RESULTS: Mean ± SD of sleep, physical functioning, physical activity, and sedentariness variables were: total time in bed 557 ± 61 min·day^{-1}; total sleep time 407 ± 54 min·day^{-1}; latency 26.8 ± 21.0 min; efficiency 73.9 ± 12.0%; wake after sleep onset 123 ± 65 min; number of awakenings 21.0 ± 6.2; average length of awakenings 6.1 ± 3.0 min; timed up-and-go 10.3 ± 3.1 s; 6-min walk distance 255.6 ± 89.6 m; moderate-to-vigorous physical activity accumulated in 10 min bouts 91.3 ± 173.0 min·week[-1]; total sedentary time 3165 ± 527 min·week[-1]; total sedentary time in 15-min bouts 731 ± 560 min·week[-1]. Six-minute walk distance was significantly associated with average length of awakenings (rho = -0.69; p = 0.005) and total sleep time (rho = 0.58; p = 0.024), and moderately, but non-significantly, with efficiency, latency, and number of awakenings (rho = 0.50, 0.45, and 0.40, respectively). There were no other significant correlations between sleep variables and physical activity, sedentariness, and BMI.
CONCLUSIONS: Adults with DS experience difficulties in sleeping and have low physical activity and physical functioning levels, and high sedentariness levels. Indices of sleep are associated with performance during the 6-min walk test, but not with physical activity or sedentariness.

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Metabolic And Cardiovascular Effects Of Body Weight Support Treadmill Walking In Healthy Adults

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(No relevant relationships reported)

PURPOSE: The use of body weight support treadmill (BWST) training for rehabilitation of patients with brain injuries, as well as musculoskeletal and neuromuscular impairments, is an emerging clinical treatment method. Because of the limited evidence of physiological stress of BWST training, the purpose of this study was to describe the metabolic and cardiovascular response to varying levels of BWST walking in healthy adult subjects.
METHODS: A total of 21 subjects (10 females; 34±6.7 yr; 74.6±14.3 kg; 170.8±6.9 cm; 26.1±5.3 kg/m²) provided their informed consent to participate in three 5-minute walking trials at a self-selected treadmill speed, with body weight support (BWS) of 0, 15, and 30%. Test order was randomized for each subject. Subjects rested for a minimum of 5 minutes between each trial, and did not begin a subsequent trial until HR was verified to be ≤ 5 bpm of HR rest. Mean HR (12-lead ECG), BP (auscultation), oxygen uptake (continuous indirect calorimetry), and RPE (Borg ratio scale) were determined from the last 3 minutes of each trial. Mean values for all variables were assessed for difference between trials using repeated measures analysis of variance (SPSS ver. 24, New York, NY).
RESULTS: At rest, HR was 78.2±11.5 bp and BP was 121.2±7.9 / 76.9±8.0 mmHg. Mean walking speed of subjects was 64.2 m/min. HR and systolic BP significantly (p<0.05) increased from rest to exercise at all BWS levels, with no significant difference in diastolic BP seen from rest to exercise at all BWS levels. There was no statistical difference among levels of BWS for HR, BP, RPE, oxygen uptake, respiratory exchange ratio, respiratory rate, tidal volume, and METs.
CONCLUSIONS: Metabolic and cardiovascular responses to treadmill walking at 3 levels of BWS (0, 15, 30%) were similar in apparently healthy adult subjects.

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Myotonic Dystrophy Alters Peripheral And Central Adaptations Involved With Movement Control

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(No relevant relationships reported)

Myotonic dystrophy type 1 (DM1) is the most common inherited muscular dystrophy in adults. The clinical manifestations of myotonia, muscle weakness, and muscle wasting are characteristic symptoms of DM1. However, "upstream" effects of myopathy on spinal cord function and overall movement control is not well established. **Purpose**: To determine the effect of DM1 on peripheral muscle properties, spinal cord excitability, and neuromuscular movement control. **Methods:** Sixteen DM1 and sixteen control subjects participated in this study. Subjects received a battery of 4 tests; 1) assessment of spinal cord excitability via suppression using paired H-reflexes (H2/H1), 2) soleus muscle single (S) and double pulse (D) twitches, 3) fatigue via a repetitive 3 Hz stimulation, and 4) a global motor accuracy movement score (coherence) during a novel weight bearing task. We used a split plot repeated measures analysis of variance to test for differences within and between DM1 and control for each test. **Results:** H-reflex suppression was not different between DM1 and control (0.40 and 0.31; p=0.52). The soleus single twitch amplitude was less for DM1 compared to control (0.59 and 0.72; p=0.03). The double pulse to single pulse (D/S) ratio, a measurement of excitation-contraction coupling, trended higher for DM1 compared to control subjects (1.96 and 1.8; p=0.08). The weight bearing task error analysis (coherence) was less for DM1 group as compared to the control group(0.42 and 0.66; p=0004). Coherence was correlated to the MIRS score (r=0.7; p<0.05). The reproducibility of all within session measurements were high (r>0.87). **Conclusion:** The reduced twitch amplitudes for DM1 group is consistent with the extensive atrophy and provides a reproducible measurement to monitor disease progression. The enhanced D/S ratio for the DM1 group is consistent with impaired excitation contraction coupling, suggesting that calcium release is functionally compromised in people with DM1. The human performance weight bearing task accuracy (coherence) was the most robust measurement and highly correlated to disease severity. These findings support that people with genetically identified myopathy also have significant upstream effects that may influence human performance. Supported by NIH Grant R01NS094387-03

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Bioimpedance Spectroscopy Measurements Comparing Different Body Positions and Electrode Types in Men and Women

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(No relevant relationships reported)

PURPOSE: To evaluate how BIS measurements are affected by metal electrodes and different body positions (sitting and standing) compared to the traditional supine, gel-backed electrode method. **METHODS**: Forty-nine subjects (m=24, w=25) participated in the study (24 +/- 6 years, 172 +/- 11 cm, 74.2 +/- 15.4 kg). Whole body, right side measurements were taken sitting with metal electrodes (SiM), standing with metal electrodes (StM), and supine with gel-backed electrodes (SuG). Supine measurements were taken with a traditional lead-based device while standing and sitting measurements were taken using a fixed metal electrode device. Both devices independently calculated R0 and Rinf. **RESULTS**: Significant correlations were identified between all measurements (r > 0.88, p < 0.001). The highest correlations were observed between SiM and StM as well as StM and SuG for Rinf in the women (r > 0.949, p < 0.001) and between SiM and StM R0 as well as SiM and StM for Rinf in the men (r > 0.973, p < 0.001). Significant differences (p < 0.05) were observed in both R0 and Rinf for men and women comparing all measurements apart from R0 between SiM (764.95 ohms) and StM (773.18 ohms, p = 0.116) and R0 between SiM (764.95 ohms) and SuG (755.2 ohms, p = 0.172) in women. Compared to SuG, (women: R0 = 755.20, Rinf = 517.43 ohms; men: R0 = 599.30, Rinf = 384.70 ohms) SiM (women: R0 = 764.95, Rinf = 553.61 ohms; men: R0 = 613.31, Rinf = 417.54 ohms) was less effected than StM (women: R0 = 773.18, Rinf = 572.06 ohms; men: R0 = 623.58, Rinf = 434.40 ohms). **CONCLUSIONS**: Successful BIS measurements and calculations using complex Cole models were obtained from all measurements (sitting with metal electrodes, standing with metal electrodes, and lying supine with gel-backed electrodes). High (significant) correlations were observed between each measurement. Compared to the traditional supine gel-backed electrodes, both standing and sitting measurements taken with metal electrodes resulted in slightly (< 55 ohms) higher R0 and Rinf values. An R0 and Rinf correction factor should be applied when utilizing standing or sitting BIS measurements using metal electrodes for the calculations of fluid volumes or tissue masses when using the same calculations and resistivity coefficients as traditional supine measurements using gel-backed electrodes.

D-74   Exercise is Medicine®/Poster - **EIM: Exercise and Various Health Conditions**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1990   Board #251   May 31 2:00 PM - 3:30 PM

Predicting Basal Metabolic Rate After Spinal Cord Injury

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(No relevant relationships reported)

PURPOSE: To assess the accuracy of existing basal metabolic rate (BMR) prediction equations in men with chronic (> 1 year) spinal cord injury (SCI). The primary aim is to develop new SCI population-specific BMR prediction models, based on anthropometric, body composition and/or demographic variables that are strongly associated with BMR.
METHODS: Thirty men with chronic SCI (Paraplegic; n = 21, Tetraplegic; n = 9), aged 35 ± 11 years (mean ± SD) participated in this cross-sectional study. Criterion BMR values were measured by indirect calorimetry. Body composition (dual energy X-ray absorptiometry; DXA) and anthropometric measurements (circumferences and diameters) were also taken. Criterion BMR values were compared to values estimated from six commonly used prediction equations. Multiple linear regression analysis was performed to develop new SCI-specific BMR prediction models.
RESULTS: Existing equations that use information on stature, weight and/or age, significantly (P < 0.001) over-predicted measured BMR by a mean of 14-17% (187-234 kcal/day). Equations that utilised fat-free mass (FFM) accurately predicted BMR. The development of new SCI-specific prediction models demonstrated that the addition of anthropometric variables (weight, height and calf circumference) to FFM (Model 3; $r^2 = 0.77$), explained 8% more of the variance in BMR than FFM alone (Model 1; $r^2 =$

0.69). Using anthropometric variables, without FFM, explained less of the variance in BMR (Model 4; $r^2 = 0.57$). However, all the developed prediction models demonstrated acceptable mean absolute error ≤ 6%.
CONCLUSIONS: BMR can be more accurately estimated when DXA derived FFM is incorporated into prediction equations. Utilising anthropometric measurements provides a promising alternative to improve the prediction of BMR, beyond that achieved by existing equations in persons with SCI.

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Effects of Resistance Training on Vascular and Hemodynamic Responses to Standardized Workloads in Coronary Patients

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(No relevant relationships reported)

PURPOSE: To determine the impact of superimposed resistance training (RT) in aerobically trained coronary patients on systolic blood pressure (SBP), heart rate (HR), rating of perceived exertion (RPE; 6-20 scale), and rate pressure product (RPP) at fixed submaximal workloads following a 12-week RT intervention. Additionally, pre and post RT measures of brachial artery reactivity, an index of endothelial function, were obtained. **METHODS:** Fifteen low risk coronary patients (13 men, 2 women; mean ± SD age = 66.1 ± 5.1yrs) completed a progressive 12-week RT program that complemented their regular aerobic training regimen. Prior to training, SBP, HR, RPP, and RPE were obtained while subjects performed 1 set (10 repetitions) of 3 different exercises (bicep curl [BC], shoulder press [SP], leg press [LP]) at an intensity ~ 60-80% of 1-repetition maximum. After the training period, testing was repeated while subjects lifted the identical pre-training loads for each exercise following a standardized protocol. Vascular function was assessed by flow-mediated vasodilation (FMD) testing prior to and immediately following the 12-week RT training intervention. **RESULTS:** Lifting the same pre-training loads evoked attenuated responses for all variables (HR, SBP, RPE, RPP). A statistically significant decrease was shown for RPP ([HR x SBP]/100) during BC (106 ± 27 to 91 ± 22, *P* < 0.007) and SP (102 ± 24 to 86 ± 17, *P* < 0.007), whereas the RPP decrease during LP (116±22 to 109 ± 26) did not achieve statistical significance (*P* = 0.18). RPE for all 3 exercises decreased significantly (*P* < 0.0001) following the RT intervention: BC (14.3 ± 2.3 to 9.7 ± 1.6), SP (13.9 ± 1.6 to 9.2 ± 1.5), LP (14.3 ± 1.4 to 10.3 ± 1.6). Pre versus post RT measurements for resting HR and resting SBP were unchanged. Peak FMD responses for the 15 subjects were 12.8% and 10.3% dilation pre- and post-training, respectively (*P* = 0.332). However, 5 of the 15 subjects showed modest improvements in their post-training time to achieve maximum dilation from a mean of 117 seconds to 81 seconds (*P* = 0.156). **CONCLUSION:** Among aerobically trained coronary patients, a superimposed resistance training program resulted in decreased hemodynamic and RPE responses to lifting fixed submaximal workloads and improved FMD responses in 5 of the 15 participants.

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The Effects Of Multi-directional Exercise Training On Body Composition, Physical Fitness, And Mobility In Stroke Patients

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(No relevant relationships reported)

PURPOSE: The aim of this study was to compare the effects of multi-directional exercise training with conventional uni-directional stroke rehabilitation training on body composition, lower body strength and endurance, flexibility, balance, and mobility in stroke patients.
METHODS: Twenty-three male patients with chronic stroke were randomly assigned either a multi-directional exercise training group (MET) or a uni-directional exercise training group (UET). All participants in both groups underwent 12 weeks of exercise training (3 times/week, 60 mins/day). The MET group utilized a half-ball balance device and the UET group utilized a treadmill. The following tests were administered pre- and post-intervention: chairstand test, up and down test, single-leg balance test, sit and reach test, 6m walking test, and 6min walking test. Data were analyzed using T-test and ANCOVA with a significance level of 5%.
RESULTS: Twenty participants completed the exercise regimen (MET, n=10, 53.9 ± 8.3 yrs; UET, n=10, 58.3 ± 12.1 yrs). There was a significant increase between pre- and post-intervention values in the sit and reach test (-6.50 ± 9.52 vs -4.45 ± 11.06, t=-2.13, p<.05) and up and down test (10.30± 2.91 vs -12.1±2.60, t=-9.00, p<.05) in MET, and although up and down values did improve in the UET the results did not meet criteria for statistical significance. Significant increases of single-leg balance test ($F_{(1, 17)} =$

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4.73, p<.05)) and up and down test (F(1, 17) = 14.03, p<.05) values were found in the post-intervention MET group compared to the UET group using ANCOVA analysis. No significant effects were found on body composition or mobility.
CONCLUSION: The 12-week multi-directional exercise training regimen utilizing half-ball balance devices improved lower limb strength, endurance, and balance compared with uni-directional conventional training in patients with chronic stroke. Therefore, this multi-directional exercise regimen may have therapeutic advantages in a clinical rehabilitation setting.

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Blood Pressure in Subjects under Treatment for Knee Osteoarthritis: Role of Physical Activity Status

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(No relevant relationships reported)

PURPOSE: Physical exercise and educational programs promote several benefits for patients with knee osteoarthritis (OA). However, little is known about their effects on blood pressure (BP) of this population. Our purpose was to assess the role of physical activity on BP of subjects under treatment for knee OA submitted to an interdisciplinary educational program.
METHODS: One hundred and thirty six sedentary subjects (25/111 men/women; age = 67.6 ± 9.6, BMI = 30.6 ± 4.4 kg/m^2), under treatment for primary knee OA, were submitted to an interdisciplinary educational program emphasizing the recommendation for regular practice of physical exercise, and have their BP, six minute walking test (6MWT), body mass index (BMI) and daily living physical activity (IPAQ -short version) assessed before (pre) and after 12 months of follow-up. Subjects were then classified, according to their physical activity status during follow-up, in sedentary-to-sedentary (SED-SED, sedentary/insufficiently active at pre and post follow-up), sedentary-to-active (SED-ACT, sedentary/insufficiently active at pre follow-up and active/very active at post follow-up), active-to-sedentary (ACT-SED, active/very active at pre follow-up and sedentary/insufficiently active at post follow-up) and active-to-active (ACT-ACT, active/very active at pre and post follow-up) groups and have their BP and physical 6MWT compared.
RESULTS: : Systolic BP increase (11 ± 3 mmHg , $P < 0.01$) and maintenance in diastolic BP were found in SED-SED, whereas tendency toward increase in systolic BP (12 ± 6 mmHg , $P = 0.07$) and increase in diastolic BP (5 ± 1 mmHg , $P < 0.01$) were found in ACT-SED during follow-up. On the other hand, maintenance in systolic BP and reduction in diastolic BP (5 ± 2 mmHg , $P < 0.01$) were found in SED-ACT, whereas maintenance in systolic BP and tendency toward reduction in diastolic BP (3 ± 2 mmHg , $P < 0.07$) were found in ACT-ACT during follow-up. The positive effects on BP in SED-ACT and ACT-ACT were accompanied by improvements ($P < 0.05$) on 6MWT (SED-ACT = 8.5 ± 2.7 %; ACT-ACT = 9.3 ± 3.6 %) and BMI (SED-ACT = 2.9 ± 0.9 %; ACT-ACT = 3.8 ± 2.0 %), whereas no changes were found in SED-SED and ACT-SED.
CONCLUSIONS:This results suggest that high levels of physical activity may have a positive role on prevention /management of high BP in subjects under treatment for knee OA.

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Endothelial Function Correlates With Aerobic Fitness In Adults With Fasting Hyperglycemia Plus Impaired Glucose Tolerance

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(No relevant relationships reported)

Background: Impaired glucose tolerance (IGT) elevates type 2 diabetes and cardiovascular disease (CVD) risk above and beyond impaired fasting glucose (IFG) alone. Endothelial dysfunction and arterial stiffness have been implicated in chronic disease and linked to reduced aerobic fitness. However, it is unknown if the presence of IGT attenuates vascular function in people with IFG. We tested the hypothesis that adults with IFG+IGT have endothelial dysfunction and arterial stiffness in relation to low aerobic fitness when compared with IFG counterparts. **Methods:** Middle-aged, obese adults with IFG (n=11, 58.3 ± 10yrs; 34.0 ± 7.4 kg/m^2; (FBG: 105.6 ± 6.1mg/dl, 2-hr glc: 120.7 ± 28.1mg/dl) and IFG+IGT (n=14, 61 ± 8.1yrs; 33.1 ± 3.3 kg/m^2; FBG: 104.2 ± 10.5mg/dl, 2 hour glc: 165.4 ± 2mg/dl) were compared in this cross-sectional study following a 75g OGTT screening based on ADA criteria. Aerobic fitness (VO$_2$peak) was assessed with a cycle ergometer via indirect calorimetry, and body fat was determined by BIA (InBody®). After an overnight fast, brachial artery flow mediated dilation (FMD) was used to assess endothelial function by ultrasound and

arterial stiffness was determined via augmentation index (AI) and pulse wave velocity (PWV) via applanation tomography. A 180-min OGTT was also performed to assess glucose tolerance. **Results:** Although there was no significant difference between IFG and IFG+IGT for body fat (P=0.94), VO$_2$peak (P=0.46), FMD (P=0.42), AI (P=0.71), or PWV (P=0.95), elevated VO$_2$peak was strongly correlated with a higher FMD in people with IFG+IGT (r=0.57, P=0.04), but not IFG (r=0.1, P=0.99). Moreover, elevated postprandial blood glucose at 180 min was associated with lower VO$_2$peak (r=-0.51, P=0.06) and FMD (r=-0.54, P=0.05) in IFG+IGT, but not IFG (r=-0.19, P=0.57; r=-0.22, P=0.52, respectively). **Conclusion:** Endothelial function was significantly related to aerobic fitness in adults with IFG+IGT but not IFG. These data highlight that post-prandial hyperglycemia may modify vascular function and training adaptation uniquely between prediabetes phenotypes. Additional research is needed to determine the effect of training across exercise doses on skeletal muscle vascular glucose regulation to optimize diabetes and/or CVD prevention.

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Six Weeks of Aerobic Exercise Improves Markers of Insulin Sensitivity and Metabolic Endotoxemia: Correlations with the Gut Microbiota

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(No relevant relationships reported)

PURPOSE: Research from our laboratory indicates that six weeks of aerobic exercise alters the gut microbiota and microbial-derived short chain fatty acids (SCFAs) in both lean and obese humans. SCFAs directly modulate inflammation, insulin sensitivity and gut barrier function. Thus, the objectives of the present study were to (1) determine the effects of aerobic exercise training on circulating metabolic and inflammatory parameters indicative of inflammation, insulin sensitivity, and gut barrier function and (2) determine whether changes in these parameters paralleled shifts in the microbiota and its metabolites.
METHODS: Previously sedentary but otherwise healthy adults (n=16 lean; n=11 obese) underwent a six-week aerobic exercise intervention. Blood samples collected before and after the intervention were analyzed for C-reactive protein (CRP), lipopolysaccharide binding protein (LBP), and insulin resistance by the homeostatic model assessment (HOMA-IR). Fecal samples were analyzed for microbiota composition (16S rRNA gene sequencing) and SCFA concentrations (gas chromatography).
RESULTS: At baseline, obese individuals had significantly higher CRP, LBP, insulin, and HOMA-IR compared to lean individuals (p < 0.05) There were no changes in CRP as a result of exercise training. However, LBP and HOMA-IR were significantly reduced by exercise in the obese group (p < 0.05). Change in CRP over the 6-week intervention positively correlated with change in abundance of *Erysipelotrichaceae* (r = 0.610, p = 0.009), a microbe previously shown to be associated with metabolic syndrome. Change in abundance of *Anaerostipes*, a genus of known butyrate-producers, negatively correlated with change in LBP (r = -0.727, p = 0.007*)* and HOMA-IR (r = -0.471, p = 0.036). Both CRP and LBP levels after the intervention were negatively correlated with post fecal acetate, butyrate, and propionate levels (p < 0.01).
CONCLUSIONS: Six weeks of aerobic exercise improved markers of insulin sensitivity and metabolic endotoxemia in obese individuals. These improvements may be related effects on the gut microbiota, as metabolic and inflammatory markers correlated with changes in several important microbial genera and post-intervention SCFAs.

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Cardio-Ankle Vascular Index (CAVI) And Leisure-Time Physical Activity In Men With Type 1 Diabetes

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(No relevant relationships reported)

Diabetes is known to amplify the vascular changes that result in arterial stiffening. Individuals with type 1 diabetes (T1D) may also have impaired cardiorespiratory fitness which may influence their leisure-time physical activity (LTPA). Cardio-Ankle Vascular Index (CAVI) is a noninvasive method used to assess arterial stiffness. Currently there are few studies investigating the relationship between arterial stiffness and LTPA in individuals with T1D. **PURPOSE**: To determine CAVI and its associations with LTPA and cardiorespiratory fitness (VO$_{2max}$) in young men with T1D. **METHODS**: As a part of a larger study investigating early signs of cardiovascular disease in T1D 12 men with T1D (33 ± 7 y, 181 ± 7 cm, 81 ± 11 kg, T1D duration 13 ± 7 y) and 17 healthy age- and anthropometry-matched men (CON) (33 ± 6 y, 181 ± 5

cm, 83±10 kg) participated in the study. CAVI was assessed using VaSera VS-1500 (Fukuda Denshi Co. Ltd., Tokyo, Japan). Self-reported LTPA (min/wk) was obtained through a questionnaire. The subjects also performed incremental cycling exercise test until volitional fatigue to determine maximal oxygen uptake (VO_{2max}). Group comparisons were made using independent samples t-test and relationships were determined using Pearson correlation coefficient. All parameters are presented as mean ± SD. **RESULTS**: CAVI was higher in T1D (7.1±0.5 for right, 7.1±0.4 for left) compared to CON (6.5±0.6 for right, 6.4±0.6 for left) (p<0.01). LTPA did not differ between the groups, whereas VO_{2max} was lower in T1D than in CON (35.9±4.8 ml/kg/min vs. 42.7±7.5 ml/kg/min, p<0.05). LTPA was inversely associated with right CAVI (r=-0.72, p<0.01) and left CAVI (r=-0.68, p<0.05) in T1D but not in CON. VO_{2max} was not associated with CAVI in T1D or in CON. **CONCLUSIONS**: Young men with T1D have increased arterial stiffness determined by CAVI which may be an early sign of cardiovascular disease. Our finding of the inverse association between CAVI and LTPA in men with T1D suggests that LTPA may be especially important in modifying arterial stiffness in T1D.

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The Influence Of Physical Inactivity On Risk Of Type 2 Diabetes In University Staff

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(No relevant relationships reported)

There is now comprehensive evidence that physical inactivity is a primary cause of most cardiovascular and metabolic diseases. The Finnish Diabetes Risk Score (FINDRISC) questionnaire has demonstrated to be an effective tool for predicting the development of cardio-metabolic disorders, such as type 2 diabetes mellitus (T2DM) and metabolic syndrome (MetS). Importantly, one FINDRISC question is related with physical activity. **PURPOSE**: Thus, the present study aimed: (i) to determine the influence of physical inactivity on the risk of developing type 2 diabetes in university staff; and (ii) to determine possible connections between health parameters and the questionnaire responses. **METHODS**: A cross-sectional, descriptive study was conducted with 252 professors and administrative staff (139 women: 42±11 yr; 113 men: 45±13 yr) from the Autonomous University of Chihuahua (UACH) who underwent a health check including anthropometric measurements (height, weight, and waist circumference), blood pressure, and the FINDRISC questionnaire. The association between physical activity and the risk of T2DM was measured by contingency tables. **RESULTS**: There was a significant association between physical inactivity and the risk of T2DM (p<0.000). Waist circumference and body max index were also associated with physical inactivity (p=0.01 and 0.03, respectively). Cardiovascular risk measured by waist circumference was 33% for women and 31% for men. Around 42% of men and 40% of women did at least 30 minutes of physical activity daily. **CONCLUSIONS**: Lack of physical activity measured by the FINDRISC questionnaire showed a robust association with the risk of development cardio-metabolic disorders, as well as with health parameters.

Subjects categorized to type 2 diabetes risks according to FINDRISC				
	Women		Men	
FINDRISC	Frequency	%	Frequency	%
Low (<7 points)	34	24.1	18	16.2
Slightly elevated (7-11 points)	61	43.3	36	32.4
Moderate (12-14 points)	22	15.6	29	26.1
High (15-20 points)	19	13.5	21	18.9
Very high (>20 points)	5	3.5	7	6.3

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Association Between Cardiovascular Markers And Physical Activity In Patients With Obstructive Sleep Apnea

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(No relevant relationships reported)

The combined effect of intermittent hypoxemia and sleep fragmentation induced by obstructive sleep apnea (OSA) is associated with high cardiometabolic risk. In contrast, high levels of physical activity (PA) decrease proinflammatory markers related to cardiovascular diseases, improve glycemic control and sleep quality. **PURPOSE**: To observe the association between PA levels with sleep parameters and a range of cardiometabolic profile in a population sample, and to assess the OSA effect on association between PA level and cardiometabolic markers.

METHODS: A cross-sectional study, the Sao Paulo Epidemiologic Sleep Study, assessed 1042 individuals aged between 20 and 80 years of age through polysomnography, self-report PA level (MET's/week) and cardiometabolic profile such as C-reactive protein (CRP), homocysteine, folic acid, vitamin B12, tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), leptin, ghrelin, insulin and blood glucose. **RESULTS**: In the 993 individuals included in the analyses, PA level had a negative association with apnea and hypopnea index (B= -0.016, P<0.001). Compared to the non-apneic group (P=0.013), the MET level was 20.9% lower in the mild apnea group, 39.9% lower in the moderate group (P<0.001), and 57.7% lower in the severe apnea group (P<0.001). There was a negative association between PA level, CRP (B=-0.34, P=0.001) and insulin (B=-0.011, P=0.023) when analyzed whole sample. A negative association between PA level and homocysteine was only observed in non-apneic subjects (B=-0.027, P=0.02). There was no association between PA level, and CRP and insulin when apneic individuals only were analyzed. **CONCLUSIONS**: A high PA level is negatively associated with OSA severity. Although PA level was negatively associated with CRP and insulin in the whole sample, this association was not found when only OSA individuals were considered.

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Obesity, Lower Extremity Soft Tissue Pain & Physical Functioning

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(No relevant relationships reported)

Loss of physical functioning due to non-surgical lower extremity soft tissue pain (LESTP) is not well studied, but LESTP have been linked to difficulty completing activities of daily living. Obese patients have high incidences of musculoskeletal pain in the back, knee, ankle, and feet as barriers to a physically inactive lifestyle. The American College of Sports Medicine (ACSM) recently published simple methods to assess physical functioning for adults with a chronic disease or disability. **PURPOSE**: To see if the ACSM methods can be implemented in a medical practice, and to examine the relationships between lower-extremity exertional symptoms, BMI and biomechanical abnormalities with poor physical functioning. **METHODS**: 15 subjects (12 female, 3 male) completed informed consent and underwent a brief medical history and physical exam for symptoms and signs of LESTP. Weight and height were recorded; knee and ankle alignments were measured (Ingham's knee mal-alignment and foot rotation instruments). Dynamic stability was assessed by Trendelenberg test, 2-legged half-squats and 1-legged squats. Functional performance was assessed by gait speed, sit-to-stand, and stair climb tests. Associations between LESTP, biomechanical burdens, and poor physical functioning were examined with Fischer's Exact test and Spearman's rank correlation. **RESULTS**: Fisher's Exact test revealed significant relationships between BMI vs abnormal gait (p<0.01), as well as BMI vs two-legged squat mechanics (p<0.05). There were strong associations between physical functioning measures: sit to stand vs stair time r=-0.64, p<0.05; gait speed vs sit to stand r= 0.60, p<0.05; gait speed vs stair climb time r=-0.65, p<0.05. Strong associations were also seen between BMI and dynamic instability score r=0.71, p<0.005, as well as dynamic instability and poor physical functioning r=0.50, p<0.05. Significant correlation was found between BMI and biomechanical burdens (r^2=0.27, p<0.05). **CONCLUSION**: In this study, BMI was associated with dynamic instability, and dynamic instability was associated with poor physical functioning. The findings support the concept of sarcopenic obesity, wherein body mass outstrips musculoskeletal ability to provide normal biomechanical functioning and impairs independence and activities of daily living.

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Special Rehabilitation Treatment of Patients with Low Back Pain

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(No relevant relationships reported)

Special rehabilitation treatment and exercises by INFINITY method® (IM) use active movement and passive therapy. The three-dimensional rehabilitation therapy and movements stabilize and centralize the posture and also lumbar region. The IM is used as a treatment of patients with low back pain (LBP) and also preventive exercise program.
PURPOSE: To test efficacy of the rehabilitation method IM in patients with LBP.
METHODS: This was a quasi-experimental and non-randomized study with repeated measures design in a rehabilitation clinic. The participants with LBP (n = 15, age 66.2 ± 18.8 yr) volunteered in the study. All patients received a 60-minute IM therapy per day for twenty days for four weeks. We measured the area of center of force (COF) (cm^2), anterior-posterior (A-P) and medial-lateral (M-L) sway components of COF (cm) before and after the treatment. Patients were standing for 30 seconds with eyes

closed to measure postural control on a pressure mat system MatScan, before and after the rehabilitation treatment. Another dependent variable, the visual analog scale (VAS) of low back subjective pain scores (1 - pain free; 10 - unimaginable, unspeakable), was measured before and after the treatment. Data were analyzed using a Paired t-test and Wilcoxon signed-ranks test. $P < .05$.
RESULTS: The mean COF before treatment (M = 4.89, SD = 0.91) was significantly greater than the mean after treatment (M = 2.81, SD = 1.77), t (14) = 2.14, p < .05. The sway was reduced in both directions after treatment. M-L instability had larger effects on sway compared to A-P instability. The mean A-P before and after (M = 2.95, SD = 1.08) and (M = 2.81, SD = 1.21) showed only small, non-significant difference, t (14) = 0.42, p > .05; however, the mean M-L score before and after treatment (M = 3.69, SD = 1.37) and (M = 2.71, SD = 1.24) revealed significant difference, t (14) = 2.63, p < .05. VAS pain scores for pre- and post-treatment indicated significant difference (Mdn = 5.00) and (Mdn = 4.00), z = -3.32, p < .01.
CONCLUSIONS: The study revealed a significant decrease in pain and the area of COF, A-P and L-R sway components of COF. Out of all these parameters study shows that over 70% of patients with LBP improved at least in three dependent variables. The results of this study present the efficacy of IM in treatment of patients with LBP.

2001   Board #262   May 31 2:00 PM - 3:30 PM
Exercise Effects On Health, Fitness, And Cardiometabolic Risk Factors Among Firefighters: A Meta-analysis

Katie L. Andrews, Stephen Gallagher, Matthew P. Herring. *University of Limerick, Limerick, Ireland.*
(No relevant relationships reported)

Exercise training may reduce cardiovascular disease (CVD) risk among at risk populations. Firefighters are a high-stress occupational group at increased risk for CVD. However, the effects of exercise training on risk factors of CVD among firefighters remain unclear. **PURPOSE** To estimate the population effect size of exercise on health, fitness, and physiological/biological risk factors for CVD among firefighters. **METHODS** Eleven randomized controlled trials and seven experimental studies published before August 2017 were located using Google Scholar, MEDLINE, PsycINFO, PubMed, and Web of Science. Trials involved 1,428 (27 females) participants aged 36.7± 8.5 years, included firefighters, aimed to increase physical activity and/or improve fitness/health, and included a validated measure of ≥1 biological CVD risk factor(s). Hedges' d effect sizes were computed to quantify the magnitude of the effects of exercise compared to control conditions. Random effects models were used for all analyses. **RESULTS** Exercise interventions included aerobic exercise training, resistance exercise training, and combined training that varied in frequency (3±1 sessions/wk), intensity (moderate to intense), supervision (n=10), and duration (16.5 ± 10 weeks). Exercise resulted in significant, small-to-moderate effects on body weight (Δ=0.29, [0.02-0.56], $p≤0.05$, k=12), body composition (Δ=0.34, [95% CI: 0.14-0.54], $p≤0.001$, k=21), body fat percentage (Δ=0.53, [0.20-0.86], $p≤0.001$, k=5), strength (Δ=0.33, [0.11-0.54], $p≤0.05$, k=15), and occupational fitness (Δ=0.59, [0.20-0.99], $p≤0.05$, k=8). Significant, large effects were found for fitness (Δ=0.85, [0.58-1.12], $p≤0.001$, k=45), aerobic capacity (Δ=1.21, [0.47-1.95], $p≤0.001$, k=8), and endurance (Δ=1.53, [0.79-2.28], $p≤0.001$, k=11). Exercise training resulted in small-to-moderate non-significant effects on cholesterol, heart rate, psychological outcomes, BMI, flexibility, and systolic blood pressure. **CONCLUSIONS** The available evidence supports positive effects of exercise interventions on risk factors of CVD, including health outcomes (i.e., body composition, weight, and body fat percentage), and relevant measures of fitness (i.e., aerobic capacity, endurance, strength, and occupational fitness).

D-75   Basic Science World Congress/Poster - Skeletal Muscle I

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2002   Board #263   May 31 2:00 PM - 3:30 PM
Morphometric Parameters in Somatic and Branchiomeric Muscles of Mdx Mice

Mariana Cruz Lazzarin, Hananiah Tardivo Quintana, Vivianne Izabelle de Araújo Baptista, Flavia De Oliveira. *Federal University of Sao Paulo, Santos, Brazil.*
(No relevant relationships reported)

Duchenne muscular dystrophy is a neuromuscular disorder characterized by progressive muscle degeneration. A common histological alteration in dystrophic muscle is variation in fiber size. However, muscles with somatic and branchiomeric embryological origins have different responses to muscular dystrophy. **Purpose:** To investigate morphometric parameters in somatic and branchiomeric muscle of mdx

mice, an experimental model of Duchenne muscular dystrophy. **Methods:** Male sixteen-week-old C57BL/10 (Control group; n=5) and C57BL/10-Dmd^{mdx} (Mdx group; n=5) mice (Ethical protocol number 8165240614). After euthanasia, the *gastrocnemius* (somatic muscle) and *masseter* (branchiomeric muscle) were dissected, sectioned, and stained with Hematoxylin-Eosin (H&E). Five fields from one section have been chosen and photographed with 40x objective, through computerized imaging equipment attached to a binocular microscope. The frame with area known was used to measure all cells ($μm^2$) in this area. Analysis of distribution frequency of the muscle fiber areas was presented in a histogram. **Results:** In *gastrocnemius* muscle, fibers areas revealed greater of heterogeneity in Mdx group when compared with Control. Mdx group showed muscle fiber area values between 70 and 3,000$μm^2$ and Control group had a lower numerical range between 190 and 2,000$μm^2$. Furthermore, we observed that the groups presented difference between frequency peaks of muscle fiber area. Control group presented two peaks of frequency: 500/600$μm^2$ and 1,000/1,100$μm^2$. In contrast, Mdx groups showed only one peak of distribution frequency between 400/600$μm^2$. In masseter muscle, Control and Mdx groups had similar values between muscle fiber areas (70-100$μm^2$ and 2,000-2,200$μm^2$), with the same frequency peaks in 600$μm^2$. **Conclusion:** Morphometric parameters are different in somatic and branchiomeric muscles of mdx mice. Muscle with somatic embryological origin was most affected by variability of muscle fiber sizes than muscle with branchiomeric embryological origin.

2003   Board #264   May 31 2:00 PM - 3:30 PM
Exercise Training Alleviates Murf1-mediated Muscle Atrophy By Activating The Sirt1-AMPK Pathway In Diabetic (db/db) Mice

HUNG-WEN LIU. *National Taiwan Normal University, Taipei, Taiwan.*
(No relevant relationships reported)

Nuclear factor-κ B (NF-κB) pathway activation in conjunction with stimulated ubiquitin-proteasome pathway, especially E3 ubiquitin ligases MuRF1, leads to muscle loss in diabetes. Aerobic exercise training stimulates oxidative energy production via activation of sirtuin 1 (SIRT1) and AMP-activated protein kinase (AMPK) which could inhibit NF-κB signaling and suppress inflammation. **PURPOSE:** The study examined the underlying mechanisms of aerobic exercise training on attenuating diabetes-related muscle loss. **METHODS:** Eight weeks moderate-intensity exercise (5m/min, 60min/day, 5days/week for a total of 8weeks) on the skeletal muscle size and transcription factors such as NF-κB involved in regulation of MuRF1 were investigated in diabetic db/db (C57BL/KsJ-lepr^{db}/lepr^{db}) mice (n=10/per group). The statistical significance of the differences between two groups was determined by independent sample t-test ($P < 0.05$). **RESULTS:** No differences in fasting glucose and serum insulin levels and the areas under the curve (AUC) of intraperitoneal glucose tolerance test were observed in db/db mice with and without exercise training. The wet weights of gastrocnemius (64.25 vs. 74.64 mg) and tibialis anterior muscles (21.56 vs. 27.14 mg) were significantly increased in db/db mice with exercise training. The average cross-sectional area of tibialis anterior muscle was significantly increased by 1.2-fold in db/db mice with training compared with untrained mice (676.5 vs. 830.6 μm²). Prevention of muscle loss by exercise training was associated with downregulation of MuRF1 (-44%, P=0.014) and K48-linked poly-ubiquitination (-24%, $P < 0.01$) in db/db mice with exercise training. Decreases in phosphorylation of IκBα (-68%, P = 0.015) and NF-κB were observed in db/db mice with training compared with untrained mice (-64%, P = 0.017). Upregulation of SIRT1 (+33%, P < 0.01) and AMPKα activity (+165%, P = 0.015) were observed in db/db mice with exercise training. **CONCLUSION:** Aerobic exercise training inhibits NFκB signaling pathway via activation of the SIRT1/AMPKα pathway, thereby alleviating MuRF1-mediated muscle atrophy.

2004   Board #265   May 31 2:00 PM - 3:30 PM
Ceramide Accumulation and Insulin Resistance During Hindlimb Suspension In Wheel-Running Mice Is TLR4 Dependent

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(No relevant relationships reported)

Short term skeletal muscle inactivity (i.e. hospitalization, bed rest) impairs muscle size, function, and insulin sensitivity. We have suggested that muscle inflammation (TLR4 signaling) and accumulation of the bioactive sphingolipid, ceramide, are potent determinants of muscle health following inactivity periods. **Purpose:** To study specific inflammatory mediated effects on skeletal muscle of physically active mice, following 7-days of inactivity. **Methods:** In efforts to build on our recent findings and to study rapid inactivity induced changes, we provided 8-week old C57BL/6 mice access to running wheels for 5-weeks. Mice were then hindlimb suspended for 7-days (HS, n=10) or continued running wheel activity (Con, n=10) during this 7-day period. An additional group of HS mice were given daily injections of TAK242, a TLR4 specific inhibitor (HS+TAK242, n=10), in an attempt to protect muscle health during

7-days of inactivity. Primary outcomes were soleus-specific ceramide content, muscle Akt signaling, insulin sensitivity, and muscle size. **Results:** Muscle total ceramide abundance was greater (45%, p<0.01) in HS vs. Con, while TLR4 inhibition prevented ceramide accumulation during HS (HS+TAK242 vs. Con, p=0.87). Muscle ceramide increases during inactivity were largely driven by ceramide carbon chain lengths C16:0 & C18:0. Soleus mass declined (27%, p<0.01) in both HS and HS+TAK242. HOMA-IR, an estimate of peripheral insulin sensitivity, was significantly impaired (53%, p<0.01) in HS vs. Con, while TLR4 inhibition provided partial protection (HS+TAK242 vs. Con, p=0.19; HS+TAK242 vs. HS, p=0.24). Muscle Akt ^{S473} and AS160 ^{S588} phosphorylation was not different across the groups. **Conclusions:** These data extend the body of evidence implicating the connection between TLR signaling, muscle ceramide accumulation, and impaired metabolic health. Follow-up analyses in other tissues (i.e. liver) are warranted, in order to understand the peripheral insulin sensitivity discrepancies compared to muscle.
Funding was provided by the NIH: R01AG050781.

2005   Board #266   May 31 2:00 PM - 3:30 PM
Muscle Activation Patterns of Lower Body Musculature Among Three Traditional Lower Body Exercises in Trained Women

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(No relevant relationships reported)

ABSTRACT
The deadlift, back and front squat are common multi-joint lower body resistance exercises that are promoted to train similar musculature. To our knowledge, muscle activity measured via surface electromyography (EMG) has never been analyzed among these three exercises. Furthermore, most literature examining this topic uses all male participants creating a void in the literature for the female population. Knowledge of lower body muscle activation among these three exercises can aid coaches, trainers, and therapists for training and rehabilitative purposes. Therefore, the purpose of this study was to compare peak muscle activity of five lower body muscles among the back squat, front squat, and deadlift in trained women. Thirteen trained women completed two days of testing including a one repetition maximum (1RM) estimation, an actual 1RM, and 3 repetitions at 75% 1RM load for the deadlift, back and front squat. Muscle activity during the three repetitions at 75% 1RM load of each muscle during the total exercise period were averaged and normalized as a percentage of the peak signals obtained during the 1RM lifts. A repeated measures within subject analysis indicated muscle activity of the gluteus maximus (GM) differed among exercises ($p = .01$, $\eta_p^2 = .39$). Specifically, post hoc analysis indicated greater muscle activity during the front squat ($M = 94\%$, $SD = 15\%$) compared to the deadlift ($M = 72\%$, $SD = 16\%$; $p < .05$) in the GM. No significant differences were observed among the lifts in the vastus medialis, vastus lateralis, biceps femoris, and rectus femoris. These findings suggest that coaches and athletes may consider utilizing the front squat exercise for training focused on the GM involvement in female athletes.

2006   Board #267   May 31 2:00 PM - 3:30 PM
Effect of the In Vitro Mechanical Loading of Myotubes on their Myogenic Lineage Progression

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(No relevant relationships reported)

Mechanical loading of differentiated myotubes mimics the loading pattern of mature skeletal muscle and alterations in signaling and gene expression responses have been reported upon mechanical loading applied on skeletal muscle myotubes. **PURPOSE:** This study investigated the effects of the mechanical loading of terminally differentiated myoblasts (myotubes) on signaling and gene expression responses associated with the progression of their myogenic lineage. **METHODS:** C2C12 myoblasts were cultured on elastic membranes up to the day 10 of their differentiation and then underwent a passive, cyclic stretching (2.2% elongation, at a frequency of 0.25Hz, for 12h). Cells were harvested and lysed 24 hours after the completion of the stretching protocol. Phosphorylation of signaling proteins ERK1/2 and Akt and the expression of the key myogenic factor MyoD were determined by immunoblotting of cell lysates derived from stretched and non-stretched myotubes. Real Time-PCR was utilized to measure changes in expression levels of the myogenic regulatory factors (MRFs; MyoD, Myogenin, MRF4), as well as growth (IGF-1 isoforms: IGF-1Ea, IGF-1Eb), apoptotic (Foxo, Fuca) atrophy (Murf1, Atrogin, Myostatin) and inflammatory factors (Il-1b, Il-6, INF-γ) in response to mechanical loading of the differentiated C2C12 cells.
RESULTS: Mechanical loading of the myotubes resulted in significantly increased activation of Akt and of MyoD protein levels (422%; p<0.05), while no significant differences were found in ERK1/2 phosphorylation. Gene expression levels of IGF-

1 isoforms (IGF-1Ea: 2.1-fold, IGF-1Eb: 1.2-fold) and MRFs (MyoD: 5.8-fold, Myogenin: 3.3-fold, MRF4: 2.3-fold) increased significantly (p<0.05), while the apoptotic (FOXO: 0.7-fold, FUCA: 0.3-fold) and atrophy factors (Atrogin: 0.09-fold, Myostatin: 0.7-fold, Murf1: 0.09-fold) decreased (p<0.05). On the contrary, an upregulation of the inflammatory factors (IL-1b: 4.6-fold, IL-6: 7.5-fold) was depicted (p<0.05), along with a downregulation of the (INF-γ: 0.5-fold) levels (p<0.05).
CONCLUSIONS: It was demonstrated that mechanical loading of myotubes can further promote the progression of their myogenic lineage by upregulating myogenic and anabolic factors and signaling, and downregulating apoptotic and atrophy genes.

2007   Board #268   May 31 2:00 PM - 3:30 PM
Glycogen Enhancement Augments Overload-Induced Protein Synthesis, Growth, and Myogenesis in Aged Skeletal Muscle.

Marcus M. Lawrence[1], Josh R. Huot[1], Bailey Peck[2], Yuan Wen[2], Michael Shields[1], Raahil Madhiwala[1], Alexander Skurat[3], Peter J. Roach[3], Eric Kane[1], Adam Reitzel[1], Benjamin F. Miller[4], Karyn L. Hamilton[4], Susan T. Arthur[1], Scott E. Gordon, FACSM[5]. *[1]UNC Charlotte, Charlotte, NC. [2]University of Kentucky, Lexington, KY. [3]Indiana University, Bloomington, IN. [4]Colorado State University, Fort Collins, CO. [5]Kennesaw State University, Atlanta, GA.* (Sponsor: Scott E. Gordon, PhD, FACSM)
(No relevant relationships reported)

Age-related skeletal muscle (SkM) wasting is associated with elevated 5'-AMP-Activated Protein Kinase (AMPK) activity, which inhibits overload-induced (OI) SkM protein synthesis (MPS) and growth. Glycogen, an inhibitor of AMPK, is reduced in aged SkM. **PURPOSE**: To examine the effects of manipulating glycogen on AMPK, MPS and related signaling, and OI-growth in aged SkM. **METHODS**: Mutant glycogen synthase (GS; designed to enhance SkM glycogen content [GC]) or empty-vector plasmids were electrotransferred into fast-twitch plantaris muscles prior to 21-day synergist ablation-induced unilateral overload in young adult (8 mo.; empty vector; YE, n=9) and old (33 mo.; empty vector, OE, n=11; or mutant GS, OM, n=13) male FBN rats. Contralateral limbs underwent SHAM ablations with no plasmid. **RESULTS**: As expected, mutant GS expression and GC were significantly higher in OM overloaded muscles (the only muscles receiving the mutant GS plasmid) vs SHAM OM muscles or vs both SHAM or overloaded YE and OE muscles. There were significant increases in OI-(all vs SHAM) MPS and hypertrophy in all groups and OM was greater than OE. Markers of AMPK activity and other signaling intermediates affecting MPS were largely unaltered by glycogen enhancement. However, there was a strong and significant effect of enhancing GC (via mutant GS vs empty vector plasmid) on myogenic regulatory factors MyoD and myogenin, embryonic myosin heavy chain-positive fibers, and total fiber number in aged muscle under conditions of overload. **CONCLUSIONS**: Thus, enhancing GC may lead to enhanced MPS and OI growth in aged SkM. This effect may be due, in part, to an enhanced myogenesis.

2008   Board #269   May 31 2:00 PM - 3:30 PM
High versus Low doses of Anti-inflammatory Drugs Do Not Differentially Affect Muscle Molecular Response to Acute Resistance Exercise

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(No relevant relationships reported)

PURPOSE: We recently reported that high doses of non-steroidal anti-inflammatory drugs (NSAIDs) attenuate resistance exercise-induced muscle hypertrophy in young adults. Yet, little is known about the molecular mechanisms behind this effect. The current study aimed to examine acute muscle molecular responses to resistance exercise during co-ingestion of high and low doses of anti-inflammatory drugs. **METHODS**: Thirty one young (age 18-35 years) healthy men and women were randomly assigned to daily consumption of high doses of ibuprofen (IBU; 1200 mg; n=15) or low doses of acetylsalicylic acid (ASA; 75 mg; n=16) during an 8-week training intervention. During this period, subjects performed 20 supervised resistance training sessions (4 x 7-12 repetitions) involving the knee extensor muscles. Gene expression and protein signaling of key muscle growth regulators were analyzed from skeletal muscle biopsies obtained before training/treatment and 3 hours after an acute resistance exercise session during week 4 of the intervention. Real-time qPCR procedures were employed to determine mRNA expression. Protein signaling was assessed using western blots. **RESULTS**: Gene expression of myostatin (0.4-fold; p>0.0005), MuRF-1 (0.8-fold; p=0.015) and FoxO3 (0.6-fold; p>0.0005) decreased in response to the resistance exercise bout, with no difference across groups. Gene expression of IL-6 and STAT3

were unaltered. Protein phosphorylation of p70S6K increased (24-fold, $P>0.0005$) in response to the resistance exercise bout, with no difference across groups. Protein phosphorylation of STAT3 remained unchanged. **CONCLUSIONS**: These results show that high and low doses of NSAIDs do not differentially affect exercise-induced changes in gene expression and protein signaling for key markers of muscle growth in young adults. We therefore conclude that these acute markers do not seem to explain the negative effects of high doses of NSAIDs on muscle hypertrophy.

2009　　Board #270　　　　　May 31 2:00 PM - 3:30 PM

ULK2 Regulates Autophagic Cargo Recognition Impacting Contractile Function In Skeletal Muscle

Jordan D. Fuqua, Caleb Mere, Jay Bloome, Dam Bae, Vitor de Melo, Estevão Scudese, Kristen Turner, Ana Kronemberger, Christopher M. Adams, Vitor A. Lira. *University of Iowa, Iowa City, IA.*

(No relevant relationships reported)

Autophagy is an anciently conserved pathway responsible for the degradation of long-lived proteins, protein aggregates, and organelles, thereby contributing to efficient protein homeostasis. Autophagy is stimulated by nutrient deprivation and is required for certain beneficial adaptations of exercise. Insufficient autophagy is a common feature of muscle diseases, obesity, type 2 diabetes, and aging. However, regulation of autophagy is incompletely understood at the molecular level. **PURPOSE:** Define the role of unc-51 like autophagy activating kinase 2 (ULK2), and contrast with that of its close homolog ULK1, in regulation of autophagy and contractile function in skeletal muscle. **METHODS: 1)** DNA plasmids encoding either Ulk1 or Ulk2 pre-micro RNAs (miR) were electroporated into the tibialis anterior (TA) muscle of one leg, and a control miR plasmid into the contralateral leg of wild type mice. Muscles were harvested 7-8 days afterwards, either at basal conditions or after 24h of starvation. **2)** ULK2$^{fl/fl}$ differentiated primary mouse myotubes were infected with Ad-Cre-GFP or Ad-GFP (control) viruses, and harvested up to 96h afterwards. **3)** Maximal force of hindlimb dorsiflexors was assessed in adult ULK2 skeletal muscle knockout mice (ULK2$^{fl/fl}$, Myogenin-Cre$^{+/-}$; ULK2mKO) via stimulation of the fibular nerve, and compared to control littermates (ULK2$^{fl/fl}$, Cre$^{-/-}$). **RESULTS:** ULK2 is expressed at ~2-fold higher levels than its close homolog ULK1 in skeletal muscle. ULK2 deficiency, but not ULK1, leads to ubiquitin and autophagy receptor protein accumulation (p62, NBR-1), suggesting impaired cargo recognition in adult skeletal muscle and primary myotubes, independent of lysosomal function. Preliminary findings indicate that maximal force is reduced in adult ULK2mKO. **CONCLUSION:** Here, we demonstrate a novel and fundamental role for ULK2 in regulating cargo recognition, an essential aspect of selective autophagy, which is commonly impaired in conditions of muscle dysfunction. These results reveal ULK2 as a potential therapeutic target for skeletal muscle contractile and metabolic dysfunction, and serve as basis for future studies dissecting the mechanisms of autophagic cargo recognition in skeletal muscle.
Supported by AHA (16SDG30360001) and Dept. of Health & Human Physiology, University of Iowa.

2010　　Board #271　　　　　May 31 2:00 PM - 3:30 PM

Mathematical Modeling of Skeletal Muscle Focal Adhesion Kinase Signaling in Response to Contraction

Sida Zhao, David C. Clarke. *Simon Fraser University, Burnaby, BC, Canada.*

(No relevant relationships reported)

Force is a stimulus of resistance exercise (RE) that prompts adaptations to muscle size. Force acts at the molecular level on mechanotransducers such as focal adhesion kinase (FAK), which is a tyrosine kinase that undergoes a conformational change in response to force and subsequently activates a signaling cascade that controls the rate of protein synthesis. The dynamics by which FAK signaling transduces mechanical forces into chemical signals to induce hypertrophy are unclear.
PURPOSE:
The purpose of this study was to develop and analyze a mathematical model of skeletal-muscle FAK signaling in response to contractions.
METHODS:
The model was expressed as a system of ordinary differential equations incorporating signaling proteins involved in the control of protein translation (the FAK/ERK1/2/TSC2 axis). Intracellular biochemical reactions were represented by mass-action or Michaelis-Menten kinetics. We constructed the model by amalgamating a published model of FAK signaling [Zhou et al. (2015) *PLoS Comput Biol*] and ERK1/2 signaling [Hatakeyama et al. (2003) *Biochem J*]. We calibrated the kinetic parameters of the Zhou et al. and Hatakeyama et al. models to reflect skeletal muscle cells.
RESULTS:
Our model outputs qualitatively agreed with published time-course data for FAK, ERK1/2, and TSC2 following the simulation of muscle force contraction profiles. Specifically, we simulated thirty contraction cycles featuring 15-pN contractions and

3 sec per contraction followed by 7 sec of rest [Ato et al. (2016) *Physiol Rep*], which led to increased ERK1/2 signaling lasting ~3.5 hrs. Parameter sensitivity analysis determined that the model was most sensitive to parameters that described the force-induced rate of conformational change for FAK. We also simulated various force inputs for the contraction protocol described above and observed that ERK1/2 signaling was responsive to forces between 8-15 pN, achieving a plateau for higher forces.
CONCLUSION:
Our model provides a working quantitative hypothesis of the dynamics of protein translational control in skeletal muscle induced by mechanical factors. Going forward we will use the model to study the effects that different RE variables (repetitions, sets, loads, rest, etc.) have on FAK signaling dynamics by simulating different contraction profiles.

2011　　Board #272　　　　　May 31 2:00 PM - 3:30 PM

Mathematical Modeling of Mammalian Target of Rapamycin following Leucine Ingestion

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(No relevant relationships reported)

The mammalian target of rapamycin complex 1 (mTORC1) is a regulatory protein for several cell processes and is critical in the control of muscle protein synthesis and hence muscle size. Its activity is primarily regulated by nutrition (i.e., protein) and growth factors (i.e., insulin); however, how the whole-body dynamics of these factors translate into protein translational signaling in skeletal muscle cells is poorly understood.
Purpose: The purpose of this study was to develop and analyze a simple mathematical model of the signaling controlling protein translation in human skeletal muscle following leucine ingestion.
Methods: The model was expressed as a system of ordinary differential equations (ODEs) incorporating the signaling proteins involved in the control of protein translation (e.g., IR/PI3K/AKT/mTOR axis). Intracellular biochemical reactions were represented by mass-action kinetics. We constructed the model by modifying amalgamated published models of mTOR signalling [Pezze et al. (2012) *Sci Signal*] and skeletal-muscle leucine kinetics [Tessari et al. (1995) *Am J Physiol*]. The Pezze model was specific to HeLa cells, so we calibrated the kinetic parameters using signaling data from human skeletal muscle following leucine ingestion. The ODEs were solved using the ODE23s solver in MATLAB.
Results: The model outputs qualitatively agreed with published time-course data for plasma leucine, plasma insulin, and phosphorylation of Akt^{S473}, mTORC1^{S2448}, and p70S6K^{T389} following the ingestion of a single leucine bolus or multiple, pulsatile leucine doses. Parameter sensitivity analysis determined that mTORC1 activity was most sensitive to total mTORC1 concentration and highly sensitive to the rate of leucine transamination to alpha-ketoisocaproate.
Conclusion: Our model represents a working quantitative hypothesis of the dynamics of protein translational control in skeletal muscle by nutritional and hormonal factors.

D-75b　Free Communication/Poster - **Sports Medicine Fellow Research Abstracts**

Thursday, May 31, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2012　　Board #273　　　　　May 31 3:30 PM - 5:00 PM

Short-term Effect Of Ultrasound-guided Iliopsoas Peritendinous Injection In Athletes With Iliopsoas Tendonitis

Julie Han, Dai Sugimoto, Maxwell McKee-Proctor, Andrea Stracciolini, FACSM, Pierre d'Hemecourt, FACSM. *Boston Children's Hospital, Boston, MA.* (Sponsor: Pierre d'Hemecourt, FACSM)

(No relevant relationships reported)

BACKGROUND: Iliopsoas injury is the second most common cause of groin pain in athletes. Treatment includes ultrasound (US)-guided iliopsoas peritendinous injection. Evidence regarding US-guided iliopsoas injection efficacy is lacking in athletes with intra-articular hip abnormalities. **PURPOSE**: To examine short-term efficacy of US-guided iliopsoas corticosteroid injection in athletes with and without intra-articular hip pathology. **METHODS**: Prospective study design to evaluate athletes 12-50 years with iliopsoas tendonitis. Participants completed a Hip Disability and Osteoarthritis Outcome Score (HOOS) questionnaire prior to US-guided iliopsoas injection and 6-weeks after injection. Outcome measures included change in HOOS subcategory scores. Independent variables included normal hips vs. hips with intra-articular pathology (labral tear, femoroacetabular impingement, osteoarthritis, and dysplasia).

Two-way repeated measures analysis of variance (ANOVA) with effect size (η^2) was used to determine effects of injection on HOOS scores of patients at baseline and 6-weeks following injection. **RESULTS**: 180 patients analyzed; 85.6% (N154) female, mean age: females 20.5±7.5, males 21.5±7.6 years. Time effects were found for both normal and abnormal hips in all five HOOS score subcategories: symptoms (p=0.041, η^2=0.050), pain (p=0.001, η^2=0.184), activity of daily living (ADL) (p=0.011, η^2=0.076), sports/recreation (p=0.001, η^2=0.151), and quality of life (QOL) (p=0.001, η^2=0.193). Significant differences between normal vs. abnormal hips were found in sports/recreation (p=0.032, η^2=0.056) and QOL scores (p=0.001, η^2=0.135). Interaction was found for QOL scores only (p=0.031, η^2=0.056). **CONCLUSIONS**: US-guided iliopsoas injection appears to improve outcomes over the 6 week study period regardless of pre-existing intra-articular hip pathology. Athletes without intra-articular pathology showed greater improvement in sports/recreation and QOL when compared to athletes with abnormal hip pathology. QOL was significantly better in athletes with normal hips than those with hip pathology during 6 weeks. US-guided iliopsoas injections may serve to help patients with iliopsoas tendonitis to advance care and continue with non-surgical treatment regimes.

2013   Board #274   May 31 3:30 PM - 5:00 PM

Pediatric and Adolescent Figure Skating Injuries: A 15-year Retrospective Chart Review

Agnieszka Kowalczyk, Dai Sugimoto, Bridget Dahlberg, Lyle Micheli, FACSM, Ellen Geminiani. *Boston Children's Hospital, Boston, MA.*
(No relevant relationships reported)

BACKGROUND
According to our literature review, there is a paucity of studies published over the last four decades, examining figure skating injuries in the pediatric and adolescent populations. **PURPOSE**: To analyze the characteristics of injuries sustained by young figure skaters, who were evaluated at a regional pediatric sports medicine clinic. **METHODS**: Retrospective chart review was conducted over the study period from 2003 to 2017. Figure skaters were identified by entering key words 'figure skating' and 'figure skater' into search engine, *HoundDog*. Eligible figure skaters were between the ages of 9 and 19 years and had been evaluated at least once at the sports medicine clinic by a physician. All skating disciplines and both sexes were included. Injuries unrelated to figure skating were excluded. Descriptive statistics were used to report injured body areas, type of injury (acute or overuse), number of injuries and time to seek medical attention. Data were stratified by sex. **RESULTS**: Of 382 figure skaters identified during the preliminary search, 296 met eligibility criteria with a total of 822 injuries (273 female and 23 male, age: 14.2±2.3 years, height: 158.8±9.68 cm, weight: 52.2±10.7 kg, BMI: 20.6±3.0, BMI percentiles: 54.5±23.2%). Approximately 31.5% were acute and 67.5 % were overuse injuries. Mean number of injuries sustained was 2.78 per female figure skater and 2.65 per male figure skater. Mean time to seek medical attention was 62.3±143 days (range, 0-1825 days) by female figure skaters and 23.4±28.5 days (range, 0-150 days) by male figure skaters. In female figure skaters, the most frequently injured body areas were, foot/ankle (30.1%), knee (19.5%), back (16.2%), hip (10.5%) and wrist/hand (4.3%). In male figure skaters, they were foot/ankle (27.9%), back (14.8%), knee (13.1%), hip (13.1%), pelvis (6.6%), and lower leg (6.6%). **CONCLUSIONS**: Pediatric figure skaters most commonly sustain foot/ankle (29%), knee (16.3%) and back (15.5%) injuries in both females and males. Approximately two-thirds of their injuries are overuse in nature while about one-third stem from acute mechanisms. This study indicates that not only are pediatric and adolescent figure skaters at risk of injuries, but that they also sustain multiple injuries requiring medical attention from sports medicine physicians.

2014   Board #275   May 31 3:30 PM - 5:00 PM

Feasibility of a Novel Strategy for Cardiovascular Screening During the Preparticipation Physical Examination

Roberta Dennison[1], Deanna Kerkhof[2], Trent Honda[2], Renato Calatroni[2], Gianmichel Corrado[1]. *[1]Boston Children's Hospital, Boston, MA. [2]Northeastern University, Boston, MA.*
(No relevant relationships reported)

Sudden cardiac death (SCD) in athletes is a devastating event in which young, seemingly healthy individuals meet an untimely death, usually without warning. Best screening practices for SCD are highly debated; they vary around the globe and with level of play. **PURPOSE:** To determine the feasibility of simultaneously conducting history and physical (H&P), limb-lead ECG, and preparticipation echocardiography by frontline providers (PEFP) at one screening station. **METHODS:** A cross-sectional study design compared 2 preparticipation cardiovascular screening strategies. There were 31 participants screened in Year 1 and 53 screened in Year 2. Year 1 screening was conducted at three stations: screening H&P, 12-lead ECG, and limited PEFP. Time to complete each station was recorded and the total time for screening was the summation of times for each of the 3 stations. Year 2 screening was conducted at a single station by 2 frontline providers. Year 2 participants underwent screening H&P,

limb-lead ECG, and limited PEFP in simultaneous fashion. Timing of the single station began when the patient entered the room and ended when all three components of screening were complete. An unpaired t-test was used to compare the mean time difference between Year 1 and Year 2 screening stations. **RESULTS:** The Year 1 screening time was significantly longer than the time to complete cardiac screening using the Year 2 protocol (10.27 minutes vs 3.96 minutes, respectively; p<0.01). Zero athletes screened positive in Year 1. Three athletes were referred to cardiology for further evaluation from the Year 2 cohort; all athletes were ultimately cleared to participate. **CONCLUSIONS:** A comprehensive preparticipation cardiac screening examination can be completed in a timely fashion using a single screening station and limited ECG to improve efficiency, while still allowing providers to gather information on personal and family history, physical exam, heart rhythm, and heart structure. This strategy may serve as a potential solution in the longstanding debate over best practices for preparticipation cardiovascular screening for athletes.

2015   Board #276   May 31 3:30 PM - 5:00 PM

Medical Utilization Patterns Among Division I Collegiate Athletes

Christopher Fox[1], Emily Miller[1], Joshua Goldman[1], Peter Awad[1], Nisha Batta[1], Montana Dunn[1], Glenda Marshall[1], Marissa Ogata[1], Phil Sundin[2]. *[1]UCLA, Santa Monica, CA. [2]UCLA, Westwood, CA.* (Sponsor: Aurelia Nattiv, FACSM)
(No relevant relationships reported)

PURPOSE: There are a multitude of medical care models for NCAA student athletes. At our Division I institution, student athletes have access to both primary care sports medicine physicians and sports medicine orthopedic surgeons on a daily basis. The purpose of our study was to determine athlete utilization patterns over the course of a single academic year.
METHODS: Using Presagia Sports, a web-based reporting system, medical visits from September 1, 2016 to August 31, 2017 were reviewed. Demographic information, team affiliation, physician type (primary care versus orthopedic surgery, fellow versus attending), and diagnosis were recorded. Encounter diagnoses were grouped into 12 categories ranging from chronic medical conditions to acute illness and operative orthopedic issues. Encounter diagnoses and categories were reviewed by two primary care sports medicine fellows and cross-referenced with athlete medical records. Poisson regression was used for statistical analysis.
RESULTS: A total of 2416 medical visits occurred during the study period, representing 517 of the 793 (65.2%) student athletes. Football (15% of athletes) represented 16.7% of total visits, followed by rowing (14.5% of athletes) with 10.9%, women's track and field (10.7%) with 9.4%, women's swim/dive (4.8%) with 8.9% and women's gymnastics (3.8%) with 7.1%. Female athletes (53.7% of student athletes) composed 62% of all visits, male athletes 38% (p<.001). 83.3% of all visits were with Primary Care Sports Medicine physicians versus 16.7% with Sports Surgery. When evaluating common diagnoses by sport the following trends were noted: football accounted for 38% of total concussion visits. Rowing had the highest percentage of mental health visits (48%), followed by swim/dive (11%) and women's water polo (7%). Women's cross country and track accounted for 58% of female athlete triad visits (amenorrhea, bone stress injuries or disordered eating) followed by gymnastics at 11% and rowing 10%.
CONCLUSIONS: A foundational understanding of current training room utilization and trends in the distribution of common sports medicine diagnoses, Sports Medicine physicians have the opportunity to prevent these diagnoses, mitigate their effects, and ensure athletes are receiving care designed to optimize their health and athletic performance.

2016   Board #277   May 31 3:30 PM - 5:00 PM

Youth Multi-sport Participation Is Associated With Higher Bone Mineral Density In Female Collegiate Distance Runners

Emily Miller[1], Michael Fredericson, FACSM[2], Andrea Kussman[3], Emily Krauss[2], Sonal Singh[4], Megan Deakins-Roche[2], Brian Kim[5], Adam Tenforde[6], Kristin Sainani[2], Aurelia Nattiv, FACSM[1]. *[1]University of California, Los Angeles, Los Angeles, CA. [2]Stanford University, Stanford, CA. [3]Stanford University, Los Angeles, CA. [4]UCLA, Los Angeles, CA. [5]University of California, Irvine, Irvine, CA. [6]Harvard University, Boston, MA.* (Sponsor: Aurelia Nattiv, FACSM)
(No relevant relationships reported)

PURPOSE:
Youth sport participation is encouraged as a way to promote health and social interactions. But specialization in a single sport at an early age is becoming increasingly common. Distance runners have lower bone mineral density (BMD) compared to athletes in other weight-bearing sports and a higher risk of bone stress

injuries (BSI). We sought to determine the effect of pre-college participation in sports other than cross country or track on BMD and BSI in collegiate middle and long-distance runners.

METHODS:
As part of a prospective study on bone health in collegiate distance runners, baseline data were collected on 81 male and 79 female NCAA Division 1 distance runners at two institutions, including prior sports participation. Baseline BMD was recorded for 55 men and 54 women. We followed athletes for up to 4 years and recorded prospective BSIs. Data were analyzed using t-tests or regression models adjusted for age and school (linear regression for BMD, Poisson regression for BSI).

RESULTS:
62 male runners (76.5%) and 47 female runners (59.5%) had participated in at least one sport in addition to running/track and field events prior to college. Soccer and basketball were the most common sports played in women and men. At baseline, women who participated in multiple sports had faster mile times (4:53 vs 5:11, p<.05), whereas male multi-sport athletes did not (4:12 vs. 4:14). All but 7 multi-sport athletes had participated in at least one high-impact or multi-directional sport. For women, prior participation in high-impact sports was associated with nearly a half-standard deviation increase in total body BMD (Z= .49, p=.047); in contrast, the effect in men was small (Z=.12, p=.65). In terms of prospective BSI risk for women, prior participation in basketball was associated with a relative risk (RR) of 0.50 (0.28-0.91, p=0.023) whereas participation in gymnastics was associated with a RR of 1.99 (1.21-3.26, p=0.007). For men, cycling was significantly associated with an increased risk of prospective BSI with a RR of 4.33 (2.1-8.95, p<0.001) however the N was small (N=6 male cyclists).

CONCLUSIONS: For female collegiate distance runners, prior participation in non-running sports was associated with higher baseline BMD. Thus, encouraging youth to participate in multiple sports may have skeletal benefits.

2017   Board #278   May 31 3:30 PM - 5:00 PM

Effects Of A 12-week Cycling Training Program On Clinical Parameters In Patients With Parkinson Disease

Zinta Zarins[1], Gary Smith[2], Robert Sallis, FACSM[1]. *[1]Kaiser Fontana, Fontana, CA. [2]Pomona College, Claremont, CA.* (Sponsor: Dr. Robert Sallis, MD, FACSM)
(No relevant relationships reported)

PURPOSE: We examined the effects of endurance training [12 week, 3 days/week, 45 min/session, 60-75% of age-adjusted maximum heart rate, targeted rpm of 80-90] on change MDS-UPDRS (Unified Parkinson's Disease Rating Scale) score in patients with mild to moderate Parkinson's Disease (n=12, 71±2.23 years, 1.5 ± 0.23 Hoehn and Yahr staging, 5.71± 0.62 years duration of Parkinson's Disease). We also looked at changes in body composition, resting blood pressure and heart rate, five-times sit to stand test, and timed up and go test. **METHODS:** The 12 subjects recruited for the study had an average BMI of 24.39± 1.13 and were weight-stable. The exercise intervention was supervised and consisted of pedaling on a stationary bike 3 days/week for 45 minutes and intensity of exercise training was gradually increased such that by the second week the subjects were exercising at 60-75% of their age-adjusted maximum heart rate and pedaling at a target rpm of 80-90. Body composition was analyzed using the InBody270. **RESULTS:** Subjects attended an average of 76.9% of the training sessions and trained at an average of 64.7% of their age-adjusted maximum heart rate and cycled at an average of 78.3 rpm. With regards to testing time, there was no significant difference in the time since the last levodopa dose. While all of the UPDRS components decreased after training, there was only a statistically significant decrease in UPDRS I (pre-training=11.5±1.31, post-training=9.50±1.58, p<0.01), UPDRS III (pre-training=20.83±4.17, post-training=7.91±2.22, p<0.01), and the total UPDRS (pre-training=51.0±7.56, post-training=32.4±6.75, p<0.01). Four of the 12 subjects in the study were unable to maintain the average target rpm goal of 80-90, but were still noted to have significant clinical improvements with training. There was no significant change in body composition, five times sit to stand, or get up and go testing. Diastolic blood pressure significantly decreased after training (pre-training=77.08±1.88, post-training=65.91±1.85, p<0.01). **CONCLUSION:** These results suggest that in patient's with mild to moderate Parkinson's Disease a cycling endurance training program 1) significantly improves the total UPDRS by 36% and UPDRS III by 62% 2) improvement in UPDRS III score was irrespective of the average rpm.

2018   Board #279   May 31 3:30 PM - 5:00 PM

Play Lifestyle And Activity Assessment In Children With Cerebral Palsy

Amy Rabatin, Rebecca Zwicker, Dai Sugimoto, Eric Nohelty, Jodie Shea, Benjamin Shore, Andrea Stracciolini, FACSM. *Boston Children's Hospital, Boston, MA.* (Sponsor: Andrea Stracciollini, FACSM)
(No relevant relationships reported)

BACKGROUND: The World Health Organization (WHO) recommends at least 60 minutes of moderate to vigorous physical activity (MVPA) for all children 5-17 years. Exercise Deficit Disorder (EDD), defined as reduced levels of MVPA, afflicts both typically developing (TD) children and children with disability. Currently there is a lack of knowledge surrounding factors that affect physical activity in children with disability.

PURPOSE: (1) To investigate knowledge and understanding, daily behavior, and motivation/attitudes surrounding physical activity in children with cerebral palsy (CP); (2) To compare TD and CP responses to Play Lifestyle & Activity in Youth (PLAY) questionnaire.

METHODS: **Study design:** cross sectional questionnaire study. **Study subjects:** children ages 6-11 with GMFCS level I and II CP or related diagnoses, and TD children in the same age group. **Main outcome measures:** answers to selected questions from PLAY questionnaire focusing on (1) family rules regarding screen-time/media-use (knowledge and understanding), (2) status of daily physical activity (daily behavior), (3) frequency of parents driving child to sporting events (motivation and attitudes). **Statistical analyses:** simple descriptive statistics and two-sided Fisher's exact test.

RESULTS: Nine children with CP (5 males, 4 females; mean age 7.9±1.4 years) and 11 TD children (4 males, 7 females; mean age 7.7±1.6 years) were enrolled. All TD children (100%) had screen-time/media-use rules in the household, as compared to 89% of CP children. Almost two thirds of TD children reported 60-min of MVPA daily, as compared to less than half of the children with CP (44%, *P*=.653). A greater proportion of parents of children with CP drove their children to sporting activities for each outing versus parents of TD children (67% and 56%, respectively, *P*=0.545).

CONCLUSIONS: The majority of CP and TD children in this study had screen time/media use rules in the household. Preliminary analyses found no significant differences between CP and TD children in knowledge and understanding, daily behavior, and motivation/attitudes surrounding physical activity. Continued research will strive to increase our understanding of physical activity barriers in all children.

2019   Board #280   May 31 3:30 PM - 5:00 PM

The Prevalence Of NCAA Division III Athletes With Positive Depression Screening: A Retrospective Cohort Study

Mary Iaculli, DO[1], Ula Lewandowski, MS III[2], Elizabeth Rothe, MD[3], Peter Sedgwick, MD, FACSM[3]. *[1]Evergreen Sports Medicine Fellowship, Augusta, ME. [2]Central Maine Medical Center, Lewiston, ME. [3]Evergreen Sports Medicine Fellowship, Lewiston, ME.* (Sponsor: Peter Sedgwick, MD, FACSM)
(No relevant relationships reported)

PURPOSE: Mental health is a growing area of concern for college athletes. A 2015 report from the NIMH estimated that 6.7% of all American adults experienced an episode of MDD within the past 12 months. Episodes were highest in college-age individuals and females. While there is currently no standardized protocol for screening student-athletes for depressive symptoms during pre-participation physical exams, it has been adopted by some. Our retrospective cohort study evaluates the prevalence of depressive symptoms in student-athletes at a division III college.

METHODS: The entire entire student-athlete population (N =729) of a single division III college was screened for depressive symptoms over the course of one year using the clinically validated questionnaires, PHQ-2 followed by PHQ-9 if positive. Screening was performed during routine pre-participation physicals for sport over a one-year period. Depression screening results were evaluated by gender, sport, class year, and time of year data was collected, and then compared to published national rates.

RESULTS: The prevalence of clinically significant depressive symptoms using the PHQ screening tools in our study was 4.1%, significantly lower than the prevalence of 23.7% cited by Wolanin et al in 2016 using CES-D screening (z= 12.45, p = <.001). Inconsistent with previously published data, there was no overall significant gender difference, $\chi2 = 1.58$, p =.21. However there was a statistically significant difference in women reporting moderate to severe depressive symptoms compared to men, $\chi2 = 16.36$, p =.001. There was no statistical difference with season of screening, $\chi2 = 4.52$, p = .61.

CONCLUSIONS: In this sample, PHQ screening revealed depressive symptoms in less than 5% of division III student-athletes from a single school. Female college athletes reported significantly more moderate-severe depressive symptoms than males. There was no statistical difference in the time of year screening was performed. Hypothesized explanations for the differences in results obtained through our study

and previously published data include, environment of screening, screening tool used, and level of collegiate play. More cross-sectional studies are needed to better elucidate rates of depression in our student-athlete population across all divisions.

2020   Board #281   May 31 3:30 PM - 5:00 PM
Comparison of Running Mechanics in Healthy Female Runners Versus Those with Sacroiliac Pain

Kristin E. Schwarz[1], Dai Sugimoto[1], Charles A. d'Hemecourt[2], Duncan A. d'Hemecourt[2], Pierre A. d'Hemecourt, FACSM[1]. *[1]Boston Children's Hospital, Boston, MA. [2]The Micheli Center for Sports Injury Prevention, Waltham, MA.* (Sponsor: Pierre d'Hemecourt, FACSM)
(No relevant relationships reported)

BACKGROUND: Injuries to the back, pelvis, hip, and thigh have been reported to account for 25-35% of all injuries sustained by runners. Repetitive torsional forces, shear stress, and inflammation can cause deleterious effects and pain in the sacroiliac (SI) joint. SI joint pain is more common among women, in part due to gender-related anatomic differences. Research on the gait mechanics of female runners with SI joint pain has been limited to date. **PURPOSE:** To identify running gait mechanical differences between healthy female runners and those with SI joint pain. **METHODS:** Retrospective case-control running gait video analysis was performed. Runners who had completed video gait analysis and who had been diagnosed as SI joint pain were identified by chart review. Diagnosis was made either by positive response to SI joint injection (i.e. resolution of pain after ultrasound-guided SI joint injection with a mixture of analgesic and steroid) and/or 2 or more positive physical exam provocative tests for SI joint pain. Based on the runner's age, height, mass, and BMI, matched healthy female runners were designated as control. Running mechanics at point of initial contact during the stance phase of the gait cycle were measured from side view (sagittal plane) of runners on a treadmill. Measurements included: foot strike angle, ankle angle, overstride angle, knee angle, hip angle, and trunk posture angles. Foot strike pattern (i.e. rearfoot, midfoot, or forefoot) was documented. Videos were analyzed by an experienced sports medicine physician. **RESULTS:** There were 19 female runners with SI joint pain and 63 healthy female runners in the control group. Runners with SI joint pain demonstrated significantly greater foot strike angles (p=0.001) than those without. Those with SI joint pain also had smaller ankle angles (p=0.001) than healthy runners. There were no significant differences between overstride angles, knee angles, hip angles, or trunk posture angles. There were no significant differences in foot strike patterns between the two groups. **CONCLUSIONS:** Female runners with SI joint pain demonstrated greater ankle dorsiflexion at the point of initial contact during stance phase compared to healthy runners. This suggests a potential role for gait retraining in the treatment and prevention of SI joint pain.

D-76   Clinical Poster/Reception - Clinical Poster Reception

Thursday, May 31, 2018, 5:45 PM - 6:45 PM
Room: Hyatt-Lakeshore C

2021   Board #1
Chest Pain and Palpitations - Lacrosse

Elizabeth E. Barton - (Sponsor: Kyle J. Cassas, FACSM), Vicki R. Nelson, Irfan M. Asif. *Steadman Hawkins Clinic of the Carolinas, Greenville Health System, Greenville, SC.*
(No relevant relationships reported)

HISTORY:
A 15-year-old female HS lacrosse player presented for episodes of chest pain and palpitations, initially at rest for minutes and then became exertional with SOB. She denied nausea, HA, and syncope. Family history was negative for congenital heart disease and sudden cardiac death, but her mother had atrial fibrillation and MGF died before age 60 from an MI.
PHYSICAL EXAMINATION:
T 97.7°F, HR 56, BP 116/68, RR 20, SpO$_2$ 98% RA, BMI 20.7
Well appearing with clear breath sounds. Cardiac exam: regular rhythm, normal S1 and S2, no S3 or S4, and a 2/6 low frequency systolic murmur best heard at the left upper sternal border. 2+ pulses. No peripheral edema, cyanosis, or hepatomegaly.
DIFFERENTIAL DIAGNOSIS:
1. arrhythmia - SVT, WPW, aflutter, afib, PACs
2. pulmonary valve stenosis, tricuspid valve regurgitation
3. cardiomyopathy—hypertrophic cardiomyopathy, ARVD
4. ASD
5. anemia
6. hyperthyroidism

TEST AND RESULTS:
-ECG- sinus bradycardia, no chamber enlargements or pre-excitation, normal QTc
-28 day event monitor- two episodes of chest pain and rapid heart beat correlate with nsr and sinus tachycardia
-Transthoracic echocardiogram- normal cardiac segmentation, valvular function, biventricular size, and systolic function. No effusion. There is a small coronary cameral fistula entering the main pulmonary artery.
-Exercise stress with 2D echocardiogram performed showed normal EF with no wall motion abnormalities, ischemia, or arrhythmias
FINAL WORKING DIAGNOSIS:
Coronary-cameral fistula
TREATMENT AND OUTCOMES:
1. The patient was cleared to play after symptoms spontaneously resolved and serial echocardiograms over a 5 year period demonstrated a stable coronary-cameral fistula.
2. Cardiology consultants recommended a rest/stress MRI to further determine the anatomical nature of the fistula given the symptom history. However, they believe that the fistula was an incidental finding and likely not the cause of her symptomatology.
3. Coronary-cameral fistula is a rare cause of congenital cardiac anomalies. Although most are small and asymptomatic, larger ones may cause MI or CHF, thus requiring intervention.
4. There are no published reports of this condition in athletes, highlighting provocative issues surrounding risks of incidental findings of unknown significance and return to play considerations.

2022   Board #2
Cotton Mouth In A Cross Country Runner

Jason A. Kirkbride - (Sponsor: John MacKnight, FACSM), Siobhan Statuta. *University of Virginia, Charlottesville, VA.*
(No relevant relationships reported)

HISTORY: A 21-year-old Division I cross-country runner presented to the athletic training room the day he was to leave for ACC championships, concerned about his intolerable dry mouth, leg heaviness and worsening fatigue. He had an unintended weight loss of 15 pounds despite working with Sports Nutrition over the summer due to a baseline BMI of 17.9 and a history of a sacral stress fracture the prior year. He endorsed normal eating pattern, but often felt full secondary to increased fluid intake from his dry mouth. Over the past few days, he also noted the onset of blurry vision. His only medication was an Omega-3 supplement and he denied a family history of autoimmune diseases, but did have an uncle with Type II diabetes mellitus.
PHYSICAL EXAMINATION: Temp. 36.9 °C (Oral) HR: 54 beats per minute Orthostatic blood pressure: Supine: 112/72 Standing: 108/65 Weight: 61.3 kg BMI: 17.36 kg/m2 GEN: No acute distress, Thin. Cachectic appearing. HEENT: Eyes prominent where conjunctiva is visible around entire iris, no thyromegaly. Tongue and uvula covered with white scrapable film, no cervical lymphadenopathy. CV: Normal S1, S2, normal rhythm. No murmurs. Bradycardic (baseline for patient). NEURO: Alert, oriented x3, speech fluent, sensation intact. PSYCH: Quiet, slower to respond compared to baseline. "Spacey," but logical thinking. No tangentiality.
DIFFERENTIAL DIAGNOSIS: Relative energy deficiency in sport Overtraining syndrome Thyroid disease Anemia Viral illness/ Mononoculeosis Diabetes Mellitus Type 1 Malignancy Diabetes Insipidus
TEST AND RESULTS: Urinalysis: Color yellow, Appearance Clear, Specific Gravity 1.035, pH 6.5, Protein Neg., Glucose 3+, Ketone Moderate, Bilirubin Neg., Blood Neg., Nitrite Neg., Leukocyte esterase neg. CBC: WBC 7.3, Hgb. 16.6, Hct. 46, Plt. 268 CMP: Na 130, K+ 5.6, Cl. 88, Bicarb. 27, BUN. 39, Cr. 0.8, Glc. 870, Alk phos. 183, ALT 67, AST 35, Anion Gap 15 TSH 0.27, Free T4 0.9, Free T3 1.5 CRP 0.2 ESR 7 Ferritin 224 HIV Non-reactive Hgb. A1c 13.6
FINAL WORKING DIAGNOSIS:New onset Diabetes Mellitus Type 1 in diabetic ketoacidosis
TREATMENT AND OUTCOMES:Urgent transport to the emergency department for DKA management including insulin and intravenous fluids with several day admission. Endocrinology work-up in process. Plan to follow weekly x 6 weeks and held from sport the remainder of the semester.

2023   Board #3
Going the Distance Makes Me Tired: Seizure in a Cross Country Runner

Caitlin G. Waters - (Sponsor: Pierre Rouzier, FACSM), James Broadhurst, John H. Stevenson. *UMass Memorial Medical Center, TEWKSBURY, MA.*
(No relevant relationships reported)

HISTORY: 21 y/o M collegiate cross country runner presents to team doctor with hand shaking and body cramping after a strenuous 12 mile run. Complained of generalized weakness, abdominal and leg cramping, nausea, diarrhea, slight shaking of his hands, and thirst. Felt well prior to the run. Endorsed increased thirst this week and had been drinking water. Sent to the ER for IV hydration. On his way to the ER, he suddenly became unresponsive with stiffness, shaking, and frothing at the mouth.

THURSDAY, MAY 31, 2018

PHYSICAL EXAMINATION: Temp: 36.9 Celsius, BP: 140/80, HR: 90-110, RR:21-27, SpO2: 100% on RA, GEN: Responsive, staring. Pale. NAD. Photosensitive. No rigidity. Clear speech. PSYCH: Answers "Yup." to most questions. Occ. confused. Alert. Oriented x3. HEENT: PERRL. EOMI. No LAD. Neck supple. No JVD. CARDIOPULM: CTA B/L. S1, S2, RRR, no MRG, ABD: Soft, NT, ND, no HSM, BS+ , EXT: No edema, capillary refill <2, SKIN: No rash, NEURO: CN II-XII testing limited, but grossly intact. Would not stick out tongue. Opens eyes on request. Normal grasp. Reflexes 2+ DTR's b/l.
DIFFERENTIAL DIAGNOSIS:Metabolic Derangement, Hyponatremia, Hypercalcemia, Hypoglycemia; Rhabdomyolysis/Dehydration; Toxic Encephalopathy; Drug Withdrawal; Intracranial Mass; CNS Infection; Epilepsy
TEST AND RESULTS:Initial Na 118, Anion Gap 17, Bicarbonate 15, Magnesium 1.5, initial CPK 917, CK rose to greater than 60,000 despite IV hydration, Toxicology Negative, CT head: questionable hypodensities in the medial temporal lobe, MRI Brain: normal, EEG: negative
FINAL WORKING DIAGNOSIS: Seizure induced by Hyponatremia Secondary to Psychogenic Polydipsia; Hyponatremia Induced Myopathy
TREATMENT AND OUTCOMES:Sodium corrected in the ICU over a few days. Patient drank a total of 48 oz prior to his run, and 160 oz post-run. Despite hydration and gentle correction of sodium, CK continued to rise. Rhabdomyolysis thought initially due to seizure and muscle breakdown in the setting of aggressive exercise; however, the delayed clearance of CPK raised concerns for glycogen storage deficiency vs genetic dysfunction. Referred to Genetics for a muscle biopsy to rule out glycogen storage deficiency, biopsy pending. Returned to cross country running with strict instructions regarding hydration, runs 5-8 miles without any issues.

2024   Board #4
Different Strokes for Different Folks - Football

Tu Dan Nguyen[1], Mark Chassay, FACSM[1], Jocelyn Szeto[1], Noor Alzarka[2]. [1]*University of Texas Health Science Center at Houston, Houston, TX. [2]Memorial Family Medicine Residency, Sugar Land, TX.*

(No relevant relationships reported)

History:
22-year-old D1 University Football Long Snapper presents to the training room for migraines. He's had migraines for 6-7 years and 4 concussions since HS. The night prior he had a migraine in the temporal region associated with transient left-sided vision loss & left arm numbness for 30-40 minutes. A diffuse headache lasting for 4-5 hours followed. Sumatriptan relieved the pain. He's had increased migraine frequency for the past 6 months. Episodes were described to his neurologist. MRI of the Brain & Cervical Spine were ordered.
Physical Examination:
AF VSS. NAD, well appearing. PERRLA, EOMI, NCAT
Cranial nerves intact, no nystagmus, normal face symmetry, tongue & palate midline
Sensation intact
Strength/tone normal bilaterally
Reflexes 2+
Coordination and gait intact
Differential Diagnosis:
Migraine (hemiplegic/retinal) with brainstem aura
Transient Ischemic Attack or Cerebrovascular Accident
Cerebral Aneurysm
Intracranial space-occupying lesion
Dissection Syndrome
Tests & Results:
MRI Brain w/o contrast: small subacute infarct in the right cerebellum. No mass effect or ICH.
MRI C-Spine: mild degenerative changes. No canal stenosis
Admitted to the hospital further work up. Labwork negative.
US LE w/ doppler - No DVT
CTA head/neck: Normal vessels. No dissection
MRA Neck: Common and internal carotid arteries w/ normal caliber and contour. Normal vertebral arteries. Left vertebral a. is dominant. No flow-limiting stenosis.
TTE: Small right to left shunt on agitated saline contrast study suggestive of a patent foramen ovale.
Transcranial Doppler US Bubble Study: Right to left shunting, showering bubbles
Final / Working Diagnosis:
Cryptogenic subacute right cerebellar infarct secondary to a PFO
Treatment and Outcomes:
Aspirin & Clopidogrel started inpatient. Discharged after workup.
PFO closure and transseptal left heart catheterization completed with Cardiovascular Surgery.
Continue ASA and Clopidogrel for 6 months post-op; ASA lifelong.
Retired from the football team.
Repeat TTE: well seated closure device.
Cardiac rehabilitation for first 2 months post-op.
4 months post-op: running about 1 mile daily, 6 days/week. Endurance and circuit training with low weights.

He's been migraine free since 2 months post-op. He takes Indomethacin as needed. Follow up scheduled for 6 months post-operation.

2025   Board #5
Forearm Pain- Gymnastics

Melissa Faubert[1], Holly Benjamin, FACSM[2], Daniel Mass[2]. [1]*NorthShore University HealthSystem/University of Chicago, Chicago, IL. [2]University of Chicago, Chicago, IL.*

(No relevant relationships reported)

HISTORY: 14 year old right handed level 8 gymnast presents with complaints of progressive right greater than left elbow and forearm pain over the past four months. Despite bracing, activity modification and three months of physical therapy she still reported progressive worsening of pain and development of tingling in her hands and forearms. She notes she has a constant feeling of tightness over her anteromedial forearms and pain and tingling of her arm occurs the worst while writing in school or vaulting. Pain and numbness resolve with a few minutes of rest and elbow extension. She does not have any nighttime pain. **PHYSICAL EXAMINATION**: - Well appearing female adolescent - Full ROM of elbow, forearm, wrist and fingers - Sensation intact to light touch in the radial, medial and ulnar nerve distribution bilaterally - 5/5 strength in the radial, medial, ulnar, anterior interosseous and posterior interosseous nerves bilaterally - Mild TTP of proximal forearm and medial elbow bilaterally - Positive compression test at the proximal forearm - Positive Tinel's test over the pronator teres - Positive Tinel's test over cubital tunnel - Negative Tinel's, Durkan's and Phalen's at the wrist bilaterally **DIFFERENTIAL DIAGNOSIS**:- Pronator syndrome - Cubital tunnel syndrome - Chronic exertional compartment syndrome of the forearm - Anterior interosseous nerve syndrome - Brachial plexus neuritis - Cervical radiculopathy **TEST AND RESULTS**: MRI elbow Left: MRI findings normal but noted presence of accessory anconeous epitrochlearis muscle. MRI elbow Right: Normal MRI. **FINAL WORKING DIAGNOSIS**: Pronator syndrome bilaterally. Left arm with accessory anconeous epitrochlearis muscle also causing ulnar neuropathy. **TREATMENT AND OUTCOMES**: Patient's older sister previously had pronator syndrome as well as chronic exertional compartment syndrome for which she underwent median nerve release and fasciotomy. Patient and her parents elected to forgo compartment testing suspecting she also had both conditions. She underwent surgery on her left elbow with a median nerve release, ulnar nerve release and fasciotomy. She is due to have surgery on her right arm for median nerve release and fasciotomy three weeks after her left.

2026   Board #6
Low Back Pain - Recreational Soccer Player

Sean Matsuwaka, Brian Liem. *University of Washington, Seattle, WA.*

(No relevant relationships reported)

HISTORY: A 21-year-old female recreational soccer player presented with intermittent right-sided low back pain for two years. She denied any trauma or inciting event. Pain was localized to the right lumbosacral region without radiating leg pain and was described as dull and aching. It was rated on average 5/10 on a numerical rating scale and associated with nausea when pain worsened. Symptoms were worse with prolonged sitting, and several times in the last month she reported worsening of typical pain with alcohol intake. She denied leg weakness, numbness, or bowel/bladder dysfunction. She participated in six weeks of physical therapy, which helped with nausea and pain with sitting, but she continued to have pain with alcohol consumption.
PHYSICAL EXAM: Full and symmetric strength, sensation, and reflexes. Mild lumbar dextroscoliosis. No palpable step-offs. Tenderness over right lumbar paraspinals and above right iliac crest. No tenderness over PSIS. Full, non-painful range of motion with lumbar flexion and extension. No pain with facet loading. Full, non-painful hip range of motion. Negative FABER, FADIR, and straight leg raise test bilaterally.
DIFFERENTIAL DIAGNOSIS: 1. Discogenic pain 2. Facet-mediated pain 3. Disc herniation 4. Muscular strain 5. Sacroiliac joint dysfunction 6. Intrabdominal/intrapelvic etiology 7. Neoplasm
TESTS AND RESULTS: 1. Lumbar spine X-rays: -Normal alignment, normal vertebral body and disc space height -Partial lumbarization of S1 vertebral body -Five degrees of lumbar dextroscoliosis 2. MRI lumbar spine: -Lumbarization of S1 vertebral body -Normal disc heights and signal -Normal central canal and neural foramen size throughout lumbar spine -T1/T2 hyperintensity within S2 vertebral body, likely lipoma -Increased T2 signal medial to right kidney suggestive of hydronephrosis 3. Renal ultrasound:-Moderate right hydronephrosis with extrarenal pelvis. No nephrolithiasis. 4. Renogram with furosemide: - Right kidney with blunted flow and delayed clearance improved slightly with furosemide, consistent with partial obstruction at right ureteropelvic junction
FINAL/WORKING DIAGNOSIS: Ureteropelvic junction obstruction causing Dietl's crisis
TREATMENT AND OUTCOMES: 1. Referral to urology 2. Resolution of pain and improvement in renal function after pyeloplasty

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Abstracts were prepared by the authors and printed as submitted.

THURSDAY, MAY 31, 2018

2027   Board #7

Chronic Medial Knee Pain in a Collegiate Basketball Player and Marching Band Member

Nicholas E. Anastasio-(Sponsor: Robert Wilder, MD, FACSM), David Hryvniak. *University of Virginia, Charlottesville, VA.*

(No relevant relationships reported)

History:
Patient 1:
A 17 year-old female collegiate basketball player presented with insidious onset right medial knee pain for the last 8 months. Pain waxed and waned with activity. No history of swelling, instability or locking. No numbness or weakness. Pain located diffusely over the medial knee and proximal medial tibia. Symptoms refractory to PT, patellofemoral kinesiotaping, medial arch support orthotics and NSAIDs. No relief following Medrol dose pack, intraarticular corticosteroid injection, or pes anserine bursa corticosteroid injection.
Patient 2:
A 19 year-old female collegiate marching band member presented with insidious onset right medial knee pain present for 4 years. Patient reported intermittent swelling but denied instability or locking. Symptoms were worse with walking and marching. Previous Rheumatologic consult unrevealing. Symptoms refractory to PT, knee sleeve, and patellar straps. No relief following right pes anserine bursa corticosteroid injection.
Physical Examination:
Patient 1 - Knee without effusion. Diffuse tenderness to palpation over the medial knee at and below mid medial joint line. ROM and strength normal. No laxity. Neurovascular intact.
Patient 2 - Knee without effusion. Tenderness to palpation over the medial joint line and distally over pes anserine. Tinel's sign positive over the medial femoral condyle. ROM and strength normal. No laxity. Neurovascular intact.
Differential Diagnosis:
1. Pes anserine bursitis
2. MCL bursitis
3. Patellofemoral syndrome
4. Medial meniscal tear
5. Medial patellar plica
6. Saphenous neuralgia
Test and Results:
Patient 1:
XR Knee - No fracture or joint effusion.
MRI knee - No meniscus tear. No internal derangement. Mild increased T2 signal within the superior lateral aspect of Hoffa's fat.
Diagnostic saphenous nerve block - 0.5% bupivacaine injected 2 inches cephalad to the medial joint line - 24 hours of relief.
Patient 2:
XR Knee - No fracture or malalignment.
MRI knee - Unremarkable MRI of the knee.
Labs - ESR 8, TSH 1.7
Final/Working Diagnosis:
Saphenous Neuralgia
Treatment and Outcomes:
Patient 1:
Saphenous nerve injection - 40 mg triamcinolone/0.5% bupivacaine - 5 months of relief.
US guided hydrodissection saphenous nerve - Full resolution for 1.5 years.
Patient 2:
US guided hydrodissection saphenous nerve - 6 months of relief.

2028   Board #8

Are Subconcussive Impacts Harmless in Youth Soccer Players?

Luis R. Lopez-Roman[1], Yarimar I. Diaz-Rodriguez[2]. [1]*Universidad del Sagrado Corazon, San Juan, PR.* [2]*Universidad del Turabo, Gurabo, Puerto Rico.*

(No relevant relationships reported)

In United States at least 3.5 million children play soccer yearly. Head Impact (concussive and subconcussive) in youth players have a growing concern throughout their short or long-term career. A subconcussive impact may induce a traumatic alteration of function of the cerebrum without associated imaging abnormalities or loss of consciousness. Accelerometers can measure the magnitude and quantity of the subconcussive impacts in the field. The SIM-G™ accelerometer is a small portable device that measures change in velocity during an impact and provides estimates of magnitude (G) and angles. The ImPACT Pediatric® is a neurocognitive test that provide information of cognitive changes. **PURPOSE:** To evaluate if a subconcussive impact could lead to negative cognitive functions in youth soccer players. **METHODS:** A group of 30 youth soccer athletes (15 males, 15 females) between 9 to 11 years old wear a head accelerometer in a specialize headband. Each

participant was encouraged to perform normally in the game. Descriptive statistics was used to assess subconcussive impacts. T-test was used for the neurocognitive pre and post-test to assess differences in sequential memory, word memory, visual memory and rapid processing. **RESULTS:** Mean age of female and male athletes (9.9 ± 0.6 years) was not different (P > 0.05). A total of 42 impacts were receive by both genders in three games. Range of acceleration was from 16g to 60g (Ave= 23.8 ± 9.1g). T-Test showed differences in sequential memory for female (p = 0.02) and rapid processing for males (p = 0.01). There were no differences between pre and post test in word memory for females and males (p = 0.97, p = 0.11; respectively) and visual memory (p = 0.30, p = 0.34; respectively). **CONCLUSION:** These results suggest that females that play soccer and receive a subconcussive impact can reflect changes in their education and social activities at short term in their word recognition, oral reading and reading comprehension (sequential memory) and males in their auditory processing and language skills (rapid processing). Parents, coaches, trainers, exercise physiologist, and speech-language pathologists (SLP) should receive education to take precautions after a game with children that received at least one sub concussive impact and do not perceived any notable changes.

2029   Board #9

Test Setting and ADHD Influence Baseline Concussion Testing Neurocognitive Performance in Collegiate Student-Athletes

Caroline A. Kelly, Caroline J. Ketcham, Kirtida Patel, Eric E. Hall, FACSM. *Elon University, Elon, NC.*

(No relevant relationships reported)

Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) is a widely used neurocognitive test for assessing and managing concussion injuries. There is inconclusive data on how test administration and environment influence baseline results for student-athletes. It has been well established that individuals with Attention Deficit Hyperactivity Disorder (ADHD) perform worse on the ImPACT, but little research has examined the effect of group test administration on neurocognitive performance and symptom reporting in student-athletes with ADHD. **PURPOSE:** To compare baseline neurocognitive performance and symptom scores in group versus individual administration settings in NCAA division 1 collegiate student-athletes. **METHODS:** 260 student-athletes completed two ImPACT baseline tests, test 1 was completed when they entered as first-year students or transfers and test 2 was completed this past summer. Of these participants, 205 athletes took test 1 individually and 55 participants took it in a group setting. All student-athletes took test 2 in a group setting. 21 of the 260 student-athletes had a diagnosis of ADHD. A 2 (time) x 2 (environment) x 2 (ADHD) Multivariate ANOVA was conducted. Time (test 1 and test 2) was within subjects and Environment at test 1 (individual and group) and ADHD (yes or no) were between subject variables. **RESULTS:** There was a significant increase in total number of symptoms reported when participants went from individual testing to group testing (p<0.05). Time x Environment Interaction for visual memory (p<0.05) with scores increasing from test 1 to 2 if in the group setting for both, but staying the same if in the individual setting for test 1. A similar effect was found for visual motor processing speed (p<0.05). Participants with ADHD performed worse on all measures no matter the setting (p<0.05). Symptom scores significantly differed for ADHD participants depending on the setting (p<0.05). **CONCLUSIONS:** A group setting has inherent distractions and seems to influence performance on visual memory, visual motor processing speed and symptom scores. Student-athletes with ADHD may be more affected by these distractions. This should be considered in baseline concussion testing and interpreting post-injury neurocognitive performance.

2030   Board #10

Jump Training Improves Psychological Impairments and Facilitates Greater Sports Participation in Athletes with ACL Reconstruction

Ryan L. Mizner, Audrey R. Elias. *University of Montana, Missoula, MT.*

(No relevant relationships reported)

PURPOSE: About 35% of athletes with anterior cruciate ligament (ACL) reconstruction fail to return to their preinjury level of sports participation. Psychological factors, such as fear of reinjury, often prevent athletes who wish to return to their sport from achieving their goal. Limited evidence is available to direct patient care to target these psychological impairments. Most ACL injuries are non-contact in nature and typically occur during a deceleration task such as jump landing. We propose that training focused on improving jump landing performance will improve psychological factors and facilitate increased sports participation. **METHODS**: Forty-eight athletes completed screening tests an average of 2 years after unilateral ACLR (Wk0). Testing included the ACL-Return to Sport after Injury (ACL-RSI) scale as measure of psychological readiness for sports participation. Athletes (n = 25, 9 men, age = 23 ± 5 yr) who scored below normative ACL-RSI recovery standards (<65%) completed 8 weeks of twice-weekly jump landing training. Retesting occurred at midtraining (Wk4), posttraining (Wk8), and 2 months after training (Wk16).

Athletes answered a survey measuring perceived changes in sports participation at the end of training. Changes observed during training were determined via repeated measures ANOVA.
RESULTS: ACL-RSI scores improved substantially throughout treatment (mean ± SD; Wk0: 53 ± 18%, Wk4: 67 ± 15%, Wk8: 76 ± 16%; p<0.001). Treatment benefits were maintained over the retention period (Wk16: 81 ± 15%; p=0.052). Four out of 5 athletes trained report that they were more likely to participate in their sports activities after training and two thirds of the cohort described at least a moderate increase in their sports participation.
CONCLUSIONS: Progressively dosed jump training that focuses on correcting aberrant landing movements is effective at addressing psychological factors in athletes who self-identified as having limited readiness for sport. The training was also effective at facilitating increased sports participation. Clinicians should consider implementing similar jump training interventions to help athletes who are struggling to return to their desired sports participation because of limited confidence or high fear of reinjury. Funded in part by the Foundation for Physical Therapy.

2030b   Board #11

Long-term Functional Impact of Viscosupplementation Versus True Placebo in Symptomatic Hip Osteoarthritis; A Randomized Control Trial

Jane Konidis[1], Philippe Corbeil[1], Antoine Cantin-Warren[2], Sylvie Turmel[3], Emile Cardinal-Soucy[1], Remi Lacroix[3], Etienne Belzile[3]. *[1]University Laval, Quebec City, QC, Canada. [2]Center for Interdisciplinary Research in Rehabilitation and Social Intergration (CIRRIS), Quebec City, QC, Canada. [3]University Hospital Center of Quebec (CHUQ), Quebec City, QC, Canada.*
(No relevant relationships reported)

INTRODUCTION: Degenerative hip osteoarthritis (OA) is a common progressive disorder causing disability. The injection of exogenous hyaluronic acid (HA), or viscosupplementation (VS), can potentially help restore the properties of synovial fluid. There is little literature available evaluating the long-term effects and the functional impact of VS in hip OA. **PURPOSE:** To determine if a single intra-articular injection of a high-molecular weight (HMW) VS would improve function and decrease pain in persons suffering from hip OA. **METHODS:** A double-blinded randomized control trial was conducted at a University Hospital Center in Canada. Patients were randomly allocated to either the treatment group, an ultrasound guided single intra-articular injection of a HMW HA, or the placebo group, a single extra-articular injection of local anesthetic. Participants underwent evaluations at 2 weeks prior to the injection (T0), and at 1 month (T1), 3 months (T2) and 6 months (T3) post injection. Patients completed two questionnaires; the Hip Disability and Osteoarthritis Outcome Score (HOOS) and the 36-Item Short Form Survey (SF-36). Gait biomechanics were evaluated in a lab. **RESULTS:** Between May 2014 and September 2017, 38 participants were evaluated in this study over the course of 6 months. In the treatment group, N = 19 and in the placebo group, N = 18. The mean age at the time of injection was 55. On the HOOS symptom subscale, the placebo group worsened from T0 to T3 by 6.29% compared to the treatment group. The VS group improved their pain subtotal from T0 to T2 by 4.73%. The control group worsened by 1.22% during that same time and continued to deteriorate by 6.09% at T3. There were also improvements in the activities of daily living subscale from T0 to T3, with the treatment group improving by 5.29% while the placebo group worsened by 5.15%. The most important change occurred in the sports and recreational subscale of the HOOS. Between T0 and T3, the placebo group worsened by 7.611 points (- 17.82%). The treatment group improved by 6.67%. **CONCLUSION:** Our preliminary results suggest that a HMW VS hip injection for degenerative OA, when compared to true placebo, may lead to long-term improvements in pain relief, increase in function and in activity participation. NIH Clinical Trials Registry: NCT02086474

2030c   Board #12

Lisa S. Krivickas Clinician/Scholar Travel Award - The Prevalence of Hypertension in a Population of Former Professional Football Players

Jaime Kaplan, Genevieve E. Smith, Gregory W. Stewart, FACSM. *Tulane University School of Medicine, New Orleans, LA.*
(No relevant relationships reported)

OBJECTIVE: There is substantial data suggesting that former professional football players have considerable cardiovascular disease risk. The objective of this study was to better understand the prevalence of hypertension, a major risk factor for cardiovascular disease, in former professional football players. **DESIGN:** Data including blood pressure, height, and weight were collected from 981 former professional football players between April 2015 and May 2017 during cardiovascular screening events held throughout the U.S. Demographic information was collected from all subjects, including age, race, previous hypertension diagnosis, and treatment. Means were analyzed using one-way ANOVA, Chi square, or paired T-tests where appropriate. **RESULTS:** Pre-hypertension was greatest for former players aged 20-59, with almost 50% of those aged 20-39 pre-hypertensive at screening. Hypertension was greatest in former players aged 60+, with more than 50% of these individuals hypertensive at screening; over 20% of those 20-39 were hypertensive. White former players aged 60+ had the lowest prevalence of pre-hypertension. Hypertension prevalence was only significantly different between age-specific racial groups at age 40-59. The majority of former players had a BMI ≥ 30 kg/m2, regardless of age; those with normal BMI were least likely to be hypertensive. Over 30% of former players reported previous hypertension diagnosis, with approximately 75% of those diagnosed reporting treatment. Of those former players that reported treatment, most had poorly controlled blood pressure at the time of screening. Of former players that reported no hypertension diagnosis, 41% had elevated blood pressure at screening. Former players aged 30-39 had the highest prevalence of previously undiagnosed elevated blood pressure at screening. **CONCLUSIONS:** Hypertension is a serious concern for former professional football players, even those considered to be younger and at decreased risk. This may be related to the high BMI typically associated with these athletes. Blood pressure control in those reporting diagnosis is also a concern, as the majority of those men had high blood pressure at screening.

THURSDAY, MAY 31, 2018

E-02   Highlighted Symposium - **The Respiratory System in Heart Failure**

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-101AB

The lungs have an intimate relationship with the heart. They are hemodynamically linked in series, accepting nearly all of the cardiac output, share a common surface area, compete for space in the thoracic cavity, are exposed to similar intrathoracic pressures and are neurally and humorally linked. Thus, as the heart remodels and function changes in patients with forms of chronic heart failure, the lungs become an important part of the heart failure syndrome. The interdependence is enhanced with exercise. This symposium will highlight current knowledge on the influence of heart failure on the pulmonary system and their interdependence at rest and during exercise.

2032   **Chair:** Sophie Lalande. *The University of Texas at Austin, Austin, TX.*

(No relevant relationships reported)

2033   **Chair:** Bruce D. Johnson. *Mayo Clinic, Rochester, MN.*

(No relevant relationships reported)

2034   June 1 9:35 AM - 9:55 AM
Keynote -

Bruce D. Johnson. *Mayo Clinic, Rochester, MN.*

(No relevant relationships reported)

2035   June 1 9:55 AM - 10:10 AM
Precapillary Pulmonary Hypertension in Heart Failure: Potential Cause and Consequences

Bryan J. Taylor[1], Barry A. Borlaug[2], Robert P. Frantz[2], Andrew D. Miller[2], Thomas P. Olson, FACSM[2], Bruce D. Johnson[2]. [1]*Mayo Clinic, Rochester, MN; University of Leeds, Leeds, United Kingdom.* [2]*Mayo Clinic, Rochester, MN.*

(No relevant relationships reported)

Combined pre- and post-capillary pulmonary hypertension (CpcPH) develops in 10-40% of heart failure (HF) patients and is a powerful predictor of short-term mortality. However, the mechanisms that underpin the pathophysiological development of CpcPH in HF remain elusive. In addition, the impact of CpcPH on the pulmonary haemodynamic response to exercise in HF requires further investigation. Purpose. To determine 1) the relationship between systemic oxygen levels and the presence of CpcPH; and 2) the impact of CpcPH on the pulmonary haemodynamic response to exercise in HF patients. Methods. Thirty-nine HF patients undergoing right-heart catheterisation were studied. Blood was drawn for the determination of PaO_2, SaO_2, PvO_2, SvO_2, and vasoactive neurohormones. Pulmonary arterial and wedge pressure (PAP; PWP), transpulmonary pressure gradient (TPG; PAP - PWP) and cardiac output (Q) were assessed at rest and throughout exhaustive incremental exercise. Results. Post catheterization, patients were classified as having no PH (n = 11), isolated post-capillary PH (IpcPH) (n = 11), or CpcPH (n = 17). At rest: PaO_2 and PvO_2 were lower in CpcPH compared to no PH and IpcPH (65 ± 9 vs 78 ± 11 mmHg and 75 ± 14 mmHg; 29 ± 4 vs 36 ± 3 mmHg and 33 ± 2 mmHg; P < 0.05). Also, SaO_2 and SvO_2 were lower in CpcPH vs. no PH ($93 \pm 3\%$ vs $96 \pm 3\%$; $51 \pm 11\%$ vs $68 \pm 4\%$; P < 0.05). TPG was inversely related to PaO_2, PvO_2, SaO_2, and SvO_2 in the CpcPH only ($r \le -0.557$; P < 0.05). Similarly, plasma endothelin-1 correlated with PaO_2, PvO_2, SvO_2 ($r \le -0.495$) and TPG (r = 0.662) (P < 0.05) in CpcPH only. With exercise: At peak exercise, mean PAP (mPAP) and mean PWP (mPWP) were greater in CpcPH compared to no PH and IpcPH. The slope of the mPAP-Q̇ and mPWP-Q̇ relationship during exercise was greater in CpcPH vs IpcPH vs no PH (mPAP-Q̇: 6.7 ± 3.2 vs 4.1 ± 3.9 vs 2.6 ± 1.7 mmHg/L/min; mPWP-Q̇: 4.2 ± 1.4 vs 3.3 ± 1.2 vs 2.9 ± 1.5 mmHg/L/min); however, only the differences between no PH and CpcPH were statistically significant. Conclusion. 1) Systemic hypoxaemia may play a role in the development of CpcPH in HF, potentially via a hypoxia-induced increase in endothelial release of the vasoconstrictor endothelin-1; and 2) the development of CpcPH is associated with greater pulmonary vascular pressures and a steeper pulmonary vascular pressure-to-Q̇ relationship in response to exercise in HF patients.

2036   June 1 10:10 AM - 10:25 AM
Manipulation of Intrathoracic Pressure Improves Stroke Volume During Exercise in Patients with Heart Failure

Sophie Lalande[1], Andrew D. Miller[2], Bruce D. Johnson[2]. [1]*The University of Texas at Austin, Austin, TX; Mayo Clinic, Rochester, MN.* [2]*Mayo Clinic, Rochester, MN.*

(No relevant relationships reported)

Exercise accentuates within-breath fluctuations in intrathoracic pressure (ITP). The more negative ITP during inspiration increases left ventricular (LV) preload and afterload while the more positive ITP during expiration decreases LV preload and afterload. In healthy individuals, the more negative ITP generated during exercise is necessary to maintain an optimal LV preload and, consequently, stroke volume (SV). Curiously, patients with heart failure avoid breathing at high lung volumes and display large positive expiratory ITPs during exercise. In heart failure, a decreased LV compliance results in an increased sensitivity to changes in LV afterload, a decreased sensitivity to increased LV preload and a resulting inability to augment SV through the Frank-Starling mechanism. It was therefore hypothesized that the shallow breathing adopted by patients with heart failure during exercise preserves or enhances SV through decreases in LV preload and afterload. PURPOSE: To investigate the effect of a less negative inspiratory and a more positive expiratory ITP on SV during moderate-intensity exercise in patients with heart failure and reduced ejection fraction (HFREF) and healthy individuals. METHODS: SV was obtained by echocardiography during 2 min of spontaneous breathing (S), two progressive levels of inspiratory unloading (UL1 and UL2) using a ventilator and during expiratory loads of 5 and 10 cmH_2O produced by a ventilator in 11 patients with HFREF (61 ± 9 years, EF: 32 ± 4 %, NYHA class I-II) and 11 age-matched healthy individuals during exercise at 60% of maximal aerobic capacity on a semi-recumbent cycle ergometer. RESULTS: During exercise, inspiratory unloading decreased SV indexed to body surface area (SVI) in healthy individuals (S: 44 ± 7, UL1: 41 ± 5, UL2: 40 ± 4 ml/m2) while it increased SVI (S: 41 ± 7, UL1: 43 ± 7, UL2: 44 ± 5 ml/m2, p = 0.02) in patients with HFREF. Expiratory loading increased SVI in patients with HFREF (S: 43 ± 6, 5: 45 ± 3, 10: 44 ± 6 ml/m2) but decreased SVI in healthy individuals (S: 44 ± 8, 5: 40 ± 5, 10: 39 ± 5 ml/m2, p = 0.01). CONCLUSION: Inspiratory unloading and expiratory loading elicited increases in SVI during moderate-intensity exercise in patients with HFREF, possibly due to beneficial reductions in LV afterload and preload.

2037   June 1 10:25 AM - 10:40 AM
Breathing With Heart Failure: How Hard Can It Be?

Troy J. Cross[1], Surendran Sabapathy[2], Ken C. Beck[3], Norman R. Morris[2], Bruce D. Johnson[3]. [1]*Griffith University, QLD, Australia; Mayo Clinic, Rochester, MN.* [2]*Griffith University, QLD, Australia.* [3]*Mayo Clinic, Rochester, MN.*

(No relevant relationships reported)

The syndrome of heart failure (HF) is often accompanied by numerous derangements in ventilatory function. These pathophysiological changes in ventilatory function are believed to augment the mechanical work required to breathe during exercise (Wb). However, the precise contributions of resistive and elastic work to this overall higher Wb in HF remain unclear. PURPOSE: To quantify the resistive and elastic components of Wb during exercise in HF patients and age-matched, healthy controls at standardized levels of minute ventilation ( ). METHODS: The elastic and resistive Wb were assessed in 9 male HF patients (NYHA class I-III) and 9 age-matched, healthy male controls at minute ventilations of 20, 40, 60 and 80 L·min-1 during graded exercise. The components of Wb were quantified using oesophageal manometry and modified Campbell diagrams. RESULTS: Dynamic lung compliance was lower across all minute ventilations in HF patients (P<0.05). Moreover, the inspiratory and expiratory resistive Wb was higher in HF patients compared with controls at any given (P<0.05). The inspiratory elastic Wb was higher at minute ventilations of 40-60 L·min-1 during exercise in HF patients. (P<0.05). CONCLUSIONS: The findings of this study indicate that the overall higher Wb in HF patients may be more so related to greater amounts of resistive than elastic Wb during exercise.

2038   June 1 10:40 AM - 10:55 AM
The Link between Muscle Mass, Afferent Feedback and Ventilatory Control in Heart Failure

Manda L. Keller-Ross[1], Bruce D. Johnson[2], Rickey E. Carter[2], MIchael J. Joyner, FACSM[2], John H. Eisenach[3], Timothy B. Curry[2], Thomas P. Olson, FACSM[2]. [1]*University of Minnesota, Minneapolis, MN.* [2]*Mayo College of Medicine, Rochester, MN.* [3]*Kaiser Permanente, Denver, CO.*

(No relevant relationships reported)

Skeletal muscle afferent feedback modulates ventilatory control during exercise. Skeletal muscle atrophy in patients with heart failure (HF) may contribute to increased

FRIDAY, JUNE 1, 2018

afferent feedback which can lead to high ventilation to carbon dioxide production (VE/VCO2) slope. Low peak oxygen consumption (VO2 peak) and high VE/VCO2 slope are strongly associated with mortality in patients with HF. PURPOSE: This study examined the influence of muscle mass on low VO2 and the change in VE/VCO2 with afferent neural block during exercise in HF. METHODS: 17 participants [9 HF (60±6 yrs, mean±SD) and 8 controls (CTL) (63±7 yrs)] completed 3 experimental sessions. Session 1: peak exercise test on a cycle ergometer to volitional fatigue and dual energy x-ray absorptiometry. Sessions 2 and 3: 5 min of steady-state exercise on a cycle ergometer (65% of peak power) randomized to a lumbar injection of fentanyl (afferent blockade) or placebo. Ventilation (VE) and gas exchange (oxygen consumption, VO2; carbon dioxide production, VCO2) were measured. RESULTS: Peak work and VO2 were lower in HF (p<0.05). Leg fat was greater in HF (34.4±3.0 and 26.3±1.8%) and leg muscle mass was lower in HF (63.0±2.8 and 70.4±1.8%, respectively, p<0.05). VE/VCO2 slope was reduced in HF during afferent blockade compared with CTL (-18.8±2.7 and -1.4±2.0%, respectively, p=0.02). The reduction in VE/VCO2 was positively associated with leg muscle mass (r2=0.58, p<0.01) and negatively associated with leg fat mass (r2=0.73, p<0.01) in HF only. In addition, the reduction in VE/VCO2 was also positively associated with arm, trunk and total muscle mass (p<0.01). Importantly, there was a strong relationship between peak VO2 and the reduction in VE/VCO2 slope in HF (r2=0.87, p<0.01), but not CTL. CONCLUSIONS: HF patients with the highest fat mass, least leg muscle mass and lowest peak VO2 had the greatest improvement in VE/VCO2 with afferent blockade. Both muscle mass and fat mass are important contributors to ventilatory abnormalities and strongly associated to improvements in VE/VCO2 slope with locomotor afferent inhibition in HF. This indicates a strong link between muscle atrophy, skeletal muscle afferent activation and ventilatory control in HF.

2039   June 1 10:55 AM - 11:15 AM
Keynote -

Norman Morris. *Griffith University, Gold Coast, Australia.*
(No relevant relationships reported)

E-05   Thematic Poster - **Firefighting**

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-Mezzanine M100C

2049   Chair: Denise L. Smith, FACSM. *Skidmore College, Saratoga Springs, NY.*
(No relevant relationships reported)

2050   Board #1   June 1 9:30 AM - 11:30 AM
Comparison of Firefighters and Instructors Physiological Responses Throughout a Day of Live-fire Training

Andrea Wilkinson, Patricia Fehling, FACSM, Leland Haigh, Denise L. Smith, FACSM. *Skidmore College, Saratoga Springs, NY.*
(No relevant relationships reported)

Approximately 10-12% of firefighter (FF) fatalities occur during training, with a significant proportion (56%) of these due to cardiac events. Although the cardiovascular strain of firefighting drills has been well documented, the cardiac and thermal strain experienced throughout an entire training day has not been well characterized.
Purpose: To compare the physiologic responses of FF and instructors during a day of departmental live-fire training that involved 3 training drills. **Methods:** On a work day, 29 career FF (34.7 ± 9.6 yr) and 6 instructors (36.2 ± 2.9 yr) wore a physiologic status monitor during an entire day of live-fire training (~ 7 hours) to record heart rate (HR) and estimated core temperature (EST T$_{co}$). Three drills (fire attack with ventilation and a multiple floor search; high-rise standpipe drill; ventilation, enter, and search), each lasting around 30 minutes were performed on each training day with debrief and clean-up periods after each drill. **Results:** There were no significant differences between the FF and instructors in any of the physiological responses (p > 0.05; see Table 1). FF and instructors achieved approximately 100% of age-predicted maximal heart rate (APMHR; 220-age) at some point during the day. Over the entire day HR mean was ~62% of APMHR. Additional analysis revealed physiologic strain was high during a single clean-up period (173 ± 16 b·min⁻¹, 37.8 ± 0.2°C).
Conclusions: All participants reached APMHR and had a mean HR throughout the day >60% APMHR. There were no differences in HR or EST T$_{co}$ between instructors or FF. We also found that physical exertion during cleanup activities can be as physically

demanding as the live-fire drills. When considering the physiologic strain of FF training, the physical work associated with set-up and clean-up should be taken into consideration.Supported by FEMA AFG Grant EMW-1015-FP-00731

Table 1. Physiologic Characteristics		
Variable	Instructors (n=6)	FF (n=2)
HR Peak (b·min⁻¹)	183 +/- 15	188 +/- 19
HR Mean (b·min⁻¹)	114 +/- 14	116 +/- 11
EST Tco Peak(°C)	38.3 +/- 0.4	38.6 +/- 0.5
EST Tco Mean (°C)	37.7 +/- 0.4	37.8 +/- 0.3
Values are means +/- SD; EST = estimated		

2051   Board #2   June 1 9:30 AM - 11:30 AM
Cardiorespiratory Responses to the USFS Wildland Firefighter Arduous Pack Test

Christopher J. Alfiero, Charles L. Dumke, FACSM, Brent C. Ruby, FACSM, Matthew W. Bundle. *University of Montana, Missoula, MT.* (Sponsor: Brent Ruby, FACSM)
(No relevant relationships reported)

Cardiorespiratory Responses to the USFS Wildland Firefighter Arduous Pack Test
Alfiero CJ, Dumke CL FACSM, Ruby BC FACSM and Bundle MW
University of Montana
US wildland firefighters administer over 30 000 physical tests per year to qualify candidates for the occupational demands of fire suppression. The primary assessment is the arduous pack test (APT) a 4.83 km hike that must be completed in 45 min while wearing a 20.45 kg pack. Delivery of individual feedback to guide the physical training of candidates is hampered by two factors; first, passing the pack test is widely considered the minimum performance level necessary needed for this occupation, and second, the binary nature of the assessment presents candidates with a task representing an unknown and self-selected exercise intensity.
PURPOSE: To determine the cardiorespiratory response elicited by the APT within a subject population whose aerobic capacity and body masses vary. **METHODS**: 63 young (age = 22.8±3.2 yrs) adults (37 males, M$_b$ = 81.2±9.4 kg; 26 females, M$_b$ = 63.6±8.5 kg; study range: 55.6-100.0 kg) performed the APT and subsequently underwent a hiking inclined-treadmill test to VO$_{2peak}$ while wearing a skin mounted heart rate (HR) monitor and 20.45 kg pack. **RESULTS**: 50 of the 63 subjects achieved the 45 min cutoff with a finishing time of 41.8 ± 2.1 min, the non-passers had a mean time of 47.7 ± 2.7 min. Non-passers were 77% female and 23% male. The VO$_{2peak}$ values of the passing and non-passing groups were 49.4 ± 7.2 and 42.6 ± 9.6 mlO$_2$ kg⁻¹ min⁻¹, respectively; the study range was 62.1 to 30.8 mlO$_2$ kg⁻¹ min⁻¹. HR, whether expressed as a fraction of the subject's maximum rate (passers = 81.2 ± 17.1 and non-passers = 79.9 ± 12.7% of HR$_{max}$), or as the fraction of the HR reserve (passers = 68.0 ± 7.9 and non-passers = 67.7 ± 15.3% of HR reserve) were not different between the groups. Regression of VO$_{2peak}$ on completion time yielded a negative relationship (R²=0.45). In contrast, the HR responses and completion time were consistent among the participants (R² < 0.01 for both % of HR$_{max}$ and % of HR reserve). **CONCLUSION**: To successfully complete the APT candidates must achieve a HR reserve of 68% or less while maintaining a walking speed of 1.8 m s⁻¹. These data suggest that monitoring HR during load carriage may be used to identify candidates with adequate and inadequate pre fire season readiness.

2052   Board #3   June 1 9:30 AM - 11:30 AM
Accelerometer-based Physical Activity And Sedentary Time Assessment In Brazilian Wildland Military Firefighters - Brasilia Firefighters Study

Daniel Saint Martin[1], Leonardo Correa Segedi[2], Edgard Von Koenig Soares[1], Rosenkranz Maciel Nogueira[2], Keila Elizabeth Fontana[1], Maria Korre[3], Guilherme Eckhardt Molina[1], Denise L. Smith[4], Stefanos N. Kales[3], Luiz Guilherme Grossi Porto[5]. *[1]University of Brasília and GEAFS, Brasília, Brazil. [2]University of Brasília, Brasília Fire Department and GEAFS, Brasília, Brazil. [3]Harvard T.H. Chan School of Public Health, Boston, MA. [4]Department of Health and Exercise Sciences, Skidmore College, Saratoga Springs, NY. [5]University of Brasília, Harvard T.H. Chan School of Public Health, Boston, MA, and GEAFS, Brasília, Brazil.*
(No relevant relationships reported)

Wildland firefighting is characterized by outdoor duties that include long walks and high physical demands. The Brasilia Fire Department Environmental Protection Brigade (EPB) is a wildland fire suppression specialized unit that also perform other duties, such as rescues. **PURPOSE**: To objectively evaluate the physical activity level (PAL) and sedentary time (ST) of wildland firefighters during a routine 24-hour on-

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Abstracts were prepared by the authors and printed as submitted.

duty period. **METHODS**: We evaluated 26 firefighters from the EPB with mean age of 35.8±6 yrs, BMI of 25.3±3.2 kg/m² and VO_{2max} of 44.4±3.7 mL(kg.min)⁻¹. Volunteers wore the ActiGraph GT3X+ accelerometer set in 60s epochs, at the right waist during a 24-hour on-duty period. Main duties were reported on a written log. PAL and ST were evaluated using vector magnitude cut-points as follow: ST <200 counts per minute (cpm), light activity: 201-2689 cpm and moderate to vigorous activity (MVPA) ≥2690 cpm. **RESULTS**: Table 1 shows descriptive data. 23 participants (88.5%) accumulated at least 30min of MVPA. 16 firefighters (61.5%) achieved ≥10,000 steps. 20 (77%) reached the MVPA intensity and 6 (23%) the very vigorous one. Of those who participated in wildland fire suppression (50% of the sample), they spent 6% less time in ST (p=0.08) and 4.6% more time in MVPA (p=0.045).

Table 1: Median (min-max) values of ST and PAL during a 24h on-duty period (n = 26)

	Absolute (min)	Relative (%)
Sedentary time	561.5 (210-807)	50.4 (19.9-70.1)
Light PA	450 (277-614)	40.3 (27.7-54.2)
MVPA	98.5 (19-272)	8.4 (2.0-25.8)
Steps/day	13145 (4833-40593) steps	
Wear time	1090 (900-1380) min	

PA: physical activity; MVPA: Moderate to vigorous physical activity

CONCLUSIONS: On average, wildland firefighters spent ≥1h30min during MVPA during a routine 24h shift-work. Including night rests, almost half of on-duty period was of ST. The other 50% of the time was mainly spent on light activities but interspersed with MVPA. Almost 80% of the firefighters had at least one episode of MVPA during a routine work period. Those who responded to an episode of wildland fire accumulated more MVPA than those involved only in other firefighters' routine duties.
Funding: CNPq 480092/2013.3.

2053   Board #4   June 1 9:30 AM - 11:30 AM

The Relationship Between Firefighters' Physical Activity Levels and Cardiorespiratory Fitness

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(No relevant relationships reported)

Improved physical activity (PA) and cardiorespiratory fitness (CRF) levels are necessary for firefighters to adequately perform strenuous occupational demands. These demands have been associated with increased cardiovascular events leading to disability and death. Sudden cardiac death accounted for 44% of all annual on-duty deaths in U.S. firefighters from 1995-2004. Thus, the National Fire Protection Association (NFPA) has made it a priority to emphasize PA levels in order to maintain and increase CRF.
PURPOSE: The purpose of the study was to investigate the relationship between sedentary behavior (SB), light physical activity (LPA), and moderate-to-vigorous physical activity (MVPA) to CRF in career firefighters. **METHODS:** Firefighters wore an accelerometer for eight consecutive on- and off-duty days. The accelerometer was worn on the right hip and tracked SB, LPA, and MVPA. Freedson's (1998) cut point determined PA intensity, while Choi's (2011) algorithm was used to remove non-wear time. Additionally, each participant completed a stage-graded exercise test with submaximal square-wave verification bout to determine maximal oxygen uptake (VO_{2max}). VO_{2max} was also estimated using self-reported physical activity rating and a non-exercise regression equation. Pearson's correlations were performed between the PA components and VO_{2max} as well as between estimated and actual VO_{2max} (ml/kg/min).
RESULTS: Preliminary results (n=9) for total wear time for the accelerometer was 920 (min) with 58.7% SB, 37.7 % LPA, and 3.6% MVPA. There were no significant correlations between VO_{2max} and SB (r = -0.18, P = 0.637) or LPA (r = 0.33, P = 0.388). Further, there was no significant correlation between estimated (45.2 ± 7.5) and actual VO_{2max} (39.2 ± 7.1) (r = 0.52, P = 0.149). There was a statistically significant correlation between VO_{2max} and MVPA (r = 0.74, P = 0.022). **CONCLUSION:** The initial results suggest that firefighters are meeting ACSM's PA guidelines but are not are not meeting the NFPA's minimal CRF recommendation of 42 ml/kg/min. Therefore, further research is necessary in order to make recommendations regarding PA and CRF for active firefighters. Twenty-one additional firefighters are expected to complete the study for a total sample of 30.

2054   Board #5   June 1 9:30 AM - 11:30 AM

Physical Factors Associated with Tower Stair Climbing In Firefighter Recruits

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(No relevant relationships reported)

Stair climbing in structural fires is a common task for firefighters. Firefighters also frequently have to ascend the stairs while carrying various equipment. The physical factors related to performance on a timed stair climb task are unclear. As a result, there is a lack of evidence to guide training programs for firefighter recruits that target the development of physical factors associated with performance on this task. **PURPOSE:** To determine the physical factors that are associated with performance during a timed stair climbing task in firefighter recruits. **METHODS:** 17 male firefighter recruits (20.4 ± 0.5 yrs, 178.5 ± 5.5 cm, 83.7 ± 8.7 kg) volunteered to participate. The recruits completed a battery of physical fitness and performance tests including: estimated body fat percentage (%Fat) via skinfold assessment; estimated one-repetition maximum squat (Squat) and bench press (Bench); seated weighted ball chest pass (Pass); 2-minute maximal push-up test (Push); estimated maximal aerobic capacity (VO_{2max}) via a submaximal step-test ; functional movement quality via a movement efficiency screen (MES); and time to complete a 5-story tower climb test ($Tower_{TIME}$). Heart rate (HR) was recorded immediately after the step-test (HR_{STEP}) and the tower climb (HR_{TOWER}). Squat, Bench, and Pass data were normalized to body mass (kg). Push data were normalized to the maximum number possible (80). Bivariate correlations were used to determine the relationship between $Tower_{TIME}$ and all the physical fitness and performance factors measured. **RESULTS:** Statistically significant ($P < 0.05$) correlations were identified between $Tower_{TIME}$ and %Fat ($r = 0.563$, $P = 0.019$), Bench ($r = -0.571$, $P = 0.017$), Pass ($r = -0.549$, $P = 0.023$), Push ($r = -0.532$, $P = 0.028$), VO_{2max} ($r = -0.560$, $P = 0.019$), HR_{STEP} ($r = 0.611$, $P = 0.009$), and HR_{TOWER} ($r = -0.638$, $P = 0.002$). Non-significant ($P > 0.05$) correlations were identified for Squat ($r = 0.448$, $P = 0.072$) and MES ($r = 0.353$, $P = 0.165$). **CONCLUSIONS:** Performance during a maximal tower climb task was related to fitness (%Fat and VO_{2max}), as well as upper body strength (Bench), power (Pass), and endurance (Push), but not lower body strength (Squat) or functional movement quality (MES). Further, those who performed better on the tower climb had a lower HR after the step-test and a higher HR after the tower climb test.

2055   Board #6   June 1 9:30 AM - 11:30 AM

Cardiovascular Risk Factor Characterization and Isokinetic Muscle Strength in Overweight and Obese Male Firefighters

Gena Gerstner[1], Andrew J. Tweedell[2], Craig R. Kleinberg[3], Hayden K. Giuliani[1], Timothy J. Barnette[1], Abbie E. Smith-Ryan, FACSM[1], A. C. Hackney, FACSM[1], Katie R. Hirsch[1], Jacob A. Mota[1], Eric D. Ryan[1]. [1]University of North Carolina at Chapel Hill, Chapel Hill, NC. [2]Army Research Laboratory, Aberdeen Proving Ground, MD. [3]Under Armour, Baltimore, MD. (Sponsor: Abbie E. Smith-Ryan, FACSM)

(No relevant relationships reported)

Sudden cardiac death is the cause of nearly half of on duty fatalities among firefighters. Although firefighters endure strenuous occupational duties, they often have sub-standard levels of fitness, and are at risk for cardiovascular disease (CVD). It is unclear if muscular strength provides a protective effect, independent of cardiorespiratory fitness (CRF). **PURPOSE**: The purpose of this study was to examine the influence of isokinetic strength on CVD risk factor characterization in overweight and obese career firefighters, prior to and after accounting for CRF. **METHODS**: Forty-four overweight and obese male firefighters [Mean ± SD; Age: 36.9 ± 7.1 yrs; Stature: 180.1 ± 7.0 cm; Body mass: 107.9 ± 19.8 kg; BMI: 33.1 ± 4.7 kg·m²] performed three maximal concentric isokinetic leg extensions on a calibrated isokinetic dynamometer at slow (1.05 rad·sec⁻¹; PT_{slow}) and fast (4.19 rad·sec⁻¹; PT_{fast}) velocities, in a randomized order. Peak torque was normalized to body mass for both velocities. Cardiovascular risk was determined based on published cutpoints for systolic blood pressure, total cholesterol, high-density lipoproteins, low-density lipoproteins, triglycerides, and trunk fat/limb fat ratio. Firefighters were characterized into three cardiovascular risk profiles (≤1 [n=14], 2 [n=16], and ≥3 [n=14] risk factors). A non-exercise prediction model including age, percent body fat from dual-energy X-ray absorptiometry, and self-reported exercise status from a questionnaire was used to calculate CRF. Two separate one-way analyses of variance (ANOVA) were used to evaluate potential differences in PT_{slow} and PT_{fast} between the three groups. Two separate analyses of covariance (ANCOVA) were used to examine whether PT_{slow} and PT_{fast}, adjusted for CRF, differed between the three groups. An alpha level was set *a priori* at $P ≤ 0.05$ for all analyses. **RESULTS**: There were no differences between groups for PT_{slow} or PT_{fast} prior to ($P =0.130$; $P =0.337$) or after ($P =0.054$; $P =0.191$) accounting for CRF, respectively. **CONCLUSIONS**: These findings suggest that isokinetic muscular strength does not provide a protective

effect from CVD risk factor characterization in this sample of overweight and obese male firefighters. **FUNDING**: Supported in part by a Junior Faculty Award from UNC-Chapel Hill.

2056   Board #7   June 1 9:30 AM - 11:30 AM
The Influence of Age and Adiposity on Functional Balance Performance in Career Firefighters

Jacob A. Mota[1], Timothy J. Barnette[1], Gena R. Gerstner[1], Andrew J. Tweedell[2], Craig R. Kleinberg[3], Hayden K. Giuliani[1], Eric D. Ryan[1]. [1]*University of North Carolina at Chapel Hill, Chapel Hill, NC.* [2]*Army Research Laboratory, Aberdeen Proving Ground, MD.* [3]*Under Armour, Baltimore, MD.* (Sponsor: Abbie Smith-Ryan, FACSM)

(No relevant relationships reported)

Slips, trips, and falls (STF) are one of the primary causes of non-fatal injuries in firefighters, incurring a large economic burden. Laboratory based measures of functional balance may help identify key risk factors for STF injuries.
PURPOSE: The purpose of the current investigation is to examine the impact of age and adiposity [body mass index (BMI) and percent fat (%BF)] on a functional balance assessment in career firefighters.
METHODS: Forty-nine healthy career firefighters (mean ± SD age = 35 ± 8 yrs; stature = 178.72 ± 7.99 cm; mass = 93.76 ± 21.85 kg; BMI = 29.11 ± 5.34 kg/m^2; %BF = 25.22 ± 5.34%) volunteered to participate in this study. Data were collected over two separate visits. The first visit required participants to arrive to the laboratory following a four-hour fast prior to a dual energy x-ray absorptiometry scan to estimate %BF and be familiarized with the functional balance assessment. On the subsequent visit, participants completed the assessment for time while wearing their personal protective equipment and a self-contained breathing apparatus. The task required firefighters to step down from a raised platform, walk across a narrow beam, pass beneath an overhead obstacle (at 75% of their height), and step up to a final raised platform. The task was repeated while walking backwards as fast as possible. Each participant performed five trials that were digitally recorded to account for minor (i.e. foot contact with the ground) and major errors (i.e. overhead obstacle falls) with a minute rest between each to create a performance index (PI). Pearson product-moment correlation coefficients were used to examine the relationship between PI and age, BMI, and %BF with an *a priori* alpha level set a $P \le 0.05$.
RESULTS: There was a significant relationship between PI and age (r = 0.406; P = 0.004) and %BF (r = 0.401; P = 0.004), but not BMI (r = 0.242; P = 0.093).
CONCLUSION: The results from the present study demonstrated that increased age and %BF were associated with poorer functional balance performance. These findings may highlight key risk factors that may contribute to an increased risk of STF injuries. Lastly, %BF may be a more sensitive measure of adiposity than BMI when identifying STF risk factors.
GRANT FUNDING: National Institute of Occupational Safety and Health (T42OH008673)

E-06   Thematic Poster - **Moving Beyond Aerobic Exercise: New Science of Strength and Health**

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100C

2057   **Chair:** Duck-Chul Lee, FACSM. *Iowa State University, Ames, IA.*

(No relevant relationships reported)

2058   Board #1   June 1 9:30 AM - 11:30 AM
Risk Of Metabolic Syndrome In Adulthood Attributable To Childhood Grip Strength

Brooklyn Fraser[1], Leigh Blizzard[1], Michael Schmidt[2], Terence Dwyer[3], Alison Venn[1], Costan Magnussen[1]. [1]*University of Tasmania, Hobart, Australia.* [2]*University of Georgia, Athens, GA.* [3]*Oxford University, Oxford, United Kingdom.*

(No relevant relationships reported)

PURPOSE: Low levels of grip strength in adults independently predicts cardiovascular disease and type 2 diabetes. However, longitudinal evidence spanning child to adulthood is sparse. This study examined the association between child grip strength and adult metabolic syndrome (MetS). **METHODS**: Longitudinal study examining participants who had grip strength, cardiorespiratory fitness (CRF, physical work capacity at 170 beats per minute), and waist circumference measured in

childhood (9, 12, 15 years) and who had measures of MetS taken 20 years later. Child grip strength was categorised according to age-and sex-specific cut-points proposed by Catley and Tomkinson (2013) based on Australian normative data (very high, high, average, low, very low). Waist circumference, blood pressure, HDL cholesterol, triglycerides, and glucose were measured in adulthood and MetS was defined using the harmonised definition and a continuous MetS risk score. **RESULTS**: Children with very low or low grip strength were at six times increased risk of MetS and had a higher continuous MetS risk score in adulthood independent of CRF (RR=6.00, 95% CI=2.53, 14.19; β=0.38, 95% CI=0.23, 0.52), compared with children without very low or low grip strength. Adjustment for childhood waist circumference reduced the effect estimates for both MetS outcomes by 50-62% (RR=2.26, 95% CI=0.90, 5.64; β=0.19, 95% CI=0.07, 0.31) and statistical significance was lost for the dichotomous MetS outcome (p=0.08). **CONCLUSIONS**: Lower levels of childhood grip strength were associated with adult MetS independent of CRF, with part of this effect potentially being mediated through childhood waist circumference. These results suggest strategies aimed at improving grip strength in childhood might reduce future development of MetS. Supported by NHMRC Grant APP1098369

2059   Board #2   June 1 9:30 AM - 11:30 AM
Muscular Strength And Cardiovascular And All-cause Mortality In Adults With Hypercholesterolemia

Duck-chul Lee, FACSM[1], Carl Lavie[2], Xuemei Sui, FACSM[3], Steven Blair, FACSM[3]. [1]*Iowa State University, Ames, IA.* [2]*Ochsner Health System, New Orleans, LA.* [3]*University of South Carolina, Columbia, SC.*

(No relevant relationships reported)

PURPOSE: To determine the associations of muscular strength (MS) with cardiovascular disease (CVD) and all-cause mortality in adults with hypercholesterolemia.
METHODS: Participants comprised 1,925 adults aged ≥40 years (mean age 50) who had a medical examination during 1980-1990 in the Aerobics Center Longitudinal Study. They were free of CVD, cancer, had ≥85% of their age-predicted maximal heart rate on a treadmill test, and hypercholesterolemia at baseline. MS was measured by 1 repetition maximums of bench and leg presses and a composite MS score was computed by combining the standardized values of both tests. Cardiorespiratory fitness (CRF) was estimated from a maximal treadmill test. We used tertiles of the sex- and age-specific total MS scores. Further, MS and CRF were dichotomized into either weak (lower one-third) or unfit (lower half), or strong (upper two-thirds) or fit (upper half) in a joint analysis of MS and CRF with mortality. Mortality follow-up was through 2003 using the National Death Index. Cox regression models included baseline age, sex, examination year, body mass index, smoking, alcohol intake, physical activity, parental CVD, hypertension, diabetes, abnormal electrocardiogram, total cholesterol, and CRF.
RESULTS: During an average follow-up of 18 years, 67 CVD and 172 all-cause deaths occurred. Compared with lower MS group, the hazard ratios (HRs) and 95% confidence intervals (CIs) for CVD and all-cause mortality were 0.45 (0.24-0.85) and 0.58 (0.40-0.85) in middle MS group ,respectively, and 0.46 (0.25-0.86) and 0.63 (0.43-0.93) in upper MS group, respectively, after adjusting for confounders including CRF. We found similar trends in both men and women, and normal weight and overweight or obese adults. In the joint analysis, compared with unfit and weak group, HRs (95% CIs) for CVD and all-cause mortality were 0.41 (0.22-0.78) and 0.41 (0.27-0.62) in unfit and strong group, respectively; 0.70 (0.30-1.66) and 0.60 (0.34-1.08) in fit and weak group, respectively; and 0.39 (0.19-0.82) and 0.59 (0.39-0.90) in fit and strong group, respectively.
CONCLUSIONS: MS, independent of CRF, should be promoted as a predictor of CVD and all-cause mortality in adults with hypercholesterolemia who are at increased mortality risk. Supported by NIH Grant AG06945, HL62508, DK088195, and HL133069.

2060   Board #3   June 1 9:30 AM - 11:30 AM
The Time-Varying Longitudinal Associations Between Muscle Strength, Functional Limitations, and Mortality in Older Adults

Ryan McGrath[1], Brenda Vincent[2], I-Min Lee, FACSM[3], William Kraemer, FACSM[4], Mark Peterson, FACSM[1]. [1]*University of Michigan, Ann Arbor, MI.* [2]*VA Ann Arbor Healthcare System, Ann Arbor, MI.* [3]*Harvard University, Boston, MA.* [4]*The Ohio State University, Columbus, OH.*

(No relevant relationships reported)

Understanding how factors, such as muscle strength, slow the disabling process may better inform interventions designed to preserve function and delay mortality.
PURPOSE: To determine the time-varying associations between 1) handgrip strength (HGS) and individual activities of daily living (ADL) functions, and 2) disaggregated ADL limitations and time to mortality in older adults. **METHODS**: A United States nationally-representative sample of 18,467 older adults (age: 66.9±11.1 years) from the Health and Retirement Study were followed for 8 years. Maximal HGS was measured

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with a hand-held dynamometer. Ability to perform ADL functions were self-reported. Date of death was identified by the National Death Index and exit interviews. Separate covariate-adjusted hierarchical logit models were used to examine the association between HGS and each ADL outcome. Discrete covariate-adjusted Cox models were used to analyze the association between disaggregated ADL limitations and time to mortality. **RESULTS**: Every 5-kilogram increase in HGS was associated with decreased odds for the following ADL limitations: 9% (95% confidence interval (CI): 0.89, 0.93) for bathing, 6% (CI: 0.92, 0.96) for transferring, 9% (CI: 0.89, 0.93) for walking, 6% (CI: 0.92, 0.96) for dressing, 12% (CI: 0.84, 0.91) for eating, and 4% (CI: 0.94, 0.98) for toileting. The presence of a bathing, transferring, walking, dressing, eating, or toileting ADL limitation was associated with a 1.20 (CI: 1.19, 1.21), 1.04 (CI: 1.03, 1.05), 1.21 (CI: 1.20, 1.22), 1.02 (CI: 1.01, 1.03), 1.14 (CI: 1.13, 1.15), and 1.14 (CI: 1.13, 1.15) higher hazard for mortality, respectively. **CONCLUSIONS**: HGS was associated with reduced odds for each ADL limitation, which in turn, decreased the hazard for mortality in older adults. These findings provide insights into how preserving strength decelerates the disabling process by identifying which ADL functions are most impacted by muscle strength and the subsequent time to mortality for each ADL limitation.

2061 Board #4 June 1 9:30 AM - 11:30 AM

Defining Gender-specific Cut-off Points Of Lower Extremity Muscle Strength For Predicting All-cause Mortality Among Us Older Adults

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(No relevant relationships reported)

Aging-related loss of muscle strength is an important predictor of mortality; but few studies have defined appropriate cut-off point of muscle strength in relation to mortality in a nationally representative population. **PURPOSE**: We aimed to explore the optimal cutoff values of lower extremity muscle strength (LMS) for predicting all-cause mortality in a nationally representative sample of US older adults from the National Health and Nutrition Examination Survey (NHANES). **METHODS**: Data sources included the NHANES1999-2002 with public-use 2011 linked mortality files, which comprised 2,209 men and 2,240 women aged 50 years and older with complete data of knee extension strength measurements. Weighted multivariable logistic regression models were used to account for multistage stratified and clustered sampling. All models were adjusted for age, race, BMI, muscle mass, cigarette smoking, alcohol use, education, leisure time physical activity, sedentary time, and comorbidities. Receiver operating characteristic curves (ROC) and Youden's J statistic were used to identify the gender-specific cutoff points. The validation of the optimal cutoff points for predicting all-cause mortality was internally assessed using bootstrap sampling method. **RESULTS**: Overall, there were nonlinear "L" shaped associations between LMS and all-cause mortality in men and women, separately. ROC curves showed that LMS appeared to provided additional predictive values beyond traditional risk factors with (c statistics: 0.94 (0.93-0.95) in men and 0.96 (0.94-0.98) in women) and without muscle mass (c statistics: 0.93 (0.92-0.95) in men and 0.96 (0.95-0.97) in women) in predicting all-cause mortality. Ten candidate gender-specific cutoff points of LMS, which had the highest Youden's J Index, were identified. In the multivariable logistic regression models the cutoff points were determined at 266newtons for men and 221newtons for women, which were the lowest cutoff points significantly associated with all-cause mortality. Internal validation using the bootstrap method with 500 sex-stratified replications revealed no apparent overfitting problem. **CONCLUSIONS**: Optimal cutoff points of LMS independent of muscle mass may help us to better assess and promote musculoskeletal fitness in terms of health outcome in older adults.

2062 Board #5 June 1 9:30 AM - 11:30 AM

Strength Training versus Aerobic Exercise in Relation to Cause-Specific Mortality

Alpa V. Patel[1], Erika Rees-Punia[2], James M. Hodge[1], Lauren R. Teras[1], Peter T. Campbell[1], Susan M. Gapstur[1]. *[1]American Cancer Society, Atlanta, GA. [2]University of Georgia, Athens, GA.*
(No relevant relationships reported)

BACKGROUND: Physical activity guidelines recommend that all adults engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity (MVPA) per week, and also state that adults should engage in muscle-strengthening activity (MSA) two or more times per week. While many studies have examined the association between aerobic MVPA and mortality, few have examined the association between MSA independent of or in combination with aerobic MVPA and mortality.
PURPOSE: To examine the role of MSA in relation to mortality independent of, and in combination with, MVPA.

METHODS: Data from 72,440 men and women enrolled in the Cancer Prevention Study-II Nutrition Cohort who completed a lifestyle and medical survey (including information on MVPA and MSA) in 2001 were available for analysis. Multivariable Cox proportional hazards regression modeling was used to compute hazard ratios (HR) and 95% confidence intervals (CI) to examine the association between MSA (none versus any) and total mortality. In addition, effect modification by MVPA (<8.75, 8.75-<17.5, and 17.5+ MET-hours per week) and body mass index (BMI, kg/m^2: normal weight 18.5-24.9, overweight 25.0-29.9, obese 30.0+) was examined.
RESULTS: During 12 years of follow-up (2001-2013), 18,023 deaths occurred. After adjusting for MVPA and other potential confounders, engaging in any MSA was associated with a modest, albeit statistically significant, lower risk of total mortality compared to no MSA (HR=0.93, 95% CI 0.89-0.98). Associations were similar when examining cardiovascular disease and cancer-specific mortality. There was no evidence of effect modification by MVPA (interaction p=0.66). The association between MSA and mortality was limited to normal weight individuals (HR=0.88, 95% CI 0.83-0.94), with no association among overweight (HR=0.97, 95% CI 0.90-1.05) or obese (HR=1.03, 95% CI 0.91-1.17) individuals (p for interaction=0.05).
CONCLUSIONS: Engaging in any MSA as part of a physical activity regimen is associated with a modest mortality benefit, regardless of aerobic MVPA participation. MSA may have a greater reduction in risk of normal weight vs overweight or obese individuals.
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2063 Board #6 June 1 9:30 AM - 11:30 AM

Strength Training in Older Cancer Survivors in Pennsylvania: What Role Does Multimorbidity Play?

Shirley M. Bluethmann, Wayne Foo, Joachim Wiskermann, Scherezade K. Mama, William Calo, Kathryn H. Schmitz, FACSM. *Penn State College of Medicine, Hershey, PA.*
(Sponsor: Kathryn Schmitz, FACSM)
(No relevant relationships reported)

Background: Older survivors experience physical deterioration from aging and cancer treatment. Strength training (ST) may mitigate symptoms but is underutilized. The extent to which physical limitations from chronic conditions ("multimorbidity") affect ST participation in older survivors is not well known. The purpose of this paper is to: 1) describe ST participation among older cancer survivors (≥55 years) by cancer site and; 2) assess the relationship of multimorbidity and ST in older cancer survivors.
Methods: We analyzed data from older survivors (n=485), identified from the Pennsylvania Cancer Registry, who were mailed a BRFSS-based questionnaire. Per ACSM guidelines, we operationalized ST participation as ≥2 sessions/week. We created age-groups (e.g., 55-64, 65-74, 75+) and a composite score of 7 common conditions (e.g., COPD, heart disease) to assess multimorbidity. Logistic regression estimated the association of demographic and behavioral risk factors (e.g., multimorbidity) with ST participation.
Results: Most respondents were female (62%), older (mean 69 years; range 55-95 years) and represented diverse cancer sites, including breast (n=106), gynecologic (n=99), prostate (n=119), colorectal (n=90) and lung (n=71) cancer survivors. ST participation was generally low; 75% of survivors reported no ST. Among those reported doing ST, survivors reported a mean ST frequency of 2.8 times/week (SE 2.8; CI 2.5,3.8), varying by cancer site/age. Gynecologic (OR=0.10, p<.05; CI 0.107-1.01) and prostate cancer survivors (OR=0.10, p<.05; CI 0.01, 0.95) were less likely to report doing ST than breast cancer survivors. We observed that older survivors with 3 comorbid conditions were less likely (OR=0.23, p=.10; CI 0.43,1.32) than survivors with fewer conditions to do ST, controlling for covariates.
Conclusion: Uptake of recommended ST is suboptimal in older survivors. Older gynecologic and prostate survivors, and those with greater multimorbidity (i.e. score=3) may have greater difficulty achieving recommended ST than survivors of other sites or with less comorbidity. Designing interventions for survivors with unique barriers, such as gynecologic and prostate cancer survivors and those with greater multimorbidity, may help these older survivors to use ST to improve symptoms and quality of life.

2064   Board #7   June 1 9:30 AM - 11:30 AM

Muscle Strength And Prevalence Of Diabetes, A Cross-sectional Study Among Japanese Men

Rumi Miyamoto[1], Susumu S. Sawada, FACSM[2], Yuko Gando[2], Munehiro Matsushita[3], I-Min Lee, FACSM[4], Steven N. Blair, FACSM[5], Shingo Muranaga[1], Yumiko Osawa[1], Kaori Ishii[6], Kohichiro Oka[6]. *[1]Kameda Medical Center, Kamogawa, Chiba, Japan. [2]National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. [3]Dokkyo Medical University, Tochigi, Japan. [4]Harvard Medical School, Boston, MA. [5]University of South Carolina, Columbia, SC. [6]Waseda University, Saitama, Japan.*
(No relevant relationships reported)

Some studies report that there is an inverse relationship between muscle strength and the prevalence of diabetes. However, limited data are available on this relationship among Japanese.
PURPOSE: To investigate the relationship between muscle strength measured by a very simple one-leg-stand-up (from a 40cm high seat) test and the prevalence of diabetes among Japanese men.
METHODS: This cross-sectional analysis was conducted in 1,674 Japanese men [median (inter quartile range) age 61 (55-67) years] who completed health examinations and a one-leg-stand-up test. Smoking and drinking habits were collected via a self-administered questionnaire. The prevalence of diabetes, defined as fasting plasma glucose $\geq$126 mg/dL and/or hemoglobin A1c $\geq$6.5% and/or self-reported physician-diagnosed diabetes, was evaluated. Odds ratios and 95% confidence intervals for the prevalence of diabetes were obtained using logistic regression models to assess the relationship between muscle strength and the prevalence of diabetes.
RESULTS: In total, 187 participants had diabetes, and 467 participants could not stand up from a 40cm high seat. Using men who could stand up as reference, the age-adjusted odds ratio of diabetes for men who could not stand up was 1.44 (1.06-1.94). After adjustment for age, smoking and drinking, the multivariable odds ratio was 1.43 (1.05-1.93). With additional adjustment for body mass index, the multivariable odds ratio was 1.26 (0.92-1.71).
CONCLUSION: Low muscle strength measured by a very simple fitness test was associated with a higher prevalence of diabetes among Japanese men. This association was mediated in part by body mass index.

2065   Board #8   June 1 9:30 AM - 11:30 AM

Muscular Strength and Cardiorespiratory Fitness on Osteopenia in Older Adults

Hyun Soo Kim, Nathan Meier, Duck-chul Lee, FACSM. *Iowa State Univrsity, Ames, IA.* (Sponsor: Duck-chul Lee, FACSM)
(No relevant relationships reported)

Purpose To examine the independent associations of muscular strength (MS) and cardiorespiratory fitness (CRF) with the prevalence of osteopenia in older adults.
Methods This cross-sectional study consisted of 127 men and 177 women aged $\geq$65 years old (mean age 74) from the Physical Activity and Aging Study (PAAS). MS was assessed by 1-repetition maximum (1-RM) leg press (lbs) and CRF was assessed by time (minutes) to complete a 400-meter walk test. Both MS and CRF were categorized into four groups based on the sex-specific quartiles of each MS and CRF. Bone mineral density was assessed by dual-energy X-ray absorptiometry (DXA), and osteopenia (pre-osteoporosis stage) was defined as t-score below -1.0 following the World Health Organization guidelines. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were calculated using logistic regression to determine the independent associations of MS and CRF with the prevalence of osteopenia.
Results The prevalence of osteopenia was 45.4% in this study. Compared to the lower MS quartile 1 (lowest 25%), ORs (95% CIs) of osteopenia in MS quartiles 2, 3, and 4 were 0.75 (0.36-1.58), 0.33 (0.15-0.73), and 0.25 (0.11-0.59), respectively, after adjusting for age, sex, heavy alcohol consumption (>14 drinks per week for male, >7 for female), smoking status, physical activity, and CRF. However, we found that CRF was not significantly associated with the prevalence of osteopenia after adjusting for the confounders including MS in this study (trend P=0.19). In the stratified analysis by CRF, we found that higher MS was significantly associated with lower prevalence of osteopenia in both low CRF (lower 50%) (trend P=0.02) and high CRF (higher 50%) (trend P=0.03) after adjusting for age, sex, heavy alcohol consumption, smoking status, and leisure-time physical activity.
Conclusion Higher MS, independent of CRF, was associated with a lower prevalence of osteopenia in older adults. However, prospective studies are required to make causal inferences between MS, independent of and combined with CRF, and the development of osteopenia and osteoporosis in older adults.

E-07   Thematic Poster - **Nutritional Status of Athletes I**

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100E

2066   **Chair:** Floris Wardenaar. *Arizona State University, Phoenix, AZ.*
(No relevant relationships reported)

2067   Board #1   June 1 9:30 AM - 11:30 AM

Effects Of A Ketogenic Diet On Triathlon's Athletes Performance: A Pilot Trial.

Antonio Paoli, Davide Grigoletto, Fabio Zambolin, Giuseppe Marcolin. *University of Padova, Padova, Italy.*
(No relevant relationships reported)

PURPOSE Sport nutrition guidelines support the idea that carbohydrates (CHO) are fundamental for performance, mainly for endurance. However recently published studies on long distance athletes suggested some advantages of a low CHO, high fat approach, i.e. ketogenic diets. We aimed to investigate the effects of ketogenic diet (KD) on triathlon athletes. :
METHODS: Sixteen expert athletes (age 30.67±10.46 yrs) were enrolled in the pilot trial. Eight athletes followed a ketogenic diet (KD) for 5 weeks whilst other eight followed a standard western diet (WD). Subjects were tested for maximal oxygen consumption (VO_2max), peak power output (PPO), respiratory ratio (RR), heart rate, VO_2, and blood lactate during one hour cycloergometer test at 45% of PPO, and body composition through electrical impedance (BIA). A two way ANOVA treatment x time test was performed.
RESULTS: After 5 weeks subjects in the KD group showed a significant increase of VO_2max ($mlO_2xKg^{-1}xmin^{-1}$) 35.68±3.86 to 36.6±5.1; a significant increase of PPO (140±5.29 to 145±9), a significant decrease of fat mass (from 10.28±3.04 to 7.86±2.53 Kg), lactate (from 2.02±0.7 to 1.2±0.6) and of RR (from 0.86±0.03 to 0.79±0.01). No changes of lean body mass and time to exhaustion were detected.
CONCLUSIONS: Our data suggest that a ketogenic diet performed for a sufficient time (> 4 weeks) could improve some parameters related to performance in high level triathlon athletes

2068   Board #2   June 1 9:30 AM - 11:30 AM

Comparative Analysis of the Gut Microbiota and Acute Changes in Exercise Among Collegiate Swimmers

Jarrad T. Hampton-Marcell. *University of Illinois at Chicago, Chicago, IL.*
(No relevant relationships reported)

ABSTRACT
Background: Numerous physiological responses occur due to changing energy demands induced by exercise training, including changes in substrate sensing and utilization in the gastrointestinal tractn and extracellular sensing to optimize substrate availability. The gut microbiota can contribute up to 10% of the host's energy demand via short-chained fatty acid production and modulate intestinal permeability and signaling. The interaction between gut microbiota and exercise is poorly understood.
Purpose: Characterize the gut microbiota in collegiate swimmers whom undergo a sequentially reduced volume of training.
Methods: Fecal samples, body composition (air displacement plethysmography) and training logs were collected from Division I NCAA collegiate swimmers for six consecutive weeks for 2016 (n = 9) and 2017 (n = 7), starting just before the taper and proceeding into the off-season. The fecal microbiota was characterized with shotgun metagenomics sequencing followed by multivariate statistical analysis using Qiime v1.9.1 and R programming language. Permutational ANOVAs, supervised learning and Bayesian modeling was used to determine significance (p < 0.05) of host-microbe interactions.
Results: Systematic reduction in practice volume from Phase 1 (mean = 23.7 km/wk) to Phase 3 (mean = 13.9 km/wk) did not show any significant shifts in body composition (p > 0.05). Yet the microbial community showed a moderate but significant shift in structure (Adonis, p < 0.05, R = 0.154) and predicted function (Adonis, p < 0.05, R = 0.352). During high levels of practice volume, swimmers were dominated by the Clostridiales order of Firmicutes. Despite interpersonal variation in community composition, its temporal shift was largely explained by Clostridium Cluster IV and XIVa, which are known short-chained fatty acid producers.
Conclusion: Acute reduction in exercise among collegiate athletes significantly shifts the sub-phylum of specific Clostridiales in gut microbiota, possibly due to reduced exercise volume or requisite alterations in the diet.

2069   Board #3   June 1 9:30 AM - 11:30 AM

Describing Weight Regain Methodologies of Male Competitive Natural Bodybuilders

Venny Lalu, Diane DellaValle. *Marywood University, Scranton, PA.*

(No relevant relationships reported)

PURPOSE: Research focusing on bodybuilding training and nutrition strategies is limited and no research has attempted to examine weight regain strategies in these athletes. Due to this limited research, contemporary bodybuilding protocols are often based on anecdote and self-trial. This study will provide information for future research that may lead to evidence based strategies for coaches and athletes. The purpose of this cross-sectional study was to describe demographic characteristics and weight regain methodologies of male, competitive, natural bodybuilders.
METHODS: Recruitment was conducted via social media posts. Participants were invited to complete an online survey that included health and demographic information, dietary supplement use, and recreational and performance enhancing drug use. Bodybuilding training and competition information included weight regain methodology, and training phase-related weight loss and gain information. Body Mass Index (BMI) was calculated based on self-reported height and weight.
RESULTS: Participants included 24 male natural bodybuilders (Age 28.3±6.6 years, 100% male, 77.8% white). The average BMI of the sample was 25.9±6.6. Participants reported using an average of 5.9±2.9 supplements during the offseason, 6.2±2.9 during contest preparation, and 5.4±2.8 during the recovery period. The majority of the sample (85.2%) reported being amateur competitors, and 48.1% of participants reported previously competing in 1-2 bodybuilding competitions. Participants reported an average contest preparation length of 152.3±95.3 days, and an average competitive season of 40.4±42.5 days. 62.9% of participants reported losing > 25 lbs during contest preparation while weight gain varied from ≤10lbs to ≥35lbs. Participants reported using the reverse dieting method of weight regain most often in the past (48.1%).
CONCLUSION: This study is the first to describe the weight regain methods of male, natural, bodybuilders and allows for further exploration of this understudied population's nutritional strategies. The current study allows for future research to be conducted which may inform coaches and athletes of the safest and most effective methods for constructing individualized dietary and training protocols.

2070   Board #4   June 1 9:30 AM - 11:30 AM

Physical Performance is not Improved with Vitamin D Repletion

Shane D. Scholten[1], Mikenzie Mikkelson[2], Jesse Springer[3], Cortney Dowling[4], Nathan Lucs[5]. *[1]Augustana University, Sioux Falls, SD. [2]Black Hills State University, Spearfish, SD. [3]University of Sioux Falls, Sioux Falls, SD. [4]Liberty University, Lynchburg, VA. [5]Des Moines University, Des Moines, IA.* (Sponsor: Sherry Barkley, PhD, FACSM)

(No relevant relationships reported)

Vitamin D insufficiency is associated with impaired physical performance in physically active adults. Vitamin D repletion could have a positive effect on neuromuscular function, which could increase physical performance. **PURPOSE:** This study assessed the role of vitamin D repletion on markers of anaerobic performance in physically active adults. **METHODS:** 16 physically active participants (5 insufficient/deficient participants with vitamin D<75 nmol/L, 11 sufficient participants with vitamin D>75 nmol/L) participated in a double blind study to assess anaerobic fitness (vertical jump, hand grip strength, 10 meter sprint, and Wingate bike test). Anaerobic fitness was assessed pre and post 8 weeks supplementation. Vitamin D insufficient/deficient participants were given doses sufficient to reach 120 nmol/L while sufficient participants received a placebo. All liquid supplements were prepared by a local pharmacy. **RESULTS:** The vitamin D group significantly increased vitamin D status (64.2 to 135.6 nmol/L, p<0.01) compared with the placebo (115.4 to 110.2 nmol/L). Vitamin D repletion was not found to significantly improve any of the anaerobic performance tests (p>0.05). **CONCLUSION:** This investigation demonstrated a lack of effectiveness for vitamin D repletion on markers of anaerobic performance in physically active adults. Supported by NIH grant P20GM103443.

Performance data. None of the variables were significant at the p>0.05 level.		
	Pre-supplement	Post-supplement
10 meter sprint (s)		
Vitamin D	2.00 + 0.14	2.01 + 0.15
Placebo	2.04 + 0.09	2.08 + 0.15
Vertical Jump (cm)		
Vitamin D	63.50 ± 11.91	62.03 ± 14.58
Placebo	61.84 ± 11.22	61.97 ± 11.86
30 second Wingate (avg watts)		
Vitamin D	613.72 ± 58.35	608.02 ± 91.59
Placebo	567.47 ± 146.88	555.81 ± 235.88
Hand Grip (kg)		
Vitamin D	54.70 ± 11.12	56.78 ± 9.51
Placebo	50.05 ± 14.553	49.10 ± 11.06

2071   Board #5   June 1 9:30 AM - 11:30 AM

Antioxidant Intake, Adiposity, And Aerobic Capacity In An Athlete Population

Emily N. Werner[1], Sinclair A. Smith[2], Janell Mensinger[3], Brandy-Joe Milliron[3], Heather H. Betz[4], Stella L. Volpe, FACSM[3]. *[1]Michigan State University, East Lansing, MI. [2]Drexel University, Phildelphia, PA. [3]Drexel University, Philadelphia, PA. [4]Albion College, Albion, MI.* (Sponsor: Stella L. Volpe, FACSM)

(No relevant relationships reported)

Dietary intake, body composition, and aerobic capacity contribute to an athlete's performance.
PURPOSE: To evaluate relationships among antioxidant intake, adiposity, and aerobic capacity, and determine what characteristics have the greatest relationship with aerobic capacity in an athlete population. **METHODS:** Athletes defined as ≥18 years of age and exercising ≥ twice weekly were recruited. Measurements included days of self-reported physical activity per week, height, body weight, body mass index, and waist circumference. Percent body fat (PBF), lean body mass, and fat-free mass were measured via dual-energy X-ray absorptiometry. Maximal oxygen consumption (VO_2max) was analyzed using indirect calorimetry. Kilocalorie, macronutrient (carbohydrate, protein, fat), and antioxidant (β-carotene, vitamins A, C and E, iron, zinc, copper, and selenium) intakes were self-reported via Block 2005 Food Frequency Questionnaires. Antioxidants were analyzed as percentages of the Recommended Dietary Allowance. Bivariate Pearson Product Moment correlations were conducted to explore relationships among antioxidant intake, adiposity and aerobic capacity. A backwards multiple regression was used to determine which characteristic(s) had the strongest relationship with VO_2max. **RESULTS:** Thirty-two athletes (n=17 women, n=15 men; 35.7 ± 11.3 years of age) were measured. There were no differences between antioxidant intake and adiposity or aerobic capacity. There were significant negative relationships between PBF and VO_2max for women and men combined (p<0.001), as well as women (p = 0.013), and men (p=0.013), respectively. The backwards regression showed PBF (B = -0.504, p<0.001), vitamin C intake (B = -0.492, p=0.063), and vitamin E intake (B = 2.055, p=0.154) combined explained approximately 51% of the variance in VO_2max [R^2= 0.514, F(3,28) = 0.9.853, p<0.001]. After excluding vitamin C and vitamin E from the model, PBF alone explained 41% of the variance in VO_2max [B = -0.493, p<0.001; R^2= 0.442, F(1, 30) = 23.799, p<0.001]. **CONCLUSION:** Percent body fat alone, or combined with vitamins C and E, may have a substantial relationship with VO_2max. Further research should consider antioxidant intake and body composition in the investigation of the nutrition-related exercise benefits.
This research was unfunded.

2072   Board #6   June 1 9:30 AM - 11:30 AM

Relationship between In-Race Nutrition and Experience Level on Overall Finish Time for Ironman Triathletes

Stephanie Harpenau, Elaina Biechler. *Loras College, Dubuque, IA.* (Sponsor: Vincent Paolone, FACSM)

(No relevant relationships reported)

Nutrition and experience level of triathletes are two factors that can affect overall finish time in an Ironman triathlon. While there appears to be a dose-response relationship between in race calories consumed and Ironman performance, there is little to no current research linking this with the experience level of the triathletes. **PURPOSE:** The purpose of the present investigation is to determine the relationship between years participating in triathlon, calories per hour on the bike, and overall ironman finish time.

METHODS: Ironman triathletes (n=152) were surveyed at Ironman Wisconsin and Ironman World Championships to determine their in-race nutrition strategy and years of experience in triathlon. A multivariate regression was used to determine if there was a relationship between years participating in triathlon, calories per hour consumed on the bike, and overall ironman finish time. **RESULTS**: The overall regression model was statistically significant $F(8, 284)= 2.27$, $p < .05$. Tukey's HSD post-hoc test revealed that the number of years in triathlon was not a significant predictor of finish time (p= .836), however the number of years in triathlon was uniquely significant in the prediction of calories consumed per hour on the bike (p < .05). **CONCLUSIONS**: Although there was no relationship between number of years in triathlon and overall finish time, there was a significant relationship between number of years in triathlon and prediction of calories consumed per hour on the bike. This suggests that the more experienced Ironman triathletes consumed more calories per hour on the bike.

2073   Board #7   June 1 9:30 AM - 11:30 AM

Longitudinal Changes in Vitamin D and Body Composition in NCAA D1 Male Basketball Players

Carolyn Aprik[1], Terry Sauerbry[1], Lorenzo DiPace[1], Brigid Byrd[2], Lisa DeCeuninck[1], Barb Ledin[3], Tamara Hew-Butler, FACSM[1]. [1]Oakland University, Rochester, MI. [2]Wayne State University, Detroit, MI. [3]Crittenton Hospital, Rochester, MI. (Sponsor: Dr. Tamara Hew-Butler, FACSM)

(No relevant relationships reported)

Quantification of body composition changes with seasonal Vitamin D changes is not well-described. **PURPOSE**: To: 1) assess longitudinal changes in total body fat, lean, and bone tissue mass over 10-months and 2) explore relationships between Vitamin D, body composition, diet and sun exposure. **METHODS**: Male collegiate basketball players underwent dual energy x-ray absorptiometry (DXA) scans on four occasions: December 2016 (Start); April 2017 (End); July 2017 (Start Weights); October 2017 (End Weights) to quantify total body fat, lean, and bone mass. Blood was collected on 3 occasions (End; Start Weights; End Weights) and analyzed for serum 25-hydroxy vitamin D (25-OH-D). Food frequency questionnaires completed twice (Start and End Weights) with subjective reporting of sun exposure throughout weight-training. **RESULTS**: 11 (7 African-American) completed testing (age 20±1years; BMI 24.0±1.7kg/m²). Non-significant (NS) changes noted in total body fat percentage, which was lowest at End (16.1±2.1; 15.5±1.8; 16.6±2.2; 15.8±2.0%) and lean mass which was highest at End Weights (70.4±9.5; 71.4±9.1; 70.8±9.1; 74.3±9.3kg) while bone mineral density (BMD) increased steadily over time (1.33±0.10; 1.34±0.13; 1.35±0.12; 1.36±0.12g/cm²); (Start; End; Start Weights; End Weights, respectively). Serum 25-OH-D levels were deficient (<20ng/mL) at End (18.9±7.3ng/mL) but replete at Start Weights (32.2±12.8ng/mL) and End Weights (32.2±7.7ng/mL). African-American players spent less hours per week in the sun vs Caucasian players (6.5±2.3 vs. 11.2±3.7 hours/week; p=0.02) and ingested less Vitamin D in their diet (135.9±58.6 vs. 207.0±70.4; p=0.10)(African-American vs. Caucasian, respectively). Start Weight serum 25-OH-D levels significantly associated with: End Weight minus Start Weight (Δ) total fat mass (r=0.69;p=0.02), dietary sodium intake (r=0.65;p=0.04), and dietary iron intake (r=0.89;p=0.001). **CONCLUSION**: Collegiate male basketball players living in the Midwest (latitude 42°) demonstrate serum 25-OH-D deficiency at the end of the competitive season, but are replete (>30ng/mL) during summer training. Mild (NS) fluctuations in body composition occurred, with increased fat while detraining and increased lean mass with strength training. BMD increased despite seasonal variation in serum 25-OH-D.

2074   Board #8   June 1 9:30 AM - 11:30 AM

Exploration of the Influences on Food Choices by a Culturally Diverse Cohort of International Athletes

Rachael Thurecht, Fiona Pelly. *University of the Sunshine Coast, Sippy Downs, Australia.*

(No relevant relationships reported)

Optimised nutrition and hydration can have a substantial effect on athletic performance, recovery and weight goals. However, an athlete's food selection may not be ideally matched to performance goals due to the various influences that drive food choice. **PURPOSE:** The aim of this study was to administer a preliminary Athlete Food Choice Questionnaire (AFCQ) with a diverse international athlete population. Objectives 1) to identify the factors that are frequently influencing athletes' food choices; 2) to investigate if frequently reported influences vary between athlete cohorts based on gender, sport and nationality. **METHODS:** The AFCQ was developed for the purpose of this study based on existing literature and input from sports nutrition experts. This consisted of demographic questions, and a 5-point Likert scale question comprising 84 factors possible of influencing food choice, organized into 10 groupings. Athletes living in the athlete's village at the 2017 Universiade were invited to complete an AFCQ. Kruskal-Wallis ANOVA and the Bonferroni adjusted Mann-Whitney U test were used to examine associations between variables. Only Performance group factors are presented here. **RESULTS:** A total of 156 AFCQ were received (41.6% male, 58.4% female, age *M*=21.5 ± 2.3 years). Athletes were from 31

(24.4%) attending countries and 17 (77.3%) competing sports. The top three influential factors were from the Performance group, the number one was "*My need to fuel my body for competition*" (*M*= 4.25 ± 0.8). Across all sporting types, country regions and gender either the Sensory Attributes or Performance groups ranked as the top factors frequently influencing athletes' food choices. Athletes in athletics or swimming were more frequently (*Mdn*= 5) influenced by their need to fuel their body for training than those in team sports (*Mdn*= 4), *U*= 952.5, *p*<0.003, *r*= 0.3, or skill-based and racquet sports (*Mdn*= 4), *U*= 117.5, *p*<0.001, *r*= 0.4. **CONCLUSION:** The results of this study will help inform the development of a validated food choice questionnaire for athletes and provide information to assist those working with athletes from a variety of sports and countries to deliver suitable advice for fuelling performance and recovery. Supported with funding from the event organisers and caterers of the 2017 Universiade athletes' village dining hall.

E-08   Thematic Poster - **O2 Uptake Kinetics**

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100F

2075   Chair: John M. Kowalchuk. *University of Western Ontario, London, ON, Canada.*

(No relevant relationships reported)

2076   Board #1   June 1 9:30 AM - 11:30 AM

A Nonlinear Dynamics Approach To Oxygen, Ventilation, and Heart Rate Dynamics During Exercise In Young Adults

Nathaniel T. Berry[1], Jessica Dollar[1], Lily Shanahan[2], Susan D. Calkins[1], Susan P. Keane[1], Laurie Wideman, FACSM[1]. [1]University of North Carolina at Greensboro, Greensboro, NC. [2]University of Zurich, Zurich, Switzerland. (Sponsor: Laurie Wideman, FACSM)

(No relevant relationships reported)

Fitness induced adaptations, such as changes in oxygen uptake (VO_2), respiration, and cardiac autonomic regulation are known to occur at rest and during exercise following endurance training. For example, submaximal intensities are associated with reductions in VO_2 per workload, reductions in heart rate (HR), and reductions in ventilation (V_E) while maximal intensities are associated with increases in VO_2 and V_E. However, less is known about the breath-by-breath dynamics of VO_2 and V_E during exercise with changes in cardiac autonomic regulation in relation to fitness. **PURPOSE** To investigate the influence of gender, body fat (BF) and maximal VO_2 (VO_{2max}) on the breath-by-breath dynamics of VO_2 and V_E, as well as HR variability (HRV), during an incremental treadmill test to exhaustion. **METHODS** Breath-by-breath VO_2 and V_E, as well as continuous R-R intervals were collected throughout an incremental treadmill test for N=39 individuals (Males: n=20; height=177±8 cm, weight=79±18 kg; BF=18±9%; VO_{2max}=54±9 ml/kg/min – Females: n=19; height=164±6 cm, weight=74±21 kg; BF=33±12%; VO_{2max}=36±10 ml/kg/min). Individual time-series were fit using polynomial regression models. The residuals from these models were used to detrend the data. The standard deviation of normal intervals (SDNI), root mean square of successive differences (rMSSD), and sample entropy (SampEn) of the residuals were calculated and relations among these variables with gender, BF, and VO_{2max} were analyzed using multivariate analysis of variance. **RESULTS** There were statistically significant differences in the variability around the increase in physiological demands of incremental exercise (SDNI; rMSSD) based on Gender (p<0.001; p=0.004), BF (p<0.001; p=0.002), and VO_{2max} (p=0.05; p=0.04). However, the complexity (SampEn) surrounding the increase in VO_2, V_E, and HRV dynamics during incremental exercise were not different based on gender, BF, or VO_{2max}. **CONCLUSIONS** The variability surrounding the increasing physiological demands (specifically, VO_2 and V_E) of incremental exercise appear to be differentially affected by gender, BF, and fitness. Better understanding these relationships may provide important information about how chronic stimuli, such as training or disease, impact the dynamics of the system.

2077 Board #2 June 1 9:30 AM - 11:30 AM

Dynamics of Skeletal Muscle Interstitial PO_2 During Recovery from Contractions

Daniel M. Hirai, Trenton D. Colburn, Jesse C. Craig, Ayaka Tabuchi, Timothy I. Musch, FACSM, David C. Poole, FACSM. *Kansas State University, Manhattan, KS.* (Sponsor: David C. Poole, FACSM)

(No relevant relationships reported)

The oxygen partial pressure in the interstitial space ($PO_2$is) drives O_2 diffusion into the myocyte thus supporting oxidative phosphorylation. Although crucial for metabolic recovery and the capacity to perform repetitive tasks, the time course of skeletal muscle $PO_2$is during recovery from contractions remains unknown. **PURPOSE:** To resolve the temporal profile and determine model parameters of $PO_2$is off-kinetics after cessation of contractions in healthy skeletal muscle. We tested the hypothesis that $PO_2$is would recover to resting values and display considerable on-off asymmetry (fast on- and slow off-kinetics) reflective of slower microcirculatory O_2 delivery relative to muscle O_2 utilization dynamics in recovery. Microvascular PO_2 (PO_2mv) was also evaluated to test the hypothesis that a significant transmural gradient ($\Delta PO_2 = PO_2$mv-$PO_2$is) would be sustained during recovery. **METHODS:** PO_2mv and $PO_2$is were determined via phosphorescence quenching (Oxyphor probes G2 and G4, respectively) in the exposed rat spinotrapezius muscle during and after contractions (1 Hz, 6 V, 3 min per transition; n=12). **RESULTS:** Muscle $PO_2$is rose progressively (p<0.05) from an end-contraction value of 11.2±1.5 to 17.6±2.2 mmHg at the end of the recovery period, which was not different from resting $PO_2$is (17.8±1.9 mmHg; p>0.05). $PO_2$is off-kinetics were slower than on-kinetics (mean response time: 49.3±12.4 vs. 19.2±2.5 s, respectively; p<0.05). A significant transmural ΔPO_2 observed at the end of contractions (17.7±2.7 mmHg) was maintained throughout the recovery period (end-recovery: 19.3±4.5 mmHg; p>0.05). **DISCUSSION:** Consistent with our hypotheses, skeletal muscle $PO_2$is recovered back to resting values with slower off-kinetics compared to the on-transient in line with the on-off asymmetry for capillary hemodynamics. Maintenance of a substantial transmural ΔPO_2 during recovery supports that the microvascular-interstitium interface provides considerable resistance to O_2 transport. As dictated by Fick's law ($VO_2 = DO_2 * \Delta PO_2$), modulation of O_2 flux during and following contractions (VO_2) must be achieved via corresponding changes in effective diffusing capacity (DO_2; mainly capillary red blood cell hemodynamics and distribution) in the face of unaltered ΔPO_2. Funding: NIH HL-2-108328

2078 Board #3 June 1 9:30 AM - 11:30 AM

Different Central Hemodynamic Response Among Patients with Incomplete Spinal Cord Injury

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(No relevant relationships reported)

The cardiovascular response to physical activity is largely regulated by the autonomic nervous system. Sympathetic innervation of the heart originates between segments T1-5, while innervation originating between segments T6-L2 affects vascular response. Injury to the spinal cord induces loss of supraspinal sympathetic control over the cardiovascular system, which may culminate in blunted speed and magnitude of central hemodynamic responses during transitions in metabolic demand. **Purpose:** To investigate the cardiac output (Qt) response in relation to oxygen consumption (VO_2) in patients with incomplete spinal cord injury (iSCI). **Methods**: We tested 11 subjects in 3 groups: Tetraplegic group (TG, n=4, 41 ± 21 years); Paraplegic group (PG, n=4, 47 ± 19 years) and healthy controls (HC; n=3, 27 ± 8 years). Each group performed a constant-workload test on the treadmill at a self-selected walking speed. Qt and VO_2 were measured simultaneously by impedance cardiography and pulmonary gas exchange analysis. **Results**: Despite HC walking at a greater speed (1.5 mph vs. TG at 0.6 mph and PG at 1.0 mph), there was no difference in Qt or VO_2 amplitude amongst the groups. Qt kinetics (reported as the time constant, τ) was longer (p<0.05) in TG (45 ± 21s) compared to either PG or HC (17±4s; 6±5s, respectively). Phase 2 VO_2 on-kinetics were not different among the groups (TG, 33±30s; PG, 25±20s; HC, 20±6s). The ratio of τQt/τVO_2 was poor (>1.0) in only TG, however was correlated (r = 0.96, p =0.002) with the responsiveness of the oxidative metabolic system (ΔVO_2/τVO_2) across all groups. **Conclusion:** Sympathetic innervation appears to influence the temporal profile of Qt depending on the level of lesion. Tetraplegics demonstrated slower Qt adjustment to increased metabolic demand compared to paraplegics. The slow increase in Qt relative to VO_2 observed in tetraplegics suggests poor matching between central hemodynamics and metabolic demand in those with a higher level of injury. SCI elicits a lesion-dependent impairment in Qt kinetic profiles that may contribute to oxygen delivery to utilization mismatch occurring during walking in people who have incomplete cervical injury.

2079 Board #4 June 1 9:30 AM - 11:30 AM

Predicting Oxygen Uptake Responses During Cycling Using an Artificial Neural Network

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(No relevant relationships reported)

PURPOSE: Oxygen Uptake (VO_2) is a valuable metric for the prescription of exercise intensity and the monitoring of training progress. However, VO_2 is difficult to measure in a non-laboratory setting. Conversely, heart rate (HR), which is intrinsically linked to VO_2, is an easily obtained measure. Recently, VO_2 predictions have been made during steady-state exercise using an artificial neural network (ANN). However, these previous models incorporated protocol-specific variables, making them unable to accurately estimate VO_2 during arbitrary exercise intensities. Therefore, the purpose of this study was to predict VO_2 during different exercise intensities with an ANN using HR and exercise intensity data. METHODS: 12 moderately-active adult males (age: 21.1 ± 2.5 years) performed a 50-minute bout of cycling at a variety of exercise intensities. VO_2, HR, power output, and cadence were recorded throughout the test. An ANN was trained, validated and tested using the following inputs: HR, time derivative of HR, power output, cadence, and body mass. RESULTS: The ANN accurately predicted the experimental VO_2 time series values throughout the test (R^2 = 0.95, SEE = 1.7 mL/kg/min). CONCLUSIONS: The predictive accuracy of this ANN is promising considering the large range of intensities and long duration of exercise. Future applications of this method could allow athletes to have accurate real-time VO_2 predictions during exercise, improving the accuracy of training intensity.

2080 Board #5 June 1 9:30 AM - 11:30 AM

Recovery Interstitial PO_2 Dynamics Following Contractions in Healthy Skeletal Muscle of Different Oxidative Capacity

Trenton D. Colburn, Jesse C. Craig, Daniel M. Hirai, Timothy I. Musch, FACSM, David C. Poole, FACSM. *Kansas State University, Manhattan, KS.* (Sponsor: Timothy I. Musch, FACSM)

(No relevant relationships reported)

The recovery of skeletal muscle from repetitive tasks is dependent, in part, on adequate O_2 delivery and blood-mitochondrial O_2 diffusion. Key steps in this pathway include the microvascular and interstitial space (is) and novel use of specific phosphorescence probes allow measurements of O_2 partial pressures (PO_2) at those sites near the myocytes. Given the disparate contribution of nitric oxide (NO) between fiber types we sought to resolve how NO impacts $PO_2$is in recovery following rhythmic muscle contractions. **PURPOSE**: To determine the contribution of NO bioavailability to the temporal profiles of $PO_2$is off-kinetics in two fast-twitch muscles with different oxidative capacities (citrate synthase: peroneal (PER) ~20 vs white gastrocnemius (WG) ~8-11 μmol/min/g). We tested the hypothesis that the more oxidative PER would display faster kinetics while recovering to baseline $PO_2$is levels compared to the WG. In addition, NO synthase inhibition via L-nitroarginine methyl ester (L-NAME) would slow recovery off-kinetics whereas this process would be speeded by increased NO. **METHODS**: $PO_2$is was determined via phosphorescence quenching (Oxyphor G4) in the exposed rat PER and WG (n=5) during and following electrically stimulated muscle contractions (1 Hz, 8 V, both 3 min) under control (CON), sodium nitroprusside (SNP, NO donor) and L-NAME (n= 3 PER, 5 WG) conditions. **RESULTS**: PER $PO_2$is was higher than WG for CON at baseline (18.1 ± 1.8 vs 11.3 ± 1.2 mmHg), end contractions (11.5 ± 1.2 vs 5.2 ± 0.9 mmHg), and following recovery (19.6 ± 2.1 vs 10.1 ± 0.9 mmHg; p<0.05 for all). SNP elevated $PO_2$is at all time points in both muscles compared to CON and L-NAME (p<0.05). $PO_2$is recovered to baseline levels in both muscles in CON and L-NAME (p>0.05) but not SNP (p<0.05). Off-kinetics were faster in the PER compared to WG in CON (35 ± 6 vs 76 ± 6 s; p<0.05). L-NAME did not alter PER off-kinetics but prolonged recovery in WG (101 ± 8 s; p<0.05). **CONCLUSIONS**: Consistent with our hypothesis, $PO_2$is returned to baseline levels faster in the CON PER than WG. This likely reflects greater O_2 delivery in PER. However, NO synthase inhibition via L-NAME did not diminish the magnitude nor rate of recovery in PER indicating that the interstitial-mitochondrial pressure head for O_2 delivery may be preserved via other pathways in more oxidative muscles in health.

2081   Board #6   June 1 9:30 AM - 11:30 AM

Estimating the Aerobic Load of Short Non Steady State Cyclic Tasks

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(No relevant relationships reported)

Current analysis of aerobic load requires steady state oxygen uptake (VO_2), limiting analyses to relatively long lasting, cyclic activities. This is problematic when assessing the aerobic load experienced by patients who are unable to perform cyclic tasks for a longer duration. **PURPOSE**: To assess validity and reliability of a method estimating the aerobic load of short non steady state cyclic tasks. **METHODS**: Thirteen healthy adults walked on a treadmill while VO_2 was measured using breath by breath respirometry. Six trials of varying length and intensity (1, 2 and 6 minutes at both 4 and 5 km/h) were performed and repeated on a second day. Aerobic load of the short walking tasks (VO_{2short}) was estimated by adding the recovery VO_2 to the VO_2 over the exercise period. The 6 minute trials were used to calculate steady state VO_2. Concurrent validity of VO_{2short} with steady state VO_2 was assessed using a no-intercept linear regression analysis. Test-retest reliability of all trials was assessed using intraclass correlation coefficients (ICC). **RESULTS**: VO_{2short} was correlated with steady state VO_2 (r = 0.60-0.84) with highest correlations for the lower intensity trials. Steady state VO_2 was consistently lower than VO_{2short}. Regression coefficients between steady state VO_2 and VO_{2short} ranged between 0.72-0.81 (p<0.001). Test-retest reliability of VO_{2short} (ICC = 0.60-0.87) was comparable to that of steady state VO_2 (ICC = 0.63-0.78). **CONCLUSIONS**: The estimated aerobic load of short walking bouts is highly correlated with steady state VO_2 at similar intensity but systematically larger, potentially due to overestimation of recovery VO_2. Test-retest reliability of the presented method is similar to that of steady state VO_2. Therefore, based on this study, using short bouts of activity seems feasible to assess aerobic load in patients unable to perform cyclic tasks for a longer time, but the overestimation of recovery VO_2 needs to be better understood.

2082   Board #7   June 1 9:30 AM - 11:30 AM

Do Contrasting Recruitment Patterns Underlie The Different Patterns Of Muscle Deoxygenation And Hemoglobin Response In Quadriceps Muscles?

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(No relevant relationships reported)

Previous investigations reported greater convective and diffusive O_2 conductance in whole-leg muscles during knee extension exercise (KE) compare to conventional cycling (CE). One reason for this is thought to derive from different muscle recruitment pattern in CE and KE. However, it is unknown whether the different muscle recruitment patterns might account for the disparate O_2 conductances during KE and CE or not. **PURPOSE:** Using time-resolved near-infrared spectroscopy (NIRS) during ramp incremental KE and CE, we tested the hypotheses that compared to CE, KE would have (1) lower amplitude (from baseline to exhaustion) of deoxy[Hb+Mb] (reflecting a greater O_2 delivery-to-utilization), (2) greater amplitude and value at task failure (i.e. reaching $\dot{V}O_{2max}$) of total[Hb+Mb] (diffusive O_2 potential) in quadriceps (*vastus lateralis* [VL] and *rectus femoris* [RF]). We also hypothesized that muscle recruitment pattern will determine muscle oxy- and deoxygenation characteristics. **METHODS:** Eight subjects completed ramp incremental CE (20 W/min) and KE (10 W/min) to the limit of tolerance. Pulmonary VO_2 was measured breath-by-breath. Deoxy- and total[Hb+Mb] were quantified in the VL and RF muscle by time-resolved NIRS. VL and RF muscle activation levels were estimated by electromyography. **RESULTS:** In VL muscle, despite greater activation for CE than KE, the amplitude of deoxy- and total[Hb+Mb] from baseline to task failure were not different between exercise modes. However, in RF muscle, deoxy- (17.0±11.3 vs. 39.5±13.8 μM, *P*<0.05) and total[Hb+Mb] amplitude (5.3±4.0 vs. 23.8±8.5 μM, *P*<0.05) were lower for KE compared with CE despite greater activation for KE than CE. In addition, total[Hb+Mb] values at task failure were not a function of exercise mode in either VL or RF muscle. **CONCLUSION:** These results do not support the notion that different recruitment patterns for CE versus KE underlie the different patterns of muscle deoxygenation and hemoglobin response across quadriceps muscles. Indeed, the total[Hb+Mb] responses suggest that perfusive and diffusive O_2 delivery in VL and RF muscles are determined more by structural and functional factors (e.g. arteriolar vasodilation regulation and capillary hematocrit control) as opposed to muscle recruitment patterns *per se*. Supported by JSPS-15K16476, 16K13011.

E-09   Thematic Poster - Training in Youth

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-Lower level L100H

2083   Chair: Meghan Baruth. *Saginaw Valley State University, University Center, MI.*

(No relevant relationships reported)

2084   Board #1   June 1 9:30 AM - 11:30 AM

Validation of A Pacer Prediction Equation For Assessing Aerobic Capacity Of Visually Impairedchildren

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(No relevant relationships reported)

The Hungarian National Student Fitness Test (NETFIT®) is a health-related, criterion-referenced test system developed by the Hungarian School Sport Federation (HSSF) and The Cooper Institute (TCI) that was implemented in 2014/15 in schools throughout the country. The test battery was developed for typically developing children (TDC), so the interpretation of the test results was difficult for students with special educational needs (SEN).
PURPOSE: to evaluate the validity of the Progressive Aerobic Cardiovascular and Endurance Run (PACER) test for children with visual impairment.
METHODS: 20 partially sighted and 20 legally blind children (aged 10–19 years old) were selected randomly from 3 special schools to complete both laboratory (maximal treadmill protocol) and field assessments (PACER) of aerobic capacity. Agreement between lab- and PACER-derived peak oxygen consumption (VO_2) was examined using linear regression analyzis and two-sided equivalence testing techniques, respectively.
RESULTS: The final sample resulted in a total of 22 visually impaired children. The regression modell used in NETFIT® fit well for the partially sighted children (R^2=0.827), but not for blind children. There was a significant difference between the predicted and the measured peak VO_2 values by blind children (34.88 vs. 39.14 mL/kg/min, t=-2.287, p=0.038). Multiple regression analyzis of PACER performance variables and peak VO_2 measures indicated the best model for estimating relative peak VO_2 for blind children: peak VO2 =43.608 + (0.636*shuttles) – (0.829 * BMI). The lab and PACER VO_2 using the new regression model shared 84% of the variance by blind children (R^2=0.835) and that limits of agreement ranged from -9.86 mL/kg/min to +18.9 mL/kg/min. The absolute error values were 1% for girl and 11% for boys, and the average peak VO_2 estimates from PACER were within the 10% equivalence region for both sexes (girls: 35.22 to 28.18 mL/kg/min, boys: 37.82 to 46.22 mL/kg/min).
CONCLUSION: The PACER test using the new regression model for blind children is a reliable field test to assess aerobic capcity for children with visual impairment. From the schoolyear 2017/2018 the adapted NETFIT® will use this method in the mandatory assessments.
Financed by priority project EFOP 3.2.8.-16. granted by European Union.

2085   Board #2   June 1 9:30 AM - 11:30 AM

Development And Validation Of Sports Orientation Questionnaire For Chinese Adolescent Students

Jindong Chang[1], Xiaolei Liu[2], Ming Yang[1], Yi Liu[1], Mingxi Guan[3], Yang Li[1], Yunsai Chen[1], Xin Liu[1], Yan Peng[4], Hao Guo[5], Naiqing Song[1]. *[1]Southwest University, Chongqing, China. [2]High School Affiliated to Southwest University, Chongqing, China. [3]Chongqing Business Vocational College, Chongqing, China. [4]Sichuan Aerospace Vocatinal College, Chengdu, China. [5]Chongqing College of Humanities,Science & Technology, Chongqing, China.*

(No relevant relationships reported)

PURPOSE: Sports orientation is critical for the adolescent. Gill & Deeter (1988) had developed and validated a sports orientation questionnaire for elite athletes. However, it was a lack of assessment for general students of sports orientation. The purpose of this study was to develop and validate a "Sports Orientation Questionnaire" for Chinese Adolescent Students (SOQ-CAS).
METHODS: Based on literature review and focus group interviews, a 30-item instrument was developed for the initial tests. Using a 5-point Likert scale, formed the SOQ-CAS and was investigated to 486 junior middle school students in Chongqing of China. Finally, 36 missing individuals data were excluded, and 450 valid data were analyzed as study samples (male=236, female=214). Exploratory factor analyses (EFA) and confirmatory factor analysis (CFA) were used to analyze samples data by SPSS 24.0 and AMOS24.0 software.

Abstracts were prepared by the authors and printed as submitted.

RESULTS: The sample was randomly split (a computer-generated randomization sequence into two groups with the ratio 1:2). The first subset of the 30 items (N=150) was performed EFA (KMO=0.877, p=0.000). EFA resulted in a 12-item, 3-subscale that each included a 4-factor scale. EFA item loadings ranged from 0.68 to 0.85, and Cronbach's alpha ranged from 0.81 to 0.87. Based on the EFA results, CFA was performed to cross-validate and confirm the 4-factor structure model (N=300). Results showed that the model index were x2=0.000, RMSEA=0.06, GFI=0.94, NFI=0.91, TLI= 0.93, CFI=0.95. The final three subscales of the SOQ-CAS was named competitiveness, win orientation, and goal orientation.

CONCLUSIONS: The SOQ-CAS was a reliable and valid measure of sports orientation of Chinese adolescent students. It can be used for the assessment of daily exercise or physical education. The future research will focus on exploring the Motor Quotient (MQ) assessment by SOQ-CAS.

Table1. Factor structures by Exploratory Factor Analysis and Reliability (N=150)						
	F1	F2	F3	Total Variance explained	r_subscales	r_full scales	r_scale
S28	.803				.858**	.733**	0.869
S29	.801				.871**	.744**	
S23	.748				.827**	.708**	
S24	.730				.837**	.745**	
S9		.804			.818**	.593**	0.833
S7		.798			.839**	.658**	
S3		.757			.812**	.630**	
S8		.725			.800**	.654**	
S10			.849		.788**	.466**	0.809
S14			.791		.819**	.612**	
S18			.763		.806**	.599**	
S26			.677	68.933%	.776**	.639**	

2086   Board #3   June 1 9:30 AM - 11:30 AM

In-situ Testing Of Cardiorespiratory Fitness And Body Mass Index Of School Children In The UK

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(No relevant relationships reported)

PURPOSE: Decreasing physical activity (PA) levels of children in the UK is a public health issue. Systematic measurement of objective PA is difficult, however cardiorespiratory fitness (CRF) has been shown to be a valid marker of PA and is a more scalable metric. In the UK there is no national measure of CRF that could be used to identify children at risk for cardiometabolic disease (CMD). The aim is to investigate the relationship between CRF and body mass index (BMI) to identify children at risk for CMD. **METHODS:** This study recruited 665 children (52% male; age 9±0.87years) from 11 primary schools in London. Testing was performed by in-place delivery staff from an external organisation. Data collection took place with the same participants in Autumn 2016 and Summer 2017. CRF was measured using the 20m Multistage Shuttle Run (20mMSR) and BMI was calculated from height and mass. Boys not reaching 33 and girls 25 shuttles are at an increased risk of CMD and were classified as "unfit". CRF and BMI z-scores were calculated adjusting for age and gender. BMI and CRF z-scores were correlated, the change in variables were assessed by paired t-tests, and differences in groups were analysed by chi square. **RESULTS:** Moderate negative correlations were found between CRF and BMI in the Autumn Term (r=-0.310, p<0.001) and Summer Term (r=-0.359, p<0.001). There was a significant increase in CRF (p<0.05) and a significant decrease in BMI (p<0.001) between the Autumn and Summer Term. Percentage of children that failed to reach the 20mMSR cut-point decreased from 47% to 38% (p<0.01). Percentage of children that were categorised as overweight or obese decreased from 30% to 22% (p<0.01). Percentage of children categorised as healthy weight but did not meet the cut-point for reduced risk to CMD decreased, from 27% to 23% (p=0.069). **CONCLUSION:** This study indicates that there is a strong association between CRF and BMI and that the health of children improves throughout the academic year. This study also found that a quarter of children categorised as being a healthy weight failed to reach the cut-point in the 20mMSR. Currently, only BMI is measured on a national scale in the UK, and these results demonstrate that a large proportion of children are not recognised as being at risk for CMD, therefore, the inclusion of the 20mMSR may be beneficial.

2087   Board #4   June 1 9:30 AM - 11:30 AM

Effects Of Chronic Hypobaric Hypoxia, Biological Maturation And Training On The Hemoglobin Mass In Children And Adolescents

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(No relevant relationships reported)

Hemoglobin mass (Hbmass) is an important factor for endurance performance and athletes born and living at altitude are described to possess elevated Hbmass values due to lifelong hypoxic exposure. It may be hypothesized that this adaptation already occurs in early life. To date, however, there exists only few data on the training influences on Hbmass during childhood and no data exists describing chronic hypoxic effects in children and adolescents. **PURPOSE:** To investigate the effects of age, sex, training status and altitude on Hbmass in children and adolescents in a cross-sectional study. **METHODS:** 436 children, 197 females and 237 males, homogenously distributed over the age from 9 to 18 years participated in the study. 189 of them were born and lived permanently at 960m, 247 at 2600m. 168 did not practice any training and 268 were endurance trained with a mean endurance training volume of 14.0h ±5.8/week. Hbmass was determined using the optimized CO-rebreathing technique and VO2max by an incremental step-test on a treadmill. Analyses of variance and multiple regression analyses were performed to estimate the effects of sex, body mass, age, sexual development (scale according to Tanner), training status, and altitude on Hbmass. **RESULTS:** Overall, ANOVA yielded highly significant effects for sex, age, body mass, altitude and training state (all p< 0.001); and regression analysis (r=0.91) showed highest effects of sex (+121.5g, ß=0.31 in males) and body mass (9.5g/kg, ß=0.57). Because Hbmass of girls reached a plateau at approx. 14 years and boys increased Hbmass until the age of 17 regression analyses were performed separately for females and males and the following effects were found: Males: r=0.93; Hbmass = 11.8*kg + 15.4*years + 60.9 (for trained status) + 35.1 (for altitude residents) + 13.7*(stage of Tanner) - 254.2; females: r=0.84; Hbmass = 6.8*kg + 9.8*years + 54.6 (trained) + 36.9 (altitude) -24.8. Absolute and relative VO2max was closely related to Hbmass (absolute values: r=0.85, y=3.57x + 308; relative values: r=0.70, y=3.56x+6.1). **CONCLUSION:** Beside the well-known effects of body mass, age and sex also growing-up at altitude and endurance training have remarkable effects on Hbmass in children and adolescents. VO2max is closely related to Hbmass. Like in adults, a change by 1 gram changes VO2max by 3.5ml/min.

2088   Board #5   June 1 9:30 AM - 11:30 AM

Effect Of Cardiorespiratory Fitness, Fatigue And Muscular Strength On Gait Biomechanics In Obese Children

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(No relevant relationships reported)

PURPOSE: The purpose is to explore the effects of cardiorespiratory fitness, fatigue, adiposity, and muscular strength in predicting altered gait biomechanics in 8-11 year old obese children.

METHODS: Thirty children, 15 girls and 15 boys, mean age 9.8±0.9 years, and mean BMI percentile 96.1±4.1, were recruited from University of Iowa Obesity Clinic. The 15 m Progressive Aerobic Cardiovascular Endurance Run (PACER) protocol was used to estimate aerobic fitness (VO_2max) and to fatigue the subjects. Adiposity, measured as percent body fat, was estimated by air displacement plethysmography (Bod Pod). Right leg isometric strength was assessed on a leg press device. Three-dimensional gait analysis (Optotrak, Kistler) using a link-based model was performed pre- and post-fatigue to calculate joint moments. Paired t-tests were used to compare pre- and post-fatigue moments, and a stepwise regression model including moments as dependent variable and fitness, adiposity and strength, as the three independent variables was used for pre- and post-fatigue. P-value < 0.05 was considered significant.

RESULTS: Subjects completed an average of 17.5±8.5 PACER laps (range: 4-45). Mean aerobic fitness as estimated by PACER was low (34.1±6.0 mL·min-1·kg-1). Mean adiposity was 32.2±7.6 % body fat and mean right lower limb strength, was 7.54±2.29 N/kg. Following fatigue, knee adduction moments (0.35±0.2 to 0.43±0.2 Nm/kg, p= 0.01), knee extensor moments (0.57±0.3 to 0.67±0.2 Nm/kg, p= 0.02) and hip extensor moments increased (0.77±0.4 to 0.97±0.4 Nm/kg, p=0.01). The step-wise regression model for knee extensor moments pre-fatigue selected strength and adiposity as predictor variables (R2=0.35) and post-fatigue selected strength (R2=0.29). Knee and hip adductor moments selected adiposity as a predictor variable for pre-fatigue (R2=0.3 and 0.22 respectively). None of the models included cardiorespiratory fitness.

CONCLUSIONS: Increase in hip and knee moments after fatigue suggests biomechanical deficiencies, which may lead to increased joint stress or to injury.

The result suggests that level of adiposity and strength might be important factors in predicting gait biomechanics and could make a significant impact for healthcare professionals as they encourage wellness and fitness among their obese clientele.

2089   Board #6   June 1 9:30 AM - 11:30 AM

Effects Of A 5-day Sports/Fitness Camp On Walking Efficiency In Children With Cerebral Palsy

Adam R. Blanchard[1], Katherine Dimitropoulou[1], Paul Weiland[2], Kelly Boscarino[2], Amber Newell[1], Heakyung Kim[1]. [1]*Columbia University Medical Center, New York, NY.* [2]*Chapter 126 Sports & Fitness, Bristol, CT.*
(No relevant relationships reported)

Physical activity (PA) participation and fitness in children with cerebral palsy (CP) are decreased compared to typically developing peers. Exercise improves fitness and walking ability but little is known for its impact on walking efficiency. **PURPOSE:** The purpose of this pilot/feasibility study was to examine the influence of a five day community sports and fitness camp at an adaptive fitness facility on walking energy consumption (walking efficiency) in children with CP. **METHODS:** Six boys with CP (mean±SD; age, 11.3±4.7 yr; height, 136.9±27.5 cm; weight, 44.9±26.8 kg) participated in supervised sports and PA for 3 hr/d on 5 consecutive days. Activity energy expenditure (AEE; J·kg·s^{-1}) and oxygen consumption (VO$_2$; ml·kg·min^{-1}) were assessed by Actiheart monitor during five, 10meter walks on day 1 and 5. The PA Questionnaire for Adolescents assessed baseline PA levels. Paired samples t-tests evaluated differences in AEE and VO$_2$ pre- to post- camp; and independent-samples t-test evaluated between-group differences between high and low baseline PA with changes in AEE and VO$_2$. **RESULTS:** Although non-significant (low N), medium effect size was seen in the reduction of AEE during walking on day 5 (2.5±0.5 J·kg·s^{-1}) compared to baseline (2.9±0.5 J·kg·s^{-1}; p=0.28, Cohen's d=-0.66). Similarly, submaximal VO$_2$ was lower on day 5 (8.4±2.0 ml·kg·min^{-1}) compared to baseline (9.3±3.1 ml·kg·min^{-1}; p=0.28, Cohen's d=-0.35). A strong effect size was seen in that children with low PA (n=3) reduced their VO$_2$ greater (Δ-1.6±2.3 ml·kg·min^{-1}) than children with high PA (n=3) (Δ0.0±0.9 ml·kg·min^{-1}; p=0.31; Cohen's d=0.92) on day 5 compared to day 1. **CONCLUSIONS:** This study was a feasibility study to test the measures and intervention procedures for the development of an evidence-based camp. Findings show that children with CP may improve walking efficiency after participating in a five day community sports/fitness camp held at an adaptive fitness facility. Our next step is to design an appropriately powered intervention to confirm these results and to determine the best frequency, intensity, time, and type of sports/PA performed in the camp.

2090   Board #7   June 1 9:30 AM - 11:30 AM

Differences In Lean Mass And Strength In Adolescent ACLR Female Athletes: A Case-Control Study

Christiana J. Raymond-Pope[1], Donald R. Dengel, FACSM[1], John S. Fitzgerald[2], Bradley J. Nelson[1], Tyler A. Bosch[1]. [1]*University of Minnesota, Minneapolis, MN.* [2]*University of North Dakota, Grand Forks, ND.* (Sponsor: Donald R. Dengel, FACSM)
(No relevant relationships reported)

PURPOSE: To compare differences in total and segmental lean mass (LM), muscle strength and lower leg force production between adolescent female athletes with and without anterior cruciate ligament repair (ACLR). **METHODS:** Twenty-four females, 12 ACLR and 12 healthy controls (CON), were matched by age (16.4±0.9 vs 16.4±1.0 yrs), body mass index (23.2±2.1 vs 23.2±2.7 kg/m^2), and sport. Total, segmental, and regional body composition were measured by 3 DXA scans (1 total body, 2 lateral leg). Muscle peak torque for knee extension/flexion (60, 120°/sec) was measured using isokinetic dynamometry. Lower limb force, power and jump height were measured using a squat jump on dual force plates. Paired t-tests assessed total, regional and segmental lean mass, peak torque and lower limb force production differences within (Involved/Non-involved) and between groups (ACLR/CON). Linear regression assessed the total-leg LM vs peak force relation of each leg and of ACLR vs CON. **RESULTS:** No body composition differences were observed between ACLR and CON groups (p=0.07-0.90). However, ACLR INV legs had significantly lower total LM (7.1±0.8 vs 7.4±1.0 kg, p=0.004), anterior upper leg LM (1.5±0.3 vs 1.62±0.2 kg, p=0.007), and posterior upper leg LM (1.9±0.2 vs 2.0±0.2 kg, p=0.036). Peak torque was significantly lower in ACLR INV vs NINV legs (p<0.003) and vs CON (p=0.010-0.019) for extension and 60 and 120°/sec and flexion at 60°/sec (p=0.011), with no differences between ACLR NINV vs CON (p=0.23-0.90). Peak force was significantly lower in ACLR INV vs NINV legs (296±45 vs 375±55 N, p<0.001) and between ACLR INV legs vs CON (296±45 vs 372±88 N, p<0.015), but no significant (p=0.736) difference between ACLR NINV leg vs CON. The slope between total LM and peak force was smaller for ACLR participants (INV: m=0.02 r=0.36, p=0.25; NINV: m=0.03, r=0.50, p=0.10) compared to CON (INV: m=0.06, r=0.63, p=0.03; NINV: m=0.06, r=0.62, p=0.03). **CONCLUSION:** One year post-ACLR female athletes have significant differences in the quantity and quality of leg muscle, compared to matched CON athletes, for both involved and non-involved legs. Importantly, muscle function (strength and force production) is limited in both ACLR legs relative to the amount of lean mass, which may provide evidence for increased risk of ACL tear in the involved and non-involved legs.

2091   Board #8   June 1 9:30 AM - 11:30 AM

Predictors of Initial Acceleration and Maximum Speed Phases of Sprint Running in Children and Adolescents

Lorena Correas-Gómez[1], José Ramón Alvero-Cruz[1], Jesús Barrera-Expósito[2], Elvis A. Carnero[3]. [1]*University of Málaga, Málaga, Spain.* [2]*Nuestra Señora de la Victoria "Martiricos" High School, Málaga, Spain.* [3]*Translational Research Institute for Metabolism and Diabetes, Florida Hospital, Orlando, FL.*
(No relevant relationships reported)

Sprint capacity is a key factor to succeed in many sports modalities and to identify successful predictors must be relevant to optimize speed training and talent detection. Jump tests, muscle strength, and anthropometric variables have been widely associated with sprint performance in adults. However, seeking the best sprinters among young individuals must be influenced by other variables such as sports training, body size, and maturation. Thus, the potential of jump and strength tests to explain sprinting phases (acceleration and maximum speed) might be affected during developmental ages. **PURPOSE**: To examine relations between the phases of sprinting performance (30m) and body composition (BC), maturation, strength, and jump tests in children and adolescents. **METHODS**: A database of 456 measures of participants aged 8-18y was analyzed (244 boys, age=14.8±2.3y, BMI=21.6±3.9kg/m^2). Photoelectrical cells were used to measure sprint times (S30m, S0-15m, and S15-30m). An electronic mat read flight time to calculate vertical height after squat jump (SJ), counter-movement jump (CMJ), and CMJ with arms (CMJA); the difference between SJ and CMJ was also calculated (VJ-d). Lower limbs strength was tested with a portable dynamometer (LLS). Fat-free mass (FFM) was assessed by anthropometry and bioelectrical impedance analysis. Sports participation (SP) was recorded by questionnaire. A stepwise regression analysis was used to explore the relationship between sprint phases and BC, SP, jump and strength. **RESULTS**: CMJA was the best predictor of S30m speed (R^2=0.724, P<0.001) and acceleration phase (S0-15m, R^2=0.566, P<0.001). Maximum speed phase was best explained by SJ (S15-30m, R^2=0.530, P<0.001). The model including FFM, gender, VJ-d, and maturity predicted S30m (R^2=0.780, SEE=0.28m/s) and S15-30m (R^2=0.698, SEE=0.51m/s). For S0-15m, the predictors were CMJA, impedance index, and SP (R^2=0.610, SEE=0.36m/s). **CONCLUSION**: In accordance with other studies, sprinting performance was partially dependent on FFM and maturity. As expected, participation in organized sports seems to affect positively S30m and acceleration performance but did not explain maximal speed phase. Overall, the results highlight the relevance of BC and jump tests as a plausible model to track sprint performance in children and adolescents.

E-10   Free Communication/Slide - Athlete Assessment

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-Mezzanine M100D

2092   Chair: Erin H. Hartigan. *University of New England, Portland, ME.*
(No relevant relationships reported)

2093   June 1 9:30 AM - 9:45 AM

Anthropometric Measures And Performance Tests In The Evaluation Of Performance And Injury Risk In Division 1 Collegiate Athletes

Alexander M. Carnall[1], Jennifer Bunn[2], John Manor[2]. [1]*University of Memphis, Memphis, TN.* [2]*Campbell University, Buies Creek, NC.* (Sponsor: Dr. Mike Webster, FACSM)
(No relevant relationships reported)

PURPOSE: Simple tools of measurement like mean and peak power output, eccentric utilization ratio (EUR), and simple anthropometrics could potentially have predictive value in determining the accelerative and decelerative strategies of athletes. The objective of the present study is to determine the efficacy of these measurements in the identification of pathological preferential movement strategies which may limit performance or heighten injury risk. METHODS: 31 NCAA Division 1 athletes were recruited and asked to perform five trials of a simple drop-jump task. Subjects met inclusive criteria if they were cleared for full participation, and were assessed based on body composition, mean and peak power output, EUR, bodily segment lengths, and handheld dynamometer muscle forces. A motion capture system was used to measure peak joint flexion ranges of motion. RESULTS: A stepwise linear regression was

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FRIDAY, JUNE 1, 2018

applied to identify potentially influential factors in the accelerative and decelerative preferential strategies between male and female athletes. Preliminary findings suggest that torso length (r=.530, p=.042) and torso to femur length ratio (r=.782, p=.005) are potentially related to peak trunk, and peak knee flexion values respectively in males. In females, it appears that EUR may hold value in identifying peak trunk flexion (r=.675, p=.004), hip flexion (r=.604, p=.013), and combined lower extremity flexion (r=.552, p=.027) strategies in females. CONCLUSIONS: Preliminary findings of the present study suggest that while males have highly variable movement strategies, females may tend to rely more heavily on storage and return of eccentric energy via the contractile component of the posterior chain in order to increase athleticism and create greater joint integrity in decelerative tasks.

2094   June 1 9:45 AM - 10:00 AM

Pre-Season Measures of Neurologic Function and Subsequent Head Impact Exposure in Youth Football

Thayne A. Munce, FACSM[1], Jason C. Dorman[1], Paul A. Thompson[2], Verle D. Valentine, FACSM[1]. [1]Sanford Sports Science Institute, Sioux Falls, SD. [2]Sanford Research, Sioux Falls, SD.
(No relevant relationships reported)

Repetitive head impacts in football create a risk for concussion, as well as sub-concussive brain injury. Nearly 70% of US football players are younger than high school age, yet little is known about intrinsic characteristics of youth players that may make them more likely to experience repetitive head impacts, resulting in an increased injury risk. **PURPOSE:** To examine the association between select measures of neurologic function and head impact exposure of youth football players. **METHODS:** During a 5-year period (2012-2016), 66 middle school football players (12.9 ± 0.6 yr) were evaluated before their respective seasons (97 player-seasons) using objective, clinical assessments of neurologic function. Participants were assessed for rapid number naming speed (King-Device Test; KD; sec), simple reaction time (RT; sec), and standing balance (BA) performed during an eyes-open, dual-task condition. Head impact frequency, severity (linear acceleration; rotational acceleration) and location during each practice and game were measured using the Head Impact Telemetry (HIT) system. Predictive modeling was performed to examine the relation of KD, RT and BA values with several head impact exposure outcome variables. **RESULTS:** The overall predictive model was significantly related to individual head impact frequency in practices (P = 0.002). Among the discrete variables, faster RT and KD times were both found to be significantly related to increased individual head impact frequency in practices (P < 0.001; P = 0.032, respectively). Faster KD times were also significantly associated with higher 95th percentile linear acceleration values (P = 0.014). There were no significant relations (P = 0.145-0.840) between any measure of neurologic function and the other head impact exposure measures examined. **CONCLUSION:** Faster reaction time and rapid number naming speed assessed during the pre-season were related to increased head impact frequency and/or severity of youth football players. While these associations are likely complex, it is possible that these specific measures of neurologic function are surrogate indicators of players' intrinsic ability and/or desire to initiate contact. Identifying players who are more likely to experience repetitive head impacts may be useful for efforts aimed at modifying injury risk.

2095   June 1 10:00 AM - 10:15 AM

Kinematic Differences of the Single Leg Cross Over Triple Hop and Modified T-Test

David Mangone, Brandon Henley, Joshua Flores-Vitti, Kathryn Young, Richard Feinn, Karen Myrick, Juan C. Garbalosa. Quinnipiac University, Hamden, CT.
(No relevant relationships reported)

Return to sport (RTS) testing has been advocated as a means of reducing the high re-injury rates of the anterior cruciate ligament (ACL). The effectiveness of RTS testing has recently come into question. Potentially, the use of RTS tests that mimic game-like scenarios more closely may help resolve this issue.**PURPOSE**: To determine how a currently used RTS test, the cross over triple jump (COH), compares to a game-like agility test, the modified T-test (MTT) with respect to lower extremity biomechanics. **METHODS**: Nineteen Division I female athletes who were free of injury at the time of enrollment completed the testing protocol. The protocol consisted of having the athlete's complete a 5 minute warm-up followed the completion of COH and MTT test, the order of which was randomized. The COH test consisted of having the subject jump forward on one limb while crossing two parallel lines, 15.25 cm apart three times on each limb. The MTT consisted of having the subject run through a T shaped obstacle course 4 times, alternating sides. Adequate rest was afforded between trials to ensure non-fatigue. The location of retroreflective markers located over specific bony landmarks located on the subjects lower extremity was recorded while the athletes completed the tests using a 16 camera motion analysis system recording at 240 Hz. Using a multilevel multivariate analysis the three dimensional joint angles of the hip and knee at the time of maximum knee valgus were compared for angular differences (Δ) between the jump and cut performances using the marker data.

RESULTS: Compared to MTT, athletes during COH were significantly more flexed at (Δ = 9.0 degrees ± 2.6, p=.001) and tended to be more internally rotated (Δ = 2.2 degrees ± 1.2, p=.088) at the hip and more flexed (Δ = 3.5 degrees ± 2.1, p=.093) at the knee. No differences were noted in the frontal plane position of the hip and knee or the transverse plane position of the knee.
CONCLUSIONS: The COH and MTT do not appear to produce similar lower extremity kinematics. The MTT appears to place more stress on the lower extremity and may be a better test to determine RTS.

2096   June 1 10:15 AM - 10:30 AM

Correlation of Hop Distance and Loading Symmetry during Return to Sport Testing in Healthy Subjects

Kristen Renner[1], Alex Peebles[1], Thomas K. Miller[2], Robin Queen, FACSM[1]. [1]Virginia Tech, Blacksburg, VA. [2]Virginia Tech Carilion School of Medicine, Roanoke, VA. (Sponsor: Robin Queen, FACSM)
(No relevant relationships reported)

The hop distance symmetry is used frequently to determine readiness to return to sport (RTS) following anterior cruciate ligament reconstruction (ACLR). It is unknown if loading symmetry is able to provide novel insights in determining readiness to RTS. **PURPOSE:** To determine if hop distance limb symmetry index (LSI) is correlated with loading LSI when completing RTS hop testing. **METHODS:** 33 healthy participants (16 male, 17 female - age 21.8 ± 3.0, height: 1.74 ± 5.79m , weight: 68.6 ± 7.8 kg) were fit with a pair of loadsol (Novel Electronics, St. Paul, MN), single sensor insoles (100 Hz). Each participant completed the Marx Activity Scale and 7 single hops (SH), 3 triple hops (TH) and 3 crossover hops (CH) per limb. The LSI (Sx/NSx*100) was calculated for hop distance as well as peak load (GRF), loading rate (LR) and impulse (I) for the final hop of each trial and condition. The LSI was calculated for each trial pair and then averaged across trials for each task. Pearson's correlation coefficients (R) were calculated between all symmetry metrics (distance and loading) and Marx score. A linear regression was completed to determine if the loading symmetry metrics predicted the hop distance symmetry. All tests were run in SPSS with a p-value<0.05 indicating significance. **RESULTS:** The hop distance and loading LSI measures either had no or weak correlations (Table 1). The Marx score was weakly correlated with the CH hop distance (R=0.36, p=0.04) and the SH LR (R=0.36, p=0.05). The regression analysis yielded no significant models for the SH, TH, or CH to predict the hop distance LSI. **CONCLUSIONS:** The load symmetry metrics and hop distance symmetry were weakly correlated and the load symmetry metrics were not able to predict hop distance symmetry. These results indicate that the loading symmetry and hop distance symmetry provide different information. Therefore, future work should determine which of these measures could be used as predictors of secondary ACL injury risk.

Table 1

	SH		TH		CH	
	LSI	R	LSI	R	LSI	R
Distance	94.65±10.71	-	98.30±8.71	-	98.08±12.75	-
Peak Load	94.47±16.92	0.38*	99.95±22.14	0.09	102.43±28.14	0.31
Loading Rate	102.27±24.58	0.45*	103.71±30.39	0.11	109.97±43.75	0.39*
Impulse	99.33±11.22	0.41*	100.80±13.04	-0.08	98.98±11.37	0.34

* Significant correlation between measures p<0.05

2097   June 1 10:30 AM - 10:45 AM

Wobble Board Dynamic Assessment in Subjects with Chronic Ankle Instability

Andrea Fusco[1], Philip X. Fuchs[2], Giuseppe F. Giancotti[1], Marianna De Maio[1], Carlo Varalda[3], Herbert Wagner[2], Laura Capranica[4], Cristina Cortis[1]. [1]University of Cassino e Lazio Meridionale, Cassino, Italy. [2]University of Salzburg, Salzburg, Austria. [3]Italian Weightlifting Federation FIPE, Roma, Italy. [4]University of Rome Foro Italico, Roma, Italy. (Sponsor: Carl Foster, FACSM)
(No relevant relationships reported)

Chronic ankle instability (CAI) has been shown to cause balance impairments during still standing and dynamic postural-control tasks. Although computerized wobble boards (WBs) are used to train postural stability and to assess dynamic balance performances, little is known about their ability to detect balance deficits in subjects with unilateral CAI. **PURPOSE:** To determine the WB ability in detecting impairments in subjects with unilateral CAI. **METHODS:** After a familiarization phase, 16 (8 female, 8 male) subjects (age=23.5±1.7years; weight=66.6±14.5kg; height=167.7±11.3cm) performed a single limb task on a WB and Y balance test (YBT). WB performance (Balance Board WSP, Italy; diameter=40cm) was assessed as the time spent in the target zone (diameter=6.5cm) displayed on a screen during a

single leg 30seconds trial with a 1-minute sitting rest in between. For YBT, normalized reach distances for anterior (A), posteromedial (PM), posterolateral (PL) directions and composite (COMP) values were recorded according to the protocol. ANOVA ($p<.05$) was used to evaluate limb differences (injured; uninjured) in relation to gender. **RESULTS:** For WB, females showed better ($p<.05$) performances than males, regardless of limb. Significantly ($p<.0001$) better performaces were found in the uninjured (WB=20±4.3s; A=89.4±9.9%; PM=101.8±13.1%; PL=107.7±13.4%; COMP=104±10.9%) limb compared to the injured (WB=16.6±4.3s; A=86.1±11.6%; PM=96.1±10.7%; PL=101.3±14.9%; COMP=100.2±11.9%) one, regardless of gender. **CONCLUSIONS:** WB test showed to be an effective tool for detecting balance deficits between injured and uninjured limb in subjects with unilateral CAI. The single outcome from the WB provided an accurate, precise and fast method for quantifying balance deficits in individuals with CAI. Hence, WBs have the capability to fill the gap caused by limitations between subjective-based clinical assessment and laboratory-based testing. Their affordable, portable and user-friendly nature make WBs suitable to be used outside of laboratory settings and helpful in clinical-decision making. Gender differences during the WB test could be due to anthropometric, neuromuscular and neurophysiologic factors. Therefore, future studies should investigate the influence of anthropometric factors on WB performances.

2098   June 1 10:45 AM - 11:00 AM

Reliability and Performance Changes with the Addition of a Cognitive Task to Static and Dynamic Postural Stability Testing

Caroline Westwood, Carolyn Killelea, Mallory Faherty, Timothy Sell, FACSM. *Duke University, Durham, NC.* (Sponsor: Timothy Sell, FACSM)

(No relevant relationships reported)

Concussions are an unfortunate consequence of sports participation. They affect motor control, neurocognitive performance, and recent reports indicate they increase the risk of lower extremity musculoskeletal injury (LEMI) upon return to sport. The increased risk of secondary LEMI may indicate the need to establish a test that is predictive of LEMI risk following return to sport. **PURPOSE:** Assess the between-session reliability and the effects of adding a cognitive task to static and dynamic postural stability testing. **METHODS:** Twelve healthy, physically active subjects (Age: 22.3 ± 2.9 years, Height: 174.4 ± 7.5 cm, Weight: 154.5 ± 28.0 lbs) participated. Subjects underwent static and dynamic postural stability testing with and without the addition of a cognitive task (Stroop task) on two separate days. Static postural stability was assessed with a single-leg balance task under eyes open (with and without the addition of the Stroop task) and eyes closed conditions. Variability of each ground reaction force component was averaged across three trials for each of the static postural stability conditions. Dynamic postural stability testing consisted of forward jump over a hurdle with a one-legged landing performed with and without the addition of the Stroop task. A stability index was calculated based on the resultant ground reaction force and each of its components. Interclass correlation coefficients (ICC, 2,1) were calculated to determine the between-session reliability of each testing condition. Comparisons were made across the static conditions and between the dynamic postural stability tasks. **RESULTS:** The addition of a cognitive load proved to have moderate to excellent between-session reliability for the majority of variables calculated during static (ICC values 0.74 – 0.81) and dynamic postural stability testing (ICC values 0.77 – 0.80; ML=0.800, V=0.774, DPSI=0.781). No significant differences were observed between the postural stability tasks (with or without the Stroop task). **CONCLUSION:** Postural stability tasks with the addition of a cognitive load prove to have moderate to excellent reliability in a healthy population. These results provide new evidence on the feasibility of dual-task postural stability testing when examining risk of LEMI following return to sport.

2099   June 1 11:00 AM - 11:15 AM

Effect of Training Level on a Visuomotor Balance Task in Youth with Previous Sport-Related Concussion.

Katelyn Mitchell, Michael E. Cinelli. *Wilfrid Laurier University, Waterloo, ON, Canada.*

(No relevant relationships reported)

INTRODUCTION: The demands of sport require the integration of cognition and sensory inputs to produce more complex, goal-directed movement. Howell and colleagues (1) revealed that the differences in balance control between athletes with or without previous concussion were greater in youth compared to young adults during dual-task gait. **PURPOSE:** 1) To determine if a novel visuomotor dynamic balance task can objectively identify differences between youth hockey players with/without sport-related concussion (SRC); and 2) If there are balance control differences between players who participate in minor hockey and private hockey academy training. **METHODS:** Youth hockey players (N=47; age=12-17 years), who reported previous SRC (n=17) and CONTROL (n=30). Group 1 was from a minor hockey team (SRC1=4; CONTROL1=12) and group 2 a private hockey academy (SRC2=13, CONTROL2=18). Participants stood in single support on a Nintendo Wii Balance

board sampled at 100Hz and performed a lower limb reaching task with their non-stance foot. Five FitLights were arranged on the floor anteriorly at ±60°, ±30°, and 0° and were used as Go(GREEN)/No-Go(RED) stimuli. Balance control was assessed using RMS velocity of COP (vCOP) in anterior-posterior (A/P) and medial-lateral (M/L) planes. **RESULTS:** There were significant differences for both A/P vCOP (SRC= 8.04cm/s; CONTROL= 11.04cm/s, p <.05) and M/L vCOP (SRC= 6.27cm/s; CONTROL= 7.72cm/s, p <.05), as the SRC group performed the task slower than CONTROL There were no significant differences between SRC1 and SRC2 in vCOP A/P (p=0.50) or M/L (p=0.26) likewise for CONTROL1 and CONTROL2 vCOP A/P (p=0.88) and M/L (p=0.97). **CONCLUSION:** The assessment of a visuomotor dynamic balance task can objectively identify youth athletes with previous history of SRC regardless of training levels. Incorporating cognitive-motor tasks may help to improve balance control deficits in youth post-SRC and ensure true readiness for return-to-sport.

1.
Howell DR, Osternig LR, Chou LS. Adolescents demonstrate greater gait balance control deficits after concussion than young adults. The American journal of sports medicine. 2015 Mar;43(3):625-32.

2100   June 1 11:15 AM - 11:30 AM

Reliability of Evaluating the Single Leg Squat Using Multiple Assessment Methods

Carolyn Dartt, Sarah De La Motte, Patricia Deuster, Timothy Gribbin. *Uniformed Services University, Bethesda, MD.*

(No relevant relationships reported)

Purpose: The Single Leg Squat (SLS) test is a physical assessment to identify movement deficits that may predispose individuals to musculoskeletal injury (MSKI). The SLS is used clinically and in research to develop corrective exercise strategies for improving movement efficiency and modify potential MSKI risk factors. Our purpose was to compare the reliability of individual criteria and overall performance of the SLS test between three assessment methods: real-time scoring (RT); post-testing video analysis (PTVA); and post-testing analysis by using PhysiMax (PM) software. **Methods:** Male U.S. Marines (N=81; PTVA n=35, PM n=22, RT n=8) entering the School of Infantry-West performed the SLS prior to beginning training. Squats were scored using RT, PTVA, and PM software. Nine individual SLS criteria were evaluated dichotomously: 0 indicated no deficiency and 1 indicated a deficiency was present. Overall SLS performance was scored as excellent, average or poor. Interrater (IRR) and intrarater (IAR) reliability were measured using % agreement (%), Cohen's Kappa (κ), and intraclass correlation coefficients (ICC). **Results:** Individual SLS criteria reliability was poor for several items, namely Hip Drop (IRR-RT: 44.4%; κ=-0.15; PTVA: 22.5%, κ=-0.02; and IAR-PTVA: 83.4%, κ=0.31; PM: 77.2%, κ=0.15,) and Trunk Inward Rotation (IRR-RT: 55.5%, κ =0.05; PTVA: 63.4%, κ=0.26; and IAR-PTVA: 57.9%, κ=0. 16; PM 81.8%, κ=0.07). For SLS overall performance, IRR % agreement was weaker for PTVA (47.9%) compared to RT (62.5%); however ICC's were both poor (PTVA: 0.20 ICC, 95% CI: -0.03-0.41; RT: 0.35 ICC, 95% CI: -0.42-0.82). SLS overall performance IAR % agreement for PTVA and PM was similar (57.9% vs. 59.1%) but ICC's were good for PM (0.63 ICC, 95%CI: 0.30-0.83) and poor for PTVA (0.34 ICC, 95%CI: -0.12-0.68). **Conclusion:** Although the SLS has been clinically validated to identify movement deficits, individual item IRR and IAR appear to be generally poor regardless of the assessment method. Overall performance evaluations also had low agreement, but PM software showed the best IAR-ICC, demonstrating good reliability which should be investigated further. However, our results may be limited by small sample sizes. Further research is needed with a larger sample to better compare SLS assessment reliability between RT, PTVA and PM.

Abstracts were prepared by the authors and printed as submitted.

E-11 Free Communication/Slide - **Exercise Psychology- Pain**

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-Mezzanine M100F

2101 **Chair:** Erica M. Taylor, FACSM. *Delaware State University, Dover, DE.*

(No relevant relationships reported)

2102 June 1 9:30 AM - 9:45 AM

Physical Activity is Indirectly Associated with Pain in College-Aged Women: Somatization and Panic Symptom Pathways

Patrick J. O'Connor, FACSM[1], Matthew P. Herring[2], Cillian P. McDowell[2], Rodney K. Dishman, FACSM[1]. *[1]University of Georgia, Athens, GA. [2]University of Limerick, Limerick, Ireland.*

(No relevant relationships reported)

Pain can be improved by the adoption and maintenance of physical activity (PA) but whether PA *per se* causes reductions in pain is uncertain. Pain is often greater in those with elevated symptoms of psychiatric disorders, including anxiety, mood and somatoform disorders. It is plausible that the severity of psychiatric symptoms mediates relationships between PA and pain as PA often reduces these symptoms. **PURPOSE:** To assess relationships among PA, pain and psychiatric symptoms known to increase the risk of pain. **METHODS:** College-aged women (N=1033; 19.7 ± 2.9 years) completed the 7-Day PA Recall and indicated if they had (11.4%), or had not, been experiencing pain for more than a month. The Psychiatric Diagnostic Screening Questionnaire assessed symptoms of somatization, panic, generalized anxiety (GAD) and major depressive (MDD) disorders, which were hypothesized as possible mediators of the relationship between PA and pain. Structural equation models were tested using robust maximum likelihood and Bayes estimation in M*plus* 8.0. **RESULTS:** The hypothesized causal model had good fit (X^2 (10) = 14.75, P = 0.141, CFI=0.996, SRMR=0.018, RMSEA= 0.021) and accounted for a significant (P=0.004) amount of variance (R^2, SE) in pain (5.3%, 1.9%). Direct paths (β, SE) from PA to: MDD (-0.163, 0.045), GAD (-0.175, 0.049), panic (-0.100, 0.046), and somatization (-0.175, 0.049) were significant (P-values ≤ 0.028). The path from PA to pain was not direct (P=0.770), but indirect (P-values ≤ 0.016) and through significant paths (P-values ≤ 0.005) to pain from panic (0.130, 0.046) and somatization (0.156, 0.044). There were no direct or indirect effects from pain to PA in a reciprocal causal model. **CONCLUSION:** The findings support that, among college-aged women, PA is associated with pain indirectly through its associations with symptoms of somatization and panic disorder.

2103 June 1 9:45 AM - 10:00 AM

Resistance Training Does Not Alter Pain Sensitivity In Gulf War Veterans With Chronic Musculoskeletal Pain

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(No relevant relationships reported)

Chronic musculoskeletal pain (CMP) is a prevalent condition among Veterans of the Persian Gulf War (GV). We have previously demonstrated augmented sensitivity to painful stimuli in GV with CMP. Exercise training is an effective method for reducing pain symptoms in patients with CMP; however, the influence of exercise training on pain sensitivity to experimental stimuli is unknown. **PURPOSE:** To examine the effect of whole-body resistance exercise training (RET) on pain sensitivity among GV with CMP. It was hypothesized that, compared to a wait-list control (WLC) condition, sensitivity to painful stimuli would significantly decrease over time in participants assigned to RET. METHODS: GV who met criteria for widespread CMP were randomly assigned to a 16-week, whole-body resistance exercise training program (*n*=21; 49±5 years) or a wait-list control group (*n*=19; 50±7 years). Pain sensitivity was measured by recording perceptual ratings (0-20) of pain intensity and unpleasantness in response to a series of noxious thermal stimuli (45ºC, 47ºC, 48.9ºC) at baseline, 6, 11, and 17 weeks. Separate three-way repeated measures MANOVA models with time (baseline, 6, 11, and 17 weeks) and temperature (45ºC, 47ºC, 48.9ºC) as the within-subjects factors, and group (RET, WLC) as the between-subjects factor were used to examine the effect of RET on pain intensity and unpleasantness ratings. **RESULTS:** Whole body strength improved across the 16-week training period (average 1-RM%

change from baseline across 10 upper & lower body exercises = 28.95%). Mean pain ratings across measurement time-points for 45ºC, 47ºC, and 48.9ºC stimuli corresponded to 3, 7, and 13, for intensity and 2, 5, and 10 for unpleasantness, respectively. Aside from a significant main effect of temperature in the intensity, $Λ = 0.14$, $F (2,29) = 90.79$, $p < .001$, and unpleasantness, $Λ = 0.17$, $F (2,29) = 72.14$, $p < .001$, MANOVA models, there were no significant main or interaction effects. **CONCLUSIONS:** Resistance exercise training does not affect pain sensitivity in GV with CMP. Importantly, this finding suggests that resistance exercise has a low risk of exacerbating pain sensitivity and is a safe strategy for increasing upper and lower body strength in this population.

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Energy, Health, and Productivity Following a Sedentary Behavior Intervention in Workers with Low Back Pain

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(No relevant relationships reported)

Decreased sedentary behavior is related to several positive health outcomes, however, further investigation of potential effects on presenteeism, health, and productivity in desk workers with chronic low back pain is warranted. **PURPOSE:** The Stand Back randomized trial evaluated subjective measures of health and psychosocial well-being before and after a six month intervention to reduce sedentary behavior. **METHODS:** 24 individuals with chronic low back pain and desk jobs (sitting ≥ 20 hours/week) completed either the control or intervention group. The intervention included monthly behavior counseling, a sit-stand desk attachment, a wrist-worn activity prompter, and cognitive behavioral therapy for pain self-management. The Stanford Presenteeism Scale (SPS), Health Work Questionnaire (HWQ), the SF-36 Health Survey (SF-36), and self-reported work sitting questionnaire were administered at baseline and six months. All questionnaires and subscales were analyzed across intervention groups using ANCOVA regression, adjusting for baseline values. Cohen's d was used to estimate effect size. **RESULTS:** At six month follow-up, the intervention group reported 1.5 hours/day less sitting time (p<0.001) and decreased low back pain Oswestry Disability Index (-7.8%, p=0.027) compared to control. Compared to controls, the subscales of energy/fatigue, social functioning, and pain (SF-36) were significantly improved across groups at six months. Productivity (HWQ), concentration (HWQ), and SPS-score remained unchanged (Table 1). **CONCLUSION:** Interventions to reduce sedentary time may be effective in improving energy, social functioning, and pain with no negative impact on productivity and concentration in desk workers with chronic low back pain.

Table 1: Changes across groups at six months			
	β	p-value	*d*
Stanford Presenteeism Scale			
SPS score	1.69	0.367	0.37
Health Work Questionnaire			
Total Score	-0.04	0.905	0.03
Productivity	-0.17	0.675	0.16
Concentration/Focus	-0.74	0.269	0.39
Supervisor relations	0.04	0.944	0.02
Non-work Satisfaction	0.82	0.092	0.49
Work Satisfaction	-0.04	0.947	0.02
Impatience/Irritability	-1.12	0.073	0.64
SF-36			
General health	5.61	0.268	0.32
Physical functioning	8.22	0.166	0.38
Limitations (physical health)	4.68	0.674	0.11
Limitations (emotional problems)	18.79	0.115	0.56
Energy/Fatigue	18.13	≤0.001	0.84
Emotional well-being	6.90	0.077	0.36
Social functioning	11.92	0.024	0.62
Pain	8.85	0.036	0.48
Note: β = adjusted group effect, *d* = Cohen's d			

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Pain Coping Skills of Female Ultrarunners

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(No relevant relationships reported)

A female ultrarunner's ability to cope with stressful situations during competition is crucial for optimal development. Therefore, the ability to cope under these circumstances is essential for creating a strong mental capacity that leads to competitive success. **PURPOSE:** To quantify the pain coping skills of female ultra runners. **METHODS:** Following written informed consent, 76 female ultra runners (mean age 38.9 ± 9.4) completed the Sports Inventory for Pain (SIP; Meyers et al., 1992): direct coping (COP), cognitive (COG), catastrophizing (CAT), avoidance (AVD), body awareness (BOD), and total coping resources (TCR). Data were grouped by distance (<50 miles, 50-99 miles, 100+ miles), experience in years (novice-3, 4-9, 10+), age (20-39 years, 40+ years), number of ultra competitions completed (1-2, 3-4, 5+), ethnicity (Caucasian, other), present injury status (yes, no), and competitive injuries (0, 1-2, 3+). To make the data more meaningful, raw SIP scores were converted to normalized standard scores (T-scores) with a mean of 50 and a standard deviation of 10. **RESULTS:** MANOVAs (Wilks' λ criterion) indicated no significant effects across distance ($F_{12,136} = 1.256$, P = 0.252), experience ($F_{12,136} = 0.840$, P = 0.609), age ($F_{6,69} = 0.511$, P = 0.798), ultra competitions completed ($F_{12,136} = 1.004$, P = 0.449), ethnicity ($F_{6,69} = 0.395$, P = 0.880), current injury status ($F_{6,69} = 1.625$, P = 0.153), and competitive injuries ($F_{12,136} = 0.856$, P = 0.59). Coping skills among this group reflected above-average response, with T-scores ranging from 43 to 57. There is a trend for ultrarunners to respond more positively in COP, COG, CAT, AVD, BOD, and TCR when compared to normative values across other athletic populations. **CONCLUSION:** While the limited sample size may have affected the results, observed power was deemed adequate (1- β = .156 to .951), with data indicating that female ultrarunners respond positively under an adverse competitive environment. Further research is warranted to assess coping skills with larger ultra populations, as well as to determine the efficacy of coping skills interventions on ultra performance.

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Exercise For Improving Pain Sensitivity: Comparing Moderate-intensity Continuous And High-intensity Interval Training (HIIT).

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(No relevant relationships reported)

Aerobic exercise training appears to promote hypoalgesia, with larger effects on pain tolerance than pain threshold. However, little is known about the optimal exercise training intensity for improving pain sensitivity. High-intensity interval training (HIIT) is becoming popular as a time-efficient alternative to moderate-intensity continuous training (MICT), with evidence of similar or greater efficacy across a range of cardiovascular and metabolic adaptations, but its effect on pain sensitivity has not been examined.
PURPOSE: To compare the effects of 6 weeks of HIIT or MICT on pressure pain sensitivity in overweight or obese, sedentary males.
METHODS: Twenty-eight males (age 28 ± 7, BMI 28.6 ± 2.9) were randomly allocated to moderate (n=12) or high intensity (n=16) aerobic exercise training. Participants trained 3 sessions/week for 6 weeks on cycle ergometers. HIIT sessions involved 10 × 1minute intervals at 90-100% workload at maximal aerobic capacity (Wmax), interspersed with 1minute of active rest at 35% of Wmax. MICT sessions involved 30minutes continuous cycling at 65-75% heart rate maximum. Training protocols were matched for total workload. Pressure pain threshold (PPT) was measured pre- and post-training using algometry over the trapezius, thigh and tibialis anterior.
RESULTS: Following training, PPT increased (i.e. less pain) in MICT participants over the thigh (% change: $52\% \pm 60$, $d = 1.08$, $p = 0.004$) and tibialis anterior ($62\% \pm 58$, $d = 1.06$, $p = 0.003$) but not the trapezius ($28\% \pm 55$, $d = 0.44$, $p = 0.08$). For HIIT participants, PPT was unchanged at all sites following training (all d -0.05 to -0.17, all $p > 0.52$). The magnitude of the change in PPT after training for MICT compared to HIIT was greater at the thigh ($d = 1.14$, $p = 0.005$) and tibialis anterior ($d = 1.37$, $p = 0.001$) but not the trapezius ($d = 0.64$, $p = 0.1$).
CONCLUSION: Moderate but not high-intensity exercise training increases PPT in sedentary overweight males. The effect was largest at the worked muscles, suggesting regional-specific pain adaptations to exercise training. Inter-individual differences in PPT in response to training were prominent.

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Preferred Versus Novel Exercise Modalities on Endogenous Pain Inhibition Following Exercise

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(No relevant relationships reported)

Athletes have been shown to be less sensitive to pain than sedentary individuals. However, it is unclear whether their ability to modulate pain via conditioned pain modulation (CPM) differs. Exercise-induced hypoalgesia is a phenomenon related to CPM where pain sensitivity decreases following a bout of exercise. Little data exist on whether the EIH response differs between athletes and non-athletes. **PURPOSE:** The study examined the effects of aerobic training status of sensitivity to pressure pain following a familiar (running) and unfamiliar (handgrip) exercise. **METHODS:** The pressure pain response of highly aerobically trained (N=13; T) and untrained participants (N=10; UT) were tested before and after performance of an isometric hand grip exercise to failure, a 30-min run at 110% of gas exchange threshold, and placing their foot in an ice bath (2°C) for 1-min. Pressure pain thresholds (PPT) were assessed in the vastus lateralis (VL) and brachioradialis (BR) using a pressure algometer. The difference between post and pre measures was defined the EIH response (exercise conditions) and CPM response (ice bath). **RESULTS:** The groups differed on $VO_{2\,peak}$ (T = 72.2 ± 4.6; UN = 44.0 ± 8.0 ml·kg^{-1}·min^{-1}; p < 0.001). PPT did not differ between groups in the VL or BR following both exercise modalities or following the ice bath (p ≥ 0.05). A significant main effect for time was observed for VL PPT's with values increasing $18.2 \pm 14.3\%$ following 30-min of running (p < 0.001), $14.8 \pm 14.6\%$ following handgrip (p < 0.001), and 19.7 ± 22.0 following the ice bath. In the BR EIH occurred following handgrip ($26.5 \pm 23.2\%$ increase; p < 0.001) and the ice bath ($17.6 \pm 21.5\%$ increase; p < 0.001), but not the treadmill run (10.4 ± 19.2; p = 0.057). **CONCLUSIONS:** Training status and exercise type had no effect on EIH or CPM when PPT were assessed in the VL. Interestingly running was not a sufficient stimulus to evoke EIH in the BR. While familiarity with the exercise modality appeared to play no role in the EIH response, the exercise modality did play a role in systemic pain modulation with isometric exercise yielding a more robust response.

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Pain Modulation in Response to Resistance Exercise Training in Gulf War Veterans with Chronic Pain

Stephanie M. Van Riper[1], Aaron J. Stegner[1], Jacob B. Lindheimer[2], Ryan J. Dougherty[3], Neda E. Almassi[3], Jacob V. Ninneman[3], Laura D. Ellingson[4], Patrick J. O'Connor, FACSM[5], Dane B. Cook, FACSM[1]. *[1]US Department of Veterans Affairs, Madison, WI. [2]US Department of Veterans Affairs, East Orange, NJ. [3]University of Wisconsin-Madison, Madison, WI. [4]Iowa State University, Ames, IA. [5]University of Georgia, Athens, GA.*
(No relevant relationships reported)

United States military Veterans of the Persian Gulf War (GV) suffer unresolved chronic musculoskeletal pain (CMP) that significantly impacts their functional ability and quality of life. Pain modulation is impaired in some groups with CMP and can be augmented with acute exercise. Whether chronic exercise training influences pain modulation in GV with CMP is unknown. **PURPOSE:** To examine the effects of a 16-week resistance exercise training (RET) program on pain modulation in GV with CMP. **METHODS:** Forty GV with CMP were randomly assigned to RET (n=19) or a wait-list control group (WLC; n=21). The RET program was individualized to begin at a low intensity and involved standardized progression. Pain modulation was evaluated at baseline and 3 subsequent time points by comparing pain ratings to a series of painful heat stimuli delivered alone or concurrently with the Stroop color word task, which has two levels of cognitive difficulty: congruent (CS) and incongruent (IS). Variance to mean ratios (VMR) of pain modulation scores were calculated as an indicator of dispersion. Separate repeated measures MANOVA were used to examine the effect of group (RET vs. WLC) and time (1-4) on pain modulation (change in pain ratings) for both types of Stroop presentation. **RESULTS:** Groups did not differ on age, height, weight, or gender (p < 0.05). Whole body strength improved with training (average 1-RM% change from baseline across 10 upper & lower body exercises = 28.95%). No significant main or interaction effects were detected for either Stroop presentation (p > 0.05). The proportion of individuals demonstrating a pain modulatory response did not differ at any time point, X^2 (1, N=40) = 0.14-2.10, p > 0.05. Pain modulation scores where highly variable for both groups across each time point (VMR Range: CS 1.77-1.96; IS 2.74-5.07). **CONCLUSION:** The degree to which GVs with CMP modulate pain at baseline does not appear to change as a result of RET, however pain modulation scores were highly variable across groups and time points. The lack of a change in pain modulation suggests that resistance exercise training in GVs with CMP does not influence the pain regulatory mechanism assessed here. Supported by US Department of Veterans Affairs grant #I01CX000383.

Abstracts were prepared by the authors and printed as submitted.

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The Effects of Mirthful Laughter on Pain Tolerance and Delayed Onset Muscle Soreness.

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(No relevant relationships reported)

Chronic pain is a debilitating disease that affects more people than any other chronic disease. Currently, there is not a singular treatment known to cure or assure relief from chronic pain. Accordingly, the management of patients' discomfort is an integral part of treating chronic pain. Such treatment, however, is not effective for many patients. **PURPOSE:** We determined if mirthful laughter provided by comic relief can influence pain tolerance and muscle soreness in young healthy participants**. METHODS:** Forty participants underwent a randomized controlled cross-over designed experiment. Each participant was exposed to a comedy video eliciting mirthful laughter and a boring documentary. Delayed onset muscle soreness was induced in one leg at a time by eccentric exercises to mimic chronic pain. Pain tolerance was tested using the blunt force application**. RESULTS:** Watching the comedy video elicited a significantly greater irregular breathing pattern compared with watching the documentary video ($p<0.001$). After watching the comedy, the participants' positive affect was increased ($\Delta 2\pm1$) while it was largely decreased (Δ-11±2) after watching the documentary video ($p<0.001$). Pain tolerance was decreased by 17±5 N after viewing the documentary video ($p<0.001$), but did not change significantly after watching the comedy. There were no significant changes in the visual analogue pain/soreness score from viewing either video. **CONCLUSION:** Thirty-minutes of watching a comedy eliciting laughter favorably influenced pain tolerance in healthy humans.

E-12　Free Communication/Slide - **Physical Activity in Clinical Populations**

Friday, June 1, 2018, 9:30 AM - 11:15 AM
Room: CC-101G

2110　**Chair:** Matthew Harber, FACSM. *Ball State University, Muncie, IN.*

(No relevant relationships reported)

2111　June 1 9:30 AM - 9:45 AM

Physical Activity Levels and Smoking Status in Relation to Weight Control after Bariatric Surgery

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(No relevant relationships reported)

Smokers typically exhibit lower body weights than non-smokers despite poorer metabolic and physiologic profiles. Nicotine, an appetite suppressant found in cigarettes and cigars, may play a role in weight control. Physical activity also contributes to lower body weights; however, this simultaneously reduces all-cause mortality, risk of coronary artery disease, and other chronic conditions. **PURPOSE:** To investigate if smoking status has an impact on weight loss and physical activity levels in patients 1-17 years after Roux-en-Y gastric bypass (RYGB). **METHODS:** A total of 509 individuals who had previously undergone RYGB (1-17 years post) were recruited for this study. To assess physical activity habits, participants were asked, "How many times per week do you exercise for 30 min or more at an intensity that makes you sweat or breathe hard?" Participants were also asked if they were a current smoker, ex-smoker or never smoked. **RESULTS:** The sample consisted of 22% smokers (114 total, 81 females), 47% never-smokers (239 total, 190 females) and 31% ex-smokers (156 total, 120 females). There were no significant differences in smoking status ($p=.45$) or physical activity ($p=.57$) between sexes. Current smokers had the highest BMI change (-21.2$\pm$.8kg/m^2) compared to both never-smokers (-18.8$\pm$.6kg/m^2; $p=.01$) and ex-smokers (-18.7$\pm$.7kg/m^2; $p=.02$) while there was no significant difference between never-smokers and ex-smokers ($p=.97$). Ex-smokers reported being significantly more active (1.7$\pm$1.9bouts) compared to current smokers (1.1$\pm$1.7bouts; $p=.01$) while there were no differences in activity between never-smokers (1.5$\pm$1.7bouts) and current smokers ($p=.07$). **CONCLUSIONS:** Although smokers lost the greatest amount of weight post-surgery, they also reported being inadequately active. Post-surgical follow-ups should evaluate numerous health measures as indicators of surgical success, as long term weight change may also be equally affected by both healthy and unhealthy habits.

2112　June 1 9:45 AM - 10:00 AM

The Effect Of Changes In Physical Activity After Bariatric Surgery On Health Outcomes.

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(No relevant relationships reported)

BACKGROUND:The prevalence of obesity is increasing at an alarming rate, as is the number of morbidly obese individuals (i.e. BMI>40) in our society. Bariatric surgery is considered an effective treatment for morbid obesity with promising results on weight control, quality of life and health. However, the success of bariatric surgery in terms of health outcomes varies largely, which might be related to changes in physical activity from pre- to post-surgery. **PURPOSE**: This study aims to determine whether pre- to post-surgery changes in physical activity were associated with health outcomes such as, excessive weight loss, VO$_2$max, fat-free mass and quality of life up to two years after surgery.
METHODS: 3879 post-bariatric patients were divided into three groups based on pre- to post-surgery change in physical activity: decrease, stable and increase. Measurements regarding physical activity (Baecke questionnaire), body composition (bioelectrical impedance analysis), cardiorespiratory fitness (Astrand) and quality of life (SF-36) were performed pre-surgery and two years post-surgery. Linear regressions between change in physical activity and change in health outcomes were conducted. **RESULTS**: Increasing physical activity was associated with larger excessive weight loss ($\beta=3.17$; 95%CI=1.40-4.93; $P<0.001$) and greater increases in VO$_2$max ($\beta=2.01$; 95%CI=0.51-3.51; $P=0.009$) and %fat-free mass ($\beta=1.05$; 95%CI=0.50-1.60; $P<0.001$) compared to stable- and declining physical activity. Decreasing physical activity was associated with a decrease in VO$_2$max ($\beta=-3.91$; 95%CI=-6.40- -1.43; $P=0.002$). The increase-group showed greater increases in all quality of life subscales compared to stable- and decrease-group ($P<0.05$), except for physical functioning. Change in physical activity was not related to changes in absolute fat-free mass.
CONCLUSIONS: Increasing physical activity from pre- to post-surgery was associated with greater excessive weight loss and greater improvements in body composition, cardiorespiratory fitness and quality of life. Therefore, increasing physical activity after bariatric surgery seems essential for bariatric success in terms of health outcomes.

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Effect of Obesity Coupled with Resting Alveolar-capillary Function on Exercise Capacity and Ventilatory Efficiency in Adult Heart Failure

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(No relevant relationships reported)

PURPOSE: Impaired oxidative capacity and exercise ventilatory inefficiency are primary features of human heart failure (HF). Although commonly assessed at rest, pulmonary limitations at the alveolar-capillary level also impact exercise. While it remains unclear how these interdependent features of HF contribute to exercise intolerance; obesity may further confound this issue. This study aimed to assess the impact of resting alveolar-capillary function on exercise capacity and ventilatory efficiency in obese (O) and non-obese (NO) HF patients.
METHODS: Male HF undergoing cardiopulmonary exercise testing (CPET) were stratified as NO or O (N=55 vs N=31; age 57$\pm$13 vs 55$\pm$13 yrs; LVEF 28$\pm$11 vs 30$\pm$11 %; BMI 26$\pm$2 vs 34$\pm$2 kg/m^2; NYHA class I-IV: 23 vs 5, 20 vs 16, 11 vs 9, 1 vs 1, respectively). Breath-by-breath ventilation and gas exchange were continuously measured via open circuit spirometry during CPET. Lung diffusion capacity for carbon monoxide (DL$_{CO}$) and alveolar volume (V$_A$) were measured at rest. The mixed expired CO$_2$ and end-tidal CO$_2$ ratio was used to estimate global ventilation-perfusion matching (PECO$_2$/P$_{ET}$CO$_2$~0.60 airway limited; ~0.70 airway/perfusion limited). The ventilatory equivalent for CO$_2$ (V$_E$/VCO$_2$) slope was calculated rest to peak exercise. RESULTS: NO and O resting DL$_{CO}$ (25$\pm$5 vs 24$\pm$5 mL/min/mm Hg), V$_A$ (6$\pm$1 vs 6$\pm$1 L) and DL$_{CO}$/V$_A$ (4$\pm$1 vs 4$\pm$1 mL/min/mm Hg/L) were similar (all P>0.05). Peak exercise RER (1.14$\pm$0.12 vs 1.12$\pm$0.15), VO$_2$ (1.8$\pm$0.7 vs 1.8$\pm$0.7 L/min), PECO$_2$/P$_{ET}$CO$_2$ (0.74$\pm$0.05 vs 0.76$\pm$0.04) and V$_E$/VCO$_2$ slope (35$\pm$12 vs 32$\pm$5) did not differ in NO and O (all P>0.05). Peak VO$_2$ correlated with DL$_{CO}$ and V$_A$ in NO and O (r=0.66 vs 0.48; r=0.62 vs 0.49; all P<0.05), but not for DL$_{CO}$/V$_A$ (r=0.11 vs 0.08). V$_E$/VCO$_2$ slope correlated with DL$_{CO}$ and V$_A$ in NO (r=-0.54 and -0.49; both P<0.05), but not O (r=-0.26 and -0.06); whereas DL$_{CO}$/V$_A$ was similar (r=-0.15 vs -0.25). Peak PECO$_2$/P$_{ET}$CO$_2$ correlated with DL$_{CO}$ and V$_A$ in NO (r=0.33 and 0.37), but only V$_A$ in O (r=0.37) (all P<0.05); whereas DL$_{CO}$/V$_A$ was similar (r=-0.06 vs -0.05).

CONCLUSION: These data suggest that exercise capacity, ventilation-perfusion matching, and ventilatory efficiency are similar in NO and O HF. However, the translation of resting alveolar-capillary function to these interdependent measures of exercise capacity may be confounded by obesity.

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Obstructive Sleep Apnea Negatively Impacts Objectively Measured Physical Activity

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(No relevant relationships reported)

Obstructive sleep apnea (OSA) is a disorder that results daytime sleepiness and fatigue. Additionally, OSA increases the risk for cardiovascular disease and diabetes, which is exacerbated by sedentary behavior. Obesity and OSA are frequent co-morbid conditions, so the impact of OSA, independent of obesity, on physical activity (PA) is not clear.
PURPOSE: To examine the effect of OSA on objectively measured PA via accelerometer.
METHODS: Overweight-to-obese individuals were recruited and screened for the presence of OSA via portable diagnostic device and divided into an OSA group [n = 35; Age = 45.2 ± 12.0; body mass index (BMI) = 33.0 ± 5.7 kg/m^2] and a Control group (n = 24; Age = 35.0 ± 11.7; BMI = 30.5 ± 4.3 kg/m^2). Daytime sleepiness was assessed with the Epworth Sleepiness Scale questionnaire. Body composition was assessed with dual-energy X-ray absorptiometry. Subjects wore an accelerometer for a minimum of 4 and maximum of 7 days, including at least 1 weekend day.
RESULTS: The OSA group's mean OSA severity (Apnea-Hypopnea Index = 20.4 ± 17.6) classifies as "moderate OSA". There were no group differences in BMI, percent fat, or daytime sleepiness. Waist (106.4 ± 11.7 vs. 98.6 ± 9.1) and neck circumference (41.9 ± 3.3 vs. 38.8 ± 2.7) were higher in the OSA group. The OSA group was significantly older than the control group. Pearson correlation analysis showed that age was not related to any PA variable except for the total number of moderate or greater PA bouts (PA for ≥ 10 consecutive minutes) and the average number of bouts per day. The OSA group had fewer steps (6409.0 ± 2317.6 vs. 7856.8 ± 2942.7, P = 0.04), moderate intensity minutes (29.9 ± 15.1 vs. 44.2 ± 25.4, P < 0.01), moderate-to-vigorous minutes (33.0 ± 3.0 vs. 46.0 ± 5.4, P = 0.03), total number of bouts (3.2 ± 3.4 vs. 5.9 ± 5.0, P = 0.02), and number of bouts per day (0.5 ± 0.5 vs. 1.0 ± 0.8, P = 0.01). When adjusted for age, the PA bout data was no longer significant.
CONCLUSION: Individuals screened as likely possessing OSA were less physically active than individuals without OSA when measured through objective means. We found no group differences in daytime sleepiness, BMI or percent fat, suggesting other mechanisms than obesity and sleepiness for this difference.

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Patterns of Prolonged, Uninterrupted Sedentary Bouts in the First Month after Acute Coronary Syndrome

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(No relevant relationships reported)

Total volume of sedentary behavior (SED) and its accrual in prolonged, uninterrupted bouts are crucial health risk behaviors to target in U.S. adults. Acute coronary syndrome (ACS) survivors engage in high volumes of SED post-hospitalization, but their accrual of prolonged, uninterrupted bouts is unclear.
PURPOSE: Characterize patterns of SED time accrued in prolonged, uninterrupted bouts and their trajectories of change in ACS patients over the first month post-discharge. **METHODS:** Participants (n=162) with confirmed ACS (myocardial infarction or unstable angina) from a university hospital in Manhattan were examined. SED was objectively measured for 28-days post-discharge via Actical wrist accelerometry. SED bout characteristics were quantified at the day-level and averaged over the 28-day period. Group-based modeling at the day-level was used to characterize the trajectories of change in SED bouts (% of total SED time accrued in ≥ 30 min) over the 28-days. **RESULTS:** Participants spent a mean (SD) of 9.5 ± 2.0 hrs/day in SED time, with a mean (SD) SED bout length of 7.1 ± 2.4 mins/bout, over one month post-discharge. The total number of SED bouts ≥30, ≥60 and ≥90 mins were, on average, 4.9 ± 2.3, 1.2 ± 0.8, and 0.3 ± 0.3 bouts/day, accounting for 31.8 ± 12.8%, 12.1 ± 8.2%, and 4.9 ± 4.8% of total SED time, respectively. Four distinct SED bout trajectory groups were identified (Fig 1). The very high (12.2%), high (38.3%), and moderate (38.9%) trajectory groups accrued, on average, 52.0%, 38.1%, and 25.7% of total SED time from bouts ≥30 min, respectively, with little change in day-level SED bouts post-discharge. The low trajectory group (10.6%) accrued, on average, 9.8% of total SED time from bouts ≥30 min, with a decline in SED bouts post-

discharge. **CONCLUSION:** ACS survivors accrued ~30% of total SED in prolonged, uninterrupted bouts ≥ 30 min, on average, after hospitalization, with the majority showing little day-level change in such bouts over the first month post-discharge.

Figure 1. Trajectories of total sedentary time accrued in bouts ≥ 30 minutes in ACS survivors post-discharge.
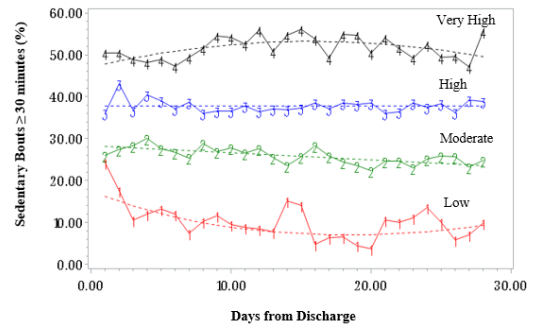
2116   June 1 10:45 AM - 11:00 AM

Abstract Withdrawn

2117   June 1 10:45 AM - 11:00 AM

Effects of Eccentric and Concentric Cycling on Markers of Oxidative Stress and Inflamation in Elderly

Luis Peñailillo[1], Karen Mackay[1], Roberto Gonzalez[1], Denisse Valladares[1], Ariel Contreras-Ferrat[1], Hermann Zbinden-Foncea[1], Kasunori Nosaka[2]. *[1]Universidad Finis Terrae, Santiago, Chile. [2]Edith Cowan University, Perth, Australia.* (Sponsor: Alvaro Gurovich, FACSM)
(No relevant relationships reported)

PURPOSE: The aim of this study was to examine the plasma concentration of oxidative stress and inflammation markers before and immediately after a moderate intensity concentric cycling bout, a moderate intensity eccentric cycling bout and high intensity eccentric cycling bout. **METHODS:** Ten healthy elderly participants (60.36 ± 6.79 years) performed 30 min of a concentric cycling bout (CONC) at 50% of the maximum power output (POmax), an eccentric cycling bout at 50% of POmax (ECC ISO PO) and an eccentric cycling bout at 50% of peak oxygen consumption (~100% POmax; ECC ISO VO2). Each bout was separated with one-week washout period. Before and after cycling blood samples were collected and plasma was stored at -80ºC until analyzes. Oxidative stress markers (MDA; protein carbonyl), antioxidant markers (total antioxidant capacity; glutathione peroxidase) and inflammatory markers (IL-6 and TNF- α) were analyzed using ELISA kits. Furthermore, indirect muscle damage markers were assessed before, immediately after and 24 and 48 h after exercise.
RESULTS: Average power output of ECC ISO VO2 was 48.8% and 41.8% higher than CONC and ECC ISO PO, respectively. Oxygen consumption during ECC ISO PO was 50% and 40% lower than CONC and ECC ISO VO2, respectively. Heart rate during ECC ISO PO was 16.8% and 23% lower than CONC and ECC ISO VO2, respectively. MDA concentration decreased immediately after CONC (-28%) and ECC ISO PO (-21.8%), but not after ECC ISO VO2. Glutathione peroxidase concentration increased after all three bouts of exercise (CONC=20.2%, ECC ISO PO= 27.2% and ECC ISO VO2=26.8%). IL-6 increased (+18%) only after ECC ISO VO2. Muscle damage was greater after ECC ISO VO2 than ECC ISO PO and CONC. **CONCLUSION:** Moderate intensity eccentric cycling (ECC ISO PO) showed lower metabolic cost than concentric cycling for the same power output. Interestingly, moderate eccentric cycling induced similar oxidative stress than concentric cycling at lower metabolic cost. However, high intensity eccentric cycling (ECC ISO VO2) induces moderate muscle damage and inflammation, which may blunt the decrease of oxidative stress induced by lighter bouts of cycling. The moderate eccentric cycling exercise is safe with low risk of increasing inflammation and oxidative stress on elderly people.

2118   June 1 11:00 AM - 11:15 AM

Impact of 10-weeks Of High Intensity Interval Training On the Myokine METRNL And Inflammatory Markers In Older Adults With Rheumatoid Arthritis Or Prediabetes

David Bartlett. *Duke University, Durham, NC.* (Sponsor: William E. Kraus, FACSM)

(No relevant relationships reported)

PURPOSE: Rheumatoid arthritis (RA) and diabetes are inflammatory diseases associated with physical inactivity. Physical inactivity and inflammation are augmented by dysregulated skeletal muscle remodeling. During exercise, skeletal muscle produces a number of factors, termed 'myokines', which enhance exercise adaptations. One such myokine, meteorin-like protein (METRNL), regulates both muscle and systemic adaptations. The purpose of this study was to examine the effects of high-intensity interval training (HIIT) in older adults with RA or prediabetes on muscle and plasma METRNL.
METHODS: Twenty-two older adults (67 ± 7 years) with either RA (n=12) or prediabetes (n=10) completed 10 weeks of HIIT consisting 3 x 30 min sessions/week of ≥ 60 second intervals at 80-90% interspersed by 50-60% VO_{2peak}. Clinical characteristics, blood and skeletal muscle METRNL and inflammatory markers were assessed before and after HIIT.
RESULTS: Following 10 weeks of HIIT, plasma METRNL increased in those with RA ($p=0.02$) but not in those with prediabetes ($p=0.568$). Muscle METRNL mRNA increased following exercise in those with prediabetes ($p=0.002$) but not RA ($p=0.986$) while muscle METRNL concentrations increased in both groups ($p<0.05$). Greater plasma METRNL with exercise was associated with a reduced percentage of inflammatory CD14+/CD16+ monocytes in those with RA ($p<0.05$). Greater METRNL mRNA with exercise was associated with greater muscle IL-8 ($r =.571$; $p=0.007$). Greater muscle METRNL with exercise was associated with greater concentrations of muscle IL-10 and IL-6 (both $r >.663$; $p<0.003$); greater muscle IL-6 with exercise was associated with better grip strength and 30-second chair stands (both $r >.443$; $p<0.05$).
CONCLUSIONS: Although METRNL was not associated with changes in disease indices, exercise-induced increased plasma and muscle protein and mRNA were associated with improved inflammatory profiles. Our data suggest METRNL is associated with a beneficial inflammatory response to exercise training in patients with inflammatory disease; although protein translation responses may differ depending on the disease. Thus, HIIT may improve the coordination of cytokines and myokines critical for skeletal muscle and systemic exercise-induced adaptations. *Funding: EU Marie Curie (PIOF-GA-2013-629981).*

E-13   Clinical Case Slide - **Hip and Pelvis II**

Friday, June 1, 2018, 9:30 AM - 11:30 AM
Room: CC-200E

2119   **Chair:** John Hatzenbuehler, FACSM. *St. Luke's Family Medicine, South Portland, ME.*

(No relevant relationships reported)

2120   **Discussant:** William W. Briner, FACSM. *Hospital for Special Surgery, Uniondale, NY.*

(No relevant relationships reported)

2122   June 1 9:30 AM - 9:50 AM

Pelvic Injury - Weightlifting

Erin S. Barnes. *Temple University, Philadelphia, PA.* (Sponsor: Mark Lavallee, FACSM)

(No relevant relationships reported)

HISTORY: A 34-year-old female was competing in the 90 kilogram weight-class at a national weightlifting competition. During her 3rd snatch attempt at 80 kilograms, the athlete was able to bring the barbell overhead. She failed to control the barbell and missed the lift behind her head, which resulted in the bar landing on her left posterior hip and lower back. She fell forward on both hands and knees and then to the platform. Medical team was present and immediately assessed the athlete.
PHYSICAL EXAMINATION: Urgent examination revealed an athlete lying on her back with her left hip slightly flexed with severe pain at rest and with passive movement of the hip joint. She was unable to move her left hip voluntarily. Her bilateral lower extremity sensory exam was intact and reflexes were symmetric. She was able to flex and extend both knees and ankles. There were no deformities on palpation of her lumbar spine and sacroiliac joints.
DIFFERENTIAL DIAGNOSIS: Posterior hip dislocation, Iliac Crest fracture, Hip Pointer, Acetabular Fracture, Femoral Neck Fracture

TEST AND RESULTS: XR AP Pelvis: showed a left comminuted acetabular fracture with an associated posterior hip dislocation
FINAL WORKING DIAGNOSIS: Acetabular pelvic fracture and posterior hip dislocation
TREATMENT AND OUTCOMES: She was transported to the local Emergency Room where she was evaluated and imaging was performed. She required a higher level of care and was transferred to a high level trauma center where she was admitted. The next morning (Monday), she underwent a surgical reduction of the posterior hip dislocation. She remained in traction until Tuesday when she had an additional CT scan and was taken back to the operating room for an open reduction, internal fixation of the acetabular fracture. She was up on crutches the next morning after surgery and spent one additional night in the hospital until being released on Thursday evening before flying home the next afternoon (Friday). After being admitted on Sunday night, she spent 4 days/nights total in the hospital and one night in a hotel. 5 days after the incident, she returned home to Utah.
The patient was non-weight bearing for 8 weeks. She was in formal physical therapy for 10 weeks and was able to ambulate without assistance 2.5 months after accident. She has slowly begun to return to weightlifting by 11 months post-injury.

2123   June 1 9:50 AM - 10:10 AM

Groin Injury- Football

Amanda Chaney[1], Amanda Goodale[1], Richard Okragly[1], Henry Stiene, FACSM[2]. [1]*Trihealth Sports Medicine, Cincinnati, OH.* [2]*Beacon Orthopedics and Sports Medicine, Cincinnati, OH.* (Sponsor: Henry Stiene, MD, FACSM)

(No relevant relationships reported)

HISTORY: A 22 year old division III college football player was running during practice and tried to make a cut on 8/22/17 and felt a pull in his left groin. The patient was evaluated by the athletic trainer and was diagnosed with adductor strain. He met with the athletic trainer frequently over the next few weeks to treat his pain with modalities such as laser therapy, electrical stimulation and cupping as well as doing strengthening exercises and activity modification. During game on 9/9/17, athlete played most of the game but had great amount of pain. He woke up the morning of 9/11 and noticed that he was severely bruised at the left groin region and was unable to walk without discomfort. The athlete said that he felt pain radiating into his abdomen and down into his left leg. At that point, he was referred to our Sports Medicine clinic.
PHYSICAL EXAMINATION:General: under no acute distress; alert and oriented Heart: regular rate and intact distal pulses; Lungs: CTA bilaterally; Abdomen: soft, mildly tender at right and left lower quadrants, non-distended, normal bowel sounds in all four quadrants; Groin- diffuse ecchymosis at left groin region & at pubic symphysis and left pubic tubercle; tender to palpation at left side of pubic region as well as at left lower quadrant of abdomen; weak left hip adductors & hip flexors noted on exam and pain with hip adduction and hip flexion **DIFFERENTIAL DIAGNOSIS**: 1. Left hip Adductor strain 2. Left hip Adductor tear 3. Left pubic tubercle bone contusion 4. Left Iliopsoas strain **TEST AND RESULTS**: Left Hip X-ray AP and Lateral: no acute fracture or abnormal findings MRI of Pelvis w/o contrast: left adductor longus tear with 2.5cm of retraction **FINAL WORKING DIAGNOSIS**: Left adductor tendon avulsion with approximately 2.5 cm of tendon retraction.
TREATMENT AND OUTCOMES: The athlete had approximately two weeks of rest after time of diagnosis. The consulting orthopedic surgeon recommended conservative treatment with activity modification and rehab exercises as he was desiring to finish his senior season. He continue to report pain with activity and at the conclusion of the season, will likely be reimaged to determine if conservative treatment is still acceptable or if injury has worsened further to the point of requiring surgery.

2124   June 1 10:10 AM - 10:30 AM

Testicular Pain- Football

Mary Iaculli, DO. *Evergreen Sports Medicine Fellowship, Augusta, ME.* (Sponsor: Peter Sedgwick, MD, FACSM)

(No relevant relationships reported)

HISTORY: 21 year-old collegiate football player presents to the clinic with recurrent, intermittent, severe left testicular pain occurring at rest for the past two weeks. The first episode was so severe it prompted him to go to the emergency department. There, urinary studies were performed which were negative for infection and he underwent a scrotal ultrasound. The ultrasound showed decreased left testicular vascularity, but negative for torsion. The pain had mostly resolved at the time of imaging. He returned to the ED the following day with another severe episode and underwent a second scrotal ultrasound, which showed swelling of epididymis. He was treated empirically for epididymitis with ciprofloxacin and asked to follow up.
At follow up, he reports his testicular pain is gradually improving but is still sore. Denies swelling or redness of testicle. No urinary symptoms. Denies risk factors for sexually transmitted infections. Denies history of genitourinary surgery. He admits to third episode that occurred one year prior and self-resolved with ice.
PHYSICAL EXAMINATION: Well appearing, no acute distress. Abdomen soft. No inguinal, femoral, ventral hernia. Normal scrotum bilaterally without erythema or rash. Normal vas deferens bilaterally, normal spermatic cord bilaterally. Left epididymidis

FRIDAY, JUNE 1, 2018

not enlarged, but mildly tender to palpation. Right normal. Left testes with Bell Clapper deformity, non-tender, no mass. Right testes normal. Circumcised penis with normal meatus.
DIFFERENTIAL DIAGNOSIS: Testicular torsion-detorsion syndrome; Epididymitis; Torsion of testicular appendage; Orchitis Inguinal hernia; Varicocele; Hydrocele; Epididymal hypertension
TEST AND RESULTS Urinalysis: negative; Urine culture: negative; Scrotal US 9/22/17: Left epididymitis. Normal testicles with symmetric blood flow; Scrotal US 9/23/17: modestly decreased but present vascularity of left testicle of uncertain significance but incompatible with torsion at this time. **FINAL WORKING DIAGNOSIS**: Testicular torsion-detorsion syndrome
TREATMENT AND OUTCOMES:
Referred to urology; Withheld from contact play until evaluated by urology; Urology recommended orchiopexy, which was performed within 1 week of specialty evaluation; Per urology, can return to aerobic and contact activity 2 weeks after procedure

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2125   June 1 10:30 AM - 10:50 AM
Hip Pain - Hiking
Cory Mitchell, Caitlin Waters, Herb Stevenson. *UMass Memorial Medical Center, Worcester, MA.* (Sponsor: Pierre Rouzier, FACSM)
(No relevant relationships reported)

HISTORY: A 78-year-old male is seen for evaluation of left lateral thigh pain. Symptoms present over the past few years but have worsened over the past six months. Recalls no specific onset. Pain is 3/10 and aching in quality. It is located over the lateral hip and thigh. Symptoms are worse with lifting and hiking, particularly on an incline. Pain is better with rest and does not radiate. He has associated burning, also with activity, in the same distribution. Denies back pain. He has no allergies, is a former smoker and takes medications for high blood pressure and cholesterol. Denies prior injuries or surgeries of the back, hip or legs.
PHYSICAL EXAMINATION: GEN: A&Ox3, in NAD. Central obesity. HEENT: NCAT. EOMI. CV: RRR, 2+ peripheral pulses PULM: CTAB SKIN: No rashes or signs of infection. NEURO: Symmetric strength and sensation in all 4 extremities. MSK: No deformity of the left hip. He has tenderness over the anterior greater trochanter but is otherwise nontender. External/internal rotation full, passive flexion to 110. Resisted abduction causes pain without reproduction of burning sensation. Negative FABER and FADIR. Antalgic gait. Lumbar spine non-tender. Full flexion/extension. Negative straight leg raise.
DIFFERENTIAL DIAGNOSIS: Gluteus medius/minimus tendinopathy Left hip osteoarthritis IT Band syndrome Piriformis syndrome
TEST AND RESULTS: Left hip x-ray: Mild degenerative changes Rheumatologic consult: Negative screening labs Left hip MRI: Partial tear of the gluteus minimus tendon Neurosurgery consult: Lumbar spine MRI - negative Physiatry consult: EMG left leg - normal, cannot rule out lateral femoral cutaneous neuropathy
FINAL WORKING DIAGNOSIS: Gluteus minimus tendinopathy with partial tear Meralgia paresthetica
TREATMENT AND OUTCOMES:
12-week course of physical therapy: 40% decrease in pain, burning feeling unchanged. Palpation-guided greater trochanteric bursa cortisone injection: minimal relief. Ultrasound-guided needle tenotomy of gluteus minimus tendon: resolution of antalgic gait with 50% improvement in pain without an effect on burning sensation. Ultrasound-guided nerve block and cortisone injection: resolved burning symptom without effect on lateral hip pain. Returned to regular daily activities and household chores. Yet to resume hiking due to lack of muscular endurance.

2126   June 1 10:50 AM - 11:10 AM
Left Hip Pain and Swelling Following a Bicycle Accident
George A. Ceremuga[1], Edward R. Laskowski, FACSM[2], Kristina M. Colbenson[2]. *[1]Mayo School of Graduate Medical Education, Rochester, MN. [2]Mayo Clinic, Rochester, MN.* (Sponsor: Edward Laskowski, FACSM)
(No relevant relationships reported)

HISTORY
A 45-year-old male bicyclist presented for evaluation of left hip pain and swelling following a bicycle accident that occurred approximately one week prior to presentation. His chief complaint was left groin and posterolateral gluteal region pain that increased with activity and improved with rest and anti-inflammatory medications. Radiographs were performed revealing no definite acute fractures of the left hip. MRI revealed nondisplaced fractures of right sacral ala and left superior and inferior pubic rami as well as a large lentiform fluid collection overlying left gluteal musculature.
PHYSICAL EXAMINATION: Healthy-appearing individual in no apparent distress. Normal gait cadence and stride. Significant ecchymosis with underlying, ballotable, fluid collection of left lateral hip and gluteal region. Tenderness to palpation in this

region. Joint range of motion is full. Strength is full and sensation is grossly intact throughout. Discomfort with hip internal rotation and Stinchfield's and FABER tests on left. Straight leg raise is negative bilaterally.
DIFFERENTIAL DIAGNOSIS:
1.Morel-Lavallee Lesion
2.Gluteus maximus contusion
3.Fracture of the greater trochanter
TESTS AND RESULTS
Left hip radiographs: No definite acute fractures involving left hip.
Left hip MRI: Nondisplaced fractures of the right sacral ala and left superior and inferior pubic rami. Large lentiform fluid collection overlying the left gluteal musculature with surrounding subcutaneous edema, consistent with a Morel-Lavallee lesion.
FINAL/WORKING DIAGNOSIS:
Moral-Lavallee Lesion
TREATMENT AND OUTCOMES
1. Touch weightbearing crutch ambulation for left lower extremity and use of compression shorts.
2. Ultrasound-guided needle aspiration of gluteal fluid collection: 180 cc of serosanguineous fluid obtained; compression dressing applied afterwards.
3. Two weeks later, surgical evaluation revealed 15 x 10 cm reaccumulation of fluid in the same location. Advised to undergo incision and drainage and partial capsulectomy. Surgery was without complications and a JP drain was placed.
4. Left thigh JP drain exchange performed for clogged drain.
5. Drain removed but 4 days later repeat aspiration of 32 cc was performed.
6. One week later, repeat aspiration of 32 cc was performed, followed by complete resolution.

2127   June 1 11:10 AM - 11:30 AM
"Hip Pop"- Acute Anterior Thigh Pain in an Adolescent Soccer Player
Jonathan Koretoff. *University of Minnesota, Minneapolis, MN.* (Sponsor: Suzanne Hecht, FACSM)
(No relevant relationships reported)

HISTORY: 15 year-old male club soccer athlete reported acute onset of left proximal thigh pain after sprinting straight ahead while playing in a game in a soccer tournament. He was the starting goalie for the team. While running, he felt a pop in his proximal thigh with inability to bear weight. Reported the sensation occurred while sprinting. He collapsed on the field and was evaluated by a sideline sports medicine physician as well as a certified athletic trainer. He was then transported to the on-site medical clinic. No numbness and tingling. No prior pain or injury.
PHYSICAL EXAM:
GEN: Mild distress while sitting in wheelchair. No distress while lying flat. Awake, alert, and oriented x 3
MSK: LEFT HIP: No bruising or gross deformity. Tenderness over proximal hip flexors. Tenderness on posteromedial aspect of hip adductor musculature. Unable to raise leg from the exam table unassisted. Marked pain with active range of motion in flexion with knee extended. Moderate pain with passive hip flexion. Unable to bear weight. 2/5 strength in hip flexion. FABER/FADIR elicited pain over proximal quadriceps. No bony pelvic tenderness
LUMBAR SPINE: No bruising or gross deformity. Non tender spinous processes and paraspinal musculature. No radicular pain with straight leg raise. Achilles and patellar reflexes bilaterally symmetrical
DIFFERENTIAL DIAGNOSIS: 1) Apophyseal avulsion fracture 2) Proximal quadriceps tendon rupture 3) Pathologic femoral fracture 4) Referred pain secondary to lumbar spinal pathology
TEST AND RESULTS: Xray left hip (AP and lateral): Lesser trochanteric apophyseal avulsion fracture, minimally displaced
FINAL WORKING DIAGNOSIS: Lesser trochanteric apophyseal avulsion fracture
TREATMENT AND OUTCOMES: He was placed non-weight bearing on crutches. At follow-up 1 week post injury he lacked active range of motion of his left hip. After his initial clinic visit, further follow up occurred at 2 weeks, 1 month, and 2 months. At 2 weeks he could bear weight with pain but lacked active range of motion. At 1 month he could bear weight without pain but lacked active range of motion. At 2 months he could bear weight and hop without pain but had 3/5 hip strength and had active range of motion with no pain. Referred to physical therapy. He is now enrolled in return to run program. Imaging at 6 weeks and 2 months showed stable fracture.

E-14   Clinical Case Slide - **Shoulder and Elbow**

Friday, June 1, 2018, 9:30 AM - 10:50 AM
Room: CC-200F

2128   **Chair:** Mary Lloyd Ireland, FACSM. *UK Healthcare Sports Medicine, Lexington, KY.*

(No relevant relationships reported)

2129   **Discussant:** Edward G. McFarland, FACSM. *The Johns Hopkins University, Lutherville, MD.*

(No relevant relationships reported)

2130   **Discussant:** Lauren M. Simon, FACSM. *Loma Linda University Medical Center, Loma Linda, CA.*

(No relevant relationships reported)

2131   June 1 9:30 AM - 9:50 AM

Suprascapular Nerve Entrapment or Compression in a Kayaker

Christa L. LiBrizzi, Jorge Rojas, Uma Srikumaranan, Edward G. McFarland. *The Johns Hopkins University, Lutherville, MD.* (Sponsor: Brian Krabak, FACSM)

(No relevant relationships reported)

HISTORY:
A 20-year-old male kayaker presented for a second opinion for increasing pain and dysfunction in his right, dominant shoulder joint for five months. The pain had begun insidiously with no history of trauma. The patient described the pain as aching, sharp, and burning which progressed to become constant in nature. The patient's pain was exacerbated specifically by kayaking and had become so severe that he had to cease participation. **PHYSICAL EXAMINATION**: The active range of motion of his shoulders was normal and symmetric. He had normal range of motion of his cervical spine. To inspection he had notable atrophy of his supraspinatus and infraspinatus of his right but not left shoulder. He had no winging but did have scapular dyskinesis. He had weakness to external rotation in the right shoulder with the arm at the side, but he had a negative external rotation lag sign. He had weakness to resisted abduction with the shoulder abducted 90 degrees and the elbow extended. He otherwise was neurologically intact for sensory, motor and reflex testing in both upper extremities. He had a negative Spurling's test. He had pain with elevation of the arm, but was not tender anywhere around the shoulder. **DIFFERENTIAL DIAGNOSIS**: 1. Suprascapular nerve entrapment or compression
2. Cervical radiculopathy
3. Facioscapulohumeral Muscular Dystrophy 4. Rotator cuff tear
TEST AND RESULTS:Cervical spine and shoulder radiographs: normal EMG-NCS: severe right suprascapular neuropathy MRI shoulder: muscle atrophy c/w nerve injury; multi-loculated synovial cyst base of coracoid MRI cervical spine: normal
FINAL WORKING DIAGNOSIS: Suprascapular nerve entrapment and compression
TREATMENT AND OUTCOMES:
1. Arthroscopic subacromial decompression, suprascapular nerve release at the transverse scapular ligament and spinoglenoid notch, and ganglion cyst excision
2. Sling for 1-2 weeks, early passive range of motion ok, no pendulums 3. No strengthening until 2 months post-op. 4. Cleared for PT, 8 days-post-op 5. Cleared to return to activities as tolerated, 4 weeks-post-op. 6 Returned to kayaking

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2132   June 1 9:50 AM - 10:10 AM

Shoulder Weakness In A 24-year-old Body Builder

Ryan Woods[1], Edward R. Laskowski, FACSM[1], James C. Presley[2], Jeff Strauss[1]. *[1]Mayo Clinic, Rochester, MN. [2]Mayo Clinic, Jacksonville, FL.* (Sponsor: Edward R. Laskowski, FACSM)

(No relevant relationships reported)

HISTORY: 24-year-old male body builder with a six month history of insidious right shoulder pain localized to the right deltoid. He reports increased shoulder discomfort working at his job as a physical therapy assistant. He also describes a one-year history of progressive right shoulder weakness noted most during bench pressing which decreased from 300 pounds to 135 pounds. No sensory symptoms present. Initial x-rays were negative. Physical exam demonstrated intact rotator cuff strength with positive impingement testing. He was diagnosed with rotator cuff tendinopathy and started on a rehab program with instructions to avoid overhead lifts, deep drop bench press, and dips. His pain improved with therapy, however he returned six months later after experiencing two to three months of painless atrophy of the right pectoralis region with continued weakness.

PHYSICAL EXAMINATION: Inspection: Visible atrophy of the right pectoralis major. Palpation: Unremarkable. Joint ROM: Full range of motion. Strength: Normal upper extremity strength. Provocative Tests: Negative Neer's, Hawkin's, Speed's and labral testing. Reflexes: Normal. Sensation: Intact to light touch throughout.
DIFFERENTIAL DIAGNOSIS:
Parsonage Turner Syndrome
Brachial Plexopathy
Radiculopathy, mononeuropathy
Inflammatory Myopathy
Facioscapulohumeral muscular dystrophy
TEST AND RESULTS: EMG: Isolated right pectoral nerve mononeuropathy. MRI: Denervation changes within the right pectoralis major muscle. No abnormalities of the right brachial plexus. Ultrasound: Atrophy of the right pectoralis major. Visualized elements of the lateral and medial pectoral nerves are normal.
FINAL WORKING DIAGNOSIS: Right pectoralis major atrophy in the context of isolated right pectoral nerve mononeuropathy.
TREATMENT AND OUTCOMES: Patient was referred back to physical therapy with recommendations to hold off on bench pressing exercise until he demonstrates neurologic recovery. At the one month follow up improved bulk and muscle quivering of his right pectoralis major was seen. He was allowed to pursue low resistance pectoral strengthening with recommendations to continue to avoid any heavy load pectoralis exercise for one to three months after which he can initiate a gradual return to normal activity.

2133   June 1 10:10 AM - 10:30 AM

Shoulder - Why So Weak? - Track And Field

William L. Patterson Jr.. *Maine Medical Center, Portland, ME.* (Sponsor: William Dexter, FACSM)

(No relevant relationships reported)

History:
20 yo M right hand dominant decathlete at a division III college presents with left shoulder weakness. Started 2 months prior, the morning after a routine weight lifting workout. Began with an ache in the shoulder followed by a tight feeling with some radiation to the trapezius up the neck, and finally with some weakness lifting and externally rotating the arm that slowly increased over a week then plateaued. He had no paresthesias. The pain slowly subsided and resolved over approximately 3 weeks, but the weakness persisted.
PMHx, PSHx, FMHx are non-contributory, not taking any medications.
ROS: fully negative and has not had any illnesses prior or since.
Physical examination:
BP 108/70 mmHg | Pulse 60 | Ht (5'9") | Wt 170 lb | BMI 25.16 kg/m2
Left shoulder exam reveals atrophy of infraspinatus and supraspinatus, non-tender to palpation in neck, shoulder or upper arm. Normal active and passive ROM in all motions of the shoulder and neck. Resisted ROM was painless and yielded 4+/5 strength in external rotation & abduction. Neer's, Hawkin's, AC compression, O'Brien's, labral shear, Yergason's, Speeds, stability testing, Spurling's are all negative. Neurovascular: dermatomes intact to light touch in B/L upper extremities, 2+ reflexes biceps, triceps, brachioradialis, 2+ radial pulses
Differential Diagnosis:
Suprascapular nerve impingement, brachial plexitis (Parsonage Turner syndrome), rotator cuff tear(infraspinatus and/or supraspinatus), cervical radiculopathy (C6), thoracic outlet syndrome.
Tests and Results:
#Limited bedside MSK US of left shoulder: no obvious entrapment at the spino-glenoid notch.
Patient was referred to Neurology for EMG who then ordered an MRI to rule out cervical radiculopathy.
#EMG of left upper extremity.
Suprascapular nerve - Right was normal. Left had normal latency, but CMAP was distorted. Median nerve normal. Needle exam - abundant acute denervation in infraspinatus, less so in supraspinatus. Both with decreased recruitment. Deltoid muscle demonstrated decreased recruitment with minimal polyphagia.
#MRI CERVICAL SPINE: Normal MRI scan of the cervical spine.
Final/Working Diagnosis: Parsonage turner syndrome with primary involvement of the suprascapular nerve.
Treatment: PT
Outcomes: Strength slowly improving. No pain.

2134   June 1 10:30 AM - 10:50 AM

Management of a Patient with Lateral Elbow Pain Secondary to Acute Adverse Neural Irritation

Sean Harris[1], James Gregory[2], Alexis Ortiz, FACSM[3]. *[1]Memorial Hermann, Houston, TX. [2]UT Health, Houston, TX. [3]Texas Woman's University, Houston, TX.* (Sponsor: Alexis Ortiz, FACSM)
(No relevant relationships reported)

HISTORY: A 38 y/o female reports to physical therapy with gradual onset of R lateral elbow pain. She received corticosteroid injection to lateral elbow from her PCP, which caused immediate exacerbation of symptoms. Additionally, she started feeling radiating/burning symptoms down anteromedial forearm. Upon initial evaluation, she presented with extremely reduced grip strength (reproduction of radiating pain), loss of full elbow extension, and shooting pain.
PHYSICAL EXAMINATION: Examination revealed full and pain-free cervical ROM, with no reproduction of symptoms. Resting postural assessment revealed increased thoracic kyphosis with segmental hypomobility from T1-6. Elbow assessment revealed bilateral elbow hyperextension of 20deg. Upper-limb tension testing was + for radial and median n. on right, with reproduction of radiating symptoms into forearm. Lateral epicondylalgia tests were all + on right (Cozen's, Mill's, Maudsley's), but did not reproduce radiating symptoms. She had painful supination, with mild reproduction of radiating symptoms. Performing Tinel percussion over supinator during elbow extension/pronation reproduced radiating pain from elbow to medial forearm.
DIFFERENTIAL DIAGNOSIS:
1.Lateral epicondylalgia
2.Cervical radiculopathy
3.Peripheral neuropathy
TEST AND RESULTS:
Elbow anterior to posterior and lateral radiograph
• Congenitally deepened olecranon fossa, resulting in excessive elbow hyperextension
Lateral corticosteroid injection
• Immediate onset of radiating symptoms into medial forearm; no improvement in lateral elbow symptoms
Grip strength measured with hand-held dynamometer
• Pain-free grip on right measured at 15# (50# on L)
FINAL/WORKING DIAGNOSIS:
Lateral epicondylalgia with underlying acute peripheral nerve irritation, and possible distal sensory overlap of radial/median nerves.
TREATMENT AND OUTCOMES:
6 PT sessions over 6 weeks consisting of:
1) Thoracic manipulation
2) Radio-humeral distraction
3) Distal radial nerve sliders
5) Closed-chain tendon loading progression
Outcomes at 6 weeks:
1) Improved Quick DASH from 34 to 3
2) Normal adverse neural testing
3) Pain-free grip improved to 45# on right
4) Return to normal functional activities

E-15   Clinical Case Slide - **Wrist and Hand**

Friday, June 1, 2018, 9:30 AM - 11:10 AM
Room: CC-101CD

2135   **Chair:** Melody Hrubes. *UIC Sports Medicine, Chicago, IL.*
(No relevant relationships reported)

2136   **Discussant:** Oluseun A. Olufade. *Emory University, Johns Creek, GA.*
(No relevant relationships reported)

2138   June 1 9:30 AM - 9:50 AM

Wrist Pain and Hand Numbness -- Football

Jonathan Harvey. *University of Minnesota Sports Medicine Fellowship, Minneapolis, MN.* (Sponsor: Dr. Suzanne Hecht, FACSM, FACSM)
(No relevant relationships reported)

HISTORY: 17 yo defensive lineman presents with new onset right hand numbness, tingling, and mild discomfort during a high school football game. He denies any known injuries to the affected extremity during the game but endorses that he uses his hands a lot during play. He had not noticed swelling, redness, or weakness. Denies elbow, forearm, shoulder or neck pain. He described the paresthesias as limited to the back of his hand and thumb. The discomfort is described as generalized pain over the back of his wrist. He denies any prior injury to the hand, wrist, elbow, shoulder, or neck; however, he does tape both his wrists to "prevent injury" during gameplay and recently bought new football gloves. PHYSICAL EXAMINATION: Right hand: No deformity, swelling, erythema, or ecchymosis. Bony prominences non-tender to palpation. Notable paresthesias and decreased sensation over the dorsal aspect of the hand with intact sensation of the ulnar side of the hand, palm, and digits. 5/5 strength in intrinsic muscles of hands, grips strength, and thumb strength. No thumb instability. Wrists: Bilateral wrists are wrapped with athletic tape. No obvious deformity or skin changes. 5/5 strength with flexion, extension, eversion, inversion, pronation and supination. Anatomic snuff box was non-tender. Mild discomfort with Finkelstein test and resisted extension of thumb. Neck non tender to palpation with full ROM.
DIFFERENTIAL DIAGNOSIS: Cheiralgia Parasthetica, DeQuervain's tenosynovitis, Intersection syndrome, Lateral antebrachial cutaneous nerve neuritis, Radial tunnel syndrome,.Brachial plexus injury, Cervical injury TEST: Gloves and wrist tape removed with partial improvement of hand/wrist discomfort. FINAL WORKING DIAGNOSIS: Cheiralgia Parasthetica "Wartenberg Syndrome" TREATMENT AND OUTCOMES: 1. Right wrist tape and football gloves were removed. 2. After evaluation and improvement in symptoms he was released to return to play in the same game without restrictions. 3. One hour later he had complete resolution of paresthesias when re-evaluated at half time 4. Symptoms at halftime could be reproduced with pronation, flexion, and ulnar deviation 5. Discontinued future wrist taping 6. The patient was symptom-free and had a normal exam at 1 week follow-up appointment. 7. He was advised to avoid overtightening of football gloves

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2139   June 1 9:50 AM - 10:10 AM

Bilateral Cubital Tunnel Syndrome in a Female Ice Hockey Player

Kiran Bojedla, Damian Mosher. *Millcreek Community Hospital, Erie, PA.* (Sponsor: Patrick Leary DO, FACSM)
(No relevant relationships reported)

Bilateral Arm Injury ---- Women's Ice Hockey
Kiran Bojedla DO, Millcreek Community Hospital Sports Medicine, Erie, PA
e-mail:Kiran.bojedla@gmail.com
(Sponsor: Patrick Leary DO, FACSM)
HISTORY: A 20 year old female junior ice hockey collegiate athlete presented with bilateral distal arm pain and grip strength weakness, developed while lifting weights during offseason conditioning. Patient had been doing front squats with increasingly heavy loads put onto flexed elbows and wrists. Complained of pain waking her up at night and worsening recently, and with hand numbness/tingling during the day.
PHYSICAL EXAMINATION: Examination in the Training Room revealed bilateral grip strength weakness, left worse than right, numbness on the medial side of the wrists and 4th/5th fingers, and positive Tinel's Sign / Phalen's Test. At the shoulder, strength was 5/5 throughout and ROM was full bilaterally. Symptoms of grip strength weakness and paresthesias worsened over several visits.
DIFFERENTIAL DIAGNOSIS
1. Carpel Tunnel Syndrome
2. Cubital Tunnel Syndrome
3. Central spinal cord lesion
4. Multiple Sclerosis
TEST AND RESULTS:
Electromyelogram: Disruption of ulnar nerve conduction velocity through cubital tunnel bilaterally
Cervical MRI: Possible Tarlov cyst at C5-C6 on left, no stenosis appreciated at any level, no herniations
Chest X-ray: No acute abnormalities
WORKING DIAGNOSIS:
Bilateral Cubital Tunnel Syndrome
TREATMENT AND OUTCOMES
1. Keep arms extended at elbow as much as possible
2. Completely shut down from hockey activities (no skating / stickhandling)
3. Plan for L ulnar nerve release with Orthopedic Surgeon 11/2017
4. RTP to be determined depending on response to therapy

2140   June 1 10:10 AM - 10:30 AM

Wrist Injury - Tae Kwon Do

Claire Gross[1], Holly J. Benjamin, FACSM[2], Daniel P. Mass[2]. *[1]MacNeal Hospital, Berwyn, IL. [2]University of Chicago, Chicago, IL.* (Sponsor: Holly J. Benjamin, MD, FACSM)
(No relevant relationships reported)

History: An 18-year-old right-hand dominant male, nationally-ranked Tae Kwon Do competitor presented with a 4 year history of left wrist pain. Four years prior to presentation, he was kicked on the ulnar wrist while sparring. At that time, he had tenderness over the ulnar styloid and distal physis, no tenderness at the ulnar-carpal

articulation, and full wrist range of motion. Wrist X-Rays were read by radiology as negative for fracture, but interpreted by the sports medicine team as a possible ulnar Salter-Harris I injury in addition to a wrist contusion. He returned to sport after three weeks of relative rest and use of a wrist brace. He presented to clinic four years later due to worsening symptoms that inhibited his level of competition in Tae Kwon Do. He had not sustained any further wrist injuries in the interim. There was increased pain with active range of motion and he felt an occasional click in his wrist and intermittent tingling in his fifth digit.

Physical Examination: Left wrist exam demonstrated no gross deformity, swelling, erythema, or ecchymosis. The limb was neurovascularly intact. There was tenderness to palpation of the hook of the hamate and the triangular fibrocartilage complex. Full wrist and hand range of motion. Mild weakness noted in fifth digit flexion and wrist flexion; strength otherwise intact. Wrist extension with ulnar deviation reproduced the patient's pain. There was increased dorsal instability of the ulnar styloid at the distal radioulnar joint (DRUJ) (positive piano key sign).

Differential Diagnosis: 1. TFCC tear 2. Post-traumatic arthritis 3. Hook of the hamate fracture 4. Flexor carpi ulnaris strain 5. Ulnar neuropathy at the wrist

Tests and Results: MR arthrogram: There is contrast extension into the distal radioulnar joint indicating disruption of the triangular fibrocartilage complex (TFCC). The TFCC appears irregular and demonstrates intermediate signal. These findings were interpreted by the Sports Medicine team to represent concomitant central and peripheral TFCC tears.

Final Diagnosis: Central and peripheral TFCC tears

Treatment and Outcomes: After consultation with orthopedic surgery, the patient is currently scheduled for arthroscopic debridement of the central tear and repair the peripheral tear of his TFCC.

2141   June 1 10:30 AM - 10:50 AM
Forearm Pain- Gymnastics

Melissa Faubert[1], Holly Benjamin, FACSM[2], Daniel Mass[2].
[1]NorthShore University HealthSystem/University of Chicago, Chicago, IL. [2]University of Chicago, Chicago, IL.
(No relevant relationships reported)

HISTORY: 14 year old right handed level 8 gymnast presents with complaints of progressive right greater than left elbow and forearm pain over the past four months. Despite bracing, activity modification and three months of physical therapy she still reported progressive worsening of pain and development of tingling in her hands and forearms. She notes she has a constant feeling of tightness over her anteromedial forearms and pain and tingling of her arm occurs the worst while writing in school or vaulting. Pain and numbness resolve with a few minutes of rest and elbow extension. She does not have any nighttime pain. **PHYSICAL EXAMINATION**: - Well appearing female adolescent - Full ROM of elbow, forearm, wrist and fingers - Sensation intact to light touch in the radial, medial and ulnar nerve distribution bilaterally - 5/5 strength in the radial, medial, ulnar, anterior interosseous and posterior interosseous nerves bilaterally - Mild TTP of proximal forearm and medial elbow bilaterally - Positive compression test at the proximal forearm - Positive Tinel's test over the pronator teres - Positive Tinel's test over cubital tunnel - Negative Tinel's, Durkan's and Phalen's at the wrist bilaterally **DIFFERENTIAL DIAGNOSIS:**- Pronator syndrome - Cubital tunnel syndrome - Chronic exertional compartment syndrome of the forearm - Anterior interosseous nerve syndrome - Brachial plexus neuritis - Cervical radiculopathy **TEST AND RESULTS**: MRI elbow Left: MRI findings normal but noted presence of accessory anconeous epitrochlearis muscle. MRI elbow Right: Normal MRI. **FINAL WORKING DIAGNOSIS**: Pronator syndrome bilaterally. Left arm with accessory anconeous epitrochlearis muscle also causing ulnar neuropathy. **TREATMENT AND OUTCOMES**: Patient's older sister previously had pronator syndrome as well as chronic exertional compartment syndrome for which she underwent median nerve release and fasciotomy. Patient and her parents elected to forgo compartment testing suspecting she also had both conditions. She underwent surgery on her left elbow with a median nerve release, ulnar nerve release and fasciotomy. She is due to have surgery on her right arm for median nerve release and fasciotomy three weeks after her left.

2142   June 1 10:50 AM - 11:10 AM
Metacarpal Stress fractures Presenting As Dorsal Hand Pain In A High School Tennis Player: A Case Report

John K. Evans, Keith A. Bengtson, Cara C. Prideaux, Edward R. Laskowski, FACSM. *Mayo Clinic, Rochester, MN.*
(No relevant relationships reported)

HISTORY:
A 17 year-old right-hand dominant male tennis player presented to the hand clinic for a two week history of right dorsal hand pain. The patient noticed hand pain while at practice the day following a one-day tennis tournament involving three separate matches. Severe pain in the dorsum of the wrist was noted with forehands, serves, and volleys, but was less notable during backhands. The pain was sharp and severe for about three seconds after each hit and then quickly resolved to a pain-free baseline.

The patient continued to practice through pain for the following week. He was able to perform all activities of daily living without discomfort. The patient denied swelling, pain in other joints, weakness, and paresthesias.

PHYSICAL EXAMINATION:
Examination revealed tenderness to palpation at the base of the second and third metacarpals and pain with stressing the second and third carpometacarpal joints. There was severe pain to use of a tuning fork over the proximal second and third metacarpal. Finger and wrist ranges of motion were full and pain-free, and there was no swelling.

DIFFERENTIAL DIAGNOSIS:
1. Wrist extensor tenosynovitis
2. Ganglion cyst
3. Rheumatoid arthritis
4. Metacarpal stress fracture
5. Crystal arthropathy

TEST AND RESULTS:
PA, oblique, and splayed lateral radiographs of the right hand: -Negative for fracture; there were no erosions or degenerative change.
Noncontrast MRI of the right hand: -Stress fracture of the right second metacarpal in the proximal shaft with extension to the proximal articular surface; also observed was a stress fracture in the adjacent trapezoid. -Less prominent stress fracture/stress reaction of the right third metacarpal with no cortical break.

FINAL/WORKING DIAGNOSIS:
Right second metacarpal proximal shaft stress fracture and right third metacarpal shaft stress fracture/reaction.

TREATMENT AND OUTCOMES:
1. Hold from tennis activities for 6 weeks.
2. Racket grip type changed from Western to Eastern grip type.
3. Gradual return to tennis starting 6 weeks after cessation of sport with focus on maintaining optical tennis mechanics and low-intensity groundstrokes.
4. Serves were initiated at 7 weeks after tolerating groundstrokes without discomfort.
5. Full return to sport by 3 months after being able to meet demands of his sport with pain-free high-intensity tennis shots.

E-26   Free Communication/Poster - **Water Sports**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2165   Board #1   June 1 9:30 AM - 11:00 AM
Associations Between Land-Based Performance Assessments and Maximal Effort Combat Swim Force Production

Meaghan Beckner[1], Elizabeth Nagle, FACSM[1], Anne Beethe[1], Takashi Nagai[1], Meghan Schmidt[1], Chris Connaboy[1], John Abt, FACSM[2], Scott Lephart, FACSM[2], Bradley Nindl, FACSM[1].
[1]University of Pittsburgh, Pittsburgh, PA. [2]University of Kentucky, Lexington, KY.
(No relevant relationships reported)

Combat swimming (CS) requires military personnel dressed in full combat gear to swim while holding or towing additional weight (i.e. ammunition, rucksack, etc.). Reportedly, additional gear can amount to over 40 kg and increases the demand on muscle force production to overcome water resistance. Limited research has explored relationships between limb length, strength, and anaerobic power assessments and CS flutterkick performance during a 30-second maximal effort tethered swim test (TST). **PURPOSE:** To examine relationships between limb length, strength, and anaerobic power assessments and maximum effort CS force production. **METHODS:** Six female (26 ± 9.2 years, 169.7 ± 3.9 cm, 67.5 ± 9.4 kg) and six male (30 ± 8.0 years, 179.4 ± 7.6 cm, 80.8 ± 15.4 kg) skilled swimmers participated in isometric muscular hip strength (HS) testing using a handheld dynamometer, and a 30-second Wingate cycle ergometer anaerobic test (WAnT). Limb length (LL) was measured from the Anterior Superior Iliac Spine to the medial malleolus. For TST, subjects wore full military gear weighing approximately 12 kg, including combat boots and fins, and performed a maximal effort flutterkick in a prone position holding a flotation device for 30 seconds. After testing for normality, correlations between HS, LL, WAnT, and TST were determined using Pearson's correlation ($p<0.05$). **RESULTS:** Absolute Wingate mean power was significantly correlated to TST mean force (TST_{mf}) (0.883, $p<0.001$). Correlations were identified between LL and TST peak force (TST_{pf}) (right: 0.653, $p=0.021$; left: 0.659, $p=0.020$). There was no significant correlation between isometric peak HS and TST_{pf}. **CONCLUSION:** LL and absolute WAnT mean power are associated with CS anaerobic kicking performance more so than isometric HS. Findings should not dismiss the relevance of strength, but promote specificity of the assessment. Identifying significant relationships between power and strength assessments and swimming force during CS flutterkick is important to help to improve training for optimal CS anaerobic performance.

2166   Board #2   June 1 9:30 AM - 11:00 AM

Predictors of 2 Kilometer Rowing Ergometer Time Trial Performance

Jason Metz[1], Fredric Goss, FACSM[2], Robert Robertson, FACSM[2], Elizabeth Nagle, FACSM[2], Jonathan Abt[3]. [1]*West Liberty University, West Liberty, WV.* [2]*University of Pittsburgh, Pittsburgh, PA.* [3]*University of Kentucky, Lexington, KY.*
(No relevant relationships reported)

ABSTRACT

Predictors of performance can aid coaches and trainers in prescribing exercise programs for rowing athletes. To date, most of the prediction models have been developed for runners and cyclists. **PURPOSE:** The aim of this study was to develop a regression model to predict performance of a simulated 2 kilometer rowing ergometer time trial. **METHODS:** A group of mixed gender rowing athletes (n=12) completed in a counterbalanced order a 2 Kilometer rowing time trial and a continuous progressively incremented graded exercise test on a rowing ergometer. Subjects were 23.91±4.99 years old, weighed 79.14±12.85 kg, were 187.38±12.60 cm, had a VO_2max of 55.48±10.32 ml/kg/min and had 3.17±2.79 years of rowing experience. Physiological measures were recorded during both testing protocols. **RESULTS:** Maximum Power/ Stroke Ratio (r = -0.96, p<0.001), Power/Stroke Ratio at the ventilatory breakpoint (r = -0.90, p<0.001), Maximal Oxygen Uptake (r = -0.84, p<0.001) and Oxygen Uptake at the ventilatory breakpoint (r = -0.82, p<0.001) were found to be strong and significant predictors of 2 kilometer rowing performance. **CONCLUSION:** The four significant predictors of rowing performance suggest training should focus on improving both aerobic capacity and strength.
Statement of Disclosure: This study was not funded and has no conflicts of interest.

2167   Board #3   June 1 9:30 AM - 11:00 AM

Influence Of Leg, Arm And Trunk Lean Mass On Aerobic Fitness And Performance In Rowers

Kristin Haraldsdottir, Stacey Brickson, Jennifer Sanfilippo, Andrew Watson. *University of Wisconsin, Madison, WI.*
(No relevant relationships reported)

Rowing is a full body exercise requiring upper body, lower body, and core strength. It has been shown that total lean mass is a predictor of maximal oxygen consumption (VO_{2max}) in athletes. However, the relative contribution of upper extremity, lower extremity and trunk lean mass to VO_{2max} has not been explored. **Purpose:** To determine the relative influence of total lean body mass (LBM), body fat percentage (BF%), upper extremity lean mass (ULM), lower extremity lean mass (LLM) and trunk lean mass (TLM) on maximal aerobic capacity (VO_{2max}) and time to exhaustion (T_{max}) in female collegiate rowers. **Methods:** 107 female collegiate rowers (ages 18-22) performed maximal progressive rowing ergometer testing to determine VO_{2max} and T_{max}. Body mass, LBM, BF%, ULM, LLM, and TLM were determined by dual-energy X-ray absorptiometry. Separate multivariable linear regression models were performed to predict VO_{2max} and T_{max} using LBM and BF% as predictors. When LBM was found to be a separate predictor, separate linear regression models were used to predict VO_{2max} and T_{max} using ULM, LLM and TLM as predictors. **Results:** Subjects were 20.2 ± 1.1 years old, with a VO_{2max} of 3.9 ± 0.5 L/min, T_{max} of 12.7 ± 2.6 minutes, BF% of 23.8 ± 4.8% and LBM of 51.3 ± 6.4 kg. After inclusion in the multivariable model, it was found that VO_{2max} was significantly predicted by LBM (r^2= 0.29, p<0.001) but not BF% (r^2=0.002, p=0.79). Similarly, T_{max} was significantly predicted by LBM (r^2=0.25, p<0.001) but not BF% (r^2=0.003, p=0.19). When evaluating the sources of LBM separately, it was found that VO_{2max} was significantly predicted by LLM (r^2=0.12, p<0.01), but not ULM (r^2=0.08, p=0.68) or TLM (r^2=0.09, p=0.17), and T_{max} was significantly predicted by TLM (r^2=0.09, p=0.02), but not ULM (r^2=0.07, p=0.89) or LLM (r^2=0.08, p=32). **Conclusion:** Among female collegiate rowers, whole body LBM is a significant predictor of both VO_{2max} and T_{max}. However, LLM is a significant predictor of VO_{2max}, while TLM significantly predicts T_{max}. This suggests that the trunk muscles play a significant role in the ability to prolong intense rowing exercise, while the legs consume the most oxygen during rowing. These results may be taken into consideration by coaches and athletes when prescribing in-season training to maximize rowing performance.

2168   Board #4   June 1 9:30 AM - 11:00 AM

Longitudinal Changes in Elite Swimmers' 200 m Freestyle Pacing

Curtis S. Goss, Joel T. Greenshields, Robert F. Chapman, FACSM, Joel M. Stager, FACSM. *Indiana University - Bloomington, Bloomington, IN.* (Sponsor: Joel Stager, FACSM)
(No relevant relationships reported)

PURPOSE: To understand the evolving strategies of elite competitors and to characterize longitudinal changes in pacing parameters in the 200 m freestyle at recent international competitions. **METHODS**: 416 swims from the top 16 finishers in the 200 m freestyle for men and women at 11 Olympic Games and World Championships from 2000-2017 were analyzed. A mixed linear model was used to characterize pacing with 5 different parameters: linear and quadratic parameters for the effect of lap number, differences between predicted and observed time for the first and last laps, and the residual standard error of the estimate summarizing random and systematic deviations from the model. The mean and the 17-year linear trend of final race time and pacing parameters were evaluated using standardization and non-clinical magnitude-based inferences with standardized thresholds of small, moderate, large, very large, and extremely large effects (0.2, 0.6, 1.2, 2.0 and 4.0, respectively). Optimization plots of final time versus each parameter were created. **RESULTS**: Data are presented as mean linear trend change (%) ±90% confidence interval, unless otherwise specified. Men exhibited a very large decrease in final time (-2.27 s; ±0.55 s), with a moderate increase in linear parameter (1.06; ±1.25) and small decrease in quadratic parameter (-0.1; ±0.25). Women exhibited an extremely large decrease in final time (-3.10 s; ±0.49 s), with a small increase in linear parameter (0.61; ±1.05). The first (0.02; ± 0.06) and last lap (-0.07; ±0.23) parameters both displayed small changes. Optimization plots displayed no clear optimum for each parameter for either sex. **CONCLUSIONS**: The sizable decreases in final time coupled with the apparent changes in pacing parameters suggest that swimmers have not only swum faster times from 2000 to 2017, but seem to have also adopted a "starting fast" strategy, evidenced by the increase in linear parameter over this period. The lack of optima in finishing time versus parameter plots suggests that elite swimmers accomplish elite times with a variety of strategies and that pacing can be optimized for individuals but not populations.

2169   Board #5   June 1 9:30 AM - 11:00 AM

Variation in Critical Speed and Finite Distance Capacity of Elite Swimmers

Joel T. Greenshields, Curtis S. Goss, Joel M. Stager, FACSM. *Indiana University, Bloomington, IN.* (Sponsor: Joel M. Stager, FACSM)
(No relevant relationships reported)

Purpose: The purpose of this study was to assess variability in critical speed (CS) and the maximum finite distance capacity above critical speed (D') of elite swimmers using longitudinal performance data.
Methods: Top 100 results from the FINA World Rankings from 2011 - 2017 in the 200, 400, 800, and 1500-meter freestyle events were used to produce CS models. Swimmers with a top 100 time in a minimum of three of the four events within a given year were included in the analysis. Linear regression models were calculated using distance as the dependent variable and performance time of the race as the independent variable. From the regression model, D' was expressed as the intercept and CS as the slope of the line. Repeated measures analysis of the log-transformed calculated values provided the typical variation of a D' and CS values.
Results: On average, 45 (37-49) men swimmers and 45 (40-54) women swimmers per year were eligible for inclusion in the analysis. Average calculated D' was (M = 25.22 ± 3.60 m; W = 23.51 ± 2.80 m) and CS was (M = 1.62 ± 0.02 m*s[-1]; W = 1.51 ± 0.02 m*s[-1]). The linear trend over the seven-year time period in D' was (M = 3.22; ±8.15 %; W = 2.42; ±7.95 %) and CS was (M = 0.48; ±0.41 %; W = 0.35; ±0.51 %). The within-swimmer variability between-year expressed as a coefficient of variation (CV) with 90 % confidence limit of D' was (M = 25.35; ±2.37 %; W = 29.05; ±3.0 %) and CS was (M = 1.05; ±0.1; W = 1.48; ±0.13 %). The between-swimmer variability expressed as CV of D' was (M = 29.0 %; W = 34.64 %) and CS was (M = 1.41 %; W = 1.74 %). The smallest worthwhile change in D' (M = 2.55 %; W = 2.97 %) and CS (M = 0.14 %; W = 0.17 %) were calculated. All selected distances showed strong correlations between performance time with D' and CS (*r* > 0.63). The 1500 m distances showed near perfect but inverse correlations between performance time and CS (M: *r* = -0.96; W: *r* = -0.99).
Conclusions: Changes in performance trends over the seven-year time period can be attributed largely to changes in CS. Potential causes of the large amount of within and between swimmer variations in D' should be explored further in relation to changes in pacing strategies. Additionally, the smallest worthwhile change values of D' and CS provide practical applications regarding the effectiveness of training interventions and athlete progression.

2170   Board #6   June 1 9:30 AM - 11:00 AM

Fitness-Related Benefits: Land Versus Aqua

Rachel Williams[1], Ryan Swiezy[1], Maddison Patterson[1], Rachel McCormick[1], Blair Bonner[1], Amber Ausley[1], Raechel Santee[1], Aubrey Burgess[1], Virginia Wilson[1], Hayley Grimes[1], Michel Heijnen[1], Tiago Barreira[2], Wayland Tseh[1]. [1]*University of North Carolina Wilmington, Wilmington, NC.* [2]*Syracuse University, Syracuse, NY.* (Sponsor: Robert Boyce, FACSM)
(No relevant relationships reported)

PURPOSE: To compare fitness-related benefits between land-based (LAND) versus aqua-based (AQUA) courses. **METHODS:** Informed consent was received from

154 volunteers (N = 76 LAND; N = 78 AQUA) who were asked to exercise within each respective course 2 days per week, 50-min per day, for 15 weeks. Pre- and post-fitness assessments obtained were body composition, muscular endurance, muscular strength, cardiorespiratory endurance, and flexibility. **RESULTS:** Mixed ANOVA was used to investigate mean differences between pre- and post-fitness assessments and between groups. There was a main effect (p = 0.003) and interaction (p = <0.001) for body composition in which, overall, participants decreased percent body fat, however, paired t-test revealed that LAND (20.4% ± 7.3% to 19.0% ± 7.4%) had a significant reduction in mean percent body fat while AQUA did not (20.1% ± 8.7% to 20.2% ± 8.9%). A main effect for both muscular strength (p = <0.001) and muscular endurance (p = <0.04) was revealed, but no interactions, therefore, both groups improved on aforementioned variables. Lastly, no significant main effect or interaction for neither cardiorespiratory endurance nor flexibility assessments were revealed. **CONCLUSIONS:** Individuals participating in land-based courses displayed greater decreases in percent body fat when compared to aqua-based courses, whereas both land- and aqua-based displayed improvements in muscular strength and muscular endurance. There were no changes in cardiorespiratory endurance and flexibility within both groups.

2171   Board #7   June 1 9:30 AM - 11:00 AM

Reliability and Validity of Swimming Flume Protocol to Measure Maximal Aerobic Power of Healthy Adults

Elizabeth F. Nagle, FACSM[1], Takashi Nagai[1], Anne Beethe[1], Mita T. Lovalekar[1], Jacquelyn N. Zera[2], Christopher Connaboy[1], John P. Abt[3], Robert J. Robertson, FACSM[1], Scott M. Lephart[3], Brad D. Nindl, FACSM[1]. *[1]University of Pittsburgh, Pittsburgh, PA. [2]John Carroll University, Cleveland, OH. [3]University of Kentucky, Lexington, KY.*

(No relevant relationships reported)

A modality specific swimming protocol to assess maximal aerobic power (MAP) is essential to accurately quantify swimming training and performance. A graded intensity MAP swimming protocol executed in a swimming flume controls swimming speed (i.e. velocity), and may facilitate kinematic and metabolic assessments. **PURPOSE:** To assess: 1) reliability of a swimming flume maximal oxygen consumption ($VO2max_{fl}$) (i.e. MAP) protocol; and 2) validity of a $VO2max_{fl}$ protocol using a swimming pool performance swim (PS) test as the criterion. **METHODS:** Nineteen healthy males (n=9) and females (n=10) (age, 28.5±8.3 yrs; height, 174.7 ± 8.2 cm; weight, 72.9 ± 12.5 kg; %body fat, 21.4 ± 5.9) performed two swimming flume $VO2max_{fl}$ tests ($VO2max_{fl}A$ and $VO2max_{fl}B$), and one PS test [500 meters (444.7 ± 139.4 seconds)]. Test-retest reliability of $VO2max_{fl}$ (ml·kg^{-1}·min^{-1}), HRmax (b·min^{-1}), cardiorespiratory efficiency (O2 pulse; $VO2max_{fl}$/HRmax), maximal respiratory exchange ratio (RERmax), ventilation (Vemax) (L·min^{-1}), and PS test time was assessed by ICC's (2,1). Test validity was determined by correlating $VO2max_{fl}A$ with the PS using Pearson's coefficients. **RESULTS:** Intra-subject reliability (ICC) for cardiorespiratory responses during the $VO2max_{fl}A$ and $VO2max_{fl}B$ tests are presented in Table 1. For validity, a moderate correlation was found between $VO2max_{fl}A$ and 500 PS (r =-0.478; p<0.05). **CONCLUSIONS:** The $VO2maxfl$ test employed presently is a reliable and functionally valid assessment of MAP. It is proposed that a swimming flume-based protocol to measure MAP will facilitate mode specific comparisons of test responses with performance outcomes for military, clinical, or athletic populations.

Table 1					
Variable	N	$VO_2max_{fl}A$	$VO_2max_{fl}B$	ICC	p-value
VO_2max_{fl}(ml·kg^{-1}min^{-1})	18	46.7± 8.6	47.9±8.5	0.628**	.002
HRmax, (b·min^{-1})	19	172 ± 18	174 ± 11.8	0.403*	.041
O2pulse (ml· b^{-1})	19	0.3 ± 0.1	0.3 ± 0.1	0.502*	.014
RERmax	19	1.2 ± 0.3	1.1 ± 0.2	0.559**	.002
Vemax (l·min^{-1})	19	103.5 ± 20.2	111.6 ± 25.3	0.671**	.000
PS time (sec)	16	444.7±139.4	452.6±53.0	0.608**	.005
**p<0.01; *P<0.05					

2172   Board #8   June 1 9:30 AM - 11:00 AM

Physiological Responses to Swimming Pool and Swimming Flume Maximal Aerobic Power Protocols

Jacquelyn N. Zera[1], Elizabeth Nagle, FACSM[2], Takashi Nagai[3], Mita Lovalekar[2], Christopher Connaboy[2], Anne Beethe[2], John Abt, FACSM[4], Scott Lephart, FACSM[4], Bradley Nindl, FACSM[2]. *[1]John Carroll University, University Heights, OH. [2]University of Pittsburgh, Pittsburgh, PA. [3]Mayo Clinic, Rochester, MN. [4]University of Kentucky, Lexington, KY.* (Sponsor: Elizabeth Nagle, FACSM)

(No relevant relationships reported)

The importance of a swimming specific test of maximal aerobic power (VO_{2max}) to assess aerobic fitness, track training adaptations, and predict performance is well established. The ability to incrementally and systematically regulate intensity with changes to flow has made swimming flume tests (VO_{2maxfl}) a desirable laboratory tool, although few exist due to the complexity and cost of equipment. Pool tests (VO_{2maxsw}) simulate free swimming and are more cost effective. However, little research has compared these modes. **Purpose:** To examine the relationship between physiological responses to VO_{2maxsw} and VO_{2maxfl}. **Methods:** Fifteen males (n=5) and females (n= 10) (age= 25.1 ± 8.5 years; BMI = 23.5 ± 3.4 kg·m²; body fat = 20.6 ± 7.0%) performed two volitional maximum swimming tests: (VO_{2maxsw}) a multi-stage swimming pool test of increasing self-regulated intensities and (VO_{2maxfl}) a graded swimming flume test of increasing flow rates, both previously described in the literature. Oxygen consumption (VO_2, ml·kg^{-1}·min^{-1}), ventilation (VE, L·min^{-1}), heart rate (HR, b·min^{-1}), and respiratory exchange ratio (RER) were measured continuously, and ratings of perceived exertion (RPE), blood lactate (BLa; mmol^{-1}), and test duration (T$_{time}$; seconds) were measured post-test. Normality was assessed, and a paired samples t-tests or Wilcoxon signed rank test, and Pearson or Spearman correlation coefficients were used, as appropriate. **Results:** VO_{2max} (p= 0.005), VE$_{max}$ (p= 0.008), RER (p= 0.011), and T$_{time}$ (p=0.001) were significantly higher, and RPE (p=0.004) was significantly lower in the VO_{2maxfl}. Additionally, no significant differences were detected for HR$_{max}$, and BLa. Finally, strong correlations were reported between the two tests for VO_{2max} (r= 0.908; p<0.001) and VE$_{max}$, (r= 0.853; p<0.001), and a moderate correlation for BLa (r= 0.634; p= 0.020). There were no significant correlations between the two tests for RER, HRmax, RPE, and T$_{time}$. **Conclusions:** Results indicate that a VO_{2maxfl} elicited higher maximal physiological responses compared to a VO_{2maxsw}, indicating that VO_{2maxfl} may provide a better mode for assessing maximal aerobic capacity in swimmers. Future research should explore the swimming flume's flow and propulsion characteristics on kinematics and its impact on the ability to predict performance.

2173   Board #9   June 1 9:30 AM - 11:00 AM

Changes in Collegiate Swim Anaerobic Performance Between Pre-season and Post-season

Haoyan Wang[1], Guillaume Spielmann[1], Brian Irving[1], Jack Marucci[1], Shelly Mullenix[1], Brian Harrell[2], Rick Sharp, FACSM[3], Neil Johannsen[1]. *[1]Louisiana State University, Baton Rouge, LA. [2]Baton Rouge General Sport Medicine, Baton Rouge, LA. [3]Iowa State University, Ames, IA.*

(No relevant relationships reported)

PURPOSE: To examine the cyclical nature of collegiate swim training on anaerobic performance. **METHODS:** Ten NCAA Division 1 swimmers (n=4 women, age 20.3±0.5 y, weight 64.8±12.3 kg; n=6 men, age, 20.0±0.6 y, weight, 82.6±6.9 kg; mean±SD) participated in 3 testing sessions: immediate post-season (V$_1$), mid-offseason (V$_2$), and early season (V$_3$) separated by 8 weeks between V$_1$ and V$_2$, and 14 weeks between V$_2$ and V$_3$. Each testing session was comprised of an in-pool power test consisting of incrementally-loaded 25-m swims at maximal effort. During the test, participants were attached to a pulley system ending with a 20-gallon bucket. Initial load was set at 40 lbs for men and 20 lbs for women, and increased by 20 lbs and 15 lbs respectively after each trial completion. Swimmers were allowed to rest for 3 min after each trial. Speed, work, and power were calculated using the distance traveled per second factoring in the additional weight in bucket. Heart rate (HR), lactate (La$^-$), and rating of perceived exertion (RPE) were assessed within the first minute of each rest period. Two-way RM-ANOVAs (visits×bucket weight) were used to compare the effect of training across the primary outcomes. **RESULTS:** A main effect of visit was observed for average speed whereby V$_2$ was faster in women (V$_1$: 1.08±0.26 m/s, V$_2$: 1.19±0.18 m/s, V$_3$: 1.11±0.31 m/s; P<0.001) and men (V$_1$: 1.20±0.26 m/s, V$_2$: 1.41±0.29 m/s, and V$_3$: 1.25±0.26 m/s; P<0.001) compared to V$_1$ and V$_3$. In addition, an interaction for speed at higher weights was observed and post-hoc analysis revealed higher speeds during V$_2$ in women at 65 lbs (V$_1$:0.75±0.22 m/s, V$_2$: 0.99±0.06 m/s, V$_3$: 0.73±0.25 m/s; P<0.02) and men at 120 lbs (V$_1$: 0.83±0.09 m/s, V$_2$: 1.45±0.57 m/s, V$_3$: 0.77± 0.14 m/s; P<0.001). A main effect of visit was seen for HR demonstrating a higher average HR during V$_2$ in women (165.3±14.4 bpm) compared to V$_1$ (156.7±17.1 bpm) and V$_3$ (156.2±14.8

bpm; P<0.02). RPE and La⁻ were not different between the three visits (P>0.05). Total work per stroke was also higher at 65 lbs in women across visits (V$_1$: 11.9±1.5 Nm, V$_2$: 16.8±2.9 Nm, V$_3$: 12.1±1.6 Nm; P<0.04).
CONCLUSIONS: Swimmers had better anaerobic performance during mid-offseason while their overall training load was reduced in both women and men. The greater swimming speeds at similar RPE and La⁻ suggest that the swimmers may benefit from altered training.

E-27   Free Communication/Poster - **Youth**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2174   Board #10   June 1 9:30 AM - 11:00 AM
Acute Cardiometabolic Responses to Medicine Ball Exercise in Children

Avery D. Faigenbaum, FACSM, Jie Kang, FACSM, Anne Farrell, Nicholas A. Ratamess, Nicole Ellis, Ira Vought, Jill Bush, FACSM. *The College of New Jersey, Ewing, NJ.*
(No relevant relationships reported)

Medicine ball (MB) exercises are effective for strength and conditioning in adults, but the cardiometabolic demand of this training modality for children is unknown. **PURPOSE**: To examine the acute cardiometabolic responses to MB exercise in children. **METHODS**: 14 children (10.1 ± 1.3 yr) were tested for peak oxygen uptake (VO$_2$) on a treadmill and subsequently (> 48 hours later) performed a progressive 10 min MB protocol of 5 exercises (EX): standing marches (EX1), alternating lunges (EX2), squat swings (EX3), chest passes (EX4) and double arm slams (EX5). A 2.3 kg MB was used for all trials and each MB exercise was performed twice for 30 sec with a 30 sec rest interval between sets and exercises. Participants exercised while wearing a heart rate (HR) monitor and connected to a metabolic system. Comparisons between exercises were made using one-way analysis of variance with repeated measures. **RESULTS**: Peak values for HR and VO$_2$ during the treadmill test were 198.9 ± 8.3 bpm and 54.9 ± 10.1 ml · kg⁻¹ · min⁻¹, respectively. During the MB protocol, mean HR significantly (p<0.05) increased from 121.5 ± 12.3 bpm during EX1 to 178.3 ± 9.4 bpm during EX5 and mean VO$_2$ significantly (p<0.05) increased from 15.5 ± 2.9 ml · kg⁻¹ · min⁻¹during EX1 to 34.9 ± 5.1 ml · kg⁻¹ · min⁻¹during EX5. Mean HR and VO$_2$ values during the MB protocol ranged from 61.1% to 89.6% and 28.2% to 63.5% of HRpeak and VO$_2$peak, respectively. **CONCLUSION**: These descriptive data indicate that MB exercise can pose a moderate-to-vigorous cardiometabolic stimulus in children and may serve as a worthwhile compliment to youth strength and conditioning programs.

2175   Board #11   June 1 9:30 AM - 11:00 AM
Dynamic Stretching Can Impair performance Of Adolescent Male handball Players For at Least 24 Hours.

Monoem Haddad[1], Mohammad Shoaib Prince[1], Nidhal Zarrouk[2], Karim Chamari[2], David G Behm[3]. *[1]Qatar University, Doha, Qatar. [2]Aspetar, Doha, Qatar. [3]Memorial University of Newfoundland, Newfoundland, NL, Canada.*
(No relevant relationships reported)

PURPOSE: There are many adult studies reporting static stretch (SS)-induced deficits and dynamic stretch (DS) performance improvements shortly after the intervention. However, there is only a single study examining stretch-induced performance changes with children at 24 hours' post-stretch. The objective of this study was to examine physiological responses of adolescent trained athletes at 24 hours after experiencing SS or DS protocols. **METHODS**: Ten male adolescent, elite handball players (age: 16±05 years) were tested prior to-, 3 minutes- and 24 hours- following the three conditions (DS, SS, Control). Tests included (i) two 4s MVCs at 60⁰ of knee flexion with 2 min rest, (ii) two isokinetic contractions each at 60⁰/sec and 300⁰/sec with 1 min rest, and (iii) two drop jumps with 30s rest. To simulate a full warm-up, dynamic aerobic activity was instituted before the pre-tests and following the interventions. **RESULTS**: Three-way repeated measures ANOVAs revealed that 1) both the SS and control conditions exhibited knee extensor 60⁰.s⁻¹ (-8.7 to -16.3%) and 300⁰.s⁻¹ (-10.3 to 12.9%) isokinetic force and power-related deficits at post-test, 2) DS impaired knee flexor 60⁰.s⁻¹ isokinetic force (-9.9 to -10.1%) and power-related (-9.6 to 19.1%) measures at post-test and at 24 hours' post-test, 3) DS (12.07% and 10.47%) and SS (13.7% and 14.6%) enhanced knee flexor 300⁰.s⁻¹ isokinetic force and power-related measures compared to control. **CONCLUSIONS**: Testing-induced knee extensor isokinetic impairments were counterbalanced by DS, however the hip flexion DS could have produced minor muscle damage decreasing knee flexor forces and power at 600.s-1.

2176   Board #12   June 1 9:30 AM - 11:00 AM
What Kind Of Scenes And Situations Make Children Find Pleasure In Exercise

Takahiro Nakano[1], Kosho Kasuga[2], Tomoaki Sakai[1], Kazuo Oguri[3]. *[1]Nagoya Gakuin University, Aichi, Japan. [2]Gifu University, Gifu, Japan. [3]Gifu Shotoku Gakuen University, Gifu, Japan.* (Sponsor: Kiyoji Tanaka, FACSM)
(No relevant relationships reported)

Recently, the need for acquiring the habit of exercise since childhood is increasing. As its background, the awareness of likes and dislikes pertaining to, and strengths and weaknesses of exercise is sometimes clarified in childhood. In order to resolve the decrease in children's physical fitness, it is necessary to convey children the pleasures of exercise at an early stage. Therefore, educators should promote exercise opportunities that exclude children's awareness of weaknesses and prioritize expressing the pleasures of exercise. Hence, we ought to understand exactly what kind of scene and situation makes children find pleasure in exercise. **PURPOSE:** The purpose of this study was to examine the difference in the kind of scenes and situations that make children find pleasure in exercise between children who like and dislike exercise. **METHODS:** The subjects of this study were 1846 elementary school children who belonged to the 5th or 6th grade. Data from seventeen items related to liking or disliking exercise, scenes and situations that make children find pleasure in exercise, and value of exercise were analyzed. The difference between children who liked and disliked exercise was analyzed using chi-square test. The most sensitive item to distinguish between children who liked and disliked exercise was examined using decision tree analysis. **RESULTS:** The ratio of children who liked exercise was 81.9% in boys and 69.1% in girls. Children who liked exercise understood the value of exercise for health and a good life significantly more than children who disliked exercise. A significant relationship was confirmed between all items related to scenes and situations that make children find pleasure in exercise and like or dislike exercise. The item "it is fun to exercise with many friends" was used to classify children who liked and disliked exercise most sensitively using decision tree analysis. In addition, 90.3% of the children who did not find pleasure in winning the game answered that they disliked exercise. **CONCLUSIONS:** It was confirmed that most of the children who dislike exercise did not understand the value of exercise since childhood. Conveying the pleasures of exercise since childhood was important. However, it was suggested that focusing excessively on winning or losing has the risk of promoting dislike of exercise.

2177   Board #13   June 1 9:30 AM - 11:00 AM
Development and Validation of the Chinese Assessment of Adolescent Physical Literacy

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(No relevant relationships reported)

PURPOSE: China's physical fitness has been declining for nearly 30 years. How to improve the quality of youth fitness into a focus. The Canadian assessment of Physical Literacy (CAPL) provided a path to evaluate Chinese adolescent physical. The purpose of developing and validating an evaluation system of Chinese adolescent physical literacy.
METHODS: Through the database of Web of Science, PubMed, and CNKI, the primary institutional resources of Physical literacy at home and abroad were collected, and the index system of adolescent physical literacy was constructed by Delphi method and mathematical statistics way.
RESULTS: Using the Likert 5 point scale designed the Chinese Evaluation of physical literacy (CEPL). Using exploratory factor analysis (EFA) method explored the reliability of the CEPL that Cronbach's alpha coefficients were 0.85. Three factors were extracted that the cumulative contribution rate was 60.6%, three elements were verified by the adolescent's physical literacy self-measurement scale of the three dimensions, each coefficient was above 0.82, and the re-test reliability range of three factors was between 0.80-0.82. The version of ESCAPL was composed of four parts, daily behavior, physical ability, knowledge and understanding and motivation, and confidence. The results of the assessment were divided into four grades as follows, Initial level <41.5, Development level 41.5 ~ 62.5, Higher level 62.6 ~ 78.5, and the highest level> 78.5.
CONCLUSIONS: The evaluation index system of adolescent physical literacy evaluation is judged by expert two rounds, and the indexes are effective. After the empirical test, the adolescent physical literacy self-test scale and the physical ability measurement table have the high reliability and the validity can be used for the young athletic level measurement and the appraisal. The research was supported by NPOPSS Grant 15CTY011, and Fundamental Research Funds for the Central Universities Grant 1709240.

2178   Board #14   June 1 9:30 AM - 11:00 AM

Physical Activity Guideline Adherence and Physical Fitness: The NHANES National Youth Fitness Survey

Matthew P. Smudde, Kelly R. Laurson, Dale D. Brown, FACSM, Karen K. Dennis. *Illinois State University, Normal, IL.*
(No relevant relationships reported)

Encouraging regular physical activity (PA) is a major public health objective in the United States for several reasons, including the promotion of physical fitness. As such, the first edition of federal Physical Activity Guidelines for Americans (PAG) was released in 2008. For youth, these PAG include recommendations for aerobic and muscle-strengthening (MS) activity. **PURPOSE:** To examine the association between adherence to PAG and physical fitness in a nationally-representative sample of children and adolescents. **METHODS:** The NHANES National Youth Fitness Survey (NNYFS) collected fitness test and PA questionnaire data on children and adolescents (ages 3-15 years, n = 1,576). Fitness testing was completed for the plank (3-15 years), modified pull-up (5-15 years), handgrip strength (6-15 years), and aerobic fitness (12-15 years) by trained test administrators. Fitness test results were converted into age-specific percentile scores. All subjects reported the number of previous days of the week that included 60 minutes of PA, while 12-15 year olds also reported the number of previous days that included MS activities. Independent *t*-tests were used to compare the mean physical fitness percentile of youth reporting 7 days of 60 minutes of PA to those reporting ≤ 6 days and adolescents reporting 2 or more days of muscle-strengthening activity to those reporting ≤ 1 day. **RESULTS:** Youth reporting 7 days/week of PA had a higher mean relative grip strength (53.8 vs. 46.8 percentile), modified pull-up (53.7 vs. 47.1 percentile), and VO$_2$max (48.9 vs. 40.8 percentile) compared to those with ≤ 6 days/week (all $p < 0.05$). Those participating in MS activity 2 days/week had a higher relative grip strength (54.7 vs. 45.3 percentile), modified pull-up (54.2 vs. 46.8 percentile), plank (54.5 vs. 44.4 percentile), and VO$_2$max (45.7 vs. 39.8 percentile) compared to the ≤ 1 day/week group (all $p < 0.05$). **CONCLUSION:** In this nationally-representative sample, meeting PAG's were associated with measures of aerobic capacity, muscular strength, and muscular endurance. Future prospective research is needed to investigate the impact of changing PA level to meet (or not meet) the PAG on physical fitness.

2179   Board #15   June 1 9:30 AM - 11:00 AM

Three-Year Tracking of Moderate-to-Vigorous Physical Activity During Structured and Unstructured Play In Youth

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(No relevant relationships reported)

Tracking is the maintenance of a relative position within a group over time. Previous studies indicate that habitual, moderate-to-vigorous physical activity (MVPA) tracks at low to moderate levels in youth, but there is limited research on specific contexts of MVPA, such as during structured and unstructured play. **PURPOSE:** To characterize tracking of MVPA in youth across four time points during a three-year period for both structured and unstructured play. **METHODS:** Youth (N=108), 58.3% female, 6-15 years old, visited the laboratory four times over three years. During each visit, participants engaged in 30 minutes each of structured and unstructured play. Youth wore a uniaxial accelerometer on an elastic belt over their right hip (data collected in 1-second epochs). MVPA minutes were determined using Evenson cut-points (≥574 counts/15-sec). Tracking of MVPA minutes was evaluated using tracking coefficients (Pearson's r) between each pair of time points [classified as low ($r<0.30$), moderate (r=0.30-0.60), or moderately high ($r>0.60$)] and intra-class correlations (ICC) via ANOVA. ICCs provided an overall correlation across the four time points [classified as poor (ICC<0.50), moderate (ICC=0.50-0.75), good (ICC=0.75-0.90), or excellent (ICC>0.90)]. Participants were classified into quartiles of MVPA for each visit, and percent agreement and weighted kappa [classified as poor (κ≤0.20), fair (κ=0.21–0.40), moderate (κ=0.41–0.60), good (κ=0.61–0.80), or very good (κ=0.81–1.0)] were calculated. **RESULTS:** Tracking coefficients were non-significant to moderate for structured play (r=-0.20-0.30) and moderate to moderately high for unstructured play (r=0.38-0.66, p's<0.05). The ICC was classified as poor (0.42) for structured play and excellent (0.80) for unstructured play ($p<0.05$). Percent agreement ranged from 24.0-36.6% for structured play and 30.1-44.3% for unstructured. Weighted kappa for structured play ranged from non-significant to poor (-0.09-0.19), but was fair to moderate (0.24-0.49, p's<0.05) for unstructured. **CONCLUSION:** We found evidence of low to moderate tracking for participation in MVPA during structured and unstructured play. Results suggest that MVPA during structured and unstructured play tracks similarly to habitual physical activity in youth.
Funded by NICHD R01 55400.

2180   Board #16   June 1 9:30 AM - 11:00 AM

Association Between Tri-Ponderal Mass Index and FITNESSGRAM Aerobic Capacity Classification in Sixth-Grade Children

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(No relevant relationships reported)

FITNESSGRAM has established criterion standards for body composition and body mass index (BMI) according to gender and age in children. Standards for aerobic capacity (AC) have also been established to assess cardiorespiratory function. Tri-Ponderal Mass Index (TMI) has been shown to better classify overweight and obesity than BMI in youth. **PURPOSE**: The purpose of this study was to determine the association between TMI and FITNESSGRAM AC classification in sixth-grade children. **METHODS**: Subjects were 528 sixth-grade boys and girls, ages 11-13, who completed each of the FITNESSGRAM components as a part of their yearly assessment. In addition to height and weight, subjects' AC was determined from one-mile run/walk times, age, gender and BMI. 52% percent of these students were classified within the Healthy Fitness Zone (HFZ) for AC. 31% percent of these students were classified as High Risk for AC. **RESULTS**: The correlation between TMI and BMI was .98, and the correlation between BMI and AC was -.75. The correlation between TMI and AC was -.73. Receiver Operating Characteristic (ROC) analysis indicated that a TMI of 13.94 represents the best cut-off score for classifying girls within the HFZ for AC, with 90% classified correctly, and AUC = .96. Also, a TMI of 15.05 represents the best cut-off score for classifying boys within the HFZ for AC, with 90% classified correctly, and AUC = .95. For determining High Risk classification for AC, a TMI of 16.53 represents the best cut-off score for classifying girls as High Risk for AC, with 92% classified correctly, and AUC = .96. Also, a TMI of 17.75 represents the best cut-off score for classifying boys as High Risk for AC, with 93% classified correctly, and AUC = .97. **CONCLUSIONS**: TMI is strongly associated with classification according to FITNESSGRAM AC standards in sixth-grade children. These data suggest that a TMI of 13.94 for girls and 15.05 for boys are the best criteria for HFZ classification for FITNESSGRAM AC. Also, a TMI of 16.53 for girls and 17.75 for boys are the best criteria for High Risk classification for FITNESSGRAM AC. Appropriate evaluation of body size is important since body size has been shown to be highly related to aerobic capacity and performance, especially in weight-bearing exercises.

2181   Board #17   June 1 9:30 AM - 11:00 AM

The Influence Of Non-cognitive Functional Characteristics At Age 6 On Physical Fitness Characteristics At Age 10

Kosho Kasuga[1], Takahiro Nakano[2], Kazuo Oguri[3], Tomoaki Sakai[2]. *[1]Gifu University, gifu, Japan. [2]Nagoya Gakuin University, seto, Japan. [3]Gifu Shotoku Gakuen University, gifu, Japan.* (Sponsor: Kiyoji Tanaka, FACSM)
(No relevant relationships reported)

Human non-cognitive functioning is developed mostly in early childhood. It may be that physical characteristics during childhood affected by daily exercise behaviors are also affected by non-cognitive functional characteristics in the early childhood. **PURPOSE**: The purpose of this study was to examine the influence of non-cognitive functional characteristics at the age of 6 years on the physical fitness characteristics at the age of 10 years.
METHODS: Subjects included 223 children (110 boys and 113 girls) who performed the physical fitness test (eight exercises) at 10 years of age. In order to understand non-cognitive functional characteristics at 6 years of age, a questionnaire of 21 questions consisting of 8 items (self-recognition, motivation, perseverance, self-control, social appropriateness, resilience and coping ability, creativity, and personality) was used. Evaluation of non-cognitive function was carried out by three kindergarten teachers who had the experience of being their homeroom teacher. From the evaluation obtained, grouping was performed with the upper group (UG), the middle group (MG), and the lower group (LG) based on the evaluation value of each non-cognitive function. Statistical analysis of the data was conducted using a one-way ANOVA and multiple comparisons (Tukey's HSD test) to compare physical fitness among the groups.
RESULTS: Results of the analysis revealed significant differences in physical fitness in all items except "nervous" among the 21 questions. UG of each item was significantly higher than LG. In particular, there was a very high effect size (ES) in "persistent efforts" (ES: 1.99), "ingenuity" (ES: 1.92), and "ability to pull out" (ES: 1.85).

CONCLUSIONS: It was suggested that children with increased non-cognitive functions such as condition judgment ability and tenacity in early childhood have a good effect on physical fitness at school age.

2182   Board #18   June 1 9:30 AM - 11:00 AM

A Comparison of Health Related Fitness Variables between Youths in Singapore and Hong Kong

Yew Cheo Ng[1], Govindasamy Balasekaran, FACSM[1], Stanley Sai-Chuen Hui, FACSM[2], Visvasuresh Victor Govindaswamy[3], Jolene Lim[1], Peggy Boey[1]. [1]Nanyang Technological University, Singapore, Singapore. [2]The Chinese University of Hong Kong, Shatin, Hong Kong. [3]Concordia University Chicago, Illinois, IL.
(No relevant relationships reported)

Physical fitness encompasses health-related fitness (HRF) variables which may reduce cardiovascular risk factors if identified early in youths. **Purpose:** To compare HRF variables between youths in Singapore (SGP) and Hong Kong (HK). **Methods:** A total of 1559 youths from SGP (age: 13.49 ± 1.21 years, height: 159.76 ± 8.94 cm, weight: 51.91 ± 13.38 kg, Body Fat (BF) %: 21.51 ± 10.25 %) and 1530 youths from HK (age: 13.51 ± 0.98 years, height: 160.69 ± 8.40 cm, weight: 52.20 ± 12.43 kg, BF%: 21.16 ± 9.99 %) participated in this study. Body Mass Index (BMI) and BF% were measured by bio-electric impedance analysis. Cardiovascular fitness, lower limb flexibility, arm strength, abdominal endurance were tested using the 15m youth Progressive Aerobic Cardiovascular Endurance Run test (PACER), one-legged sit-and-reach test for both legs (SRT), handgrip strength test for both hands (HS), and 1-minute sit-up test (SUT) respectively. **Results:** Using the Independent T-Test, significant differences were found between SGP and HK youths for height (SGP: 159.76 ± 8.94 cm, HK: 160.69 ± 8.40 cm, $p < 0.0005$), SRT (SGP: 54.14 ± 10.15 cm, HK: 49.59 ± 12.04 cm, $p < 0.0005$), HS (SGP: 25.18 ± 7.77 kg, HK: 26.01 ± 6.96 kg, $p = 0.002$), SUT (SGP: 38.94 ± 11.92, HK: 30.56 ± 10.14, $p < 0.0005$) and PACER (SGP: 40.93 ± 23.90 laps, HK: 35.49 ± 18.44 laps, $p < 0.0005$). There were no significant differences in weight, BMI, and BF% between youths in both countries, with low obesity rates in both countries (SGP: 12.7%, HK: 10.32%). **Conclusion:** Results indicated similar body composition results in both countries. SGP youths had lesser arm strength as compared to HK youths. However, SGP youths had higher abdominal endurance, better flexibility and were more aerobically fit as compared to HK youths. Both SGP and HK youths need to maintain their physical activities to improve their cardiovascular fitness as this will help to reduce cardiovascular diseases in youths in the future.

2183   Board #19   June 1 9:30 AM - 11:00 AM

Effects of Jump Rope Exercise on Stretch-Shortening Cycle Ability in Elementary School Students

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(No relevant relationships reported)

PURPOSE: Not much research has investigated how jump rope exercise can lead to improvements in physical abilities, including stretch-shortening cycle (SSC) ability, in children. This study examined whether the maximum number of jumps elementary school students could perform in a jump rope exercise ("max jump count": MJC below) was associated with their jumping performance, short-distance sprint performance, and other fitness indicators, as well as whether a jump rope training program led to improvements in those abilities.
METHODS: Seventy-four elementary school students (34 boys, 40 girls) aged from 6 to 12 years old participated in this study (mean height: 138+11 cm, mean weight: 33+8 kg). In addition to MJC, all students were assessed in terms of 20-m sprint time (ST), rebound jump index (RJI), vertical jump (VJ), and grip strength (GS). For RJI, students were measured with an optical measurement system as they performed five consecutive rebound jumps with both legs: RJI was calculated as jump height divided by ground contact time. Pearson's product-moment correlation coefficients (r) were determined to check for associations between MJC and the other fitness indicators. The training effects of jump rope exercise were investigated by comparing students' performance before and after completing four weeks of training. Students were allowed to decide for themselves how often to jump rope during these four weeks.
RESULTS: Before training, students achieved a mean MJC of 93+98 jumps, with a range of 2-459 jumps. A negative correlation was observed between MJC in before training and ST ($r=-0.46$, $p<0.01$). Additionally, positive correlations were observed between it and RJI ($r=0.57$, $p<0.01$), VJ ($r=0.33$, $p<0.01$) and GS (left-hand: $r=0.31$, $p<0.01$; right hand: $r=0.34$, $p<0.01$). Four weeks of training resulted in significant improvements in MJC ($+43\%$, $p<0.001$), RJI ($+7\%$, $p<0.05$), and VJ ($+5\%$, $p<0.01$). However, jump rope exercise frequency did not result in any apparent differences in training effects.

CONCLUSIONS: These results suggest that MJC was associated with a variety of physical abilities in elementary school students. However, it could not be clearly demonstrated that jump rope training improve performance indicators related to SSC ability in elementary school students.

2184   Board #20   June 1 9:30 AM - 11:00 AM

A Comparison Of Health Related Fitness Variables Between The Youths Of Singapore And Bangkok

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(No relevant relationships reported)

Obesity is identified as a worldwide issue and thus assessing health related components of physical fitness in youths may help in identifying risk factors associated with obesity. **Purpose:** To compare fitness variables between the youths of Singapore (SGP) and Bangkok (BKK). **Methods:** A sample of 1559 (Age: 13.49 ± 1.21 yrs; Height: 159.76 ± 8.94 cm; Weight: 51.91 ± 13.38 kg) youths from SGP and 1098 (Age: 13.95 ± 0.85 yrs; Height: 158.88 ± 7.98 cm; Weight: 53.01 ± 14.13 kg) youths from BKK were recruited for this study. Body composition was measured using a bio-impedance analysis (BIA) machine. A one-legged sit-and-reach test for both legs (SRT), handgrip strength test for both hands (HST), sit-up test (SUT), and 15m youth Progressive Aerobic Cardiovascular Endurance Run (PACER) test was conducted to measure flexibility, arm strength, abdominal endurance, and cardiorespiratory endurance respectively. **Results**: There was a significant difference in body composition between the youths in SGP and BKK, as indicated by their body mass index (SGP: 20.19 ± 4.21 kg.m^{-2}, BKK: 20.85 ± 4.64 kg.m^{-2}, $p < 0.0005$) and body fat percentage (SGP: 21.51 ± 10.25 %, BKK: 23.43 ± 11.23 %, $p < 0.0005$). Significant differences were found between the youths of both countries for SRT for both legs (SGP: 108.27 ± 20.31 cm, BKK: 103.59 ± 18.25 cm, $p < 0.0005$), HST for both hands (SGP: 50.32 ± 15.53 kg, BKK: 52.20 ± 12.72 kg, $p = 0.001$), SUT (SGP: 38.94 ± 11.92, BKK: 27.19 ± 9.72, $p < 0.0005$), and PACER (SGP: 40.93 ± 23.90 laps, BKK: 30.37 ± 16.26 laps, $p < 0.0005$). **Conclusions:** The youths of SGP had lower body composition, were more flexible, had higher abdominal endurance, and were more aerobically fit compared to the youths of BKK. This indicated a lower risk of obesity and cardiovascular risk in SGP youths as compared to BKK. More research is needed to identify the reasons for these differences which may help youths to continue participating in high levels of physical activity and exercise to reduce cardiovascular risks.

2185   Board #21   June 1 9:30 AM - 11:00 AM

Assessment Of Quality Of Movement Patterns In Spanish Pediatric Population During Classes Of Physical Education

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(No relevant relationships reported)

The Functional Movement Screen(FMS) test has become increasingly popular as a tool designed to evaluate the quality of fundamental whole-body movement patterns, for the assessment of the normal function and for identifying limitations and asymmetries in basic functional movements. Although there are already considerable data analyzing FMS outcomes in adults, this research is currently scarce in pediatric population.
PURPOSE: This exploratory and descriptive study was undertaken to evaluate the physical functional capacity in school-aged pediatric population, in order to assess the prevalence of asymmetries and confirm feasibility of performing the FMS in a sample of children from Spanish primary school. **METHODS**: 136 elementary school children, 69 girls and 67 boys between 8-13 years old, took part in this investigation (age: 9.96 ± 1.22 years, weight: 39.21 ± 7.01 kg, height: 1.35 ± 0.097 m, BMI: 21.36 ± 2.69). Each participant performed the FMS during the classes of Physical Education in a primary school of Spain. Throughout data collection, information was digitally recorded for later data analysis. Statistical analysis was made using a two-way ANOVA with repeated measures. **RESULTS**: Obtained results showed that girls scored highest in all the FMS tests, compared with boys (14.38 ± 3.078 vs. 11.91 ± 2.58) and these outcomes indicate significant differences between both genders, throughout all studied age range ($P = 0.000$). The mean of total FMS score from all the study participants was 12.76 ± 2.89. **CONCLUSION**: Girls presented higher quality of fundamental movement skills than boys, which indicates more optimal function, and boys scored lowest, which indicates lower quality of basic movement patterns and, therefore, higher prevalence of limitations and asymmetries. The low values of total FMS scores in both genders showed throughout all the age range studied indicate suboptimal physical functional capacity and high prevalence of asymmetries. Finally, the results

of this study highlight that FMS can be a feasible screen test for evaluating functional movement skills and asymmetries in pediatric population, in order to reduce the risks of orthopaedic abnormality arising from suboptimal movement patterns in adult lifespan.

2186   Board #22   June 1 9:30 AM - 11:00 AM

Impact of Flag Football Intervention on Fitness Outcomes among 9-11 Years Old Chinese Children

Jie Zhuang[1], XinZhao Cao[1], Peijie Chen[1], Yong Gao[2]. [1]*Shanghai University of Sport, Shanghai, China.* [2]*Boise State University, Boise, ID.* (Sponsor: Weimo Zhu, FACSM)
(No relevant relationships reported)

PURPOSE: To examine the impact of a 10-week flag football intervention on aerobic fitness, muscular strength and speed among 9-11 years old Chinese children. **METHODS**: A total of 122 9-11 years old Chinese children were randomly divided into intervention group (IG; n=62) and control group (CG; n=60). The IG received ten-week flag football (FF) lessons (60-90 mins per lesson, twice a week), including throwing and catching balls, positioning, attacks,defending, game rules and games while CG took conventional PE lessons (35 mins per lesson, 3 times a week). Participants took 20-m shuttle run (20-m SRT), jump rope (for muscular power) and 50-meter dash (for speed) tests before and after intervention. VO_{2max} was estimated from 20-m SRT using Pacer equation. Mixed model Repeated Measures ANOVAs were used for data analysis.
RESULTS: A significant group-by-time interaction was observed for jump rope test (turns/min), p=0.03: no difference between IG and CG at baseline, but jump rope performance was significant improved among IG while no change among CG after intervention. There was also a significant group-by-time interaction for 50-meter dash (in sec), p=0.013: no difference at baseline between IG and CG, but 50-meter dash performance improved among IG while no change in CG after intervention. Although VO2max and 20-m SRT scores of both IG and CG participants increased from baseline to after intervention, there was no group difference in the improvement, p>0.05.
CONCLUSIONS: 10-week FF training effectively improves muscular power and speed among 9-11 years old Chinese children.

Fitness comparison				
Variable	Group	IG	CG	ES
20-m SRT (laps)	Baseline	25.92±9.18	22.67±7.69	0.38
	Post	31.32±9.72	26.20±8.03	0.57
	ES	0.57	0.45	
VO_{2max} (ml/kg/min)	Baseline	46.02±2.86	45.05±2.68	0.35
	Post	47.37±3.10	45.93±2.49	0.51
	ES	0.45	0.34	
Jump rope test (times/min)	Baseline	106.60±29.41	107.87±28.30	0.04
	Post	115.30±31.08	108.73±32.64	0.21
	ES	0.29	0.03	
50-meter dash (s)	Baseline	10.11±0.94	10.02±0.87	0.1
	Post	9.69±0.82	9.89±0.84	0.24
	ES	0.48	0.15	

2187   Board #23   June 1 9:30 AM - 11:00 AM

Effect of Injury Prevention Program on Performance Measures in Middle School Boys Soccer Players

Stuart McCrory, Shane Caswell, Nelson Cortes. *George Mason University, Manassas, VA.*
(No relevant relationships reported)

Lower extremity injuries are common in boys' youth soccer. Lower extremity injury prevention programs (IPPs) have been shown to be effective in reducing injury risk and increasing performance among high school and adult soccer players. To date, little research has examined the effectiveness of IPPs to change physical performance characteristics among middle school-age (10-14 years) athletes.
PURPOSE: To determine the effectiveness of a novel 16 exercise IPP in male middle school soccer players on vertical jump (VJ), single-leg long jump (SLLJ), and single-leg anterior reach (SLAR).
METHODS: Students (N=49, 12.6 ± 0.7 years, 1.59 ± 0.1 m, 53 ± 13 kg) playing on 3 separate boys' middle school soccer participated in this study. During the season and at the beginning of each practice session all athletes completed a 16-exercise IPP that lasted 6 weeks. Each IPP session was supervised by the team's coach and the athletic trainer. The IPP involved dynamic movements with the aim of improving physical performance for the athletes including power, core stability, balance, and agility. Performance testing was conducted pre- and post-season and included VJ, SLLJ, and SLAR. The VJ and SLLJ were completed on a turf field with the athletes in cleats

to produce a more realistic environment during testing. The SLAR was completed indoors with the athletes standing barefoot on a flat, hard surface. The SLAR and SLLJ tests were normalized to participant's leg length. Paired t-tests were conducted to compare pre- and post-intervention groups (p<.05).
RESULTS: A statistically significant improvement in VJ (pre = 41.3 ± 9.8 cm, post = 46.9 ± 13.9 cm; p<.05) and a reduction in SLAR for both right and left limbs (Right pre = 66.8 ± 7.5, post = 65.8 ± 6.2 cm; Left pre = 68.0 ± 6.9 cm, post = 61.2 ± 8.3 cm; p<.05) was attained. No significant differences were found for SLLJ (p>.05).
CONCLUSION: The findings suggest that our IPP was effective in improving VJ in middle school soccer players, but was detrimental for SLAR. Coaches and other professionals should ensure that performance improvements are not at the cost of injury risk. Future research should be conducted to determine which aspects of the injury prevention program affects the various tests performed so that more comprehensive and effective IPPs can be implemented.
Supported by the Potomac Health Foundation.

2188   Board #24   June 1 9:30 AM - 11:00 AM

Season Long Changes in Training Load Metrics for a World Champion Youth Ice-Hockey Team

Brandon Bastianelli, Davor Stojanov, Dakota Burke, Andrea Workman, Kenneth Martel, Stephen Mcgregor. *Eastern Michigan University, ypsilanti, MI.*
(No relevant relationships reported)

With increasing use of player worn sensors (PWS) in team sports, previously unknowable information is now within grasp. The team sport of ice hockey presents numerous challenges with regard to the assessment of training load. More specifically, the differences in training load experienced by skaters of different positions is of interest to optimize player development and avoid injury.
PURPOSE:
Use (PWS) to measure on-ice physiological exertions and quantify training load differences between forwards (F) and defensemen (D) members of a national junior ice hockey team over the course of a season.
METHODS:
19 members of the US National Team Development Program (17.5+.21 y, 1.82+0.8 m, 83.1+7.6 kg) consented to procedures approved by the EMU-HSRC. Zephyr bioharness-3 (Zephyr, MD) PWS measured triaxial accelerations and heart rate for all on-ice practices and games. Exponentially weighted session Dynamic Accelerations (DYNAs) were used to determine Intensity Factor (IF) that was expressed relative to a player's Dynamic Functional Threshold (DFT; 30 min maximal acceleration). Dynamic Training Load (DTL) was calculated using the individualized IF and session duration to reflect training load of a single session. DTL was used as the input for an impulse-response performance model to calculate Chronic Training Load (CTL), Acute Training Load (ATL) and Performance Readiness (PR) over a given period of time. MANOVA statistical tests compared metrics by session type and position for main effects and a Bonferoni *post hoc* in the event of statistical differences (α=.05).
RESULTS:
Overall, differences by position were observed with F being higher than D for both DA (.311+.001 v .303+.001) and IF (0.82+.002 v 0.81+.003)(p<.05). No differences were observed, overall, for DTL, CTL, ATL or PR by position. Interactions were also observed for DA and IF by position and session. For F, DA was greater for games than practice, while practices were greater than games for D.
CONCLUSION:
F appeared to perform greater accelerations and relative intensities in games and practices than D, but this did not result in significantly different training loads between positions. It also appears as though F exhibited greater accelerations and intensities in games than practices, while D exhibited the converse. Supported by the USA Hockey Foundation

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2189   Board #25   June 1 9:30 AM - 11:00 AM

Season Long Changes in Training Load Metrics for a World Champion Junior Ice-Hockey Team

Dakota J. Burke, Davor Stojanov, Andrea Workman, Kenneth Martel, Stephen McGregor. *Eastern Michigan University, Ypsilanti, MI.*
(No relevant relationships reported)

PURPOSE: Use player worn sensors (PWS) to measure on ice physiological exertions and quantify training load changes for players on a Junior National ice hockey team over the course of a single season which culminated in a World Championship.
METHODS: 19 members of a National Team Development Program (17.5+.21 y, 1.82+0.8 m, 83.1+7.6 kg) consented to procedures approved by the EMU-HSRC. Zephyr BH3 (Zephyr, MD) PWS measured triaxial accelerations (g's) for all on ice practices (P) and games (G). Dynamic Accelerations (DYNAs) were generated from exponentially weighted accelerations and Dynamic Functional Threshold (DFT) from peak 30 min DYNAs within a 2 week moving window. Intensity Factor (IF) was based on session DYNAs relative to DFT. Dynamic Training Load (DTL) for a single session

was calculated using the IF and the session duration. DTL was used as the input for an impulse response performance model to calculate Chronic Training Load (CTL), Acute Training Load (ATL) and Performance Readiness (PR) over a given amount of time. MANOVA was used to compare metrics by session type, (G) vs (P), and by month (M1 - M7) for main effects and Bonferoni *post hocs* in the event of statistical differences (α=.05)

RESULTS: **RESULTS:** All training load metrics were different between G and P, by month and an interaction for session by month (p<.05). When P were examined separately, DTL was not different across M1-M4, but declined during M5-M7 (108.5+2.5, 116.3+29.2, and 58.4+2.5, respectively; p<.05) with M7 being lower than M1-M6. IF was highest during M1 (.86+.01) and significantly declined over the season and was lowest at M7 (.74+.01). In contrast, for G, DTL increased for M1 (193.0+1.9) and M2 (200.0+2.2) but were not different for the remainder of the year, while IF peaked at M3 (.83+.01) and was lowest (p<.05) at M7 (.79+.01). For performance modeling metrics, CTL peaked at M3 (p<.05), but despite the reduced DTL for P in M7, CTL, ATL and PR were not different during M7 compared to M6 (p>.05)

CONCLUSIONS: In the last month before the World Championships, training loads and intensities of practices were reduced substantially, while game loads remained constant but intensities were reduced. The training loads imparted by games were sufficient to maintain CTL, but ATL was not reduced and PR was not increased leading into the primary objective of the season

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2190   Board #26   June 1 9:30 AM - 11:00 AM

Implementing a Progressive Resistance Training Program in Youth Junior Olympic Women's Gymnastics.

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(No relevant relationships reported)

Competitive gymnasts in the Women's Junior Olympic (JO) program are highly conditioned, typically training 8-20 hours per week. Training often consists of high-repetition body-weight activities with little variability in the exercises performed. This method of training lacks progressive resistance training (PRT), a cornerstone to adaptation for specific training goals. **PURPOSE**: To investigate the benefits of 10 wks of PRT, 1 day/wk, on muscular strength and power in women's JO child and adolescent gymnasts. A program was implemented for all competitive levels during regular practice, while minimizing time away from normal training. **METHODS**: 47 females aged 7-17 yrs (mean 10.2±2.7 yrs), competing on JO levels 3-10 participated. 15 exercises were each completed for 1 set of 10 reps. Tests for upper- and lower-body power included vertical leap, medicine ball-put, and an arm-ergometer modified Wingate anaerobic test (Arm-WAnT). Analysis: Gymnasts must have attended at least 70% of the training sessions during the 10-week study. Level 3 gymnasts (n=19) underwent the control condition, completing normal body-weight non-progressive conditioning. They were compared to the Level 4 gymnasts who were of similar age and gymnastics training experience. Level 4-10 gymnasts were separately analyzed in a quasi-experimental repeated measures design. **RESULTS**: Compared to the Level 3 controls, Level 4 gymnasts had greater improvement in vertical power (p=0.003), and Arm-WAnT peak power and mean power (p=0.044 and 0.023), but no difference in medicine ball-put distance or Arm-WAnT fatigue index. Gymnasts Levels 4 to 10 similarly improved vertical power (2224±756W to 2473±688W, p<0.001), Arm-WAnT peak power (80.9±30.1W to 93.2±40.6W, p<0.001), and mean power (62.8±23.2 to 70.1±27.3, p<0.001), with no change in medicine ball-put distance or Arm-WAnT fatigue index. **CONCLUSION**: 10-wks of PRT will improve upper- and lower-body power in child and adolescent female JO gymnasts.

E-28   Free Communication/Poster - Cerebral Blood Flow

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2191   Board #27   June 1 11:00 AM - 12:30 PM

Ipsilateral and Contralateral Posterior Cerebral Artery Blood Velocities During Handgrip Exercise

Kazuya Suzuki, Takuro Washio, Masato Hatanaka, Hiroki Sakurai, Shigehiko Ogoh, FACSM. *Toyo University, kawagoe, Japan.*

(No relevant relationships reported)

Previous studies reported that an increase in the contralateral middle cerebral artery mean blood velocity was larger than mean blood velocity in the ipsilateral side during handgrip (HG) exercise. These findings suggest a significant increase in blood flow for the artery supplying the cortical projection of the exercising limb. On the other hand, the response of posterior cerebral blood flow (CBF) to exercise

is significantly different from anterior CBF. However, it remains unknown whether there is different CBF response to HG exercise between ipsilateral and contralateral posterior cerebral arteries. **PURPOSE:** The purpose of this study was to examine the effect of HG exercise on CBF in ipsilateral and contralateral posterior cerebral arteries. **METHODS:** Six healthy male subjects performed HG exercise of the right hand for 3 min at 30% maximum voluntary contraction in a semi-supine position. Arterial pressure and posterior cerebral artery blood velocity (PCAv) were measured by finger photoplethysmography and the Transcranial Doppler Sonography, respectively. Cerebral vascular conductance index (CVCi) was estimated using the ratio of PCAv to mean arterial pressure (MAP). **RESULTS:** MAP significantly increased from rest during HG exercise (+26.9%, P=0.02). During HG exercise, both ipsilateral and contralateral PCAv significantly increased, but there was no significant difference between sides (P = 0.87). Also, CVCi decreased significantly during HG exercise. Similarly, there was no difference in CVCi between ipsilateral and contralateral arteries (P=0.96). **CONCLUSION**: The findings of the present study suggest that the blood flow response in the posterior regional CBF during HG exercise is different from that in the anterior cerebral circulation.

2192   Board #28   June 1 11:00 AM - 12:30 PM

Age-related Differences in Cerebral Oxygen Diffusive Capacity during Normobaric Hypoxia Exposure

Xiangrong Shi, FACSM, Xiaoli Liu, Hannah Schenck, Shande Chen, James Hall, Sarah Ross, Geoffrey Kline, Robert T. Mallet. *UNT Health Science Center, Fort Worth, TX.*

(No relevant relationships reported)

Purpose: Cerebral perfusion and oxygen diffusive capacity were enhanced in young adults during hypoxia-induced hypoxemia. This study examined cerebral oxygenation and perfusion in elderly adults during exposure to normobaric hypoxia. **Methods**: Eight elderly (70 ± 2 yr, 4 women) and eight young adults (25 ± 1 yr) were exposed to 5 min 10% O_2. During the test, heart rate (HR, electrocardiogram), arterial blood pressure (ABP, NIBP100D), O_2 saturation (SaO_2, Radiometer), middle cerebral arterial blood flow velocity (V_{MCA}, Ez-Dop) and cerebral tissue oxygenation (ScO_2, Somanetics 5100C INVOS) were continuously monitored. **Results**: Baseline SaO_2, HR, and mean ABP were not significantly different in elderly vs. young subjects (SaO_2 96.9±0.3 vs 97.0±0.3%; HR 71±4 vs 63±2 bpm; ABP 93±3 vs 89±2 mmHg). However, baseline V_{MCA} (43.5±2.2 vs 53.7±1.8 cm/s, P=0.005) and ScO_2 (68.6±0.7 vs 75.4±0.9%, P<0.001) were lower in elderly than young adults. During hypoxia exposure, HR was significantly increased with decreases in SaO_2; the rate of tachycardia per unit hypoxemia was smaller (P<0.001) in elderly (-0.48 ±0.05 bpm/%) than young (-0.84 ±0.02 bpm/%) group. ABP was not altered during hypoxia-induced hypoxemia in either group. SaO_2 during 5-min hypoxia exposure fell appreciably, to 77.5±2.3% and 75.9±1.4% in elderly and young groups, respectively; the rate of decrease in SaO_2 per unit time was not significantly different between the groups. However, in terms of unit hypoxemia, the rate of decrease in ScO_2 was smaller (P = 0.002) in elderly (0.69±0.01 %/%) than young (0.85±0.03 %/%) adults, while the rates of increase in V_{MCA} were similar between elderly and young groups (-0.28±0.05 vs -0.37±0.07 cm/s/%, P = 0.325). Fractional cerebral oxygen extraction during hypoxemia declined in elderly subjects (P = 0.038), but progressively increased in young adults (P <0.05). **Conclusions**: Aging diminishes cerebral oxygenation and perfusion at rest. During exposure to normobaric hypoxia, elderly adults depend solely on an activated cerebral vasodilation to maintain O_2 delivery, but cerebral oxygen diffusive capacity is not enhanced as in young group.

2193   Board #29   June 1 11:00 AM - 12:30 PM

Cerebral Blood Flow Pulse Is Influenced By Ascending Aortic Flow During Acute Hypotension

Tomoya Suda[1], Ai Hirasawa[1], Takahiro Uechi[1], Kazukuni Hirabuki[1], Noritaka Hata[1], Yuki Sano[1], Takeaki Matsuda[1], Shigeki Shibata[1], Shigehiko Ogoh, FACSM[2]. [1]*Kyorin University, Tokyo, Japan.* [2]*Toyo University, Saitama, Japan.*

(No relevant relationships reported)

Purpose: Recently, it has been suggested that cardiac function is one of important physiological factors to determine cerebral blood flow (CBF). However, dynamic relationship between cardiac outflow and CBF is still unknown. The purpose of the present study was to assess the dynamic relationship between arterial blood pressure (BP) or ascending aortic blood flow and CBF.
Methods: Six male healhy subjects participated (age, height, and weight; 33±6 yrs, 173±3 cm, and 72±8 kg) in the present study. Continuous beat-by-beat arterial BP was recorded from a finger using the Penaz method. Ascending aortic blood flow velocity (Ao-BFV) and middle cerebral artery blood flow velocity (MCA-BFV) were continuously measured using supra-sternum and transcranial Doppler ultrasound. After 10 min of resting condition, bilateral thigh cuffs were rapidly inflated to 200 mmHg and maintained for 2 min. Then both cuffs were rapidly deflated, and data were subsequently collected for 1 min. The same measurements were performed in the

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FRIDAY, JUNE 1, 2018

supine and 45-degree semi-Fowler's positions. Pearson's correlation coefficients were calculated to identify the relationship between relative change of BP or Ao-BFV and those of MCA-BFV among individuals.

Results: Correlation coefficient of mean BP and mean MCA-BFV was much larger than that of mean Ao-BFV and mean MCA-BFV in both the supine and semi-Fowler's positions (R=0.615 vs. 0.009 and 0.353 vs. -0.753). In contrast, the correlation coefficient of pulse BP and pulse MCA-BFV was much smaller than that of pulse Ao-BFV and pulse MCA-BFV in the supine position (R=-0.068 vs 0.659), while it was comparable in the semi-Fowler's position (R=0.555 vs 0.435).

Conclusions: Dynamic change in mean CBF are likely to be only influenced by mean BP. However, dynamic change in pulse CBF seems to be more influenced by that of pulse ascending aortic blood flow rather than pulse BP especially in the supine position.

2194   Board #30   June 1 11:00 AM - 12:30 PM

Effect Of Postural Stimulation On Cerebral Hemodynamics

Yuka Ninomiya[1], Tsubasa Tomoto[2], Tomoko Imai[3], Shigehiko Ogoh, FACSM[4], Koki Takahashi[1], Jun Sugawara[2]. [1]Tokyo Ariake University of Medical and Health Sciences, Tokyo, Japan. [2]National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan. [3]Aichi Institute of Technology, Toyota, Japan. [4]Toyo University, Kawagoe, Japan. (Sponsor: Shigehiko Ogoh, FACSM)

(No relevant relationships reported)

The previous prospective study identified that prolonged sleep could be associated with the increased future stroke risk in an apparently healthy aging population. However, the underlying mechanism is unknown. Chronic excessive pulsatile flow is thought to be a risk for cerebrovascular disease. In the supine posture, stroke volume (SV) is greater than that in upright posture since decrease in hydrostatic pressure increases venous return and consequently cardiac preload.

PURPOSE: We determined whether greater SV in the supine posture is associated with the augmented mechanical stress (characterized by cerebral pulsatile hemodynamics) in the cerebral vasculature. **METHODS**: To test this hypothesis, we applied -30 mmHg of lower body negative pressure (LBNP) as mild orthostatic stimulus in 18 healthy men (mean age = 21.9 ± 1.9yrs). TCD-determined MCAV was used to evaluate cerebral hemodynamics. SV was estimated from the radial arterial pressure waveforms using the Modelflow method. **RESULTS**: SV, peak and pulsatile MCA velocity, and PI of MCA velocity were significantly decreased during LBNP stimulation (P<0.05 for all, vs. supine posture), whereas mean MCA velocity and cardiac output remained unchanged. Importantly, the change in SV during LBNP significantly correlated with corresponding changes in peak and pulsatile MCA velocity (r=0.50, P=0.034; r=0.63, P=0.005, respectively). **CONCLUSIONS**: These results suggest that orthostatic stress (or postural change)-induced modified pulsatile component of cerebral hemodynamics (or augmented cerebral vascular stress) are partly due to change in SV. Our findings may partly support the phenomenon that long-time sleep is a risk for cerebrovascular disease.

2195   Board #31   June 1 11:00 AM - 12:30 PM

Effect Of Muscle Metaboreflex On Anterior and Posterior Cerebral Blood Flow

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(No relevant relationships reported)

Previous study demonstrated that post-exercise muscle ischemia (activation of muscle metaboreflex) following leg cycling failed to elevate anterior cerebral blood flow (CBF) despite a higher arterial blood pressure and this result was associated with hyperventilation-related decrease in the partial pressure of end-tidal carbon dioxide. However, the effect of muscle metaboreflex on posterior CBF remains unknown. **PURPOSE**: The purpose of the present study was to test the hypothesis that the response of posterior CBF to activation of muscle metaboreflex is different from that of anterior CBF. **METHODS**: Eleven healthy participants performed one-legged static knee extension exercise at 30 % maximal voluntary contraction for 2 min. The muscle metaboreflex was activated for 2 min by post-exercise muscle ischemia (PEMI). Blood flow to the internal carotid and vertebral arteries (ICA/VA) were evaluated by duplex ultrasonography. **RESULTS**: The both ICA and VA blood flow increased and reached to the peak value at 60 s after the start of exercise (+19±15 and 26±14%, P<0.05, respectively). Thereafter, ICA blood flow gradually decreased to the end of exercise (P<0.05) despite no change in VA blood flow (P=0.710). During PEMI immediately after exercise, both ICA and VA blood flow returned to the baseline level despite a high blood pressure. **CONCLUSIONS**: VA circulation has a low cerebral autoregulation and carbon dioxide CBF reactivity. However, similarly with anterior CBF, VA

blood flow was not affected by metaboreflex-induced elevated blood pressure. This phenomenon may be important for protecting posterior cerebral circulation from high blood pressure but the mechanism remains unclear.

2196   Board #32   June 1 11:00 AM - 12:30 PM

Effect of Acute Sleep Deprivation on Dynamic Cerebral Autoregulation

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(No relevant relationships reported)

Sleep disorders increase the risk of cardiovascular disease. For example, previous cohort studies suggested that sleep deprivation contributed to the onset of cerebrovascular disease. However, its physiological mechanism remains unknown. We hypothesized that sleep disorders attenuated dynamic cerebral autoregulation (CA), which is one physiological mechanism of cerebral blood flow regulation.

PURPOSE: To test our hypothesis, the present study investigated if there was an effect of acute sleep deprivation on dynamic CA. **METHODS:** Six healthy young men participated in the present study. Each subject was instructed to shorter his individual sleep duration (individual averaged sleep duration minus 2 hours) to created sleep deprivation condition. Following manipulating sleep duration, each subject visited the laboratory to perform experiments in the morning (between 8 and 10 am). Mean arterial pressure (MAP) and middle cerebral artery blood velocity (MCAv) were measured during the experiment. Dynamic CA was assessed by transfer function analysis of spontaneous oscillations between MAP and MCAv in the low-frequency range (LF, 0.07-0.20 Hz) in each subject under these two different sleep conditions: control (averaged sleep duration, 6.5 ± 0.9 h) and sleep deprivation conditions (3.9 ± 0.4 h). **RESULTS:** Acute sleep deprivation did not change either MCAv or MAP. Also, unexpectedly, there was no difference in the LF phase shift (P=0.46) and gain (P=0.53) of transfer function analysis between conditions, indicating that dynamic CA was not affected by acute sleep deprivation. **CONCLUSIONS:** In the present study, the manipulated acute sleep deprivation did not change dynamic CA. This finding suggests that an insufficient sleep-induced cerebrovascular disease may be associated with other physiological factors, but two hours less sleep or acute change in sleep deprivation may not be enough to alter cerebral circulation.

2197   Board #33   June 1 11:00 AM - 12:30 PM

Effect of Sympathetic Activation on Dynamic Cerebral Autoregulation in Posterior Cerebral Circulation

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(No relevant relationships reported)

The previous study reported that cold stimulation-induced acute high sympathetic nerve activity (SNA) impaired dynamic cerebral autoregulation (CA) in anterior cerebral circulation using transfer function analysis. However, the effect of acute change in SNA on dynamic CA in posterior cerebral circulation remains unknown. The posterior cerebral circulation has insufficient sympathetic innervation compared to anterior cerebral circulation; therefore, we hypothesized that the effect of sympathetic activation on dynamic CA in posterior cerebral circulation may be different from that in anterior cerebral circulation. **PURPOSE**: The purpose of the present study was to examine the effect of cold stimulation-induced high sympathetic activation on dynamic CA in posterior cerebral circulation. **METHODS**: Six healthy young subjects participated in this study. Mean arterial pressure (MAP), left middle cerebral artery blood velocity (MCAv) and right posterior cerebral artery blood velocity (PCAv) were measured throughout the experiment. At 90 sec after left hand immersion in cold water (2℃), dynamic CA was evaluated using thigh cuffs occlusion and release technique. To quantify dynamic CA, the rate of regulation (RoR) was calculated from the change in cerebral vascular conductance index during occluded-cuffs release. **RESULTS**: The cold stimulation increased MAP (mean ± SD; +14.6 ± 10.8 %,P = 0.02), while there was no change in MCAv (P=0.52) and PCAv (P = 0.75) compared with control condition. The RoR in both middle cerebral artery (MCA) and posterior cerebral artery (PCA) was not changed by cold stimulation (MCA and PCA, P=0.26 and P=0.30). In addition, there was no difference in the change in RoR between MCA and PCA (P=0.224). **CONCLUSIONS**: The cold stimulation-induced high SNA did not modify dynamic CA in both anterior and posterior cerebral circulation. These findings suggest that the role of SNA on dynamic CA in posterior cerebral circulation may be similar to anterior cerebral circulation.

2198   Board #34   June 1 11:00 AM - 12:30 PM

Aerobic Exercise Training and Cerebral Vasomotor Reactivity in Patients with Mild Cognitive Impairment

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(No relevant relationships reported)

Aerobic exercise training (AET) may improve cerebral blood flow (CBF) regulation and reduce the risk of dementia. CBF is sensitive to changes in the arterial partial pressure of carbon dioxide (CO_2), which is assessed as cerebral vasomotor reactivity (CVMR). Currently, the effect of AET on CVMR in patients with mild cognitive function (MCI) is unclear. **PURPOSE**: To determine 1) effects of AET on CVMR in MCI patients, and 2) the reproducibility of CVMR over 12 months. **METHODS**: Seventy MCI patients were randomized to 12 months of moderate-intensity AET or stretching program. CBF velocity (CBFV) via transcranial Doppler, mean arterial pressure (MAP) via plethysmograph, and end-tidal CO_2 ($EtCO_2$) via capnograph were measured during hyperventilation (hypocapnia) and with a modified rebreathing protocol (hypercapnia). Cerebrovascular conductance index (CVCi) was calculated by CBFV/MAP, and CVMRs were calculated by $\Delta CBFV/\Delta EtCO_2$ and $\Delta CVCi/\Delta EtCO_2$. In addition, blood pressure response to hypo- and hypercapnia was determined by $\Delta MAP/\Delta EtCO_2$. Cardiorespiratory fitness was assessed by maximal oxygen uptake (VO_2max) using a modified Astrand-Saltin treadmill protocol. Intraclass correlation (ICC) was used to test the reproducibility of CVMRs over 12 months. **RESULTS**: Data were available from 16 patients in AET program and 17 patients in stretching program. After intervention, VO_2max significantly increased in AET group compared with stretching group. Mean CBFV, MAP, and $EtCO_2$ at rest remained at similar levels in both groups. Hypocapnic CVMRs increased significantly over time in both groups but no effect of AET or stretching intervention. Hypercapnic CVMRs did not change with treatment or time. The ICCs of $\Delta CBFV/\Delta EtCO_2$ and $\Delta CVCi/\Delta EtCO_2$ were 0.553 (*P*<0.001) and 0.74 (*P*<0.001) during hypercapnia and 0.316 (*P*=0.008) and 0.545 (*P*<0.001) during hypocapnia, respectively. **CONCLUSIONS**: In MCI patients, a 12-month AET program did not alter hypo- or hypercapnic CVMRs compared with stretching group. Although hypercapnia CVMRs were reproducible over 12 months, hypocapnic CVMRs showed lower reproducibility. Supported by the NIH (R01AG033106)

2199   Board #35   June 1 11:00 AM - 12:30 PM

Cerebral Autoregulation Is Impaired In Recurrent Syncope Patients

Ai Hirasawa, Tomoya Suda, Kazukuni Hirabuki, Takahiro Uechi, Noritaka Hata, Yuki Sano, Takeaki Matsuda, Shigeki Shibata. *Kyorin University, Tokyo, Japan.* (Sponsor: Shigehiko Ogoh, FACSM)

(No relevant relationships reported)

PURPOSE: Cerebral autoregulation is a homeostatic mechanism that serves to maintain cerebral blood flow constant over a wide range of perfusion pressure. Syncope is thought to be caused by cerebral hypoperfusion due to the transient blood pressure drop, and thus impairment of cerebral autoregulation may facilitate syncope. A previous study has reported that a past history of syncope is a strong predictor of future syncope recurrence. However, it is unclear whether impaired cerebral autoregulation would be related with recurrent syncope. The purpose of this study was to test our hypothesis that cerebral autoregulation would be impaired in syncope patients with a past history of syncope as compared with those for the first time. **METHODS**: We evaluated cerebral autoregulation in 24 syncope patients for the first time (age; 64±19 years old, male/female; 15/9) and 20 syncope patients with a past history of syncope (age; 52±26 years old, male/female; 11/9). In patients with recurrent syncope, the number of past syncope was 2.9±1.6 times (range 2-7 times). Middle cerebral artery mean blood flow velocity (MCA Vmean) and mean arterial pressure (MAP) were measured by transcranial Doppler ultrasound and tonometry on right radial artery for 3 min in the supine position. In offline analysis after the measurement, the transfer function gain between MAP and MCA Vmean were calculated at very low frequency (0.023-0.07 Hz, VLF) and low frequency (0.07-0.2 Hz, LF) ranges to estimate dynamic cerebral autoregulation. **RESULTS**: LF gain did not differ between syncope patients with a past history of syncope and those for the first time (P=0.23). In contrast, VLF gain was significantly higher in patients with a past history of syncope than in those for the first time (1.81±1.17 cm/s/mmHg vs. 1.09±0.65 cm/s/mmHg, P=0.02). **CONCLUSIONS**: These data suggest that impaired cerebral autoregulation at least in part explains physiological mechanisms underlying recurrent syncope.

2200   Board #36   June 1 11:00 AM - 12:30 PM

Cerebral Microvascular Reactivity and Neurocognition in Childhood Cancer Survivors

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(No relevant relationships reported)

PURPOSE: To determine the differences in cerebral microvascular reactivity (CVR) and neurocognition between childhood cancer survivors (CCS) and matched controls (CON). **METHODS**: Seven cancer survivors and seven matched [age, sex, and body mass index (BMI)]; healthy cancer-free controls were enrolled in the study. Each participant completed neurocognitive testing (i.e., IQ screening, memory, attention/executive, and fine motor) and a self-report survey of executive/self-regulation skills. A computer-controlled gas-blending device was used to evaluate baseline and manipulate end-tidal carbon dioxide ($P_{et}CO_2$). To alter brain blood flow, a $P_{et}CO_2$ gas challenge consisting of two square wave increases of 10 mmHg above baseline $P_{et}CO_2$ and a ramp protocol that decreased $P_{et}CO_2$ to 32 mmHg and then increased linearly to 50 mmHg over 7 mins was utilized. $P_{et}O_2$ was maintained at 100 mmHg. Each participant underwent brain imaging using a 3T MRI for structural and functional (BOLD) imaging. CVR (%BOLD signal change/mmHg CO_2) was computed by using the robust linear least squares fit to the correlation between the two time courses. **RESULTS**: By design, CCS and CON were similar in age (27.1±1.1 vs. 26.0±0.8 y) and BMI (25.2±1.2 vs. 25.2±0.7 kg/m²) (all p>0.05). Baseline $P_{et}CO_2$ (37.0±1.1 vs. 38.0±0.9 mmHg, *p*=0.34) was not significantly different between the two groups. Whole brain gray matter CVR was also not significantly different in CCS vs. CON groups for the full sequence (0.36±0.01 vs. 0.35±0.02 %BOLD/mmHg), squares waves only (0.37±0.02 vs. 0.36±0.02 %BOLD/mmHg) and ramp only (0.35±0.01 vs. 0.34±0.01 %BOLD/mmHg) (all p>0.05). The CVR variability (dCVR) was increased and model fit (R²) was significantly decreased in CCS compared with CON (p=0.004 and p=0.01, respectively) in the full sequence, but not in the square or ramp waveforms independently. No significant between-group differences were observed in neurocognitive testing. **CONCLUSIONS**: The data from this study suggest that childhood cancer survivors may have long-term treatment effects on microcirculation of the brain that affect CVR stability. Although this decline in brain microcirculation did not result in neurocognitive deficits, the long-term consequences of this decline in brain microvascular function have yet to be determined.

E-29   Free Communication/Poster - **Cardiovascular, Renal and Respiratory Physiology - Disease**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2201   Board #37   June 1 11:00 AM - 12:30 PM

Augmented Mechanoreflex In Type 2 Diabetic Rats: Piezo Channels, An Important Part Of The Puzzle?

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(No relevant relationships reported)

Type 2 diabetics (T2DM) have an abnormal cardiovascular response to exercise. The exercise pressor reflex, which is evoked by metabolic and mechanical stimuli arising from the contracting muscle, is a critical cardiovascular regulatory mechanism during exercise and is exaggerated in hypertension, heart failure and peripheral artery disease. A recent study found that T2DM patients have an augmented metaboreflex. However, whether the mechanoreflex is also altered in T2DM is not known. **PURPOSE:** The purpose of the study was to test whether the mechanoreflex is exaggerated in T2DM. Furthermore we tested the contribution of mechano-gated Piezo1 and 2 channels to the mechanoreflex in T2DM. **METHODS**: In unanaesthetized, decerebrated rats we stretched the Achilles tendon for 30 s and measured changes in mean arterial pressure (MAP) and heart rate (HR) in 12 mo old male T2DM rats (BW=546±26 g, glucose=549±28 mg/dl, HbA1c=12.82±0.18%) and healthy male controls (CTL: BW=453±22 g, glucose=229±31 mg/dl, HbA1c=4.6±0.1%). To test the contribution of Piezo channels, we injected GsMTx-4 (10 μg), a known antagonist of Piezo1 and 2 channels, into the arterial supply of the hindlimb and repeated the stretch maneuver. **RESULTS:** We found that the pressor (T2DM: ΔMAP=69±6 mmHg, n=5; CTL: ΔMAP=13±2 mmHg, n=5) and cardioaccelerator (T2DM: ΔHR=28±4 bpm, n=5; CTL: ΔHR=5±3 bpm, n=5) responses to tendon stretch were significantly greater in T2DM rats compared to CTL; p<0.05. Injection of GsMTx-4 into the arterial supply of the hindlimb reduced the pressor response (before GsMTx-4; MAP: 80±7 mmHg; after GsMTx-4; MAP: 55±9 mmHg, n=2) to tendon stretch by approximately 30%. Likewise, GsMTx-4 lowered the cardioaccelerator response (before GsMTx-4; HR:

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31±9 bpm; after GsMTx-4; HR: 12±2 bpm, n=2) by approximately 61%; p<0.05.
CONCLUSION: We conclude that T2DM significantly exaggerates the pressor and cardioaccelerator response to mechanoreflex activation and that Piezo channels play an important role in evoking the mechanoreflex in T2DM rats.

2202   Board #38   June 1 11:00 AM - 12:30 PM

Aerobic Exercise Improved Cardiac and Mitochondrial Function in Chronic Heart Failure in Rats

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(No relevant relationships reported)

Purpose: The purpose of this study was to investigate whether aerobic exercise can improve cardiac and mitochondrial functions of heart failure induced by pressure overload in rats. We explored the mechanism of adaptational changes at the post-transcriptional level with the experimental model. **Methods:** The rat model of heart failure was accomplished by abdominal aorta constriction (AC). Eight weeks after the operation, the animals were divided into 4 groups: sham control (SC), sham plus training (ST), AC without training, and AC plus training (AT). Training was performed on treadmill at 25m/min, 0º grade for 60 min per day and last for 8 weeks. Heart structural and functional parameters were measured with echocardiography. Mitochondrial respiratory functions were measured with high-resolution respirometry. The miRNAs expression profiles were investigated by Affymetrix® Microarray. RT-PCR was used to validate the expression levels of miRNAs. **Results:** Compared with AC, the cardiac structure index LVID were significantly decreased, while the cardiac functional indexes ejection factor (EF) and fractional shortening (FS) were significantly increased in AT hearts. Mitochondrial state 3 respiration and respiratory control ratio (RCR) decreased significantly in AC vs. SC, whereas the reductions were restored by AT to SC level. Mitochondrial complex I activity in AC was significantly lower than that in SC, but such reduction was not observed in AT. MiR-10a-5p and miR-542-5p levels in AT hearts were significantly higher than those in AC, and some target mRNA of these two miRNAs were related to mitochondrial function and dynamic. For example, Coa 7 and Creb1 were affected by miR-10a-5p, and Tfrc by miR-542-5p. **Conclusion:** Aerobic exercise can ameliorate the pathogenesis of heart failure and improve heart function in experimental animals. This effect is largely achieved by improvement of mitochondrial function, especially complex I function in electron transfer chain. miR-10a-5p and miR-542-5p may be involved in this process through regulating key components of mitochondrial dynamic.

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2203   Board #39   June 1 11:00 AM - 12:30 PM

Waist Circumference and BMI Are Associated With Cardiovascular Disease Risk Markers In Police Officers

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(No relevant relationships reported)

INTRODUCTION: Christou et al. (Circulation. 2005; 111:1904-1914) has shown that body fatness is a better predictor of cardiovascular disease (CVD) risk than aerobic fitness in a cohort of healthy men. We sought to replicate their findings in a cohort of police officers. **PURPOSE:** The purpose of this study is to determine whether fatness or aerobic fitness is more highly associated with selected CVD risk markers in a cohort of police officers. **METHODS:** Six female and 49 male police officers underwent screening for 9 selected metabolic and hemodynamic risk markers for CVD along with a maximal treadmill test to determine aerobic fitness. Waist circumference (WAIST), fat mass (FATMASS), percent body fat (%FAT), and body mass index (BMI) were chosen as indicators of fatness. Multiple linear regression models using WAIST, BMI, FATMASS, and %FAT as dependent variables were used to obtain partial correlation coefficients to determine the independent association of fatness to CVD risk while controlling for fitness and age. **RESULTS:** The regression models for FATMASS and %FAT were not statistically significant. The model for WAIST showed an association with 5 of the 9 risk markers after partialling out the effects of aerobic fitness and age (r=.13 to .27, p<.01). The model for BMI demonstrated similar associations with 4 of the 9 risk markers (r=.10 to .15, p<.05). In contrast, aerobic fitness was not independently associated with any of the risk markers in either of the significant regression models. **Conclusions:** In police officers, body fatness is associated with CVD risk while aerobic fitness is not.

2204   Board #40   June 1 11:00 AM - 12:30 PM

Pulmonary Artery Sling And Exercise Capacity : A Longitudinal Study In A Young Girl

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(No relevant relationships reported)

Introduction: Pulmonary artery sling is a rare congenital vascular malformation that consists of an anomalous origin of the left pulmonary artery from the posterior aspect of the right pulmonary artery. The anomalous left pulmonary artery crosses the mediastinum posterior to the trachea or carina and anterior to the esophagus, compressing both organs. Respiratory complaints predominates over esophageal symptoms. In asymptomatic patients, surgical repair is controversial. Data regarding exercise capacity and other cardiopulmonary parameters is scarce.
Aim: To evaluate exercise parameters in an early pubertal girl with uncorrected pulmonary artery sling at baseline and 3 years later (late puberty).
Methods: Maximal cardiopulmonary exercise testing (CPET) was completed on a cycle ergometer at age 11 y/o and 14 y/o by a girl with uncorrected pulmonary artery sling. Data was processed and analyzed retrospectively.
Results: Peak oxygen uptake (VO$_2$) was higher in the first test (41.9 ml/kg/min, 119% predicted) than in the second test (30.6 ml/kg/min, 87% of predicted). Maximal and submaximal pulmonary exercise parameters improved in the second test (breathing reserve; 9.7 liters, 15% predicted in the first test vs. 31.5 liters, 39% predicted in the second test and for lowest VE/VCO$_2$ and VE/VCO$_2$ slope; 28.7 and 34.9 vs 25.7 and 27.7 respectively), with no similar expected improvement in cardiovascular parameters (oxygen pulse (VO$_2$/HR) 9.2 ml/beat, 125% predicted in the first test vs. 9.3 ml/beat, 92% of predicted respectively and for VO$_2$/HR slope; 14.1 ml/beat vs. 14.9 ml/beat).
Conclusions: In this case of uncorrected pulmonary sling a deterioration in exercise capacity and cardiovascular exercise parameters was observed over puberty inspite of improvement in pulmonary parameters. Possible mechanisms are maturation dependent abnormal pulmonary sling flow, deconditioning and increased % body fat. To the best of our knowledge this is the first report of exercise evaluation in this unique population. More studies are needed with larger number of patients, including accurate measurement of body composition and characterizing exercise capacity evaluation following surgical repair.

2205   Board #41   June 1 11:00 AM - 12:30 PM

Pulse Wave Analysis of HbA1C Categorized Prediabetes, Type 2 Diabetes and Normo-Glycemic Populations: A Pilot Study

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(No relevant relationships reported)

Arterial stiffness is a significant risk factor for cardiovascular events and early detection is key for intervention and monitoring. This pathophysiological process is accelerated in type 2 diabetes (T2D), yet the onset of this condition has a limited body of research.
PURPOSE: To evaluate (1) arterial stiffness properties via pulse wave analysis (PWA) across a 4-group spectrum, and (2) determine whether waist-to-height-ratio (WHtR), waist circumference (WC) or body mass index (BMI) serves as the best predictor of early changes in PWA pathophysiology.
METHODS: PWA was measured in 52 participants across four groups separated by HbA1c values: 13 normo-glycemic (N, 4.0-5.1), 14 high normal (HN, 5.2-5.6), 10 prediabetes (PD, 5.7-6.4) and 13 with T2D (T2D, ≥ 6.5). Brachial, central and peripheral pressures, central and peripheral augmentation index (AIx) data were collected via Sphygmocor using validated methods after overnight caffeine abstinence and a minimum 4-hr fast. Group differences were evaluated via MANCOVAs. Hb$_{A1C}$, WHtR, WC and BMI data were assessed through regression to determine the best predictor.
RESULTS: Significant differences were found between N to T2D and HN to T2D for brachial systolic blood pressure (SBP) [$F(3,46)$=2.743, p<.05], brachial diastolic blood pressure (DBP) [$F(3,46)$=3.329, p<.028] and brachial mean pressures (MP) [$F(3,46)$=4.321, p<.009]. Central DBP and MP differed between N to T2D, and HN to PD and T2D groups [DBP:$F(3,44)$=3.874, p<.015; MP:$F(3,44)$=3.303, p<.029]. Central pulse pressure (PP) and CAIx showed no differences between groups. Peripheral pressures significantly differed between N and both PD and T2D; HN and both PD and T2D groups for peripheral SBP [$F(3,44)$=3.007, p<.040], peripheral DBP [$F(3,44)$=4.316, p<.009] and peripheral MP [$F(3,44)$=3.487, p<.023], but not PP or

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PAIx. WHtR and WC were identified as the best predictors of CAIx after adjusting for age and height [R^2=.800, $F(5,45)$=16.023, $p<$.0005; adj. R^2=.640], while PAIx had no significant predictor.
CONCLUSIONS: PWA may be effective for identifying differences in multiple brachial, central and peripheral pressure measures across a novel, pre-defined HbA1C spectrum; however, more research needs to be executed to validate these findings. WHtR and WC, but not BMI, effectively predicts CAIx.

2206   Board #42   June 1 11:00 AM - 12:30 PM

Insulin Potentiates Neuronal Responses to Chemical Stimulation in Thin Muscle Afferents and Dorsal Root Ganglia

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(No relevant relationships reported)

The cardiovascular response to physical activity is abnormally exaggerated in patients with type 2 diabetes mellitus (T2D). Recent studies in patients with T2D have suggested that this exaggerated responsiveness is mediated, in part, by the skeletal muscle metaboreflex. However, the mechanisms causing augmentations in muscle metaboreflex function in this disease remain to be elucidated. Chronic hyperinsulinemia associated with peripheral insulin resistance is one of the pathophysiological characteristics of T2D. Evidence suggests that transient receptor potential vanilloid receptors, which contribute to metaboreflex activation, are more responsive to stimuli in the presence of insulin. Given that metaboreflex afferent fibers reside in skeletal muscle, it is suggested that hyperinsulinemia may underlie the skeletal muscle metaboreflex overactivity manifest in T2D. **PURPOSE**: To examine the impact of insulin on neuronal responses to chemical stimulation in thin muscle afferents and dorsal root ganglia (DRG) of normal healthy rodents. It was hypothesized that insulin potentiates the activity of metabolically sensitive afferent neurons. **METHODS**: Chemically activated neurons were assessed by single-fiber recordings from rat muscle-nerve preparations in vitro and by whole cell patch-clamp recordings from cultured mice DRG neurons. The magnitude of responses to capsaicin stimulation and the capsaicin activated current were recorded, respectively. **RESULTS:** Compared to control conditions, thin muscle afferent response magnitude was significantly increased by insulin exposure (0.03±0.03 vs. 0.25±0.02 imp, n=3, P<0.05). In DRG cell culture, total charge transfer by capsaicin activated current was largely augmented by insulin administration (403±159 % changes from control conditions, n=3, P=0.11). **CONCLUSIONS**: These data demonstrate that thin muscle afferent as well as DRG neuronal responses to capsaicin are augmented by insulin exposure in normal healthy animals. The data support the concept that chronic hyperinsulinemia may potentiate skeletal muscle metaboreflex function in T2D contributing to the abnormal cardiovascular response to exercise characteristic of this disease. *Supported by the Lawson & Rogers Lacy Research Fund in Cardiovascular Disease and JSPS KAKENHI JP17K01769*

2207   Board #43   June 1 11:00 AM - 12:30 PM

High Intensity Treadmill Running Reduces Tumour Hypoxia in Mice.

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(No relevant relationships reported)

PURPOSE: Low blood perfusion and hypoxia are characteristic features of tumours and are factors of resistance to radiation and chemotherapy. A few rodent studies have shown that aerobic exercise, that has no severe side-effects, may improve perfusion and reduce hypoxia, however the optimal exercise intensity and timing of the effect on the tumour response during radiation and chemotherapy remain uninvestigated. The aim of our study was to investigate the acute effect of one exercise bout of either low, moderate, or high intensity aerobic exercise on tumour perfusion and hypoxia.
METHODS: Two weeks after injection of the C3H mammary carcinoma in the mammary fat pad, 24 female CDF1 mice were allocated to either a control group (no exercise) or three groups performing low (6 m/min), moderate (12 m/min) or high intensity (18 m/min) treadmill running for 30 minutes (n=6 for each group). Just prior to running all mice were injected (i.p.) with Pimonidazole (60 mg/kg) and immediately after exercise they were injected (i.v.) with Hoechst 33342 (10 mg/kg). Exactly 1 minute later the mice were sacrificed, tumours excised, and histological sections prepared. Hypoxia could be determined from the degree of Pimonidazole binding, while analysis of the Hoechst 33342 staining enabled us to analyses perfused vessels in the tumour. The results were statistically compared to similar measurements in the control tumours using a Student's T-test (p<0.05). **RESULTS**: Pimonidazole binding revealed a hypoxic fraction (HF) of 8.7±3.7% in tumours from control animals. This was not significantly changed by low intensity (HF = 8.5±3.2%) or moderate

intensity (HF = 10.3±3.7%) running. However, for those mice exposed to the high intensity running schedule, the tumour hypoxic fraction was significantly reduced to 4.3±2.2% (p=0.03). The Hoechst 33342 analyses on tumour perfusion are currently pending. **CONCLUSIONS**: Our data show that mice running at high intensity for 30 minutes elicit an acute reduction in the hypoxic fraction in the tumour when compared to sedentary mice or mice running at both moderate and low intensities. Our future studies will focus on how long the reduction in hypoxia is maintained after running stops and how that exercise regime can be used to improve tumor treatment-response, especially to radiation.

2208   Board #44   June 1 11:00 AM - 12:30 PM

Preliminary Results of Vascular Function and Aerobic Capacity Profile of Breast Cancer Survivors

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(No relevant relationships reported)

PURPOSE: To describe vascular function and aerobic capacity in breast cancer survivors (BCS) who are within one year of completing primary anti-cancer therapy pre and post a 16-week exercise intervention.
METHODS: Applanation tonometry was used to evaluate vascular function (pulse wave velocity, PWV) and cardiopulmonary exercise testing to evaluate aerobic capacity (VO_{2peak}) pre and post 16 weeks of progressive aerobic and strength training exercise at a community based exercise program. Descriptive statistics were used to characterize the sample, paired t-tests to assess pre-post change, and Pearson correlations to evaluate associations between PWV and VO_{2peak}.
RESULTS: Eight BCS, mean age=60 (±8y), BMI=29.5 (±7.4) have been evaluated at baseline. Baseline mean PWV=7.2 (±1.65 m/s) and mean VO_{2peak}=17.3 (±3.24 mL/kg/min). Baseline correlation between PWV and VO_{2peak} was moderate (r^2=0.42, p=0.083). Mean VO_{2peak} improved (+4.04±1.43, p=0.049) in 3 subjects who have completed the exercise intervention to date. Post-intervention PWV was not evaluable at follow-up.
CONCLUSIONS: It has been previously established that aerobic capacity is impaired in BCS compared to age-matched, non-cancer populations. Our findings support this notion (17.3 vs. ~26mL/kg/min healthy; Jones *et al.*, 2012). Vascular function in our sample is similar to previously reported values in BCS (Grover *et al.*, 2015) but reference literature is limited. Our approach exploring correlations between vascular function and aerobic capacity following primary cancer therapy is novel and important as it relates to the potential for designing future preventative interventions. Exercise appears beneficial to aerobic capacity. More follow-up data is needed, and is underway, to assess impact of exercise on vascular function. Supported by funding from Breast Cancer Research Foundation of New York.

E-30   Free Communication/Poster - **Vascular Function**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2209   Board #45   June 1 11:00 AM - 12:30 PM

Seven Days Of Remote Ischemic Preconditioning Augmented Local-heating Induced Vasodilation In Human Skin

Jahyun Kim, Warren Franke, FACSM, James Lang. *Iowa State University, Ames, IA.* (Sponsor: Warren Franke, FACSM)
(No relevant relationships reported)

PURPOSE: Remote ischemic preconditioning (RIPC), induced by intermittent periods of sublethal ischemia and reperfusion, is a powerful stimulus for adaptations that increase cardioprotection from ischemic-reperfusion (IR) injury. Although RIPC-induced cardioprotection has consistently been demonstrated using animal models, two major clinical trials in humans undergoing cardiac surgery has yielded conflicting results. These different results may be explained by coexisting conditions (e.g., diabetes, obesity, and hypertension) and other factors (e.g., dose of ischemia used to 'precondition' vessels, preexisting ischemia, medications, age, fitness level, etc). Using skin as an alternative human model to study RIPC, we tested cutaneous microvascular responsivity to local heating (Tsk=42oC) before and after repeated RIPC. We hypothesized that seven consecutive days of RIPC will improve the vasodilation response to local heating.
METHODS: Nine young participants (26 ± 1 years, 4 male and 5 female) performed RIPC for seven days. Each daily RIPC session consisted of 4 repetitions of upper arm blood flow occlusion by inflating an arm cuff to 220mmHg for 5 minutes followed by deflation for 5 minutes. Before and after the 7-day RIPC training period, laser

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FRIDAY, JUNE 1, 2018

speckle contrast imaging (LSCI) was used to measure the speed and number of blood cells moving through the forearm cutaneous microvasculature and reflected as a flux value, thereby providing an index of skin blood flow changes during local heating. Flux and blood pressure measurements were collected during baseline (Tsk=33oC) and local heating of forearm skin (Tsk=42oC). Data are represented as cutaneous vascular conductance (CVC), which was calculated as flux / mean arterial pressure.
RESULTS: After seven days of RIPC, the cutaneous vasodilation response to local heating was increased (Pre: 1.17 ± 0.10 vs. Post: 1.51 ± 0.20 CVC, p<0.05). But, baseline values were not different following RIPC (Pre: 0.22 ± 0.03 vs. Post: 0.29 ± 0.40 CVC).
CONCLUSIONS: Seven days of RIPC augmented the local heating response in young forearm skin blood flow. These data suggest that endothelial factors contributing to the local heating response in skin may be affected with repeated RIPC.

2210   Board #46   June 1 11:00 AM - 12:30 PM

The Role of Melatonin In Exercise Enhanced Endothelium-dependent Vasorelaxation In Mesenteric Arteries of SHR

WU Ying, Shi Lijun. *Beijing Sport University, Beijing, China.*
(No relevant relationships reported)

PURPOSE: To determine if melatonin plays an important role in the hypotensive effects of exercise training. Further, to study the role of melatonin binding to melatonergic receptors in the vasorelaxation of small MAs in SHR.
METHODS:Twelve-week-old male normotensive Wistar-Kyoto rats (WKY, n=18) and SHRs (n = 48) were used. SHRs were randomly divided into four groups: SHR sedentary group (SHR-SED, n = 18), SHR sedentary with melatonin receptor antagonist luzindole (Luz) injection group (SHR-SED + Luz, n = 6), SHR exercise group (SHR-EX, n = 18) , and SHR exercise with luzindole injection group (SHR-EX + Luz, n = 6). Luzindole injection groups were injected intraperitoneally (i.p.) with luzindole (1 mg/kg/day in sterile saline) each day. Rats in the exercise groups were subjected to aerobic exercise. Blood pressure and heart rate were measured after exercise. Serum melatonin levels were examined by ELISA. The mechanical properties of small mesenteric arteries were studied with myograph. Western blot and immunofluorescence colocalization were performed to examine the protein expression and distribution of MT1, MT2 receptors and eNOS.
RESULTS: Exercise training produced a significant reduction in blood pressure and heart rate in SHR, which was significantly attenuated by intraperitoneal administration of luzindole, a nonselective melatonin receptor (MT1/MT2) antagonist. Serum melatonin levels in the SHR group were significantly lower than those in the WKY group at 8:00-9:00 and 21:00-22:00, and exercise training reduced this difference. Endothelium-dependent vessel relaxation induced by acetylcholine was significantly blunted in SHR compared with age-matched WKY. Both exercise training and luzindole ameliorated this endothelium-dependent impairment of relaxation in hypertension. Immunohistochemistry and Western blotting showed that protein expression of the MT2 receptor and eNOS, as well as their colocalization in the endothelial cell layer in SHR, was significantly decreased; exercise training suppressed this reduction.
CONCLUSIONS:These results provide evidence that regular exercise has a beneficial effect on improving endothelium-dependent vasorelaxation in MAs, in which melatonin plays a critical role by acting on MT2 receptor to increase NO production and/or NO bioavailability.

2211   Board #47   June 1 11:00 AM - 12:30 PM

The Effects Of Acute Bouts Of Whole Body Vibrate On Central Hemodynamics In The Frail Elderly: A Pilot Study.

Katie Burnet. *University of North Carolina at Chapel Hill, Chapel Hill, NC.*
(No relevant relationships reported)

PURPOSE: Whole body vibration training (WBV) is a promising alternative to conventional exercise therapy in the frail elderly. However, little is known about its effect on the cardiovascular system. The aims of this study were to determine whether an acute bout of WBV: (i) improves measures of central hemodynamics [central systolic blood pressure (cSBP), Augmentation Index (AIx), and Double Product (DP)]; and (ii) can be completed without inducing orthostatic intolerance - a sustained drop in systolic blood pressure (SBP) >20 mmHg or diastolic pressure (DBP) >10 mmHg.
METHODS: Nine elderly rest home residents [81.1 years (SD 7.1), 88% F] participated in a randomized cross-over design incorporating WBV and non-vibrational control experimental conditions (CON) on two separate testing day. On each occasion, participants laid supine for their basement measurement, completed their CON or WBV training, then returned to supine for 90-minute post-exercise evaluation.
RESULTS: There was no between-day difference at baseline. During training, no interaction or between-condition effects were observed for any variable, but there were moderate-large time effects for cSBP (P=0.001), and DP (P<0.001). Following training, no interaction or between-condition effects were observed for cSBP or DP,

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but an interaction effect was reported for AIx (P<0.019). Post-hoc analysis revealed a non-significant time effect for CON (P=0.0167, Eta 0.0151) and a significant large increase in AIx for WBV (P=0.020, Eta=0.202). None of the participants exhibited orthostatic tolerance.
CONCLUSIONS:WBV is a safe training method for the frail. Future research is warranted to determine the chronic effects on cardiovascular health.

2212   Board #48   June 1 11:00 AM - 12:30 PM

Effects Of Habitual Isometric Handgrip Exercise On Central Blood Pressure In Older Adults

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(No relevant relationships reported)

Central (aortic) blood pressure (BP) is a more important predictor of cardiovascular diseases than peripheral (brachial) BP. Isometric handgrip exercise can effectively decrease peripheral BP. However, effects of isometric handgrip exercise on central BP remain unknown. **PURPOSE:** The present study aimed to determine whether habitual isometric handgrip exercise decreases central BP in older adults with stage 1 and 2 hypertension. **METHODS:** Twenty-four males and females (mean age 63 ± 2 y; $\pm$ SEM) with stage 1 and 2 hypertension (brachial systolic or diastolic BP of 140-179 or 90-109 mmHg, respectively) who were not actively involved in regular resistance or endurance training were randomly assigned to a group that did isometric handgrip exercise (IHG) or a control (CON) group. The isometric handgrip exercise comprised four unilateral 2-min isometric contractions at 30% of maximal voluntary contraction using a programmed handgrip dynamometer with 1-min rest periods for five days per week for four weeks. Central systolic BP (cSBP), brachial systolic BP (bSBP), brachial diastolic BP (bDBP), and the augmentation index at a heart rate of 75 beats per minute (AIx75) were non-invasively measured after resting in the supine position for at least five minutes in both groups before (baseline) and after four weeks of training using an automated applanation tonometric system. **RESULTS:** Baseline cSBP, bSBP, bDBP, and AIx75 did not significantly differ between the groups. Consistent with previous studies, bSBP and bDBP after training significantly decreased from baseline from 155 ± 3 to 142 ± 3 mmHg and from 94 ± 3 to 88 ± 2 mmHg, respectively (p<0.05 for both). The cSBP and AIx75 did not change in the CON group, but significantly decreased from baseline after training in the IHG group from 165 ± 4 to 148 ± 4 mmHg and from $88\pm4\%$ to $82\pm4\%$, respectively (p<0.05 for both). The cSBP was significantly lower after training in the IHG than in the CON group (148 ± 4 vs. 159 ± 3 mmHg, p<0.05). **CONCLUSIONS:** These results suggest that isometric handgrip exercise could reduce central BP in older adults with stage 1 and 2 hypertension. Therefore, isometric handgrip exercise might be an effective non-pharmacological therapy for prevention and treatment of cardiovascular disease.

2213   Board #49   June 1 11:00 AM - 12:30 PM

Arterial Stiffness and Mitochondrial Oxidative Capacity in Obese African Americans

Joshua E. McGee, Terence E. Ryan, Gabriel S. Dubis, Savanna G. Barefoot, Patricia M. Brophy, Damon L. Swift. *East Carolina University, Greenville, NC.*
(No relevant relationships reported)

Arterial Stiffness and Mitochondrial Oxidative Capacity in Obese African Americans
Joshua E. McGee, Terence E. Ryan, Gabriel S. Dubis, Savanna G. Barefoot, Patricia M. Brophy, Damon L. Swift.
East Carolina University, Greenville, NC
PURPOSE: African Americans are at greater risk for arterial stiffness and mitochondrial dysfunction compared to Caucasian Americans. Prior studies report a relationship between arterial stiffness and mitochondrial function in individuals with hypertension or gestational diabetes, but it has not been evaluated in healthier populations or African Americans. This study assessed arterial stiffness and in vivo skeletal muscle mitochondrial capacity in obese African Americans. **METHODS**: Fifteen (47.7 ± 6.9 yrs; 34.6 ± 4.2 kg/m²; 86.7% female) obese African Americans from an on-going exercise training study were analyzed. Mitochondrial capacity was determined via near-infrared spectroscopy (NIRS) and quantified as recovery kinetics of muscle O_2 consumption (rate constant) after a short bout of exercise (vastus lateralis), followed by short bouts (5-10 s) of ischemia. Arterial stiffness was assessed as carotid-femoral pulse wave velocity (cfPWV) and aortic augmentation index (AIx). **RESULTS**: No significant correlation was observed between rate constant and cfPWV (r=0.17, p=0.55) or AIx (r=-0.01, p=0.97), but approached significance with mean arterial pressure (r=0.50, p=0.057). Adjusting for age and gender revealed no significant findings between arterial stiffness and mitochondrial capacity parameters. **CONCLUSIONS**: Arterial stiffness was not associated with mitochondrial oxidative capacity. Future studies should consider a larger sample size or greater variance in African American participant demographics (e.g. sedentary status, BMI, gender).

2214   Board #50   June 1 11:00 AM - 12:30 PM

Skeletal Muscle Oxygenation During Plantarflexion Exercise In Young-old And Older-old Adults

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(No relevant relationships reported)

The aging process is associated with a gradual decrease in exercise performance, leg muscle blood flow and oxygenation, and endothelial vascular function. **PURPOSE**: To examine potential differences in femoral artery flow-mediated dilation (fa-FMD) and calf muscle oxygenation (HbO_2) during low-intensity plantarflexion exercise in older adults. **METHODS**: 43 young-old (YO; n=24, 67 ± 1 years) and older-old (OO: n=19, 70 ± 1 years) individuals were included in this study. We measured body fat % and leg lean mass (LLM) by DEXA and handgrip maximal voluntary contraction (MVC) using a dynamometer. VO_{2max} was estimated using a submaximal treadmill test. fa-FMD was assessed by Doppler ultrasound, measuring the relative change in diameter from baseline to peak hyperemic response following 5 min of muscle ischemia. After a 10-min semi-recumbent rest, participants performed three sets (3-min each) of rhythmic plantar-flexion exercise at increasing intensity (20, 30 and 40 pounds) separated by 1-min of rest. Percent changes (%Δ) in muscle HbO_2 from baseline to the 3rd min of each set was monitored by near-infrared spectroscopy (NIRS) on the medial gastrocnemius muscle. **RESULTS**: There were no between-group differences in VO_{2max}, MVC, LLM, body fat %, and fa-BF (*P*= .07). The OO group had significantly lower fa-FMD compared to the YO group (5.7 ± 1.4 vs 6.7 ± 1.6%, *p* < .05). During exercise, the OO group exhibited a higher %Δ in HbO_2 compared to the YO in sets 2 (-60.0 ± 21.2 vs. -44.7 ± 17.2%, *p* < .05) and 3 (-66.7 ± 18.8 vs. -52.6 ± 18.2%, *p* < .05). **CONCLUSIONS**: There was a lower calf muscle oxygenation during low-intensity plantar-flexion exercise performed at the same absolute intensity in OO compared to YO adults. Exercising at a greater relative intensity may explain the lower calf muscle oxygenation in OO adults.

2215   Board #51   June 1 11:00 AM - 12:30 PM

Assessment of Vascular Function throughout the Menstrual Cycle

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(No relevant relationships reported)

BACKGROUND: Fluctuating sex hormones throughout the menstrual cycle, particularly endogenous estrogen, have been documented to correspond with nitric oxide (NO) bioavailability and likely have a cardioprotective effect in premenopausal women. However, the corresponding temporal changes in vascular function are not entirely understood. **METHODS:** Passive leg movement (PLM) is a relatively novel technique assessing NO-mediated vascular function, with a higher degree of NO-dependence than the traditionally used flow-mediated dilation (FMD) technique that could provide additional insight. **PURPOSE:** To assess vascular function throughout the menstrual cycle in premenopausal women using PLM, in addition to FMD. **RESULTS:** Brachial artery FMD tended to be increased during the OV phase (8.8±1%) compared to the EF (7.8±1%) and ML (7.6±1%) phases. The femoral artery PLM AUC response during the ML phase was significantly lower than the EF response (leg blood flow AUC EF: 154±41 mL, OV: 79±24 mL, and ML: 44±15 mL). **CONCLUSION:** These findings support the importance of menstrual cycle when interpreting vascular function data as measured by FMD and PLM.

2216   Board #52   June 1 11:00 AM - 12:30 PM

Different Restrictive Devices to Achieve Blood Flow Restriction on Pulse Wave Reflection

Erica M. Marshall, Jason C. Parks, Yu Lun Tai, Alaina Glasgow, Leslie Sensibello, Kathryn Geither, J. Derek Kingsley, FACSM. *Kent State University, Kent, OH.*
(No relevant relationships reported)

Blood flow restriction (BFR) has mainly been achieved with an automated blood pressure cuff. However, knee wraps to restrict flow are used as a form of practical BFR (pBFR). The effects of resistance exercise with BFR and pBFR on pulse wave reflection is unclear. **PURPOSE**: To examine the effects of BFR, pBFR, and traditional high-intensity (HI) bench press resistance exercise on pulse wave reflection in resistance-trained individuals. **METHODS**: Twenty-three (Age: 23±3yrs) resistance-trained men underwent either bench press with BFR, pBFR [30% 1-repetition maximum (1RM), 4 sets, 30-15-15-15 repetitions, 30sec of rest], HI [70% 1RM, 4

sets, 8 repetitions, 60sec of rest] or a control. Measurements were taken at rest and 10mins postexercise. A 4x2 ANOVA was used to evaluate condition (BFR, pBFR, HI, Control) across time (rest, recovery) on pulse wave reflection. **RESULTS:** There were significant (p=0.0001) increases in heart rate [(BFR: rest: 60±7bpm; recovery: 69±7bpm), (pBFR: rest: 58±10bpm; recovery: 64±11bpm), (HI: rest: 58±12; recovery: 72±13bpm)] such that all three conditions were different compared to rest and the control. There was a significant interaction (p=0.0001) for the augmentation index (AIx) in that during recovery from BFR (rest: 117.9±8.2%; recovery: 126.2±9.0ms), pBFR (rest: 114.9±4.9ms; recovery: 127.9±9.8ms) and HI (rest: 115.6±6.2ms; 122.8±6.4ms) it was elevated compared to rest, and the control. There was also a significant (p=0.0001) interaction for the AIx normalized at 75bpm (AIx@75) [BFR: rest: 8.8±13.3%; recovery: 25.9±9.5%; pBFR: rest: 2.7±8.5%; recovery: 23.3±14.2%; HI: 4.4±12.1%; recovery: 21.2±9.9%)] in that it was augmented during recovery to rest and the control. The subendocardial viability ratio (SEVR) for BFR (rest: 138.4±19.5; recovery: 111.2±11.3), pBFR (152.2±27.5; recovery: 125.5±33.5), and HI (rest: 152.9±37.9; recovery: 111.9±28.7) also demonstrated a significant (p=0.0001) condition by time interaction such that they were elevated above rest in all three resistance exercise conditions, which were different than the control. **CONCLUSION:** These data demonstrate that BFR using an automated cuff or knee wraps has similar effects as traditional high-intensity resistance exercise on pulse wave reflection in resistance-trained men after the bench press.

2217   Board #53   June 1 11:00 AM - 12:30 PM

Effect of a High Fat Meal on Microvascular Responsiveness Measured using Near Infrared Spectroscopy

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(No relevant relationships reported)

Studies indicate that the rate of tissue oxygen reperfusion following brief periods of occlusion can detect differences in vascular responsiveness. Consumption of a high fat meal (HFM) has been shown to reduce vascular function in conduit arteries. The extent that consumption of a HFM effects microvascular reactivity has not been examined. **PURPOSE:** To examine the effect of a HFM on microvascular responsiveness in the brachial artery (BA). It was hypothesized that a HFM would slow tissue reperfusion consistent with impaired microvascular function. **METHODS:** Eleven healthy (27.8 ± 3.2 yrs, (± SEM)) men (n=7) and women (n=4) reported to the laboratory following a 12 h fast and no prior exercise. Vascular function in the left BA was assessed using the flow-mediated dilation (FMD). BA images were obtained in B-mode using a linear array probe (operating frequency of 7.0 MHz). Images were captured (10 fps) and analyzed using software that incorporates automated wall detection. %FMD was calculated as the difference between baseline diameter and the maximal diameter measured following cuff release. Near infrared spectroscopy was used to measure changes in oxy- (HbO_2) and deoxy-hemoglobin (HHb) in the right forearm. Tissue oxygenation saturation (StO_2) was calculated ($[HbO_2]/[HbO_2 + HHb]$). The slope of StO_2 reperfusion (S2) following cuff release was measured using linear regression. After Pre-HFM measures were obtained, subjects consumed a HFM consisting of 90 g total fat (63 g saturated fat), 364 mg cholesterol, 17 g carbohydrate, and 139 mg sodium. Measures of %FMD and S2-StO_2 were repeated after 2 hours. **RESULTS:** The HFM resulted in a decrease in BA reactivity (Pre-HFM, 6.80 ± 0.79 %FMD; Post-HFM, 4.12 ± 0.55 %FMD; p>0.05). Compared to baseline, the HFM resulted in a lower S2-StO_2 slope (Pre-HFM, 3.32 ± 0.18 % a.u./s; Post-HFM, 2.96 ± 0.16 % a.u./s; p<0.05). **CONCLUSION:** This study provides evidence that a HFM reduces the reperfusion rate in the microcirculation, consistent with an impaired vasodilatory response. While there was no correlation between the slowed reperfusion and impaired FMD following the HFM, it may be speculated that differences in measurement site may have contributed, at least in part, to this discrepancy. The mechanism responsible for the slowed reperfusion requires further investigation.

2218   Board #54   June 1 11:00 AM - 12:30 PM

Different Responses Of Arterial Stiffness And Nitric Oxide Bioavailability To Different Exercise Training Programs

Natsuki Hasegawa[1], Shumpei Fujie[1], Naoki Horii[1], Eri Miyamoto-Mikami[2], Katsunori Tsuji[1], Masataka Uchida[1], Takafumi Hamaoka, FACSM[1], Izumi Tabata, FACSM[1], Motoyuki Iemitsu[1]. *[1]Ritsumeikan University, Kusatsu, Japan. [2]National Institute of Fitness and Sports in Kanoya, Kanoya, Japan.*
(No relevant relationships reported)

Aerobic training (AT) and high-intensity intermittent training (HIIT) reduce arterial stiffness, whereas resistance training (RT) induces no change or deterioration of arterial stiffness. Nitric oxide (NO) is produced from L-arginine by endothelial NO synthase (eNOS) in endothelial cells. AT enhances arterial NO-derived vasodilation,

resulting in the reduction in arterial stiffness. However, the underlying molecular mechanism related to different effects of different exercise training on arterial stiffness remains unclear. **PURPOSE**: This study aimed to clarify the different responses of arterial stiffness and NO production to different exercise training in rats and humans. **METHODS**: Animal study; Forty 10-week-old male Sprague-Dawley rats were randomly divided into 4groups; sedentary control (CON), AT (treadmill running for 60min at 30m/min, 5days/wk for 8weeks), RT (ladder climbing, 8-10sets/day, 3days/wk for 8weeks), and HIIT (fourteen 20sec swimming sessions with a weight equivalent to 14-16% of each body weight and 10 sec pause was allowed between exercise sessions, 4days/wk for 6weeks from 12-week-old). Human study; 21 healthy young subjects were randomly divided into 3groups; CON, AT (45min of cycling at 60-70% maximal oxygen uptake [VO2max] intensity, 3days/week for 8-week), and HIIT (6-7×20sec exhaustive cycling at 170%VO2max with 10 sec rest between each sessions, 4days/week for 6-week). **RESULTS**: Animal study; aortic pulse wave velocity (PWV), as an index of arterial stiffness, was significantly reduced in both AT and HIIT as compared to CON and RT (P<0.05), whereas there was no difference between RT and CON. Arterial eNOS and Akt phosphorylation and plasma NOx level were significantly elevated in AT and HIIT as compared to CON and RT (P<0.05), but did not change in the RT. Arterial eNOS phosphorylation was negatively correlated with aortic PWV (r=-0.38, P<0.05). Human study; carotid-femoral PWV was decreased and plasma NOx level was elevated by AT and HIIT (P<0.05). HIIT-induced reduction of carotid-femoral PWV and elevation of plasma NOx level were equal to that caused by AT. **CONCLUSIONS**: HIIT-induced increase in aortic NO bioavailability may improve central arterial stiffness, as same degree of AT. Supported by Grants-in-Aid for Scientific Research (#17H02182 and #16K13059, M. Iemitsu)

2219   Board #55   June 1 11:00 AM - 12:30 PM

Estrous Cycle-Mediated Regional Diversity in BK Channel Expression and Function in Arterial Myocytes

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(No relevant relationships reported)

Large-conductance calcium (Ca^{2+})-activated potassium (BK) channels are significant regulators of arterial smooth muscle cell (myocyte) membrane potential and arterial contractility. The expression and function of BK channels in ovary-intact female resistance arteries are poorly understood. Moreover, the effects of endogenous steroid levels associated with the estrous cycle on arterial BK channels are unclear. **PURPOSE:** To investigate estrous cycle effects on BK channel expression and function in uterine and cerebral arterial smooth muscle. **RESULTS:** Western blotting and biotinylation of whole uterine arteries revealed an increase in total (~ 39%, n=7) and plasma membrane-localized (~ 64%, n=4-5) β1 subunits during proestrus as compared to diestrus. Patch-clamp electrophysiology demonstrated that BK channel activation (open probability $[P_O]$) was enhanced ~ 5-fold during proestrus in uterine arterial myocytes (diestrus: P_O=0.09±0.05 (n=4), proestrus: P_O =0.55±0.10 (n=5); 10μM free Ca^{2+}). In contrast, BK channel expression and activation were unchanged during proestrus in cerebral arterial myocytes (diestrus: P_O=0.48±0.08 (n=11), proestrus: P_O =0.56±0.09 (n=4); 10μM free Ca^{2+}). **CONCLUSION:** These data suggest that endogenous steroids associated with the estrous cycle can alter BK channel expression and function in female resistance arteries. However, the estrous cycle effects on arterial BK channels are region-specific.

2220   Board #56   June 1 11:00 AM - 12:30 PM

Comparison of Vascular Structure and Function in Obese Children and Youth: A Pilot Study

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(No relevant relationships reported)

Comparison of Vascular Structure and Function in Obese Children and Youth – A Pilot Study

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Introduction: Atherosclerotic cardiovascular disease is accelerated by early exposure to established risk factors and their persistence over time. The purpose of this pilot study was to compare vascular structure and function between obese (OB) and normal weight (NW) children and youth. **Methods:** Five OB (mean ±SD; age 12.2 ± 2.0 yr) and six NW controls (13.5 ± 1.3 yr) made a single visit to DCU following an overnight fast. A blood sample was taken and left far wall (LFW) carotid intima-media thickness (cIMT), changes in brachial artery diameter (BAD) in response to shear stress and glyceryl-trinitrate, and VO_2max were measured. Values are mean ±SD. **Results:** Compared to NW participants, OB participants had a significantly higher BMI (20.85 ± 2.69 vs. 36.62 ± 3.74 kg×m²), waist-hip ratio (0.85 ± 0.06 vs. 0.94 ±

0.08), systolic blood pressure (SBP) (110.33 ± 8.33 vs 129.60 ± 2.60 mmHg) and significantly lower VO_2max scores (41.08 ± 13.69 vs. 24.72 ± 3.00 mL×kg×min^{-1}×). LFW-cIMT was significantly higher in OB than NW (0.06 ± 0.00 vs. 0.05 ± 0.00 mm) and there was no significant group difference in BAD in response to shear stress (OB vs NW; 11.27 ± 7.94 vs. 11.79 ± 4.94 mm) or glyceryl-trinitrate (30.63 ± 10.84 vs. 29.20 ± 12.67 mm). LFW-cIMT was positively related to fasting insulin (p<0.05), BMI (p<0.001), SBP (p<0.001) and inversely related to VO_2max (p<0.003). **Conclusion:** cIMT is i) higher in OB than NW children and youth, ii) positively related to SBP and BMI, and iii) inversely related to VO_2max.

2221   Board #57   June 1 11:00 AM - 12:30 PM

The Comparison Of High-intensity Interval Exercise Vs. Continuous Moderate-intensity Exercise On C1q/tnf-related Protein-9 Expression And Flow-mediated Vasodilation In Obese Individuals

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(No relevant relationships reported)

PURPOSE: A recent novel adipocytokine, C1q-TNF-related protein-9 (CTRP9), has been shown to increase activation of endothelial nitric oxide synthase and reduce vasoconstrictors (e.g., endothelin-1). In addition, CTRP9 may play a compensatory role in obesity-related endothelial dysfunction. Although there is limited information regarding exercise-mediated CTRP9, high-intensity interval exercise (HIIE) has been shown to be as or more effective than continuous moderate-intensity exercise (CME) in improving indicators of endothelial function (e.g., brachial artery flow-mediated dilation [BAFMD]). Therefore, the purpose of this study was to investigate the effect of acute HIIE vs. CME on serum CTRP9 and BAFMD responses in obese individuals. **METHODS**: Sixteen young male subjects (9 obese and 7 normal-weight) participated in a counterbalanced and caloric equated experiment: HIIE (30 minutes, 4 intervals of 4 minutes at 80-90% of VO_{2max} with 3 minutes rest between intervals) and CME (38 minutes at 50-60% VO_{2max}). Serum CTRP9 and BAFMD, were measured prior to, immediately following exercise, and 1 hour and 2 hours into recovery. **RESULTS**: The concentration of serum CTRP9 was significantly increased immediately following acute HIIE and CME in both obese and normal-weight groups (p = 0.003). Furthermore, both significant treatment by time and group by time interactions for BAFMD were observed following both exercise protocols (p = 0.018; p = 0.009; respectively), with a greater CME-induced BAFMD response at 2 hours into recovery in obese compared to normal-weight subjects. Additionally, a positive correlation in percent change (baseline to peak value) between CTRP9 and BAFMD was found following acute CME (r = 0.589, p = 0.016). **CONCLUSIONS**: Acute HIIE is as effective as CME to upregulate CTRP9 expression in both obese and normal-weight individuals, although CTRP9 may potentially improve CME-mediated BAFMD. The novel results from this study provide a foundation for additional examination of the mechanisms of exercise-mediated CTRP9 on endothelial function.

2222   Board #58   June 1 11:00 AM - 12:30 PM

The Effect Of Aquatic Exercise On Arterial Stiffness And Central Blood Pressure

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(No relevant relationships reported)

Purposes: Aquatic exercise is ideal for older adults because it mitigates weight-bearing stress. However, the effect of aquatic exercise on arterial stiffness and central (e.g., aortic) blood pressure (BP), strong determinants of future cardiovascular disease, remains unclear. We determined if aquatic exercise would decrease arterial stiffness and central blood pressure. **Method:** Twelve normotensives middle-aged and older peoples (mean age = 66±9 yrs, 5 men) participated a supervised aquatic exercise training program (90 min, 1 day/week, 3 months) which mainly consisted of walking, stretching, and muscle strengthening in water. Brachial and aortic BP (estimated from brachial BP waveform via general transfer function), and brachial-ankle pulse wave velocity (baPWV; an index of arterial stiffness) were measured before and after the training period. **Results:** Following the training intervention, body mass did not change significantly, whereas brachial and aortic systolic BP significantly decreased (from 116 ± 10 to 109 ± 12mmHg, P = 0.04 and from 111 ± 9 to 104 ± 11mmHg, P = 0.03, respectively). In addition, baPWV lowered significantly after the training

intervention (from 1355 ± 154 to 1274 ± 168 m/s, P = 0.004). **Conclusion:** The current study firstly demonstrates that regular aquatic exercise, even at a low frequency, could mitigate cardiovascular disease risk in normotensive middle-aged and older people. In the future, we should compare effectiveness of aquatic exercise with that of exercise on land, and study on other populations (e.g., hypertensive patients).

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Oxidant-Antioxidant Balance And Peripheral Vascular Function: The Impact Of Chronic Antioxidant Supplementation

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(No relevant relationships reported)

Reactive oxygen and nitrogen species (RONS) have been revealed to incur both positive and negative changes to physiological function and adaptation. Specific to the peripheral vasculature, RONS can act to reduce important vasoactive components, such as nitric oxide (NO), or, in some instances, act in vasodilatory capacity as an endothelial-derived hyperpolarizing factor. **Purpose:** This study sought to determine the effects of altering the oxidant-antioxidant balance, via a chronic antioxidant supplementation, on leg vascular function. **Methods:** Five healthy, young male subjects ingested an antioxidant cocktail (500mg vitamin C, 400mg vitamin E, and 200 mg of alpha lipoic acid) twice a day for 28 days. Leg vascular function, measured via passive leg movement (PLM), was performed prior to supplementation (Day 0) and on days 1, 7, 14, 21, 28 after the start of supplementation. An additional testing day was performed 7 days after cessation of the supplementation (Day 35). **Results:** Leg vascular function, measured via PLM-induced leg blood flow (LBF) and AUC, was significantly decreased over time with a 50% reduction in the PLM-induced LBF and 60% reduction in LBF AUC. After a 7-day cessation of supplementation, PLM-induced LBF and LBF AUC returned to baseline. **Conlusion:** This study revealed that 28 days of chronic antioxidant supplementation resulted in a reduction in peripheral vascular function in young healthy individuals that was completely restored after cessation of supplementation. As PLM has been revealed to be highly NO-mediated, this study identifies antioxidant supplementation as a modulator of NO bioavailability potentially through the inhibition of RONS-induced vasodilatory capacity or a reductive stress-like mechanism.

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Racial Differences in Vascular Function in Response to Mental Stress

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(No relevant relationships reported)

African Americans (AA) have a higher prevalence of hypertension and other cardiovascular (CV) complications compared to other populations. While the reasons for this elevated CV disease risk are multifactorial, vascular dysfunction is a key contributing factor. It has been previously shown that mental stress, induced by mental arithmetic, results in a significant increase in forearm blood flow (FBF). This response has been predominantly attributed to a mental stress-induced release and subsequent vasodilatory effect of Nitric Oxide (NO). In this regard, a previous study has reported that AA have an attenuated increase in FBF as compared to Caucasians (CA) in response to mental stress, which may be related to impaired vascular function and thus elevated CV disease risk in AA. However, this study was conducted in a middle-age cohort (mid to late 40's). Whether this attenuation is present in a relatively young and healthy population is unknown. **PURPOSE:** The purpose of this study was to test the hypothesis that the vasodilatory response to mental stress is blunted in a relatively young and healthy AA population. **METHODS:** 6 AA and 6 CA males (AA age: 22 ± 2.6, CA age: 23 ± 4.6) participated in this study. All measurements were obtained in the morning following an overnight fast. Brachial artery diameter and blood velocity were assessed using high resolution duplex ultrasound. Mental stress was induced by asking subjects to subtract 7 continuously from a 3-digit number while attempting to report answers at a pace set by a 60 bpm metronome. The 3-digit number was changed at 20 second intervals. FBF was measured during a two minute baseline followed by 3 minutes of mental stress. Vascular function was assessed as the absolute peak blood flow response (ml/min) as well as peak conductance (ml/min/mmHg) during the mental stress. **RESULTS:** The absolute peak flow (AA: 183 ± 39 ml/min, CA: 307 ± 127 ml/min; P = 0.05) were significantly greater in CA compared to AA. The maximum increase in conductance (AA: 2.03 ± 0.32 ml/min/mmHg, CA: 3.69 ± 1.39 ml/min/mmHg; P = 0.02) was also significantly higher in CA as compared to AA. **CONCLUSION:** This preliminary data support our hypothesis that vascular function in response to mental stress is attenuated in young healthy AA as compared to their CA counterparts.

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The Effect Of Exercise On Endothelial Function And Glycemic Control In Type 2 Diabetes: Meta-analysis

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(No relevant relationships reported)

PURPOSE: Vascular endothelial dysfunction induced by hyperglycemia and elevated insulin resistance is a potent risk factor for cardiovascular disease (CVD) and likely contributes to multiple chronic disease complications associated with aging like dementia. The aim of this study was to systematically review and quantify the effects of exercise on endothelial function (EF) in type 2 diabetes (T2D). **METHODS**: Five electronic databases were searched (until June 2017) for studies that met the following criteria: (i) randomized controlled trials; (ii) T2D aged ≥18 years; (iii) measured EF by brachial artery flow-mediated dilation (FMD); (iv) structured and supervised exercise intervention for ≥8 weeks. **RESULTS**: Thirteen cohorts of eight studies (306 patients, average age 59 years) met the inclusion criteria. Exercise training significantly increased FMD (mean ES = 0.41, 95% CI = 0.21 to 0.62, P < 0.001). Low to moderate intensity subgroups and aerobic exercise (AE) subgroups significantly increased FMD more than moderate to high intensity subgroups and combined AE and resistance exercise (RE) subgroups respectively (P < 0.01, P < 0.05). Exercise training significantly decreased glycated hemoglobin (HbA1c) (mean ES = -0.40, 95% CI = -0.61 to -0.19, P < 0.001). Low to moderate intensity subgroups significantly decreased HbA1c more than moderate to high intensity subgroups (P < 0.05). **CONCLUSIONS**: Our results suggest that in patients with T2D, lower intensity exercise has physiological meaningful effects on EF, in support of the emerging concept that the lower efforts of exercise are not necessarily less cardioprotective than higher intensity training.

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High Aerobic Fitness And Muscular Strength Offset Aging-induced Deterioration Of Male Sexual Function

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(No relevant relationships reported)

PURPOSE: Erectile dysfunction (ED) is an impaired male sexual function and associated with depressive symptoms, quality of life and cardiovascular disease in men. The main causes of ED are aging and impaired vascular functions. Vascular functions are positively influenced by physical fitness, such as aerobic capacity, muscle strength and flexibility. However, the relationship between physical fitness and erectile function remains poorly understood. The aim of this study was to investigate the association between physical fitness parameters and erectile function. **METHODS**: In 177 adult males (age; 57 ± 15 [range: 23−82] years, BMI; 22.6 ± 2.6 [range: 17.3−33.6] kg/m²; mean ± SD [range]), we measured peak oxygen consumption (VO_{2peak}) as an index of aerobic fitness, handgrip strength (HGS) as an index of muscular strength, and sit and reach as an index of flexibility. Also, we measured serum testosterone levels. Erectile function was assessed by using International Index of Erectile Function-5 questionnaire (IIEF5: descending score indicates worsening of erectile function). **RESULTS**: IIEF5 score was significantly correlated to age (r_s = −0.56, P < 0.01), height (r_s = 0.35, P < 0.01), glucose (r_s = −0.26, P < 0.01), HbA1c (r_s = −0.43, P < 0.01), testosterone (r_s = 0.18, P < 0.05), VO_{2peak} (r_s = 0.52, P < 0.01) and HGS (r_s = 0.37, P < 0.01), but not sit and reach (r_s = 0.08, n.s.). Multivariate linear regression analysis revealed that IIEF5 score was significantly and independently associated only with VO_{2peak} and HGS, although age and other factors were included in the regression model as confounders. Furthermore, when the subjects were divided into four groups according to median value of HGS value and VO_{2peak} value, IIEF5 score exhibited the highest value in the group with high-HGS and high-VO_{2peak}, and the lowest value in the group with low-HGS and low-VO_{2peak}. **CONCLUSION**: These results suggest that the maintenance of high aerobic fitness and muscular strength may offset aging-induced deterioration of male sexual function. Our present findings may provide a novel insight into the role of physical fitness in reducing the risk of ED and contribute to establish a new approach for ED treatment.

Abstracts were prepared by the authors and printed as submitted.

2227   Board #63   June 1 11:00 AM - 12:30 PM

Reproducibility of a Ramping Protocol to Measure Cerebral Vascular Reactivity Using Functional Magnetic Resonance Imaging

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(No relevant relationships reported)

PURPOSE: Though individual differences in arterial carbon dioxide and oxygen levels inherently exist, the degree of their influence on cerebral vascular reactivity (CVR) is less clear at the micro-vessel level. The introduction of a partial re-breathing method that independently controls end-tidal carbon dioxide ($P_{et}CO_2$) and end-tidal oxygen ($P_{et}O_2$) has enabled examination of hypercapnic effects on blood oxygen level-dependent (BOLD) magnetic resonance imaging (MRI) signal changes. The purpose of this study was to examine the within- and between-visit reproducibility of BOLD signal changes to an iso-oxic ramping protocol in $P_{et}CO_2$.
METHODS: To stimulate changes in CVR, PetCO2 was altered while $P_{et}O_2$ was held constant using a computer controlled prospective gas-blending device. Two fMRI scans, each including a linear change in $P_{et}CO_2$ were performed on the same visit using a 3-Tesla (3T) scanner. This ramp sequence consisted of decreasing $P_{et}CO_2$ to 30 mmHg and then increasing $P_{et}CO_2$ linearly to 50 mmHg over a 7 min period. The protocol was repeated on a separate visit with minimum of 3 days between scanning sessions. Intraclass correlation coefficients (ICC) and coefficients of variation (CV) were calculated to quantify reproducibility.
RESULTS: Eleven subjects (6 females; mean age 26.5±5.7 years) completed the full testing protocol. Very good reproducibility was observed for the within-visit ramp wave (Visit 1: ICC = 0.82, CV = 6.5%; Visit 2: ICC = 0.74, CV = 6.36%). Similarly, ramp waves were reproducible between scanning sessions (Scan 1: ICC = 0.74, CV = 6.5%; Scan 2: ICC = 0.66, CV = 6.13%).
CONCLUSION: This study demonstrates BOLD signal changes in response to ramp alterations in $P_{et}CO_2$ are reproducible both within- and between-visit MRI scans. Establishment of reproducible methodologies for measuring BOLD signal changes while altering $P_{et}CO_2$ using a ramp protocol will allow researchers to study CVR functionality. Finally, adding a ramping protocol to CVR studies could provide information about linear changes in CVR over a broad range of $P_{et}CO_2$.

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Impact of Acute Aerobic and Resistance Exercise on Postprandial Flow-Mediated Dilation in Overweight and Obese Adults

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(No relevant relationships reported)

Postprandial hyperglycemia (PPH) transiently impairs brachial artery flow-mediated dilation (FMD) and increases future cardiovascular disease risk. A single bout of aerobic exercise (AE) has been shown to attenuate PPH-induced impairments in FMD in healthy adults for up to 17 hours post-exercise. Studies examining the effects of acute resistance exercise (RE) on postprandial FMD responses are lacking. **PURPOSE:** The purpose of this ongoing investigation is to determine the effects of different exercise modalities on postprandial glucose and FMD responses to an oral glucose tolerance test (OGTT) in overweight and obese adults. We hypothesize that a single bout of exercise performed the prior evening will attenuate PPH-mediated impairments in FMD, independent of exercise modality. **METHODS:** Recruitment for the current study is ongoing. In a randomized, cross-over design, overweight and obese adults [n=4 (3 women); age=21.3±2.1 y; BMI=30.6±4.2 kg/m², VO_2max=31.6±4.5 ml/kg/min; mean±SD] completed three separate trials. Seated rest (control), a single bout of AE (30 min at ~60% VO_2max), or a single bout of whole-body RE (6 exercises, 3 x 10-repetition maximum) preceded an OGTT (1 g/kg body weight) by 14-17 hours. Blood glucose and brachial artery FMD were measured prior to and at 30 min intervals for 2 hours following the OGTT. Repeated-measures ANOVA and LSD post-hoc tests were used to evaluate differences within and between trials. **RESULTS**: Brachial artery FMD (8.3%, 9.1%, and 9.4% for control, AE, and RE trials, respectively) and blood glucose did not differ between trials at baseline. A main effect due to time (P<0.05) was observed for FMD. Brachial FMD transiently decreased (P<0.05) at 30 min post-ingestion in the control (6.1%), AE (6.8%), and RE (6.0%) trials, respectively. A main effect due to time (P<0.001) was observed for blood glucose. Relative to baseline, blood glucose increased (P<0.05) at 30-120 min post-ingestion in the control (%Δ from baseline = 32-57%), AE (20-53%), and RE (28-45%) trials, respectively. **CONCLUSIONS:** Preliminary findings from our ongoing study in overweight and obese adults suggest that acute AE or RE performed the evening prior to an OGTT does not attenuate postprandial decreases in FMD. **Supported by Miami University Seed Grant and Committee on Faculty Research Grant.**

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Effects of Obese Skeletal Muscle Cells on Endothelial Cell Angiogenesis

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Vascular disease is a leading cause of morbidity and mortality in obesity. Obesity is associated with impaired endothelial cell (EC) angiogenesis. Skeletal myocytes are important regulators of angiogenesis - EC proliferation, migration, and tube formation. **Purpose**: Determine the effects of obesity on skeletal muscle regulation of EC angiogenesis. **Methods**: Primary human skeletal muscle satellite cells were isolated from the vastus lateralis from lean (LN) and obese (OB) subjects and differentiated into myotubes (HSkMC). Conditioned medium (CM) from HSkMC was collected after a two-day incubation period and used to treat Human Umbilical Vascular Endothelial Cells (HUVECs). HUVEC proliferation was assessed via cell counting, cell viability was determined using an MTT assay, and EC tube formation (tube length and branches) was measured in matrigel after a 4-hour incubation. **Results**: After 24-hour treatment, there was no difference in HUVEC proliferation (LN: 23,333 vs. OB: 22,750, cells) or viability (LN: 181.62 vs. OB: 183.52, AU) between LN and OB HSkMC CM. Also, there was no difference in HUVEC tube length (LN: 23,726 vs. OB: 24,046, AU) or branches (LN: 452 vs. OB: 465, AU) between LN and OB HSkMC CM. **Conclusion**: In cell culture, there is no apparent effect of obesity on skeletal muscle regulation of endothelial cell angiogenesis. However, incubating cells (SkM and EC) with high glucose or high fatty acid, metabolic challenges that are present in vivo, may reveal insights into obesity impaired angiogenesis.

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Perfusive and Diffusive Microvascular Oxygen Delivery During Simulated Hypovolemia and Dynamic Forearm Exercise

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(No relevant relationships reported)

The maintenance of brachial artery blood flow during dynamic forearm exercise in the face of simulated hypovolemia (via lower-body negative pressure (LBNP)), has been previously demonstrated. The distinct facets of microvascular oxygen delivery (i.e. perfusive and diffusive) during such an event, however, have not been described. **PURPOSE:** We tested the hypothesis that, during dynamic handgrip exercise, the initiation of LBNP would result in no significant changes in the indices of microvascular perfusive or diffusive oxygen delivery (deoxy-[heme] and total-[heme], respectively) in the exercising muscle. **METHODS:** Six men (26.2 ± 1.7 yrs, 85.5 ± 6.2 kg, 177 ± 1 cm) participated in this study. To determine the effects of LBNP in the absence of exercise, LBNP (~30 mmHg) was applied for two minutes following a resting baseline. After recovery to a second resting baseline, subjects performed seven minutes of dynamic handgrip exercise at 20% MVC. During the final two minutes of exercise, LBNP was initiated. Mean arterial pressure (MAP) was measured continuously via calibrated finger photoplethysmography (Finometer Pro, FMS). Absolute concentrations of deoxy-[heme] and total-[heme] of the flexor digitorum superficialis muscle were measured continuously via frequency-domain multi-distance near-infrared spectroscopy (OxiplexTS, ISS). **RESULTS:** MAP (92.4 ± 12.8 mmHg), deoxy-[heme] (83.7 ± 14.5 μM) and total-[heme] (343 ± 48 μM) were not different between resting baselines (p > 0.05). While all subjects demonstrated an increase in deoxy-[heme] (99.1 ± 8.6 μM) following the application of LBNP at rest, intersubject variability precluded statistical significance (p > 0.05). No significant changes were detected in MAP or total-[heme] (p > 0.05). Dynamic handgrip exercise resulted in significant increases in MAP (104 ± 14 mmHg), deoxy-[heme] (121 ± 29 μM) and total-[heme] (367 ± 52 μM) (p < 0.05); however, the initiation of LBNP during exercise resulted in no significant further changes in MAP, deoxy-[heme] or total-[heme] (p > 0.05). **CONCLUSION:** The absence of any significant changes in deoxy-[heme] or total-[heme] during simulated hypovolemia (i.e. LBNP) suggests that perfusive and diffusive microvascular oxygen delivery to skeletal muscle was preserved at rest and during dynamic handgrip exercise.

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Influence of Short, Disrupted Sleep and High-Intensity Interval Exercise on Brachial Artery Vascular Responses

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(No relevant relationships reported)

Brachial artery flow-mediated dilation (FMD) is a nitric oxide-dependent measure of conduit artery endothelial function that is transiently potentiated by exercise; yet, it is unclear how short, disrupted sleep (SDS) modifies post-exercise FMD responses to a single episode of high-intensity interval exercise (HIIE). **PURPOSE:** To determine the influence of a single night of SDS on brachial artery FMD responses after HIIE. **METHODS:** Fifteen male participants (age 31.1 ± 5.3 yr; weight 83.5 ± 11.4 kg; BMI 25.8 ± 2.7 kg/m^2; VO$_2$max 49.1 ± 8.5 ml/kg/min) completed a non-exercise control trial after 9 to 9.5 hrs of reference sleep (REF), HIIE by treadmill running (90% and 40% of VO$_2$reserve in 3:2 min ratio) to expend 500 kcals after reference sleep (REF+EX) and HIIE after 3 to 3.5 hrs of short and disrupted sleep (SDS+EX) in a randomized crossover design. Ultrasound measurements of brachial artery FMD were obtained by the same technician under standardized conditions just before, 1 hr and 4 hrs after exercise. FMD responses were analyzed using 3 (condition) by 3 (sample point) repeated measures ANOVAs. **RESULTS:** FMD was augmented 1 hr after exercise in REF+EX (pre-exercise = 12.5 ± 0.9; 1 hr = $17.2^* \pm 1.5$; 4 hr = $12.5 \pm 0.9\%$) and SDS+EX (pre-exercise = 14.9 ± 1.7; 1 hr = $19.3^* \pm 2.2$; 4 hr = $16.2 \pm 2.4\%$) versus no change in REF (pre-exercise = 12.6 ± 1.4; 1 hr = 11.3 ± 1.0; 4 hr = $13.5 \pm 2.1\%$) (p < 0.0494 condition by time interaction). **SUMMARY:** HIIE transiently augments brachial artery FMD and this response is not modified by a single night of short, disrupted sleep.

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Obesity Associated Hypertension in Admitted Patients: Treating Isolated Systolic Hypertension May Be Short Sighted

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(No relevant relationships reported)

The close association of excess adiposity and elevated blood pressure is well documented. The role of obesity as a contributing factor for resistant hypertension, cardiovascular disease, and cerebrovascular disease is recognized. Given that exercise training could be used to treat both obesity and elevated blood pressure when patients are admitted for trauma care, identifying obesity-associated systolic hypertension may help with long-term control of the root causes for these illnesses. **PURPOSE:** To examine the relationship between body composition, blood pressure, and other measures collected on patient admittance. **METHODS:** Data were collected from 2,306 consecutive patients admitted to a Level 1 trauma center between July, 2012 and June 2015. Patients with head trauma or traumatic brain injury were not analyzed. Patients were considered obese if their BMI was ≥ 30. Multiple linear regression was used to examine the effect of obesity on blood pressure. Other significant variables were examined from the database that contributed to the prediction model. **RESULTS:** Significant predictors of systolic hypertension included blood lactate, age, obesity, pulse pressure, pH, %O2 saturation and hemoglobin levels (R=0.464; p<0.001). Holding all other variables constant, obesity was associated with a 9.7 mmHg increase in systolic blood pressure (p=0.009). A mild (3 mmHg) increase in diastolic blood pressure was noted, but was not found to be statistically significant (p=0.172). **CONCLUSIONS:** The demonstrated relationship between obesity and systolic blood pressure illustrates the need for integrated blood pressure and obesity treatment with exercise training. Therapeutic exercise focused on weight loss goals will likely ameliorate elevated systolic blood pressure. Weight management discussions are challenging, and often avoided by health professionals, but these data show that concomitant antihypertensive medication with therapeutic exercise training may be warranted for prevention of subsequent cardiovascular and cerebrovascular diseases.

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Changes in Scattering, Absorption, and Resulting Differential Pathlength Factor During Arterial Occlusion and Reperfusion

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Continuous wave near-infrared spectroscopy (CW-NIRS) has been used to assess microvascular function and the balance between muscle oxygen delivery and oxygen consumption via post-occlusion reactive hyperemia (PORH) tests. However, CW-NIRS relies on the assumption that the scattering and absorption characteristics of the investigated tissue remain unchanged via a constant differential pathlength factor (DPF). **PURPOSE:** We tested the hypothesis that the DFP of forearm tissue would be significantly different among the phases of a PORH test (i.e. baseline, arterial occlusion, and arterial reperfusion). **METHODS:** 5 subjects (22.6 ± 1.8 yrs, 170 ± 5 cm, 66.0 ± 10.8 kg) completed three PORH tests consisting of 1 min of baseline, 5 min of brachial arterial cuff occlusion, and 3 min of recovery following arterial reperfusion. Reduced scattering (μ_s') and absorption (μ_a) coefficients were continuously measured, and later used to calculate a DPF, at wavelengths of 692 and 834 nm (DPF$_{692}$ and DPF$_{834}$, respectively) via frequency domain near-infrared spectroscopy (FD-NIRS) during the entire duration of the PORH tests. The minute averaged DPF response was averaged among the three PORH tests. **RESULTS:** DPF$_{692}$ was significantly greater that DPF$_{834}$ during each minute of the PORH tests (p < 0.05). DPF$_{834}$ did not significantly change during any phase of the PORH test from baseline (3.83 ± 0.79; p > 0.05). DPF$_{692}$ was significantly less during the final minute of arterial occlusion (4.07 ± 0.69) when compared to baseline (4.67 ± 0.78; p < 0.001). Further, following arterial reperfusion, DPF$_{692}$ was significantly greater (4.91 ± 0.78) when compared to the final minute of arterial occlusion (p < 0.001), but not different when compared to baseline. **CONCLUSION:** These data demonstrate that the DPF$_{692}$ of forearm tissue does not remain constant across the phases of a PORH test. The assumption of a constant DPF may alter interpretations of data related to microvascular function and the balance between muscle oxygen delivery and oxygen consumption obtained via PORH tests.

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Exercise-levels Of Laminar Shear Stress In Combination Of Aspirin And Celecoxib Normalize An Atherognic Environment

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Optimal vascular function is a hallmark of cardiovascular health. Specifically, the balance of vasoconstricting and vasodilating substances in the vascular bed is recognized as a surrogate measure of the health of resistance vessels. Endothelial Nitrix Oxide Synthase (eNOS) is considered to be one of the best indicators of vasokine balance in these vessels, with high levels of expression being considered to be favorable. Further, the balance of the vasodilating/anti-thrombotic substance prostacyclin and vasoconstricing/pro-thrombotic substance thromboxane in the endothelial cell layer is a further indicator of the overall health of the cardiovascular system. One of the greatest challenges to vascular health and vasodilatory balance is TNFα-mediated inflammation. Uncovering effective strategies that maintain a vascular environment that is more vasodilatory and anti-thrombotic in the face of an inflammatory challenge is favorable. **Purpose:** To test the ability of various anti-thrombotic and pro-vasodilatory treatments, as well as combinations thereof, to prevent disruptions of vascular health of endothelial cells when faced with an inflammatory challenge in the form of TNFα. **Methods:** Human Umbilical Vein Endothelial Cells HUVECs were pre-treated exercise-like levels of laminar shear stress (LSS), aspirin, celecoxib, and their combination prior to a TNFα challenge. Western blot analysis, as well as calorimetric assays were used to determine levels of eNOS and prostacyclin (6-keto PGF$_{1\alpha}$)/thromboxane (TXB$_2$) metabolite ratio, respectively. **Results:** Neither aspirin, nor celecoxib was effective in preventing TNFα-induced reduction in eNOS. Further, aspirin was unable to maintain baseline levels of prostacyclin/thromboxane ratio in the face of the inflammatory challenge. LSS, aspirin/LSS combination, and celecoxib/LSS combination were all able to prevent TNFα-induced reductions in eNOS levels and prostacyclin/thromboxane ratio. **Conclusion:** Effective strategies to maintain a healthy endothelium and therefore resistance vessel health, need to include exercise-levels of shear stress to be effective.

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Abdominal Aorta Compliance and Distensibility Among Youth Ranging from Normal Weight to Severe Obesity

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PURPOSE: This study evaluated abdominal aorta stiffness and diameter among youth throughout a range of body mass index (BMI) values. **METHODS:** Non-invasive ultrasonographic measurements of the abdominal aorta were obtained from 190 youth (92 males; mean±SE: age=12.9±0.2 years). Body composition was assessed by dual-energy X-ray absorptiometry. Obesity status was defined using age- and sex-based BMI percentiles: normal-weight (NW) (≥5th to <85th percentile); overweight (OW) and obese (OB) (≥85th to <1.2 X 95th percentile); and severe obese (SO) (≥1.2 X 95th percentile). Analysis of covariance compared differences by obesity status with adjustments made for race, sex, and Tanner stage. Multiple linear regression evaluated the association of sex, age, and percent body fat (%BF) on abdominal aorta elasticity. **RESULTS:** Prior to adjustment, abdominal aorta diameter (aBD) was significantly larger among SO (mean±SE: 11.1±0.4 mm) compared to both OW/OB (9.6±0.3 mm, $p=0.006$) and NW (8.9±0.3 mm, $p=0.001$). Abdominal aorta incremental elastic modulus (aIEM) was higher among SO (1153.0±70.8 mmHg) compared to OW/OB (960.4±48.6 mmHg, $p=0.044$) and NW (846.0±40.9 mmHg, $p<0.0001$). Abdominal aorta diameter distensibility (aDD%) was lower among SO (14.2±0.6%) compared to NW (16.6±0.6%, $p=0.029$). Abdominal aorta cross-sectional distensibility (aCSD) was lower among SO (30.6±1.5%) compared to NW (36.4±1.5%, $p=0.03$). After adjusting for covariates, aBD remained significantly larger among SO compared to OW/OB ($p=0.018$) and NW ($p=0.001$); aIEM was significantly higher among SO compared to NW ($p=0.002$). Adjusted aDD% and aCSD were not significantly different among groups. Age was associated with higher aBD (β=0.41, $p<0.001$), higher aIEM (β=42.92, $p<0.001$), decreased aDD% (β=-0.38, $p=0.007$), and decreased aCSD (β=-0.96, $p=0.004$). Percent body fat was associated with both higher aBD (β=0.06, $p=0.001$) and aIEM (β=7.44, $p=0.007$), while sex was not associated with measures abdominal aorta elasticity and stiffness. **CONCLUSION**: The deleterious effect of obesity on arterial stiffness extends to the abdominal aorta. Higher age and BF%, but not sex, was associated with greater abdominal aorta stiffness.

2236   Board #72   June 1 11:00 AM - 12:30 PM

Effects Of Different Frequencies Of Electric Muscle Stimulation Of The Lower Limbs On The Vascular Endothelial Function

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(No relevant relationships reported)

The use of electrical muscle stimulation (EMS) has been shown to potentially improve the arterial function as well as the muscle strength. However, few attempts have been made to identify the effects of different frequencies of EMS on the vascular endothelial function. **PURPOSE**: The aim of this study was to evaluate the effects of different frequencies of EMS on the vascular endothelial function in the lower extremities as determined by flow-mediated vasodilation (FMD). **METHODS**: Nine healthy adult men underwent 2 experimental trials (4 and 20 Hz of EMS) in the face-down posture. EMS was applied for 20 min to both lower leg and thigh muscles at 4 Hz sequentially or 20 Hz with duty cycle of 3 sec stimulation/2 sec relaxation. To measure the FMD, a lower limb cuff was inflated to 300 mmHg for 5 min with subsequent deflation. The right popliteal artery diameter was measured using a high-resolution ultrasound device. The FMD was then estimated as the percent change in the arterial diameter over the baseline value at maximum dilation during reactive hyperemia. The blood flow (BF) at the left popliteal artery was also measured using an ultrasound Doppler device. **RESULTS**: In both trials, the FMD and BF were significantly elevated immediately after and at 30 min after EMS compared with at rest ($p<0.05$). Immediately after each trial, significant differences in the FMD were found between the 4- and 20-Hz trials (7.8±0.6% vs. 6.3±0.8%, $p<0.05$). There was also significant differences in the BF between the two trials (125.4±20.1ml/min vs. 87.9±17.9ml/min, $p<0.05$). **CONCLUSIONS**: Acute EMS at 4 Hz resulted in a larger improvement in the vascular endothelial function than EMS at 20 Hz due to a greater BF. These findings suggest that chronic low-frequency EMS might be useful for reducing the risk of cardiovascular disease.

2237   Board #73   June 1 11:00 AM - 12:30 PM

Exercise-levels Of Laminar Shear Stress In Combination With Aspirin And Celecoxib On Tnf-α Induced Emp Formation

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(No relevant relationships reported)

Endothelial Microparticles (EMPs) are increasingly being accepted as an important marker and regulator of vascular homeostasis and atherosclerotic disease state. TNFα is key regulator of the athero-genic process and thereby heart disease. Exercise-mimetic levels of laminar shear stress (LSS), aspirin, and celecoxib have long since been implicated in the prevention and treatment of the athero-genic process. **Purpose:** To determine the effect of combination treatment of exercise-mimetic levels of LSS with aspirin or celecoxib on the prevention of TNFα-induced EMP formation in Human Umbilical Vein Endothelial Cells (HUVECs). **Methods:** HUVECs were challenged with athero-genic levels of TNFα after various athero-protective pre-treatments and combinations thereof. EMPs were analyszed using flow cytometry. Both EMPs indicative of cellular apoptosis (CD31+) and cellular activation (CD62E+) were measured. **Results:** Neither aspirin, nor celecoxib pre-treatment of HUVECs were able to blunt TNFα-mediated production of EMPs indicative of cellular apoptosis and activation. However, exercise-mimetic levels of LSS blunted TNFα-mediated production of EMPs when given in isolation and in combination with aspirin and celecoxib. **Conclusion:** When given in isolation, neither aspirin, nor celecoxib seem effective enough to prevent TNFα-mediated EMP production. Only when HUVECs were treated with combinations of LSS and aspirin or celecoxib could EMP production be blunted. This implicates the powerful potential of exercise to prevent the athero-genic process, especially when compared to commonly prescribed preventative treatments in the form of aspirin and celecoxib.

2238   Board #74   June 1 11:00 AM - 12:30 PM

Aerobic Fitness is not Protective of Endothelial Function with Menopause

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(No relevant relationships reported)

Endothelial dysfunction is a pre-clinical marker for cardiovascular disease (CVD). In most populations, aerobic fitness is protective of endothelial function. Whether this protection remains during and after menopause is unclear. **PURPOSE:** To evaluate differences in endothelial function before and after acute exercise in women at different menopausal stages with disparate levels of aerobic fitness. **METHODS:** Brachial artery flow-mediated dilation (FMD) was evaluated before and after 30min of treadmill exercise (60-64% VO_{2peak}) in healthy high (HIGH) and low (LOW) fit perimenopausal (PERI: HIGH, n=12, 50.8±1.0 yr, 49.1±2.5 ml/kg/min; LOW, n=7, 47.3±1.5 yr, 30.1±1.6 ml/kg/min) and postmenopausal (POST: HIGH, n=13, 60.5±1.0 yr, 43.8±1.8 ml/kg/min; LOW, n=8, 58.9±1.4 yr, 28.3± 1.1 ml/kg/min) women. High fit premenopausal (PRE: n=6, 44.6±1.3 yr, 50.5±3.6 ml/kg/min) women were included as a reference group. Data were evaluated with repeated measure ANOVAs and post hoc testing, where appropriate, and are presented as mean±SEM. FMD data in LOW were previously published (Serviente et al., 2016). **RESULTS:** Overall, there was a main effect of menopause on FMD (p=0.024), with lower FMD in POST compared to PERI (p=0.007). There was a main effect of fitness (p=0.031) with lower FMD in HIGH compared to LOW. Within HIGH, PRE had higher FMD than POST (p=0.018), but not PERI (p=0.737). FMD was lower in HIGH vs. LOW POST (4.2±0.8% vs. 6.51±0.5%, p=0.047) before, but not after acute exercise (4.31±0.6% vs. 6.2±1.0%, p=0.103). After acute exercise, FMD was lower in HIGH POST compared to PRE (6.2±1.0% vs. 7.7±1.1%, p=0.011). There was no difference in FMD in HIGH vs. LOW PERI before exercise (7.1±1.5% vs. 6.5±0.5%, p=0.73); however, FMD was higher in LOW after exercise (5.7±0.6 % vs. 8.5±1.1%, p=0.029). **CONCLUSIONS:** While endothelial function does not appear to decline until postmenopause, the protective effect of aerobic fitness is not apparent in perimenopausal or postmenopausal women; although, fitness appears to modulate the response to acute exercise. These data suggest that targets other than aerobic fitness may be important for improving endothelial function, and therefore CVD risk, in menopausal women. **Funding:** ACSM Foundation Doctoral Student Research Grant (Serviente) & UMass Amherst Faculty Research Grant (Witkowski)

2239   Board #75   June 1 11:00 AM - 12:30 PM
Impact of Remote Ischemic Preconditioning Post-application Delay on Muscle Oxygenation during Subsequent Cycling Intervals

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(No relevant relationships reported)

INTRODUCTION: Remote ischemic preconditioning (RIPC) involves brief, repeated bouts of manually-imposed blood flow restriction of the arms or legs. The alternating periods of occlusion and reperfusion lead to endothelial adaptations, capable of enhancing blood flow and oxygen delivery. **PURPOSE:** The aim of this study was to investigate the effect of a lower limb RIPC protocol, with either a 5-min or 45-min post-application delay, on muscle oxygen saturation within that same limb at rest and during short-duration intense cycling. **METHODS:** Subjects included recreationally aerobically trained college-aged students (23± 3 years, 173.5± 5.4 cm, 69.2± 4.0 kg, 15.2± 4.0 % BF, VO_{2peak}: 46.6± 1.1 mL•kg^{-1}•min^{-1} at 215± 19 W). All subjects randomly completed four experimental trials: RIPC with 5-min delay, RIPC with 45-min delay, SHAM with 5-min delay, and SHAM with 45-min delay. For the RIPC conditions, each subject received 5-min of alternating-leg blood flow occlusion using a blood pressure cuff (220 mmHg) placed on the upper thighs for a total of 40 min. After a 5 or 45-min delay, the subjects completed 5, 1-min cycle sprints separated by 2 min of recovery. The SHAM conditions were identical to the RIPC, however, subjects laid supine for the same 40-min duration with alternating-leg cuff inflation to 20 mmHg. Muscle oxygen saturation was measured continuously using a portable NIRS-based sensor placed over the vastus lateralis (VL). **RESULTS:** RIPC decreased muscle oxygen saturation in the VL in a replicable manner (MD: 29.5± 13.4%, mean occlusion slope: -5.0± 2.4 %•min^{-1}, mean reperfusion slope: 38.5± 22.4%•min^{-1}) while SHAM conditions left muscle oxygen saturation largely unchanged (MD: 2.9± 1%). Mean VL oxygen saturation (RIPC45:71.9± 0.7%; RIPC5: 67.3± 1.7%; SHAM45: 72.0± 4.4%; SHAM5: 69.9± 3.0%) and preservation of muscle oxygen saturation (MD: RIPC45: -12.4± 6.2%; RIPC5: -14.4± 9.9%; SHAM45: -11.6± 6.4%; SHAM5: -13.0± 7.1%) during high intensity cycling intervals varied minutely between experimental conditions. **CONCLUSIONS:** The muscle oxygenation response during a standard occlusion/reperfusion protocol may lack assumed constancy. Furthermore, the use of RIPC and the length of the delay following RIPC did not greatly alter the muscle oxygenation response to repetitive high-intensity cycling intervals.

2240   Board #76   June 1 11:00 AM - 12:30 PM
Effects Of Aerobic Exercise Habit On Age-related Arterial Stiffening: A 10-year Longitudical Study

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(No relevant relationships reported)

Increased arterial stiffness has emerged as a strong predictor of future cardiovascular events and all-cause mortality. Cross-sectional studies and the relatively short-term exercise intervention studies suggested that regular aerobic exercise can restore and improve arterial stiffness. However, long-term longitudinal studies examining the effects of regular physical activity have been sparse. **PURPOSE**: The aim of this study was to elucidate influences of regular physical activity on age-related arterial stiffening through a 10-year longitudinal study. **METHODS**: A decadal change in brachial-ankle pulse wave velocity (baPWV), an index of arterial stiffness, was evaluated retrospectively among 92 volunteers (63 ± 14yrs, 51 men). Regular physical activity level over the past year was evaluated with a semi-structured interview via a questionnaire. Based on the distribution of aerobic exercise volume, subjects were divided into three groups: engaging <5 METs·h/wk (LO, n=50), 5-15 METs·h/wk (MID, n=24), and >15 METs·h/wk (HI, n=18) of aerobic exercise. **RESULTS**: baPWV was significantly elevated in the LO and MID groups (P<0.0001, for both), whereas it tended to increase in the HI group (P=0.06). The HI group exhibited a significantly smaller decadal increase in baPWV (+0.7±1.4 m/sec) than those in the LO and MID groups (+1.8±1.5 m/sec and +2.0±1.6 m/sec, respectively). These differences remained significant after the adjustment for confounding factors including the baseline baPWV and current age. **CONCLUSIONS**: Our current longitudinal study suggests that regular sufficient aerobic exercise attenuates age-associated increases in arterial stiffness.

2241   Board #77   June 1 11:00 AM - 12:30 PM
Body Mass Index Does Not Influence the Endothelial Response to Acute Inflammation

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(No relevant relationships reported)

Acute and chronic inflammation are associated with an increased risk of cardiovascular (CV) events in older adults and reduced endothelial function (flow-mediated dilation; FMD). Obesity is also associated with greater inflammation. Whether this greater inflammatory state in overweight/obese individuals plays a role in the endothelial response during acute inflammation is unknown. **Purpose:** To evaluate the role of obesity status in the endothelial response to acute inflammation in younger (YA) and older (OA) adults. **Methods:** An influenza vaccine was used to induce acute inflammation in 25 YA (13 male, 26±4 yrs) and 56 OA (18 male, 65±5 yrs). Blood pressure, FMD and serum inflammatory markers were measured before vaccination and 24 and 48-hours after. Participants were divided into normal weight (NW) (body mass index, BMI: 18-25 kg/m^2) and overweight/obese (O/OB) (BMI >25 kg/m^2) for analysis. **Results:** See table. All groups increased IL-6 at 24-hours (p<0.01), which returned to baseline at 48. CRP was elevated at 24- and 48-hours in all groups except NW OA (p for interaction = 0.04). Endothelial function (FMD) was reduced at 24- and 48-hours (p<0.01) in all groups. During the inflammatory bout, NW and O/OB YA had a greater FMD than both NW and O/OB OA (p<0.02). **Conclusion:** It does not appear body mass index influences the endothelial response during acute inflammation in YA or OA. In our sample, these results may be due to the similar baseline level of inflammatory markers between the NW and O/OB in each age category. Future studies are required to further investigate this relationship.

	YA – Normal Weight	YA – Overweight/ Obese	OA – Normal Weight	OA – Overweight/ Obese
n	15	10	18	38
Age, yrs.	26 ± 3	25 ± 5	66 ± 5	64 ± 5
BMI, kg/m^2	21.6 ± 1.9	28.1 ± 2.3[1]	22.4 ± 3.9[2]	30.5 ± 4.5[13]
MAP, mmHg	79 ± 9	88 ± 9	89 ± 11[1]	90 ± 10[1]
CRP, mg/L*^				
Baseline	0.7 ± 0.6	1.0 ± 0.7	2.7 ± 2.7[1]	2.9 ± 3.1[1]
24h	1.6 ± 1.2	2.5 ± 1.0	2.8 ± 3.0	3.9 ± 3.5
48h	2.5 ± 2.4	3.0 ± 2.4	3.7 ± 3.8	4.0 ± 3.3
IL-6, pg/mL*				
Baseline	0.8 ± 0.5	1.0 ± 0.7	1.5 ± 1.3	1.7 ± 1.3[1]
24h	1.4 ± 0.7	2.1 ± 1.5	1.9 ± 1.2	2.4 ± 2.2
48h	0.8 ± 0.4	1.2 ± 0.9	1.6 ± 1.2	2.0 ± 2.1
FMD, %*~				
Baseline	12.9 ± 4.5	8.8 ± 2.6	6.6 ± 3.9[1]	6.0 ± 2.5[1]
24h	9.8 ± 3.1	7.2 ± 3.6	4.0 ± 3.6	5.7 ± 3.1
48h	8.9 ± 2.9	7.6 ± 3.1	4.3 ± 2.3	5.0 ± 2.9

Data presented as mean ± standard deviation. BMI: Body mass index; CRP: C-reactive protein; FMD: Flow mediated dilation; IL-6: interleukin-6, MAP: mean arterial pressure
[1]p<0.05 vs. normal weight young adults; [2]p<0.05 vs. overweight/obese young adults; [3]p<0.05 vs. normal weight older adults
*overall time effect, p<0.05; ~overall group effect, p<0.05; ^group*time interaction effect, p<0.05

2242   Board #78   June 1 11:00 AM - 12:30 PM
Evidence of Racial Differences in Microvascular Function Among College-Aged Women

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(No relevant relationships reported)

Microvascular dysfunction contributes to the development of hypertension and insulin resistance. The black population is at an elevated risk of both conditions relative to other racial groups. Previous studies indicate that college-aged black men, compared to their white counterparts, exhibit impaired microvascular function as assessed by post-occlusion reactive hyperemia (RH). It is unknown whether this racial disparity is present in healthy, young adult black (BW) and white women (WW). Furthermore, whether nitric oxide-mediated cutaneous microvascular hyperemia during local heating

(LH) is different in these populations has not been determined. **PURPOSE**: The purpose of this study was to test the hypothesis that college-aged BW exhibit blunted RH and attenuated LH induced cutaneous hyperemia compared to age-matched WW. **METHODS**: College-aged BW (n=7) and WW (n=7) were studied during the early follicular phase of the menstrual cycle. For RH, brachial artery diameter and blood velocity were measured via Doppler ultrasound before and after 5 min of forearm occlusion. For LH, a microdialysis membrane was inserted in the dermis of the forearm and perfused with Ringer's solution. Red blood cell flux was assessed with laser Doppler after ~40 min of continuous 39ºC LH. Maximal flux was established with 28 mM sodium nitroprusside infusion and 43ºC LH. Brachial BP was measured throughout the protocol and cutaneous vascular conductance (CVC) was calculated as flux / MAP and reported as % of max CVC.
RESULTS: WW and BW were matched for age (21 ± 3 vs 20 ± 1 y, P = 0.58) and BMI (23 ± 2 vs 23 ± 3 kg/m^2, P = 0.94). There were no differences between WW and BW in baseline blood velocity (23.1 ± 5.7 vs 24.4 ± 11.6 cm/s, P = 0.79) or blood flow (98.9 ± 38.3 vs 114.5 ± 80.7 ml/min, P = 0.65). WW and BW also had similar peak blood velocity (109.2 ± 13.8 vs 109.7 ± 28 cm/s, P = 0.97), peak blood flow (453.7 ± 164.7 vs 482.5 ± 187.7 ml/min, P = 0.77), and total blood flow AUC during the 120 s after cuff release (487.4 ± 178.5 vs 486.8 ± 190.1 ml, P = 0.99). However, compared to WW, BW had a significantly blunted CVC during 39ºC LH (66 ± 17 vs 45 ± 10 %max, P = 0.02).
CONCLUSIONS: BW had blunted blood flow responses to LH compared to WW despite similar blood velocity and flow responses during RH. This suggests that LH is more sensitive than RH to early impairments in microvascular function.

2243   Board #79   June 1 11:00 AM - 12:30 PM

Impact of Aerobic Capacity on Prolonged Sitting-Induced Vascular Dysfunction

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(No relevant relationships reported)

Prolonged sitting has been reported to have deleterious effects on lower limb vascular function. High amounts of aerobic fitness are associated with positive vascular adaptations that could potentially provide a protective effect on this sitting-induced vascular insult. PURPOSE: This study examined the effect of aerobic capacity on vascular function after a bout of prolonged sitting. METHODS: Ten young (25 ±3 yrs) aerobically trained subjects (VO2max: 52 ±7 ml/kg −1min −1) and ten young (23 ±2 yrs) sedentary (VO2max: 38 ±5ml/kg −1min −1) subjects matched for age and gender were recruited for the study. During the prolonged sitting session, vascular function, via passive leg movement (PLM), was measured at baseline, 1.5 hours and 3 hours with Doppler ultrasonography. RESULTS: Vascular function data obtained prior to sitting revealed no significant difference between the high (HAC) and low (LAC) aerobic capacity groups. Independent of group, vascular function was significantly reduced after 1.5 and 3 hours of prolonged sitting, determined by Δ Peak LBF and LBF AUC. Interestingly, no significant between–group differences were revealed in Δ Peak LBF or LBF AUC at 1.5 hours [Δ Peak LBF (LAC: −370 ±317 ml·min-1; HAC: −167 ±258 ml·min −1; p>0.05), LBF AUC (LAC: -149 ±201 ml·min −1; HAC: −94.7 ±90 ml·min −1; p>0.05), or at 3 hours [Δ Peak LBF (LAC: −373 ±268 ml·min −1; HAC: -243 ±299 ml·min −1; p>0.05), LBF AUC (LAC: −119 ±202 ml·min −1; HAC: -91 ±132 ml·min −1); p>0.05]. CONCLUSION: This study found that aerobic capacity did not mitigate the vascular dysfunction resulting from prolonged sitting.

2244   Board #80   June 1 11:00 AM - 12:30 PM

The Effect of Lower Body Aerobic Exercise on Forward and Backward Pressure Wave Amplitude

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(No relevant relationships reported)

In young healthy adults, acute lower body aerobic exercise increases central systolic blood pressure (cSBP) and central pulse pressure (cPP) while a reduction in cSBP and cPP are observed post-exercise. Exercise induces alterations in surrogate measures of wave reflection, augmentation pressure (AP) and index (AI), suggesting that exercise reduces wave reflection. However, wave separation analysis provides a more comprehensive method to examine relative contributions of the forward pressure wave (Pf), backward pressure wave (Pb), and reflection magnitude (RM = Pb/Pf) to central pressure. **Purpose:** To determine the effect of acute exercise on Pf, Pb, and RM using wave separation analysis. **Methods:** Applanation tonometry was performed to record radial artery pressure waveforms in 13 young (25 ± 4 years) male (n=8) and female (n=5) subjects during seated rest, incremental recumbent cycle exercise at 40, 50, and 60% age-predicted HR max, and 5 and 10-minute seated post-exercise. Radial waves were calibrated to respective brachial mean and diastolic pressure. Central pressure waves were synthesized from the calibrated radial pressure wave using a generalized transfer function. Pf, Pb, and RM were derived via wave separation analysis utilizing a modified triangular flow wave. Data were analyzed by repeated measures ANOVA

with post-hoc analyses when appropriate. **Results:** As expected, cSBP and cPP were increased during exercise (p <0.05) while AP and AI were reduced (p<0.05). Additionally, cSBP, cPP, AP, and AI were reduced post-exercise (p <0.05). Pf was increased at 40, 50, and 60%HRmax vs rest (27.6 ± 1.0, 38.7 ± 2.8, 44.2 ± 1.9 vs 24.3 ± 1.2mmHg, p < 0.05). Pb was increased at 60%HRmax vs rest (15.6 ± 1.3mmHg vs 13.2 ± 0.9mmHg, p < 0.05) and was reduced at 10-minute post-exercise vs rest (9.7 ± 0.9 vs 13.2 ± 0.9mmHg, p < 0.05). Lastly, RM was reduced at 50, 60%HRmax, 5 and 10-minute post-exercise vs. rest (32.8 ± 1.9, 34.8 ± 2.1, 40.0 ± 1.5, 41.4 ± 1.4 vs 52.7 ± 3.3%, p < 0.05). **Conclusion:** RM is reduced during lower body aerobic exercise coupled with an increase in Pf while a decrease in RM is maintained post-exercise as a result of a decrease in Pb. These findings suggest that the increase in exercising cSBP and cPP during exercise is driven by increased Pf while post exercise reductions in cSBP and cPP may be a result of reduced Pb.

2245   Board #81   June 1 11:00 AM - 12:30 PM

Resistance Exercise on Pulse Wave Reflection and Arterial Stiffness Between Trained and Untrained Individuals

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(No relevant relationships reported)

Pulse wave reflection [augmentation index (AIx), augmentation pressure (AP)], and arterial stiffness [pulse wave velocity (PWV)] are indicative of cardiovascular health. Acute resistance exercise (RE) alters pulse wave reflection, and arterial stiffness, but responses in resistance-trained individuals is unclear. **PURPOSE:** To examine the responses in pulse wave reflection and arterial stiffness after RE in resistance-trained (RT) versus untrained (UT) individuals. **METHODS:** Twenty-one (RT: n=14; UT: n=7) individuals volunteered. Pulse wave reflection and arterial stiffness were collected at rest, and 10min following a control, or RE consisting of 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) on the leg press, lat pulldown, leg extension, chest press and leg curl. A 2x2x2 ANOVA was used to examine group (RT, UT) differences across conditions (RE, control) and time (Rest, Recovery). **RESULTS:** The groups were similar (p>0.05) for age, height, and BMI, but not weight (p<0.05). The 1RMs for all exercises, except leg extension (p=0.26), were different between groups. At rest, the groups were statistically different for the tension-time index [TTI (RT: 1999±282ms; UT: 2192±209ms, p=0.04)], diastolic pressure-time index [DPTI (RT: 2817±316ms; UT: 3047±171ms, p=0.003)], and PWV (RT: 5.5±0.7m/s; UT: 6.3±0.4m/s, p=0.0001). There were significant time by condition interactions for aortic pulse pressure (Rest: 34±6mmHg; Recovery: 37±8mmHg, p=0.01), AP (Rest: 5±3mmHg; Recovery: 6±5mmHg, p=0.003), AIx normalized at 75bpm (Rest: 8.7±12.6%; Recovery: 16.4±6.0%, p=0.004), and TTI (Rest: 2084.6±273.4ms; Recovery: 2760.9±463.3ms, p=0.0001) such that they increased during recovery, compared to rest after RE, and the control. There were condition by time interactions for DPTI (Rest: 2889.6±297.0ms; Recovery: 2394.9±458.3ms, p=0.005) and subendocardial viability ratio SEVR (Rest: 138.4±19.3%; Recovery: 86.6±33.0%, p=0.006) such that they increased after acute resistance exercise, compared to rest and the control. There were no significant changes in arterial stiffness. **CONCLUSION**: These data suggest that resistance-trained individuals have reduced workload of the heart and lower arterial stiffness at rest, but are similar to untrained individuals after acute resistance exercise.

2246   Board #82   June 1 11:00 AM - 12:30 PM

Effect of a High Fat Meal on Blood Flow and Endothelial Function during Passive Leg Movement

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(No relevant relationships reported)

Passive leg movement (PLM) leads to a significant increase in femoral artery blood flow (FABF). Recent studies suggest that the increase in FABF during PLM is mediated by the bioavailability of nitric oxide (NO) since inhibition of NO attenuates the FABF response. PLM has been gaining popularity as a simple, reliable method for assessing endothelial function. Since the consumption of a high fat meal (HFM) has been shown to induce endothelial dysfunction, investigators have used a HFM to demonstrate the therapeutic benefits of exercise, anti-inflammatories and anti-oxidants on endothelial function. Consumption of a HFM on the FABF response to PLM has not been previously examined but may prove useful in determining endothelial function in healthy and diseased populations. **PURPOSE:** To examine the effect of consuming a single HFM on FABF during PLM. It was hypothesized that consumption of a HFM would attenuate the FABF response compared to control, consistent with impaired endothelial function. **METHODS:** Eight healthy (31.8 ± 4.2 yrs, (±SEM)) men (n=5) and women (n=3) reported to the laboratory following a 12 h fast and no exercise. PLM was accomplished using an isokinetic (Biodex) machine which allowed the lower leg to move through 90° range of motion at 30 cycles/min. Femoral artery blood velocities (FABV) were measured continuously at baseline (60 s) and during PLM

(120 s) using Doppler ultrasound. FABF was calculated using the arterial diameter measured at baseline. Each subject consumed a HFM consisting of 90 g total fat (63 g saturated fat), 364 mg cholesterol, 17 g carbohydrate, and 139 mg sodium and after 2 hrs of rest, subjects returned to the isokinetic machine and completed a second PLM trial. **RESULTS:** Consumption of a HFM did not lead to any differences in baseline FABF (Pre-HFM, 139.1 ± 21.0 ml/min; Post-HFM, 165.8 ± 44.3 ml/min; p>0.05). Similarly, the peak FABF responses were not different (p>0.05) between Pre-HFM (301.1 ± 40.8 ml/min) and Post-HFM (359.3 ± 73.3 ml/min). **CONCLUSION:** In contrast to our hypothesis and in comparison to previous studies demonstrating a decrease in endothelial function following consumption of a HFM, we did not observe blunted FABF during PLM. The reason(s) for this discrepancy is not readily apparent but warrants further investigation if PLM is to be used to assess endothelial health.

2247　　Board #83　　　　　June 1 11:00 AM - 12:30 PM

Cardiorespiratory Fitness And Menopausal Symptoms: Effects On Quality Of Life And Cardiovascular Disease Risk

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(No relevant relationships reported)

Menopausal symptoms lead to reduced quality of life (QOL). Hot flashes have been associated with CVD risk and endothelial function. Aerobic fitness may improve QOL and endothelial function; however, these relationships are still unclear. **PURPOSE:** To determine if aerobic fitness is related to QOL, menopausal symptoms, and endothelial function in peri- (PERI), and post-menopausal (POST) women. **METHODS:** Healthy high- and low-fit PERI (HIGH n=9; LOW n= 6), and late POST (HIGH n=10; LOW n=8) women self-reported QOL (Utian questionnaire) and menopausal symptoms. Women were classified into fitness categories via treadmill VO_{2max} test (VO_{2peak}; HIGH 47.3±1.79ml/kg/min; LOW 29.1±0.95ml/kg/min). Brachial artery flow-mediated dilation (FMD) was assessed before and after treadmill exercise (30min, 60-64% VO_{2peak}). Associations between menopausal status, symptoms, fitness, and FMD were analyzed using Chi-squared or Fisher's Exact Tests. The influence of fitness, menopausal status and symptoms on QOL was evaluated with a 3x2 ANOVA. **RESULTS:** There was an association between menopausal symptoms and menopausal status (p=0.053, Phi=0.314). Menopausal symptoms were related to fitness (p=0.006) and menopausal status (p=0.029) such that a greater percentage of HIGH PERI women reported symptoms compared to LOW PERI women (HIGH PERI 100% vs. LOW PERI 46%). There was an effect of fitness on overall QOL (HIGH 95.44±2.189; LOW 78.05±2.476, p<0.0001) but not menopausal status or symptoms (p>0.05). High fitness was related to higher QOL for health (HIGH 30.45±0.746; LOW 22.083±0.0853, p<0.0001), occupational (HIGH 27.6±0.999, LOW 24.2±1.13, p=0.032), emotional (HIGH 25.461±0.741; LOW 23.017±0.847, p=0.014), and sexual QOL (HIGH 12.061±0.687; LOW 7.81±0785, p=0.004). There was no difference in pre-exercise (p>0.05), post-exercise (p>0.05), or change in FMD with exercise (p>0.05) in women who did vs. did not experience menopausal symptoms. **CONCLUSIONS:** High aerobic fitness was associated with higher QOL, independent of menopausal status or symptoms. Highly-fit perimenopausal women reported more symptoms compared to low-fit women; however, symptoms did not influence endothelial function or overall QOL in our population. **Funding:** ACSM Doctoral Student Research Grant (Serviente) & UMass Amherst FRG (Witkowski).

2248　　Board #84　　　　　June 1 11:00 AM - 12:30 PM

Arginase Activity in Red Blood Cells Is Not Altered with Sub-maximal Exercise.

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(No relevant relationships reported)

Nitric oxide (NO) is an important mediator of exercise remodeling. Its role has been highlighted in the promotion of vascular growth as well as in mitochondrial function. While the endothelium has long been thought to be the dominant physiological source of NO, recent work has suggested that red blood cells (RBCs) express the enzyme endothelial nitric oxide synthase (eNOS) and may contribute to total NO production. Within RBCs, the NO production can be decreased by the activity of the enzyme arginase, which competes with eNOS for the substrate L-arginine. **PURPOSE:** The aim of the study was to test the hypothesis that RBC arginase activity is modulated by exercise. **METHODS:** Nine subjects (4 male and 5 females, age; 26±5 years, VO2peak; 54,8±8,1 mL/min/kg) performed a 60-min sub-maximal exercise bout corresponding to 65% of VO2peak. Blood samples were taken at rest (T0), 30 min in to the exercise (T1), directly after exercise (T2), 30 min post-exercise (T3) and 60 min post-exercise (T4). Arginase activity in RBCs was measured by colorimetric determination of urea formed from L-arginine substrate with α-isonitrosopropiophenone as a marker of urea content. **RESULTS:** Contradictory to our initial hypothesis, arginase activity was unaffected by exercise. No changes in

urea production (T0; 0.52±0.08, T1; 0.50±0.08, T2; 0.51±0.09, T3; 0.51±0.09 and T4; 0.52±0.08 mM/g Hb, p>0.05) was seen between the resting blood sample and the ones taken during or after exercise. **CONCLUSION:** Arginase activity in RBCs is not modulated by sub-maximal exercise in young healthy subjects. Hence, the increase in eNOS activity and NO production from RBCs with exercise is most likely not explained by a reduced activity of arginase.

2249　　Board #85　　　　　June 1 11:00 AM - 12:30 PM

Muscular Strength is Inversely Associated with Central Hemodynamic Load in Young Women.

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(No relevant relationships reported)

Muscular strength is important for overall fitness. Strength is also associated with cardiovascular health; individuals with higher strength have a lower risk of developing hypertension. Muscular strength has been shown to be inversely associated with aortic stiffness, a precursor of hypertension. **Purpose:** Determine the relationship between muscular strength, aortic stiffness, and central hemodynamic load in young women. **Methods:** Seventy-two healthy young women (age 30 ± 14 years, body fat 24.7 ± 8.1 %) underwent muscular strength and vascular testing. Muscular strength was evaluated using a five-repetition maximum bench press and expressed relative to body weight. An aortic blood pressure waveform was derived from the brachial artery via an oscillometric cuff and used to estimate aortic pulse wave velocity (PWV). From this waveform, we also derived measures of central hemodynamic load: augmentation index (AIx@75, at heart rate of 75 bpm), forward wave pressure (Pf) and reflected wave pressure (Pb). Body composition was evaluated using air displacement plethysmography. **Results:** As seen in Table 1, after adjusting for age, mean arterial pressure and body fat, there was a negative correlation between relative strength and Pf (p=0.052), Pb (p<0.05) and PWV (p<0.05). There was a positive correlation between relative strength and AIx (p<0.05). **Conclusion:** Women who have higher relative strength have lower aortic stiffness and lower forward and reflected wave pressure suggesting lower central hemodynamic load. Maintaining strength is important for cardiovascular health in women.

Table 1. Correlation matrix between strength and central hemodynamics controlling for age, mean arterial pressure and body fat				
	Relative Strength	AIx @75	Pf	Pb
AIx@75	0.23*			
Pf	-0.20	-0.03		
Pb	-0.23*	0.21*	0.80**	
PWV	-0.32**	-0.02	0.67**	0.50**
AIx@75, augmentation index at 75 beats per minute; PWV, pulse wave velocity; Pf, forward wave pressure; Pb, reflected wave pressure (n=72). **. Correlation is significant at the 0.01 level (1-tailed). *. Correlation is significant at the 0.05 level (1-tailed).				

2250　　Board #86　　　　　June 1 11:00 AM - 12:30 PM

Comparing Two Low-Intensity Strength Training Modalities on Vasodilatory Capacity in Postmenopausal Women

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(No relevant relationships reported)

PURPOSE: Dynapenia, the age-related loss in muscle strength, is an emerging risk factor for the development of cardiovascular disease and physical disability. Vasodilatory capacity, both endothelial-dependent reactive (RH) and active hyperemia (AH), are important for adequate blood flow to active muscles. Although high-intensity resistance training (RT) increases mass and strength, there are limited data regarding the effect of low-intensity RT (LIRT) on RH and AH in older adults. We investigated the effects of two low-intensity strength training modalities on RH and AH in postmenopausal women with low muscle strength. **METHODS**: Thirty-one postmenopausal women were stratified by age, body mass index (BMI), and maximal voluntary contraction (MVC) (age, 65 ± 4 years; BMI, 23.2 ± 2.6 kg/m²; MVC, 17.3 ± 2.7 kg) and randomized into isolated lower-body whole-body vibration training (WBVT) (n=12), LIRT (n=11) or control (n=8) groups for 12 weeks. Brachial and popliteal diameter, mean blood velocity, blood flow during RH (flow-mediated dilation, FMD) and AH after 6-minute walk test, and strength on the leg press (LP), flexion (LFlex), and extension (LExt) were measured at baseline and 12 weeks.

Abstracts were prepared by the authors and printed as submitted.

FRIDAY, JUNE 1, 2018

RESULTS: WBVT and LIRT similarly improved brachial (systemic) and popliteal (local) vasodilation compared to control ($P < 0.01$). Additionally, WBVT elicited a greater popliteal artery vasodilatory response (4.9 ± 1.4 %, $P = 0.007$) post-6MWT compared to no change in control. LIRT had no effect on post-6MWT popliteal artery vasodilatory response. WBVT and LIRT elicited similar increases in LP and LFlex strength compared to control ($P < 0.01$); however, WBVT induced a greater increase (19.2 ± 3.7%) in LExt strength compared to the LIRT (8.4 ± 2.6%, $P = 0.007$) and control groups. The increases in brachial FMD were correlated to the increases in LExt and LFlex strength ($r= .37$, $P = 0.04$ and $r= .37$, $P = 0.04$; respectively).
CONCLUSIONS: WBVT and LIRT elicited significant improvements in brachial FMD, which were related to the increases in leg strength. However, despite similar improvements in brachial and popliteal FMD, WBVT may be a more efficacious for improvements of leg post-exercise vasodilation and muscular strength than LIRT in non-obese postmenopausal women.

2251   Board #87   June 1 11:00 AM - 12:30 PM

Prolonged Standing Increases Lower Peripheral Arterial Stiffness Independent Of Walking Breaks

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(No relevant relationships reported)

Prolonged sitting creates an atherogenic environment that causes reductions in arterial function. Standing desks have been promoted as a healthy alternative to sitting, but the cardiovascular benefits of standing desks have not been thoroughly investigated. Physical activity, such as taking walking breaks, increases shear stress, and thereby prevents sitting-induced reductions in arterial function. Therefore, walking breaks, even when compared to standing may provide cardiovascular benefits **PURPOSE:** First, to observe changes in arterial stiffness, as assessed by pulse wave velocity (PWV), with a 2 hour bout of standing. Second, to determine if short, intermittent walking bouts provide a comparative advantage to standing alone. **METHODS:** 20 apparently healthy adults (BMI = 22.9 ± 3.2 kg/m^2; Age = 21 ± 5 years old) stood for 2 consecutive hours while being assessed for heart rate (HR), mean arterial pressure (MAP), and central (C_{PWV}), upper peripheral (U_{PWV}), and lower peripheral (L_{PWV}) PWV before, during, and after the standing bout. Subjects participated in two trials in a randomized order. In one trial, the subjects stood at a standing desk immobile for 2 hours. In the other trial, subjects performed 5 minute walking breaks after every 25 minutes of standing for a total of two hours of standing with 4 walking breaks. **RESULTS:** There was no time by trial interaction for any measure of arterial stiffness (p = 0.82, p = 0.21, and p = 0.15; for C_{PWV}, U_{PWV}, and L_{PWV} respectively). However, from beginning to end of each trial L_{PWV} increased 85 ± 126 cm/s independent of trial (i.e., main effect of time; p < 0.001). There was a non-significant tendency for greater increases in L_{PWV} during the standing (120 ± 142 cm/s) versus the walking trial (50 ± 127 cm/s; p = 0.15). Changes in HR and MAP were not dependent on time or trial (i.e., non-significant interaction time; p = 0.20 & p = 0.39, for HR and MAP, respectively). **CONCLUSION:** Standing for 2 hours leads to increases in peripheral arterial stiffness. Walking breaks during 2 hours of standing did not significantly attenuate these changes. However, the suggestive evidence (p=0.15) for walking breaks to improve L_{PWV} suggests that future studies should investigate longer duration trials and/ or longer walking breaks that are applicable to occupational settings, such as assembly-line work.

2252   Board #88   June 1 11:00 AM - 12:30 PM

Hydrogen Sulfide Does Not Functionally Contribute to Acetylcholine-Mediated Vasodilation in Young Healthy Adults

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(No relevant relationships reported)

Hydrogen sulfide (H_2S) is one of several endothelium-dependent vasoactive molecules that contribute to the regulation of vessel function. In the cutaneous vasculature, young adults express enzymes that synthesize H_2S, and exogenous delivery of H_2S elicits substantial dilation, suggesting that H_2S may be important for the regulation of vessel function *in vivo*. However, because there are several redundant endothelium-dependent contributors, the functional contribution of endogenous H_2S to dilation in the cutaneous circulation is unclear. **PURPOSE:** To quantify the contribution of H_2S to endothelium-dependent dilation in young adults and pharmacologically determine the primary enzymatic source of H_2S in the microvasculature. We hypothesized that CSE-derived H_2S would mediate a portion of acetylcholine (ACh)-induced dilation. **METHODS:** Four microdialysis fibers were placed in the ventral forearm skin of 10 young adults (22 ± 2 y). Red cell flux was measured (laser-Doppler flowmetry) during graded perfusion of the endothelium-dependent agonist ACh (10^{-10}-10^{-1} M) alone and during co-perfusion with D-Penicillamine [10mM DPen; selective inhibitor of the H_2S-

producing enzyme cystathionine γ-lyase (CSE)], aminooxyacetic acid [8mM AOAA; inhibitor of H_2S-producing enzymes CSE and cystathionine β-synthase (CBS)], and a combination of DPen+AOAA. Cutaneous vascular conductance (CVC=flux·mmHg^{-1}) was expressed as a percent of maximal CVC (CVC$_{max}$, 28 mM sodium nitroprusside + local heat 43º C). Sigmoidal dose-response curves were generated and the logEC$_{50}$ was used as an index of vessel sensitivity. **RESULTS:** ACh elicited endothelium-dependent dilation in all subjects (82.9±4.3% CVC$_{max}$; P<0.05). CSE inhibition alone or combined CSE/CBS inhibition had no effect on ACh-induced dilation (ACh: -4.1±0.5; DPen -3.2±0.5; AOAA -3.3±0.7; Combo -2.6±0.4; P>0.05). **CONCLUSION:** H_2S does not appear to have a functional role in mediating cutaneous dilation in response to ACh in young adults. Despite the ability to synthesize H_2S it is likely that other redundant mechanisms, including nitric oxide, mask any functional contribution of H_2S to endothelium-dependent agonists in the cutaneous circulation of young adults.

2253   Board #89   June 1 11:00 AM - 12:30 PM

Associations Between Leg Lean Mass And Arterial Function In Pre-menopausal And Post-menopausal Women.

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(No relevant relationships reported)

Vascular dysfunction has been associated to sarcopenia, the age-related impairment in skeletal muscle mass, strength, and performance, in postmenopausal women. Previous research has shown inverse relationships between leg lean mass (LM) and arterial stiffness (measured as pulse wave velocity, PWV) or pressure wave reflection (augmentation index, AIx) in men and women. AIx is an appropriate vascular marker in young but not middle-age/older adults, especially in women.
PURPOSE: To examine the associations between leg LM and arterial function (cfPWV and aortic AIx adjusted to 75bpm (AIx@75) in pre-menopausal (PRE-M) and post-menopausal (POST-M) women.
METHODS: 47 women (24 PRE-M, age 36 ± 4 years; 23 POST-M, age 69 ± 4 years) participated in this study. Leg LM (expressed as kg/m^2) was measured by DEXA. cfPWV and AIx@75 were measured using applanation tonometry. The relationship between both cfPWV and AIx@75 to leg LM were analyzed using multiple linear regression analysis by each group. Results are reported as mean ± SD and unstandardized regression coefficient (b).
RESULTS: cfPWV (9.0 ± 1.3 m/sec vs. 6.9 ± 0.9 m/sec, $p < .001$) and AIx@75 (29.3 ± 5.3% vs. 18.1 ± 8.7%, $p < 0.001$) were significantly greater in POST-M compared to PRE-M. Leg LM was significantly lower in POST-M compared to PRE-M (4.30 ± 0.32 kg/m^2 vs. 4.67 ± 0.47 kg/m^2, $p = 0.003$). Leg LM was inversely associated with cfPWV ($b = -2.07$, $p = 0.02$) when adjusted for body mass index (BMI) in POST-M. This inverse association remained after adjustment for brachial systolic blood pressure (BSP), fasting blood glucose (FBG), and waist circumference (WC) ($b = -1.884$, $p = 0.02$). Leg LM was not associated with cfPWV in PRE-M. Leg LM was inversely associated with AIx@75 ($b = -9.95$, $p = 0.01$) in PRE-M when adjusted for BMI. The inverse association remained after adjusting for BSP, FBG and WC ($b = -10.52$, $p = 0.02$). No association was found between leg LM and AIx@75 in POST-M.
CONCLUSIONS: Our findings suggest that low leg LM may adversely affect pressure wave reflection in PRE-M and aortic stiffness in POST-M. Future studies will be necessary to investigate the potential benefits of strength training on arterial function in non-obese POST-M and PRE-M.

2254   Board #90   June 1 11:00 AM - 12:30 PM

Increased Serum Irisin Level By Aerobic Training Is Involved In NO Production In Obese Rats

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(No relevant relationships reported)

INTRODUCTIN: Aerobic exercise training reduces arterial stiffness mediated by nitric oxide (NO)-derived vasodilation in obese patients. Irisin is mainly expressed in myocytes and promotes NO release by regulating endothelial nitric oxide synthase (eNOS) expression, leading to vasodilation. Although exercise accelerates irisin secretion, the involvement of irisin in the mechanism of exercise effect on arterial stiffness in obese patients remains unclear. PURPOSE: This study aimed to clarify whether aerobic exercise training-induced elevation of irisin secretion is associated with reduced arterial stiffness with elevation of NO production in obese rats. METHODS: 20-week-old male obese (OLETF) rats were randomly divided into two groups; 8-week sedentary control (CON) and aerobic exercise training (AT; treadmill running for 60min at 25m/min, 5days/week). After 8-week, in each group, we assayed aortic pulse wave velocity (PWV) as an indicator of arterial stiffness, and the aorta and gastrocnemius muscle were isolated after collection of blood. RESULT: Aortic

PWV in OLETF-AT group significantly decreased as compared with OLETF-CON group. Aortic Akt and eNOS phosphorylation and plasma nitrate/nitrite (NOx) level significantly increased in OLEFT-AT group. Additionally, the significant increased muscle FNDC5 protein expression and serum irisin level in aerobic exercise training group were observed. Circulating irisin level was positively correlated with aortic phosphorylation eNOS ($p<0.05$, $r=0.756$) and circulating NOx level ($p<0.05$, $r=0.697$). Additionally circulating NOx level was negatively correlated with aortic PWV ($p<0.05$, $r=-0.695$). CONCLUSION: These results suggest that aerobic exercise training-induced acceleration of irisin secretion may be involved in the reduced arterial stiffness in obese rats. Moreover, as its underlying molecular mechanism, irisin release via increased muscle FNDC5 expression may be involved in aortic eNOS activation, leading to reduction of arterial stiffness via NO-derived vasodilation. Supported by Grants-in-Aid for Scientific Research (#17H02183, #16K13059, M. Iemitsu)

2255   Board #91   June 1 11:00 AM - 12:30 PM

Cardiovascular Responses To Steady State Exercise In Well-healed Burned Survivors After Six Months Of Exercise Training

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(No relevant relationships reported)

Aerobic exercise is an important component of rehabilitation in burn survivors, but no studies to date have examined whether burn survivors demonstrate cardiovascular adaptations to long-term training. It is well established that exercise training reduces heart rate at rest and during steady-state exercise in non-burned individuals. **PURPOSE:** To test the hypothesis that six months of aerobic exercise training reduces heart rate at rest and during two workloads of steady-state cycling in well-healed burn survivors. **METHODS:** Ten participants (7 males; aged 43 ± 14 years) with well-healed burn injuries covering an average total body surface area of 52±25% (range: 22-88%) participated in a progressive 6-month aerobic-focused exercise training regimen. Heart rate responses were obtained at rest and during two steady-state submaximal cycling workloads (SS1; 50 W) and (SS2; 75 W) prior to and after exercise training. **RESULTS:** Six months of exercise training tended to decrease resting heart rate (Pre, 77 ± 15 bpm vs Post, 70 ± 11 bpm, P=0.09)**.** During both workloads, heart rate was ~ 10 bpm lower post training (50W: pre 100 ± 26 bpm, post 90 ± 18 bpm, P=0.02; 75W: pre 113 ± 33 bpm, post 101 ± 23 bpm, P<0.01). **CONCLUSION:** These data show that cardiovascular adaptations to long-term aerobic exercise training can be obtained in well-healed burned subjects. Work funded by NIH GM068865

2256   Board #92   June 1 11:00 AM - 12:30 PM

Repeated Bouts of Passive Limb Movement Result in a Sustained Hyperemic Response in Those with Paraplegia

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(No relevant relationships reported)

Previous studies have reported passive limb movement (PLM) could be used as a modality to increase blood flow and tissue perfusion in the paralyzed lower limbs of those with spinal cord injuries. However, the hyperemic response to PLM observed in these studies transient, lasting only 30-45 seconds despite continued limb movement. No studies have sought to determine if this hyperemic response can be sustained by using repeated bouts of PLM interspaced with recovery periods. **PURPOSE**: To investigate the feasibility of repeated bouts of PLM to invoke a sustained hyperemic response in those with paraplegia.
METHODS: Nine paraplegics with a clinically confirmed complete injury between the 3rd and 11th thoracic vertebra underwent 5 bouts of PLM. Each bout was 60 seconds in duration and the PLM was performed at a rate of 1 Hz and there was 60 seconds of recovery between each bout. Heart rate (HR), mean arterial pressure (MAP), femoral artery blood flow (FABF) and skin blood flow (SBF) above the vastus lateralis muscle were continually measured.
RESULTS: No change in HR (p=0.81) or MAP (p=0.40) were observed during any of the bouts of PLM. FABF showed a robust and sustained hyperemic response with increases in blood flow of 85±103%, 71±87%, 79±%90%, 76±87% and 88±93% for each of the five bouts of PLM, respectively (p=0.043). SBF values rose 497±373%, 465±302%, 503±315%, 523±332% and 582±309% across the five bouts, respectively (p=0.005).

CONCLUSIONS: With repeated 60 second bouts of PLM interspaced with 60 second recovery periods there is a consistent increase in FABF and SBF which could have implications on improving vascular health and tissue perfusion in the lower limbs in those with paraplegia.

2257   Board #93   June 1 11:00 AM - 12:30 PM

Effects Of Physical Activity On Sympathetic, Cardiovascular, And Perceptual Responses To A Painful Stimulus

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(No relevant relationships reported)

EFFECTS OF PHYSICAL ACTIVITY ON SYMPATHETIC, CARDIOVASCULAR, AND PERCEPTUAL RESPONSES TO A PAINFUL STIMULUS

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Purpose: The purpose of this study is to examine sympathetic neural, cardiovascular, and perceptual responses to the cold pressor test (CPT) in physically active and sedentary young women. **Methods:** After pre-health screening and consent, physically active (PA; n=4) and healthy sedentary (SED; n=2) women completed a VO_2max test on a cycle ergometer. Subjects returned to the laboratory for autonomic function testing, where arterial blood pressure (SBP; DBP), heart rate (HR), and muscle sympathetic nerve activity (MSNA) were continuously recorded before, during, and following a two-minute CPT. Subjects were asked to rate their pain on a scale of 1-10 immediately following the CPT. **Results:** PA and SED women were similar in age (22.8 ±1.3 vs. 20.5 ±0.7 yr, respectively), BMI (22.7 ±1.9 vs. 23.6 ±1.1 kg/m^2), and resting blood pressure (SBP: 115 ±3 vs. 113 ±15 mmHg; DBP: 72 ±8 vs. 75 ±7 mmHg). PA women performed more moderate-vigorous physical activity per week than SED (319 ±136 vs 0 ±0 min/week) and had higher VO_2max values (44 ±3 vs. 31 ±5 ml/kg/min). Resting HR (62 ± 11 vs. 76 ± 12 bpm) and MSNA (7 ± 7 vs. 17 ± 1 bursts/min) tended to be lower in PA compared to SED women. During the CPT, PA and SED groups had similar increases in SBP (peak Δ = +26 ±22 vs. +41 mmHg, respectively), DBP (peak Δ = +17 ±5 vs. +22 mmHg), HR (peak Δ = +14 ±4 vs. +10 ±1 bpm), and MSNA (peak Δ = +36 ±15 vs. +28 ±8 bursts/min). SED women reported slightly higher pain ratings than PA (8.8 ±1.1 vs. 7.4 ±1.5). **Conclusion:** Chronic aerobic physical activity appears to be related to lower pain sensitivity; however, both groups displayed similar sympathetic neural and cardiovascular responses to a painful stimulus.

E-31   Free Communication/Poster - **Basic Science and Skeletal Muscle**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2258   Board #94   June 1 9:30 AM - 11:00 AM

Yap as an Indicator of Nuclear Mechanotransduction in Mature Myofibers

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(No relevant relationships reported)

Mechanical forces transduced through the extracellular matrix to muscle fibers are critical for regulating muscle development, hypertrophy, homeostasis, and response to loading. Force transmitting structures reside not only at the sarcolemma (e.g., dystrophin), but also at the nuclear envelope (e.g., nesprin) for direct nuclear mechanotransduction. YAP/TAZ (Yes-associated protein/transcriptional coactivator with PDZ-binding motif) is touted as a nuclear relay of mechanical signals in many cell types (i.e. epithelial & cardiac cells, osteoblasts, fibroblasts, mesenchymal stem cells, myoblasts), and can induce a wide range of downstream signaling cascades. However, localization of YAP/TAZ to the nucleus in mature skeletal muscle fibers in response to substrate stiffness and cell loading remains unclear. **PURPOSE:** To assess YAP/TAZ nuclear localization in healthy (WT), dystrophin null (*mdx*) and nesprin-1 null skeletal muscle with varying substrate stiffness and loading. We hypothesized that absence of dystrophin and nesprin-1 would prevent YAP/TAZ nuclear localization secondary to reduced mechanotransduction to the nucleus. **METHODS:** We measured

YAP/TAZ nuclear localization in WT (n=4), *mdx* (n=4), and nesprin-1^{-/-} (n=4) isolated myofibers with different substrate stiffness or with 3% cyclic passive stretch for 30 minutes, and in whole muscle after *in-vivo* isometric contractions. **RESULTS:** With increasing substrate stiffness, we found that increased YAP/TAZ nuclear localization occurs in WT (25% increase at 50 kPa compared to 1 kPa, p<0.05) and *mdx* myofibers (64% increase, p <0.05), but not in myofibers lacking nesprin-1 (15% increase, not significant). Cyclic tensile loading resulted in YAP/TAZ nuclear signaling in WT myofibers, but significantly less in *mdx* myofibers and no signaling in nesprin-1^{-/-} myofibers. A lack of nuclear localization in *mdx* was also observed after isometric contractions *in-vivo*. Interestingly, the centrally located nuclei in the *mdx* displayed YAP/TAZ nuclear translocation after isometric contraction loading. **CONCLUSIONS:** Nuclear mechanotransduction is nesprin-dependent and is impaired in dystrophic muscle, which can further the pathology due to altered nuclear function.

2259   Board #95   June 1 9:30 AM - 11:00 AM

Skeletal Myotubes From Obese Individuals Display Attenuated Response to Resveratrol Treatment

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(No relevant relationships reported)

Resveratrol is a polyphenol compound that has been used for the prevention and treatment of obesity-related diseases. Precisely, some studies have indicated that resveratrol improves insulin sensitivity *in vivo*, but these results are inconsistent and have yet to include a severely obese cohort (BMI > 40 kg/m^2). Preliminary research indicates that myotubes derived from obese individuals are resistant to the insulin sensitizing effects of resveratrol, but the mechanism remains undefined. PURPOSE: To determine the effects of resveratrol treatment on basal and insulin-mediated glucose metabolism in myotubes derived from lean, healthy and severely obese individuals. METHODS: Primary skeletal muscle cells were isolated from skeletal muscle biopsies taken from age-matched lean (BMI= 21.9 ± 0.7 kg/m^2) and severely obese (46.1 $\pm$ 3.1 kg/m2) Caucasian women, which were treated with 1μM resveratrol for 24 hours. Radio labeled 1-^{14}C glucose was used to measure glucose oxidation (GO) and glycogen synthesis (GS) with or without insulin. Additionally, western blot analysis was conducted on the cell lysate to measure changes in the phosphorylation status of proteins along the insulin signaling cascade. RESULTS: Resveratrol increased insulin-stimulated GS (9.4 ± 0.2 nmol/min/mg vs. 10.3 ± 0.5 nmol/min/mg, p < 0.05) and GO (211.69 ± 7.51 pmol/min/mg vs. 234.82 ± 11.52 pmol/min/mg, p < 0.05) in severely obese myotubes, but to lower extent when compared to the lean myotubes (GS: 12.8 ± 1.0 vs. 10.3 ± 0.5 nmol/min/mg; GO: 305.78 ± 23.36 vs. 234.82 ± 11.52 pmol/min/mg, for lean and obese, respectively, p < 0.05). In agreement, insulin-induced phosphorylation of IRS and AKT was increased by resveratrol in lean, but to a lesser extent in obese myotubes (IRS: 1.9 ± 0.2 vs. 1.3 ± 0.1; AKT: 3.4 ± 0.3 vs. 2.6 ± 2.4, fold increase over non-insulin, non-resveratrol treated condition, for lean vs. severely obese, respectively, p < 0.05). CONCLUSIONS: Resveratrol improved insulin-mediated glucose metabolism in myotubes derived from both groups. However, obese myotubes were not able to achieve the same improvements which may be due to underlying defects in the insulin signaling cascade.

2260   Board #96   June 1 9:30 AM - 11:00 AM

Do Notch and mTOR Correlate for Myotube Formation In C2C12s?

Susan T. Arthur, Brian Q. Thompson, Charlotte McMullen, Josh R. Huot. *UNC Charlotte, Charlotte, NC.*

(No relevant relationships reported)

PURPOSE: Notch and Mechanistic Target of Rapamycin (mTOR) are important for myogenesis but their interaction is not well studied. The purpose of this project was to determine if Notch affects mTOR to correlate myotube fusion of C2C12s using a Notch inhibitor, Gamma Secretase Inhibitor (GSI) and mTOR inhibitor, Rapamycin. **METHODS**: C2C12s were seeded, proliferated to 90-100% confluence and then differentiated for four days. At the onset of differentiation, C2C12 cells were treated every 12 hours with one of the following conditions: 4 μmoL of GSI, 100 nmoL of Rapamycin, both, or control. At four days post-differentiation, the C2C12 cells were either fixed for immunofluorence and myotube fusion and area were determined, or were collected for western blot analysis for measurement of mTOR signaling protein expression.
RESULTS:GSI treatment increased fusion index compared to the other three treatments (fusing nuclei/total nuclei) (p < 0.0001). Rapamycin subsided fusion index relative to control (p < 0.0001). GSI and Rapamycin also decreased fusion index compared to control (p < 0.0001). GSI-treated myotubes displayed elevated p-mTORSer2448 compared to control (p < 0.05). Rapamycin and GSI+Rapamycin treated myotubes displayed reduced p-mTORSer2447 expression compared to control and GSI (p < 0.05).

CONCLUSIONS: Our data suggests that Notch is inhibited and mTOR activated for myotube fusion to occur.

2261   Board #97   June 1 9:30 AM - 11:00 AM

Serial Passaging Reduces Replication and Fusion Capacity of Primary Human Skeletal Muscle Satellite Cells

Zachary R. Hettinger[1], Yaohui Nie[2], Ron T. Garner[1], Chris K. Kargl[1], Shivam H. Patel[1], Shihuan Kuang[1], Tim P. Gavin, FACSM[1]. *[1]Purdue University, West Lafayette, IN. [2]Harvard University, Cambridge, MA.* (Sponsor: Dr. Tim Gavin, FACSM)

(No relevant relationships reported)

Replication and fusion of skeletal muscle satellite cells (SkMSCs) are essential for skeletal muscle maintenance and repair. Advancing age impairs SkMSCs replication potential and fusion capacity, however SkMSCs isolated from older human skeletal muscle do not consistently demonstrate these defects, making it difficult to study SkMSC isolated from aged human muscle. **PURPOSE**: To investigate if serial passaging of SkMSCs can mimic aging associated defects in replication and fusion. We hypothesized that serial passaging of primary human SkMSCs induces replicative senescence and poor fusion capacity in part through inhibition of the cell cycle regulator cyclin-dependent kinase 4 (CDK4) through the activation of CDK inhibitor p16[Ink4a]. **METHODS**: SkMSCs were isolated from vastus lateralis biopsies of young men. SkMSCs were serially passaged every five days and passaging continued until SkMSCs were unable to replicate. Population doubling level (PDL) was calculated using passage specific final and starting SkMSC counts. Expression of the myogenic regulator, myogenin (MyoG) and the regeneration regulator, paired box 7 (Pax7) were analyzed via rt-PCR. Senescence was determined by SA-B-gal staining and fusion capacity determined by immunohistochemical staining. **RESULTS**: Primary human SkMSCs failed to replicate at passage 16 (Pass16) and Pass16 SkMSCs exhibited decreased fusion. PDL was decreased from passage 4 to 16 (Pass4: 3.9 vs. Pass16: 0.6, AU). CDK4 mRNA decreased (Pass4: 1.0 vs. Pass16: 0.4, AU) and p16Ink4a mRNA was increased (Pass4: 1.0 vs. Pass16: 4.9, AU). Pax7 mRNA was unchanged (Pass4: 1.0 vs. Pass16: 1.3, AU), while myoG mRNA was increased (Pass4: 1.0 vs Pass16: 8.6, AU). **CONCLUSIONS**: Serially passaging SkMSCs isolated from young humans mimics an aged phenotype evidenced by impaired replication and fusion. Our findings suggest serial passaging of primary human SkMSC may be used to study aged SkMSCs.

2262   Board #98   June 1 9:30 AM - 11:00 AM

Effect of Acute Exercise on Skeletal Muscle Exosome Biogenesis

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(No relevant relationships reported)

Exercise training promotes a wide range of beneficial adaptations. Skeletal muscle is now considered an endocrine organ. Exosomes, small microvesicles, are produced by and participate in the endocrine function of skeletal muscle. Exosome biogenesis is regulated in part by components of the multivesicular body (MVB) processing pathway: hepatocyte growth factor-regulated tyrosine kinase substrate (HGS), signal transducing adapter molecule 1 (STAM), VTA1 homolog (VTA1), and vacuolar protein sorting-associated protein 4A (VPS4a). **PURPOSE:** Determine if exercise induces skeletal muscle exosome biogenesis. **METHODS:** Twelve lean, young men completed acute aerobic cycling at 55% VO$_{2Max}$ for 45 minutes followed immediately by single leg knee extensor resistance exercise (3 sets, 8-12 reps, 55% 1-RM). Vastus lateralis biopsies were obtained prior to (PRE) and 1-hour post aerobic (AEX) and aerobic+resistance (A+REX) exercise. Gene expression for proteins in the MVB pathway was analyzed using rt-PCR. **RESULTS:** There was no effect of exercise on STAM (PRE: 1.0; AEX: 1.03; A+REX: 1.28, AU), VTA1 (PRE: 1.0: AEX: 0.93; A+REX: 1.14, AU), or VPS4a (PRE: 1.0: AEX: 0.93; A+REX: 1.06, AU) . There was a trend for an increase in HGS at 1 hr post-exercise (PRE: 1.0; AEX: 0.97; A+REX: 1.27, AU). **CONCLUSIONS:** There was no effect of acute exercise on the gene expression of components of the exosome biogenesis pathway. However, activation of exosome biogenesis may be evident at different time points post exercise or with greater exercise intensities.

2263   Board #99   June 1 9:30 AM - 11:00 AM

Differential Musculoskeletal Adaptations to Exercise of the Soleus and Vastus Lateralis: A Pilot Proteomics Approach

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(No relevant relationships reported)

The vastus lateralis (VL) and soleus (SOL) muscles show vigorous changes when exposed to unloading conditions. There is evidence that the SOL muscle shows an increased sensitivity to loading yet has been shown to be resistant to exercise-induced adaptations. **PURPOSE:** To utilize high-resolution two-dimensional gel electrophoresis combined with mass spectrometry to identify anomalous biomarkers of the SOL muscle. **METHODS:** Biopsy samples of the VL and SOL muscles were obtained from three healthy, inactive individuals (1 male, 21 yrs, 92.5 kg, 167.5 cm; 2 females, 18 and 19 yrs, 66.6 and 71.7 kg, 153.3 and 161.9 cm respectively). Muscle tissue was homogenized in a bead homogenizer and protein quantified with a DC protein assay. Two-dimensional gel electrophoresis was performed and differences in spot abundance between the two muscles were used to select spots of interest. Proteins of the 24 selected spots were subsequently identified by MALDI-TOF MS/MS scanning and Mascot database searching against Swiss-Prot human protein database. **RESULTS:** Results from the 2D gel electrophoresis varied across the three subjects. Proteins identified from spots of greater intensity in the VL were myosin light chain isoforms, actin, adenylate kinase isoenzyme, alpha-crystallin B, ankyrin repeat domain-containing protein, plasminogen receptor, G-protein coupled receptor, and troponin I. The main proteins identified in the SOL were related to myoglobin with a protein phosphatase protein also being identified. Western blotting will be conducted to verify the identified proteins. **CONCLUSION:** This preliminary work has identified differential proteins between the SOL and VL relating to oxygen transport, cytoskeletal components, and energy regulation. Future work should examine changes to the proteome between these two muscle with exercise and unloading.

2264   Board #100   June 1 9:30 AM - 11:00 AM

Whey Peptides Intake activates mTOR Signaling after Resistance Exercise Independent of Sex and Menstrual Cycle

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(No relevant relationships reported)

PURPOSE: Sex differences are evident in human skeletal muscle as the cross-sectional area of individual muscle fibers is greater in men than in women. In addition, the female steroid hormone fluctuates during menstrual cycle phase. We have recently shown that whey peptides intake after resistance exercise stimulates mammalian target of rapamycin (mTOR) signaling related to protein synthesis in young men. Therefore, the purpose of this study was to determine the effects of sex and menstrual cycle on mTOR signaling following resistance exercise and whey peptide intake. **METHODS**: Young healthy, recreationally active men (n=7) and women (n=16) performed a bout of one-leg isokinetic knee extension exercise (angular degree; 30º/sec, 6 reps. × 4 sets). Immediately after exercise, all subjects took a whey peptide drink (0.19 g/kg). At resting and 1h post-exercise, muscle samples were taken from vastus lateralis using needle biopsy technique. Phosphorylations of mTOR signaling transducers (mTOR, S6K1, 4E-BP1) was analyzed by western blotting. At rest, 30 min and 60 min post-exercise, blood amino acids and insulin concentrations were measured. **RESULTS**: Peak torques during resistance exercise was significantly greater in men than in women (p<0.05), but the relative value (% MVC) was the same between men and women. Blood amino acids and insulin concentration were significantly increased at 30 min after whey peptide intake (p<0.05), but there was no effect of sex and menstrual cycle. The phosphorylation of mTOR, S6K1 and 4E-BP1 after resistance exercise and whey peptide intake was significantly increased compared with that in the rest (p<0.05), but there was no effect of sex and menstrual cycle. **CONCLUSIONS**: Our data suggest that sex and menstrual cycle do not affect mTOR signaling in response to whey peptide intake after resistance exercise in human skeletal muscle. Supported by MEXT-Supported Program for the Strategic Research Foundation at Private Universities, 2014-2018.

2265   Board #101   June 1 9:30 AM - 11:00 AM

Acute and Chronic Resistance-Training Downregulates Select Line-1 Retrotransposon Activity Markers in Human Skeletal Muscle

Matthew A. Romero[1], C. Brooks Mobley[1], Paul A. Roberson[1], Cody T. Haun[1], Wesley C. Kephart[1], Petey W. Mumford[1], James C. Healy[1], Darren T. Beck[1], Kaelin C. Young[1], Jeffrey S. Martin[1], Christopher M. Lockwood[2], Michael D. Roberts[1]. *[1]Auburn University, Auburn, AL. [2]Lockwood Nutrition, Draper, UT.*

(No relevant relationships reported)

Transposable elements or "jumping genes" are mobile genetic elements with the ability to amplify themselves within the genome. This gene mobility lends itself to the possibility of mutagenesis within cells, which is further compounded by the fact that these elements constitute ~50% our genome. Transposable elements, most notably LINE-1, have important implications for both gene regulation and gene expression under a variety of conditions. **PURPOSE:** To better understand the role of LINE-1 in skeletal muscle physiology, we examined if acute and/or chronic resistance exercise affected skeletal muscle LINE-1 retrotransposon activity. **METHODS:** In study 1, 10 resistance-trained males performed three consecutive daily squat sessions. *Vastus lateralis* biopsies were taken Pre, 2 h post (Post1), and 3 days following session 3 (Post2). In study 2, 13 untrained males performed a full-body resistance-training program. *Vastus lateralis* biopsies were taken at weeks 0 and 12. **RESULTS:** Study 1: LINE-1 mRNA content was lower at both Post1 (p=0.028) and Post2 (p=0.013), while RT activity trended down at Post2 (p=0.067). A methylation assay at the LINE-1 promoter, however, did not yield significant results. Study 2: LINE-1 mRNA trended down by week 12 (p=0.056) along with RT activity (p=0.063) and ORF2p content (p=0.041). Although, mRNA was not significantly lower after training, LINE-1 promoter methylation significantly increased at week 12 (p=0.041). Interestingly, changes in RT activity versus satellite cell number were inversely associated (r²= -0.725). **CONCLUSION:** Resistance exercise downregulates select skeletal muscle LINE-1 markers and this may be suggestive toward an involvement of LINE-1 in satellite cell activity. Supported by gift monies donated to M.D.R. through Hilmar Ingredients (Hilmar, CA, USA) and Bionutritional Research Group (Irvine, CA, USA), and contract to J.S.M. through NormaTec (Newton Center, MA, USA).

E-32   Free Communication/Poster - **Muscle Physiology Applications**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2266   Board #102   June 1 9:30 AM - 11:00 AM

A Preliminary Comparison Of Muscle Pennation Angle Measures To Explain Variance In Maximal Force Production

Micheal J. Luera, Carlos A. Estrada, Jesus A. Hernandez Sarabia, Julia Troung, Tyler W. D. Muddle, Jason M. DeFreitas. *Oklahoma State University, Stillwater, OK.*

(No relevant relationships reported)

Previous literature has shown that a muscle's pennation angle influences that muscle's force producing capabilities. However, how the pennation angle of mono- and bi-articular muscles are related to single- and multi-joint force production is less clear. **PURPOSE:** To examine the relationships between resting and contracting pennation angles of the biarticular rectus femoris (RF_{REST} + RF_{CONT}) and the monoarticular vastus lateralis (VL_{REST} + VL_{CONT}) muscles with maximal force production during single and multi-joint isometric tasks. **METHODS:** Eight lower-body resistance trained males (mean ± SD; 27 ± 3 yrs; 102 ± 6.55 kg; 197 ± 7 cm) performed maximal voluntary isometric contractions during the squat (SQ_{max}) and knee extension (KE_{max}) exercises at knee joint angles of 110° and 150°. The order of the joint angles were randomized. The hip angle was ~105° during KE_{max} and ~110° during SQ_{max}. Maximal force (N) was measured with an S-beam load cell. Muscle pennation angles were measured in both the RF and VL at rest and again during the maximal contractions using ultrasound imaging. **RESULTS:** Using multiple regression, RF_{CONT} at 150° was the only variable that contributed significantly to KE_{max} (R^2 = 0.758, p = 0.005) at the same angle. Interestingly, there were no significant relationships with RF_{REST} or RF_{CONT} during KE_{max} at 110°, or SQ_{max} at both knee joint angles. Furthermore, neither VL_{REST} nor VL_{CONT} were significantly related to either KE_{max} or SQ_{max} at any knee joint angles (all p-values ≥ 0.05). **CONCLUSION:** The finding that RF_{CONT} at 150° being related to KE_{max} at the same angle was the only significant outcome was surprising. However, caution should be applied in the interpretation of this preliminary examination, as

the sample size is underpowered to fully address the research question. Nevertheless, given that KE is a single-joint task, we expected pennation angles of the monoarticular VL to contribute more to the model than the biarticular RF.

2267   Board #103   June 1 9:30 AM - 11:00 AM

Contribution Of Mono- And Bi-articular Muscle Sizes Of Single- And Multi-joint Maximal Strength

Jesus A. Hernandez Sarabia, Michael J. Luera, Carlos Estrada, Jason M. DeFreitas. *Oklahoma State University, STILLWATER, OK.*

(No relevant relationships reported)

Contribution of Mono- and Bi-articular Muscle Sizes to Single- and Multi-joint Maximal Strength

Jesus A. Hernandez-Sarabia[1], Michael J. Luera[1], Carlos Estrada[1], and Jason M. DeFreitas[1].
[1]Oklahoma State University, Stillwater, OK

The strong relationships between the size of monoarticular muscles and strength during single-joint contractions are well established (e.g. biceps brachii and elbow flexion force). However, the contributions of biarticular muscles during multi-joint contractions are less so. **PURPOSE:** To examine the relationships between the size of the vastus lateralis (VL, monoarticular) and rectus femoris (RF, biarticular) muscles with maximal force production during single- and multi-joint isometric tasks. We hypothesized that the size of the biarticular RF would demonstrate a stronger relationship with isometric squat force than VL size, and that VL size would have a stronger relationship with single-joint force. **METHODS:** Eight strength-training men were recruited for this study (M±SD 27 ± 3 yrs). First, three ultrasound images of the right VL and RF were obtained to calculate muscle cross-sectional area (CSA) and thickness. Isometric squats (SQ_{max}) and isometric knee extensions (KE_{max}) were performed to assess multi-joint and single-joint maximal strength. Both were performed at the same knee joint angle (110°). **RESULTS:** Using multiple regression, RF muscle size was significantly related to SQ_{max} ($R^2 = 0.878$, p = 0.005). Interestingly, both RF CSA and thickness contributed to the model. Also of surprise is that VL size did not contribute to SQ_{max}. VL thickness was significantly related to KE_{max} ($R^2 = 0.579$, p = 0.047), but none of the other measures contributed. **CONCLUSION:** Our primary finding was that RF muscle size contributes significantly to squat force, a multi-joint task, but not to the single-joint, knee extension force. Vice versa, VL size contributed to single-joint force, but not to squat force. While our hypotheses technically were supported, we did expect both muscle sizes to still contribute to the regression model (not either RF or VL only for each task). This lack of contribution to the statistical model by both muscles for each task is likely due to insufficient sample size.

2268   Board #104   June 1 9:30 AM - 11:00 AM

Flexor Pollicis Brevis Muscle Provides Another Eccentric Contraction Model In Human

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(No relevant relationships reported)

PURPOSE: Exercise induced muscle damage (EIMD) impair the skeletal muscle functions. To induce EIMD, many studies have used unaccustomed eccentric muscle contractions (ECs). ECs is frequently applied on biceps brachii or quadriceps muscles in human experiments. Flexor pollicis brevis muscle (FPBM) is a small flexor muscle of thumb MP joint. We examined whether EIMD could be induced into FPBM by forced extension of the thumb MP joint. **METHODS**: Eleven men received description and provided informed consent. ECs was applied by custom-made torque dynamometer. They performed maximal ECs on their FPBM of non-dominant hand. Five subjects (years, 21.8 ± 0.4; height, 171.5 ± 7.1 cm; weight, 68.3 ± 6.9 kg) performed 60 (6 × 10 sets) ECs with 90 deg / s fast joint angular velocity (severe EIMD). Other 6 subjects (years, 21.0 ± 1.3; height, 166.8 ± 3.1 cm; weight, 65.2 ± 2.6 kg) were assigned to 60 deg / s slow joint angular velocity (mild EIMD) of 100 (10 × 10 sets) ECs. Maximal voluntary contraction (MVC), joint range of motion (ROM) and muscle soreness were assessed before, immediately post, and 1, 2 and 5 days after ECs. Muscle soreness was quantified by using of visual analog scale (VAS). Values were statistically analyzed and the significance level was set at *p* < 0.05. **RESULTS**: In the severe EIMD, MVC and ROM were significantly decreased at post compared with pre (MVC, 18%; effect size = 1.30, 95 % CI 0.17 - 2.51; ROM, 14 %; effect size = 0.49, 95 % CI 0.81 - 1.70 *p* < 0.05). Mild EIMD also showed significant deficit of MVC and ROM values after post (MVC, 5 %; effect size = 0.33, 95 % CI 0.83 - 1.45; ROM, 12 %; effect size = 0.61, 95 % CI 0.59 - 1.71; *p* < 0.05). VAS markedly developed at 2 days after ECs in both groups (severe EIMD, pre, 0 cm, 2 days, 3.9 cm; effect size = 3.73, 95 % CI 1.44 - 5.29; mild EIMD, pre, 0 cm; post, 2.46 cm, effect size = 2.53, 95 % CI 0.87 - 3.8; *p* < 0.05). **CONCLUSIONS**: This study showed similar results with previous ECs studies, suggesting that FPBM is another novel ECs model in human.

2269   Board #105   June 1 9:30 AM - 11:00 AM

Stimulated, but Not Voluntary Critical Torque Differs between Men and Women

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(No relevant relationships reported)

Previous studies have demonstrated gender differences in fatigue with women showing small declines in force compared to men. To our knowledge no study has examined whether gender differences exist in critical power or its isometric analog critical torque (CT) which are strong predictors of endurance performance. **PURPOSE:** The purpose of the study was to assess gender differences during voluntary and stimulated assessments of CT. **METHODS:** Nineteen participants (10 women, 9 men) completed 4 assessments of their quadriceps femoris CT over 3 randomly assigned testing visits: 1) voluntary CT assessment (VOL), 2) stimulated CT assessment at 100Hz (STIM100-1), and 3) stimulated CT assessment at 100Hz (STIM100-2) and 15Hz (STIM15). The work to rest cycle was 3:2 (3-sec of contraction to 2-sec of rest) during VOL and 2:2 during the stimulated tests. Voluntary activation (%VA) and twitch-torque (TT) were determined every 30-sec during VOL to determine central and peripheral contributions to fatigue. **RESULTS:** Gender differences were not observed for VOL (p = 0.55) with CT occurring at 47.5 ± 9.9% and 43.9 ± 16.3% of MVC, respectively. %VA and TT declined over time during the CT test (p ≤ 0.001), but no effect for gender was found %VA (p = 0.76 for %VA) or TT (p =0.31 for TT). Initial torque values and CT values did not differ for STIM100-1 and STIM100-2 (p ≤ 0.51). Stimulated CT at 100Hz occurred at a higher percentage of starting torque in women compared to men—33.2 ± 5.8% vs. 26.8 ± 4.9% (p = 0.02) and 35.5 ± 7.6% vs. 28.9 ± 5.5% (p = 0.046) for STIM100-1 and STIM100-2, respectively. No gender difference was observed during STIM15 (p = 0.79). **CONCLUSION:** Unlike previous studies of voluntary endurance exercise, we found no gender differences in VOL CT which was supported by similar central and peripheral fatigue during the CT test. Interestingly, women demonstrated less peripheral fatigue and a consistently high stimulated CT during 100Hz stimulation. However, this gender difference was lost when stimulation frequency was reduced to 15Hz. This finding may indicate the gender difference may be in part mediated by initial torque values and/or the rate of fatigue during exercise.

2270   Board #106   June 1 9:30 AM - 11:00 AM

Relationship Between Muscle Activation and Force Recovery Following Sustained Maximal Voluntary Isometric Contractions

Kade E. Kinney[1], Ellen V. Sloan[2], Katherine E. Houle[1], William F. Brechue, FACSM[1]. [1]*A.T. Still University of Health Sciences, Kirksville, MO.* [2]*University of Tennessee Health Sciences Center, Memphis, TN.* (Sponsor: William F. Brechue, FACSM, FACSM)

(No relevant relationships reported)

Previously we observed dissociation of skeletal muscle activation and force recovery following sustained maximal voluntary isometric contractions (MVIC). Fatigue was specifically related to reduced muscle activation within bouts; yet, incomplete recovery of force between bouts occurred with maximal muscle activation, suggesting interference in excitation-contraction coupling. **Purpose:** to investigate time-dependency of nervous system recovery following MVIC. **Methods:** Men (n=29) performed two bouts (B1, B2) of sustained handgrip MVIC preceded by 10-min recovery periods. Force (dynamometer) and surface EMG (sEMG) from the brachioradialis (BR), flexor carpi radialis (FCR), flexor carpi ulnaris (FCU), and flexor digitorum profundus (FDP) were collected continuously (1000 Hz) during bouts. sEMG signals were band pass filtered, rectified, and integrated (iEMG), then normalized (nEMG) to initial B1 iEMG. Force and sEMG were analyzed at 0.5 second intervals every 15 seconds. **Results:** Recovery (B2 initial force >90% of B1) response fell into two groups; recovered (R, n=13) and not recovered (NR; n=16). Force decreased similarly in B1 (R: 77%; NR: 78%) and B2 (R: 79%; NR: 80%), yet initial B2 force was less (22%) than B1 in NR. Fatigue progressed in two-phases; B1 fast-phase decreased more rapidly with slow phase inflection occurring earlier (60 sec; 35% initial force) in R compared to NR (90 sec; 26% initial force). In R, B2 had a similar rate of decline in force and inflection (60 sec; 32% initial force). NR B2 showed a similar rate of decline in force, but inflection occurred sooner (75 sec) at the same level of initial B1 force (22%). Muscle activation (iEMG) during B1 was reduced similarly in R and NR (R: BR: 68%; FCR: 63%; FCU: 73%; FDP: 75%; NR: BR: 61%; FCR: 67%; FCU: 43%; FDP: 57%). During B2, R and NR showed similar decreases as B1, but all muscles except FCR showed lower initial B2 muscle activation compared to B1. **Conclusions:** Fatigue manifested in two phases; fast and slow. Recovery of force following sustained MVIC appears to be related to initial rate of decline of force (fast phase) with earlier onset of phase two. Earlier onset of phase shift may be related to changes in external compressive force and blood flow through the muscle, reducing metabolic perturbation and reflex inhibition of activation.

2271   Board #107   June 1 9:30 AM - 11:00 AM

The Magnitude Of Hamstring Co-activation During A Knee Extension Is Dependent On Knee Flexor Strength

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(No relevant relationships reported)

Involuntary muscle activation of the opposing muscles (antagonists) during agonist muscle actions is referred to as antagonist coactivation. It has been shown that strength training the agonist leads to a decrease in antagonist co-activation. However, it is unknown if the relative antagonist strength plays a role in the magnitude of co-activation. **PURPOSE**: To assess if antagonist coactivation of the knee flexors during a maximal knee extension is related to Hamstring-to-Quadriceps strength ratio (H:Q). **METHODS**: Twenty-two men (M ± SD age = 23.32 ± 3.17 years) visited the laboratory and performed isometric maximal voluntary contractions (MVC) of the knee flexors and extensors. Surface electromyography (sEMG) was recorded from the vastus lateralis (VL) and the biceps femoris (BF). The root-mean-square (RMS) value of the sEMG signal was used to calculate the EMG amplitude, which was then normalized to the RMS obtained during that muscle group's MVC. Pearson's correlation coefficients were used for statistical analysis. **RESULTS**: A significant, moderate, negative correlation (r = -0.569; R^2 = 0.324; p = 0.006) was observed between H:Q strength ratio (M ± SD = 52.6% ± 12.2%) and antagonist co-activation of the BF (M ± SD = 18.03% ± 9.48%) (Figure 1). **CONCLUSION**: The results of the present investigation reveal that as hamstring strength increases in relation to the quadriceps, coactivation may be reduced. Since a commonly proposed purpose of antagonist co-activation is to provide joint stability, it is possible that a stronger and stiffer hamstrings muscle group would require less co-activation during a knee extension to stabilize the joint.
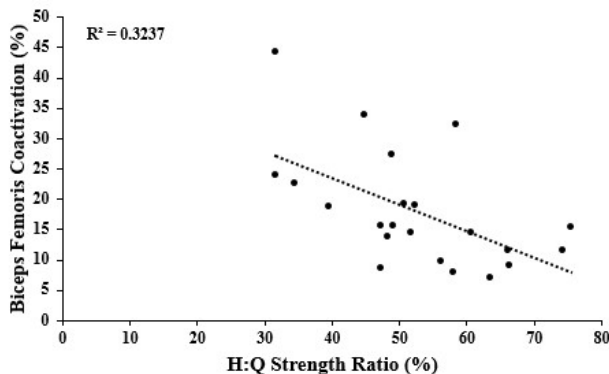
2272   Board #108   June 1 9:30 AM - 11:00 AM

Acute EMD Responses of the Knee Extensors Following Free-Weight Back Squat Protocols

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(No relevant relationships reported)

Electromechanical delay (EMD) may play a significant role in joint stabilization during mechanical loading. Fatigue-related deficits in EMD have been observed when the level of volitional fatigue has been controlled, primarily through isolated muscle actions. However, few studies have assessed EMD responses following bouts of practical compound movements in which joint stabilization is essential. **PURPOSE:** Investigate the effects of EMD following work-matched submaximal back squat protocols during a 30-minute recovery period. **METHODS:** Thirteen resistance trained males (mean ± SD: age = 22.08 ± 2.75 years) visited the laboratory on three separate occasions, separated by seven (±1) days. The first day included determining each participant's one repetition maximum (1-RM) for the back squat, followed by a familiarization trial of maximum voluntary isometric contractions (MVICs) for the knee extensors. Day two and three included performing either an explosive power (EP) (5×16 at 40% 1-RM), or controlled hypertrophic (CH) (5×8 at 80% 1-RM) exercise protocol. Participants performed MVICs prior to each squat protocol, and at each recovery time point (Pre, Post 0, Post7, Post15, Post30). CH repetitions were performed at a cadence of two-second eccentric and two-second concentric phases. The EP repetitions were performed at a cadence of a two-second eccentric phase but the concentric phase was performed as fast as possible. Surface electromyography (EMG) was recorded from the vastus lateralis (VL) and EMD was identified as the time (ms) between onset of VL EMG to the onset of torque during all MVICs. A two-way repeated measures ANOVA (intensity [PE vs CH] × time [Pre vs Post0 vs Post7 vs Post15 vs Post30]) was used to analyze all EMD data. **RESULTS:** No interaction

(P = 0.528) nor main effect for intensity (P = 0.202) was observed. There was however a main effect for time (P = 0.039), where only Post0 was lower compared to Pre (P = 0.039). **CONCLUSIONS:** The present findings suggest that work-matched submaximal back squat protocols elicited similar EMD responses for the knee extensors. Specifically, EMD was longer at Post0 compared to Pre. These findings indicate that caution should be exercised following compound movements, regardless of intensity, as acute deficits in EMD may have important injury and performance implications.

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Acute Effect of Localized Vibration on Reducing Masseter Stiffness as Measured by Elastography

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine if the application of localized vibration would reduce masseter muscle stiffness as measured by shear wave elastography (SWE).
METHODS: 12 female subjects (21 +/- 1.8. yrs) without any history of TMJ disorder underwent both control (vibrator turned off) and Vibration conditions (randomized) on two different days. Methods: Subjects relaxed in a reclined seated position for 5 minutes before having the baseline masseter SWE measures taken with the jaw in a relaxed position. A GE S8 ultrasound machine with a 9L probe was used under the elastography setting. SWE values were calculated using a minimum of 7 separate .5cm circles within the defined elastography box fit within the muscle borders. 8 total images were assessed and averaged for the calculation of the baseline SWE measure in kPa. Subjects then underwent localized vibration treatment using a Rezzimax™ handheld vibration module with a specialized 2-pronged contact extension. All Subjects underwent 2 x 60-second bouts of vibration at 3 different randomized points (supraorbital margin of both eyes (70 Hz), medial and lateral sides of the base of the neck (105 Hz), and inside the mouth at a point just in front of the mandibular ramus(105 Hz). Post-measures of SWE followed the same protocol as the baseline measures. **RESULTS**: All measures were compared using a general linear model repeated measures ANOVA. A group x time interaction existed $F_{(1,11)}$ = 31.184 with a p-value of .000. Mean values for baseline SWE were 16.55 ± 5.59 kPa for Control and 16.57 ± 6.06 kPa for Vibration. Post-measure means were 15.78 ± 4.73 kPa for Control and 8.05 ± 1.92 kPa for Vibration. A paired samples T-test showed no significant difference in Baseline Control vs Post Control measurements (p = .180) or Baseline Control and Baseline Vibration (p=.984). Baseline Vibration vs Post vibration was significant (p=.000).
CONCLUSIONS: Localized vibration to these three spots resulted in acute reductions in masseter stiffness as measured by SWE in normal individuals. Use of localized vibration may be beneficial in reducing tension/stiffness of the masseter muscle in those with chronic TMJ disorder. Future studies should look at it's effect on pain, duration effect, and consider measuring the lateral pterygoid.

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Influence Of Various Forms Of Pressure Stimulation On Skeletal Muscle Condition

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(No relevant relationships reported)

PURPOSE: We investigated the effect of various forms of pressure on skeletal muscle condition with muscle temperature, muscle stiffness, oxygen saturation and B-mode ultrasound. **METHODS;** Six young male students (age 22.7 ±1.8 y, height 177.1 ± 3.9 cm, weight 69.7 ± 2.1 kg) completed the following intervention protocols in a randomized order on separate days: non-stimulation (C: control condition), Low pressure stimulation (LP), and High pressure stimulation (HP) at the rectus femoral. Subjects kept rest on bed. After the various forms of pressure stimulation or control intervention, muscle temperature, oxygenated saturation, muscle stiffness, B-mode ultrasound. The indicators of muscle condition were measured pre-stimulation, immediately post, 10, 20, and 30 minutes afterward. **RESULTS:** The muscle temperature increase to 10 minute in the HP, and a significant difference was recognized as compared with the C and LP (p<0.01). However, no significant difference was observed after 30 minutes. Oxygen saturation showed that the HP tended to be high after stimulation. Muscle stiffness decreased in both HP and LP immediately after stimulation, and the HP showed to return to baseline after 30 minutes from immediately after stimulation, and no significant difference was observed. The LP showed to maintain and a significant difference was observed as compared with the C (p<0.01). B-mode ultrasound were analyzed and compared with muscle luminance histograms, and neither HP nor LP showed changes before and after pressure stimulation. **CONCLUSION:** There was no change in the B-mode ultrasound

in both the HP and the LP, and the muscle stiffness decreased. The muscle temperature also increased, but when looking at the oxygen saturation level, only the HP showed a high value, indicating an increase in blood flow rate.

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Antagonist Coactivation During A Reactive Leg Drop In Young And Older Adults

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(No relevant relationships reported)

It appears that older adults use a coactivation strategy to control body sway and stiffen the joint. However, this strategy might limit reaction times, increasing the risk of falling. **PURPOSE:** Examine the age differences in antagonist coactivation during a reactive leg drop; a lower-body sensory-motor integration test designed to predict fall risk and the ability to recover from a slip. **METHODS:** Thirteen older (74 ± 7 yrs.) and 11 younger (23 ± 3 yrs.) adults were included in this study. For the reactive leg drops, participants were seated in a dynamometer with their dominant leg passively extended to max range of motion supported by an elastic band. Once the participant was completely relaxed, the researcher suddenly released the elastic band allowing the lower leg to free-fall. The participants were instructed to kick up as soon as they felt or saw the drop. Surface electromyography (sEMG) was collected from the biceps femoris (BF). Drop angle (DA) was assessed as the difference in angle between the straight position and the lowest point reached during the limb's free-fall. BF coactivation (%) was quantified as the RMS of the first 50 ms of activation and was normalized to BF sEMG of a maximal voluntary knee flexion. Independent t-tests with a 95% CI were used to identify the differences between groups in BF coactivation. Pearson product-moment analyses were used to determine the relationship between DA and BF coactivation. **RESULTS:** There was no significant differences between the young and old participants in BF coactivation (Younger = $3.16 \pm 1.36\%$; Older = $4.34 \pm 2.40\%$; p > 0.05). However, there was a significant relationship between DA and BF coactivation in the older group (r = 0.719; p = 0.006), as well as when collapsed across both groups (r = 0.637; p = 0.001; shown below). **CONCLUSION:** Even though BF coactivation was similar between groups, it was negatively associated with DA; suggesting that higher coactivation in the older population may result in a slower motor response time.
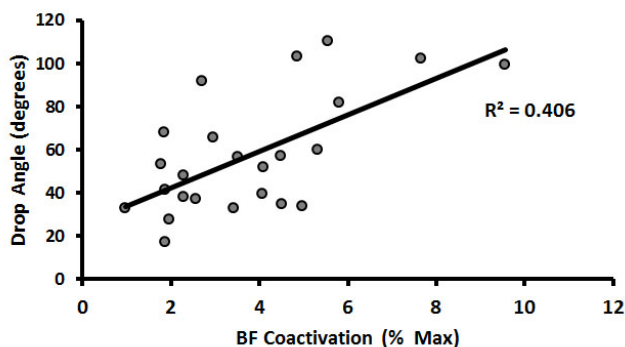
2276   Board #112   June 1 9:30 AM - 11:00 AM

Variations of Acute Bouts of High-Intensity Training Programming Minimally Influence Biomarkers of Growth

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(No relevant relationships reported)

Plasma biomarkers of skeletal muscle growth are influenced by the modality, duration, and intensity of an exercise bout. High-Intensity Training Programs (HITP) are prescribed using various modalities, orders, weights, and repetition schemes. The duration of these bouts varies greatly, from shorter bouts of less than 5 minutes to longer bouts of 15 minutes or more. **PURPOSE**: To examine the effects of short- (< 5min) and long- (15min) duration bouts of HITP on markers of skeletal muscle growth.

METHODS: Ten apparently healthy males (28.1 ± 5yrs) participated in this study. Two HITP sessions (SHORT and LONG) were performed in a randomized crossover fashion. Blood plasma was collected at five time points: PRE, POST, 1HR, 3HR, and 6HR in order to examine growth hormone (GH), insulin-like growth factor (IGF-1), and insulin-like growth factor binding proteins 1 & 2 (IGFBP-1, IGFBP-2). **RESULTS**: The repeated measures ANOVA revealed no trial differences among any of the markers (IGF-1, IGFBP-1 & IGFBP-2) except GH at POST, where the LONG bout produced a greater effect (p = 0.005). A repeated measures ANOVA revealed a main time effect in GH (p = 0.037), while a posthoc t-test demonstrated elevated GH at 1HR (p = 0.018) when compared to PRE, while no time-dependent change (p > 0.05) was observed in IGF-1, IGFBP-1, or IGFBP-2. **CONCLUSIONS**: The findings suggest that there are no differences in markers of skeletal muscle growth other than GH between the SHORT and LONG bouts of HITP.

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Impact of Sitting on Different Types of Stability Balls on EMGs During Arm Ergometry

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(No relevant relationships reported)

Past studies have demonstrated that sitting on a stability ball (SB) elevates oxygen consumption (VO_2) and leg electromyography (EMG) activity during arm ergometry when compared to chair sitting. In addition, our laboratory has reported that a SB made of stiff material had lower VO_2s when compared to a more elastic SB but had not indicated if there was an impact on muscle activity. **PURPOSE:** To determine if the characteristics of a SB also affects muscle activity during arm ergometry. **METHODS:** Twenty apparently healthy young adults underwent rest and two stages of submaximal arm ergometry under three different conditions (order randomized): sitting on a stiff material SB (SMB), same size but elastic material SB (SEB), and a smaller SEB (SSEB). Exercise intensity was determined during a prior day's testing with stage 1 set at 20 to 40 b/min above resting heart rate and stage 2 set at 20 to 40 b/min above stage 1's heart rate. Anterior Deltoid (AD), External Oblique (EO), and Rectus Femoris (RF) EMGs were recorded during the last 10 seconds of each stage. Repeated Measures ANOVA was used to determine SB type effect (alpha= .05) for peak rectified EMG levels. **RESULTS:** There were no significant SB type effects for AD ($P = 0.553$) and EO ($P = 0.963$) EMGs. However, RF had significant ($P = 0.002$) SB type effect. The SMB (Stage 1: 283 ± 229 mv; Stage 2: 370 ± 248 mv) had 19% to 37% lower EMG levels than the SEB (Stage 1: 337 ± 256 mv; Stage 2: 461 ± 305 mv) or SSEB (Stage 1: 361 ± 300 mv; Stage 2: 508 ± 371 mv) EMGs. **CONCLUSION:** A SB made of more elastic material requires more leg muscle activity during arm ergometry and may account for the higher VO_2 response noted in previous studies.

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Musculoskeletal Complaints Prevalence And Surface Electromyographic Recordings From Upper Limbs In Surgeons

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(No relevant relationships reported)

Purpose: to determine the prevalence of musculoskeletal complaints of the trunk and thoracic limbs and to characterize the electric muscular activity registered superficially in the forearms of physicians having surgical practice.
Methods: in a cross-sectional study 43 physicians actively practicing surgical specialties were assessed. After signing an informed consent, to determine the presence of musculoskeletal complaints (MMC) of the cervical and lumbar spine and upper extremity, answered The Nordic Questionnaire. 12 of the participants accepted a second phase, consisting of surface electromyography (EMGs) of the upper limbs (Flexor Digitorum Superficialis) while performing maximal handgrip contractions. Results were analyzed by descriptive statistics, using SPSSv21.
Results: the total sample was composed of 32 men, and 11 women, 42.7±9.0 years of age (mean±s.d). 71% of the surgeons declared the presence of at least one MMC. Out of them, the lumbar spine was the most affected (71%), followed by shoulder affection (53%); hand and wrist (45%), and the neck (44%).
In the EMGs analysis, 50% of the participants achieved normal responses, characterized as maximal, minimal response, and peak to peak amplitud. For the right arm 2.26±0.94 mV; 0.10±0.70 mV, and 2.15±0.94 mV, in the same order. The opposite arm displayed 2.29±0.94; 0.18±0.15, and 2.11±0.87, respectively.
Conclusions: prevalence of MME in surgeons is high, suggesting surgeons' maladaptation to the surgical environment. The EMGs results corroborate muscular function alterations in a similar proportion to the MMC for hand and wrist.

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Pre-workout Supplementation Does Not Augment Intramuscular MAPK Phosphorylation Immediately Following an Acute Resistance Exercise Bout

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(No relevant relationships reported)

Ingestion of multi-ingredient dietary pre-workout supplements (PWS) are popular, however the molecular responses of PWS have not been investigated. Mitogen-activated protein kinase (MAPK) signaling proteins respond differently depending on resistance exercise (RE) volume, load, and contraction mode. Since RE performance is improved with PWS consumption by increasing repetitions to failure; it is plausible MAPK activation may also be potentiated. **PURPOSE**: To determine if acute RE MAPK phosphorylation is augmented with PWS. **METHODS**: In a randomized, counter-balanced, double-blind, placebo-controlled, within-subject crossover study, ten resistance-trained males ((M±SD, age=22±2.4 yrs, hgt=175±7 cm, body mass=84.1±11.8kg) performed four sets of 8 repetitions of barbell back squats at 75% of their 1-repetition maximum (1-RM) with two minutes of rest between sets and a fifth set of barbell back squats at 60% of 1-RM until concentric failure. A PWS or flavor and color matched placebo (PL) was consumed 60-minutes prior to RE. Muscle biopsies were taken from the vastus lateralis prior to supplementation at rest (BL), and ten minutes post-exercise (POST). Biopsy samples were analyzed for the ratio of (pMAPK/totalMAPK) of extracellular signal-regulated kinase (ERK), c-Jun NH_2-terminal kinase (JNK), and p38 via western blotting. Wilcoxon sign-rank tests were utilized to determine pairwise differences from BL to POST and between PL and PWS conditions. Statistical significance was determined at $p \leq 0.05$. Data are expressed as median and interquartile range [25th-75th]. **RESULTS**: RE increased phosphorylation of JNK (PWS: 7.4 [4.6 - 17.3] vs PL: 8.2 [5.45 - 16.2] fold-change), p38 (PWS: 19.6 [7.4 - 27.3] vs PL: 9.9 [5.7 - 27.8] fold-change), and ERK (PWS: 9.0 [1.5 - 48.3] vs PL: 13.2 [3.8 - 20.5] fold-change) (all p < 0.005), with no differences between PWS and PL conditions (p>0.05). Repetitions to failure tended to favor the PWS condition (PWS: 20 [17-21] vs PL: 16 [14-22]; p=0.058). **CONCLUSIONS**: RE increased MAPK phosphorylation but was not augmented by PWS in the immediate recovery period. Future studies should investigate if molecular signaling responses are altered at later time periods or after a period of chronic supplementation.

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Peripheral Fatigue Mechanisms During Voluntary and Stimulated Assessments of Critical Torque

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(No relevant relationships reported)

Critical torque (CT) is an integrative measure/concept that represents the "critical" or upper boundary of steady-state work that can be performed without leading to exhaustive fatigue. We have developed a stimulated CT test, but the extent to which the mechanism(s) of torque decline are similar between voluntary and stimulated CT is unknown. **PURPOSE**: The purposes of this study was to determine if the decline in torque production stimulated exercise occurred due to similar mechanism(s) as the decline in torque during voluntary exercise. **METHODS**: Nineteen (Women = 10) participants completed 5 CT assessments over 3 testing visits: 1) voluntary CT (VOL), 2&3) stimulated CT at 100 Hz (STIM100-1 and STIM100-2), 4) stimulated CT at 15Hz (STIM15) and 5) stimulated CT at a frequency that elicited a torque below CT determined at 100Hz (BELOW). Twitch torque (TT), low frequency fatigue (LFF), and M-wave amplitude were measured before, during, and after each protocol. **RESULTS**: Stimulated CT did not differ among STIM100-1 (30.2 ± 6.2%), STIM100-2 (32.3 ± 7.3), and STIM15 (33.9 ± 8.2%; $p \geq 0.127$). VOL (45.3± 13.1%) and BELOW (20.8 ± 5.5%) differed from the others (p < 0.01). TT declined to 49% of starting ($p \leq 0.014$) in VOL, to 60% during the 100 Hz protocols ($p \leq 0.018$), but did not decline in STIM15 or BELOW conditions ($p \geq 0.08$). LFF occurred in VOL (0.58 ± 0.8 vs. 0.34 ± 0.1; p < 0.001). High frequency fatigue occurred following the stimulated protocols (p ≤ 0.001). No changes were observed in M-wave amplitude in the VOL, STIM15, or BELOW conditions (p ≥ 0.29). Significant decreases were observed in STIM100-1 and STIM100-2 with amplitudes declining to 77 ± 30% and 82 ± 28% of pre (p < 0.01), respectively **CONCLUSIONS**: Despite differences in peripheral fatigue mechanisms, CT occurred at similar values regardless of whether 100 Hz or 15 Hz stimulation was used. Higher frequency stimulation appears to induce greater deficits in axonal and neuromuscular junction transmission than VOL and lower stimulation exercise. None of the stimulated exercise protocols exactly mimicked the peripheral fatigue profile of the VOL condition, but 15 Hz stimulation was a better approximation than 100 Hz. Further research is needed to develop a stimulated exercise protocol that more closely mimics voluntary exercise.

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Overstretch-Induced Reactive Oxygen Species Formation and Functional Decline in Skeletal Muscle

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(No relevant relationships reported)

Lengthening of skeletal muscle in eccentric exercise is linked with reduced fatigue resistance and muscle injury. Previous study has shown that eccentrically-biased exercise (i.e., downhill run) induced muscle damage is associated with leukocyte apoptosis. However, molecular evidence of reactive oxygen species (ROS) in stretched or eccentric muscle activities induced muscle dysfunction and apoptosis is not clear. **PURPOSE:** To evaluate ROS formation and muscle function in overstretched skeletal muscle in mice and to determine the effects of antioxidant intake on peripheral leukocyte apoptosis following eccentrically-biased downhill running. **METHODS:** Diaphragm muscle strips were isolated from C57BL6 mice and mounted in a contractile chamber. The muscles were either kept at its optimal length (control) or stretched to 30% of the optimal length, followed by a 5-min tetanic contraction. Cytochrome *c* was used to monitor superoxide $O_2^{\cdot-}$ release during contraction. Muscle force was recorded during the contractile protocol. In human eccentric exercise model, 22 subjects were randomly assigned into two groups taking: i) vitamin C (1000 mg/day) and vitamin E (400 IU/day); ii) maltodextrin (placebo) in a double-blinded fashion. Supplementation was administered for two weeks before downhill running exercise and two additional days after the training. At 0, 6, 24, 48h following the trial or prior to the trial, blood samples were collected for anti-apoptosis Bcl-2 assay via ELISA. Data were statistically analyzed as mean ± SE using one-way ANOVA. **RESULTS**: Overstretched diaphragm showed compromised muscle function compared to control (n = 10-13; p < 0.05). More ROS were induced in overstretched groups than control during contraction (n = 6-10; p < 0.05). In human model, we observed an increase in circulating leukocyte apoptosis and muscle soreness/damage 24-48 hours following exercise. Antioxidant attenuates the decrease in Bcl-2 at 24 hours following acute downhill running. **CONCLUSION**: Overstretched skeletal muscle is subjected to declined contractile function and exacerbated ROS formation. The combination of antioxidants supplementation appears to have a protective role via the attenuation of decrease in anti-apoptotic protein during eccentric exercise.

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Downhill Running Impairs Strength And Activation Of The Elbow Flexors

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(No relevant relationships reported)

PURPOSE: The aim of this study was to determine if knee extensor injury induced by 1 h of downhill running attenuated force production in uninjured skeletal muscle (e.g., elbow flexors). **METHODS:** Recreationally active subjects (n = 12) completed a two group (injury vs control) repeated measures design with the injury group running downhill for 1 h and the control group performing only the measurement procedures. Strength and percent voluntary muscle activation were measured using an isokinetic dynamometer and electrical stimulation of the elbow flexors and knee extensors before and after a fatigue protocol at the following time points in relation to the downhill run: 15 min pre, 15 min post, 24 h post, and 48 h post. Blood samples were collected at the same time points to measure IL-1β and TNF-α concentrations. **RESULTS:** Knee extensor strength was significantly reduced by 53.5±9.9% immediately post-injury and remained reduced for up to 48 h in the injury group. Elbow flexor strength was significantly reduced immediately and 24 h post-injury by 13.2±3.9% and 17.3±4.0% respectively in the injury group. Elbow flexor electrically stimulated strength was not found to be different at any time point (P = 0.561). Elbow flexor activation was significantly reduced compared to control at 24 and 48 h post-injury by 22.9±9.1% and 13.5±5.7% respectively. No differences were observed in IL-1β or TNF-α between groups. **CONCLUSIONS:** A 1 h downhill run significantly injured the knee extensors. The elbow flexor muscles remained uninjured based on electrically stimulated strength, but voluntary strength of these muscles was impaired due to reduced activation. This suggests an injury to the knee extensors can impair strength in uninjured muscles by reducing voluntary activation. The mechanism behind this reduction remains undetermined.

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Motor Unit Action Potential Amplitude Vs Recruitment Threshold Relationships In Endurance Runners And Sedentary Females

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(No relevant relationships reported)

PURPOSE: To examine potential differences in the motor unit action potential amplitude ($MUAP_{AMP}$) vs. recruitment threshold (RT) relationship between female cross-country athletes and healthy controls. **METHODS:** Eight chronically-endurance trained (ET) females (age=20±0.93 yrs; height=166.18±5.93 cm; body mass=54.44±5.47 kg) nine healthy sedentary (SED) females (age=19.7±2.12 yrs; height=167.2±8.9 cm; body mass=66.61±11.9 kg) volunteered for the study. The ET group consisted of NCAA Div. I collegiate cross-country runners that ran 10-20 hrs/week. The SED subjects participated in minimal regimented physical activity in the previous 6 months. Subjects performed three isometric maximal voluntary contractions (MVCs) followed by a 70% isometric trapezoidal muscle action performed at 70% MVC. Surface electromyography was recorded from the vastus lateralis via 5-pin surface sensor array. The EMG signals were decomposed and AP_{AMP} (mV) and RT (expressed as %MVC) were calculated for each MU. For each subject, $MUAP_{AMPS}$ were linearly regressed against RTs with the slope and y-intercept calculated and used for statistical analysis. Two independent samples t-tests were used to examine potential between-group differences in the slopes and y-intercepts from the $MUAP_{AMP}$ vs. RT relationships. Statistical significance was set at p ≤0.05. **RESULTS:** The average RT ranges for observed MUs were 23.4 – 55.7% and 16.1 – 44.4% MVC for the ET and RT, respectively. There were no significant differences between groups for the slopes (ET=0.0035±0.0016 mV/%MVC, SED=0.028±0.0021 mV/%MVC, p=0.47) or y-intercepts (ET=-0.032±0.068 mV/%MVC, SED=-0.018±0.0.067 mV/%MVC, p=0.67). **CONCLUSIONS:** Previously, increases in the slopes from the $MUAP_{AMPS}$ vs. RT relationships have been correlated with increases in muscle cross-sectional area following resistance training, which was suggested to indicate MU hypertrophy. The similar $MUAP_{AMP}$ vs RT relationships observed between the cross-country runners and sedentary controls may suggest that chronic endurance training did not result in hypertrophy of higher-threshold MUs of the vastus lateralis.

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The Effect of Compression Garments Worn During Resistance Exercise on Muscle Damage, Fatigability and Hemodynamics

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(No relevant relationships reported)

Use of compression garments during and after exercise has gained notable popularity, yet, their utility in augmenting performance and recovery from resistance exercise remains elusive. **PURPOSE:** To evaluate the effects of wearing compression during resistance exercise on exercise induced muscle damage (EIMD), muscle oxygenation and muscular fatigue. **METHODS**: Ten healthy, untrained individuals ([mean ± SD] 8 females, 2 males, 22.10 ± 2.23 years, 159.09 ± 3.47 cm, 66.22 ±15.93 kg) performed two exercise trials: 1) wearing compression tights and 2) without compression. Exercise trials were randomized and separated by seven days. The exercise protocol consisted of 12 sets of 10 repetitions of knee flexion, at a velocity of 120 degrees per second, in the CON/ECC mode of an isokinetic dynamometer (HUMAC NORM). Muscle oxygenation of the vastus medialis oblique (VMO) was assessed by oxy-hemoglobin (HbO2) and deoxy-hemoglobin (Hb) through near-infrared spectroscopy (NIRS; TRS-21, Hamamatsu). Leg circumference, ratings of perceived muscle soreness (RPMS) and blood samples for creatine kinase (CK) were collected before, immediately after, and 24, 48 and 72 hours after exercise. **RESULTS**: Pre-exercise and inter-set rest period values for Hb, HbO2, total Hb (tHb) and tissue oxygenation index (TOI) were similar between conditions. Intra-exercise Hb and tHb were significantly (p<0.05) reduced with compression compared to control. Post-exercise Hb was significantly reduced and TOI was significantly increased (p<0.05) with compression compared to control. Main effects for time revealed significant (p<0.05) increases in leg circumference, RPMS and CK, however, no differences were observed between conditions. Additionally, a main effect for time revealed significant reductions in average torque (N*m) from the first four sets to the middle four sets and again during the final four sets but there were no differences between conditions. **CONCLUSION**: Lower body compression worn during resistance exercise did not impact muscular fatigue or damage, but venous return and muscle re-oxygenation may have been improved.

2285   Board #121   June 1 9:30 AM - 11:00 AM

Muscle Architecture, Central Fatigue, and Contractile Properties Do Not Explain Age-Related Differences in Muscle Fatigue

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(No relevant relationships reported)

High-velocity contractions elicit greater muscle fatigue in older compared with young adults. In general, fatigue can occur due to failure at numerous sites from the central nervous system to the contractile machinery. Additionally, sarcopenia-induced architectural remodeling may place older muscle at a disadvantage for producing power at high contraction velocities. **PURPOSE:** To examine the potential roles of muscle architecture, central fatigue, and contractile properties on age-related differences in high-velocity knee extensor fatigue. **METHODS:** Baseline muscle architecture (thickness, MT; pennation angle, θ; fascicle length, FL) of the vastus lateralis was determined by ultrasonography in 7 young (YW; 21.6±0.4 yrs) and 7 older (OW; 69.6±1.3 yrs) women. Maximal voluntary dynamic (MVDC) and isometric (MVIC), and stimulated (80Hz and 10Hz, each 500ms) contractions were performed before and immediately after a fatigue trial consisting of 120 knee extensor MVDCs (240° s^{-1}, one every 2s). Muscle architecture, central fatigue (fall of MVIC:80Hz torque) and contractile properties (10Hz:80Hz torque ratio; torque half-relaxation time, $T_{1/2}$) were compared across groups using t tests and repeated measures ANOVA. **RESULTS:** Baseline MT (p<0.01) and FL (p=0.01) were lower in OW than YW, with no age-related difference in θ (p≥0.14). OW fatigued more than YW (to 33±5% and 56±5% initial power, respectively; p<0.01), with no evidence of central fatigue in either group (p≥0.35). Failure of excitation-contraction coupling (fall in 10:80Hz ratio) occurred in both groups (p≤0.02), with no group×time interaction (p=0.36). $T_{1/2}$ was longer in OW than YW at baseline (p<0.01), but no group×time interaction was observed (p=0.50). While neither MT nor FL were associated with fatigue (r²≤0.15), $T_{1/2}$ at baseline was associated with fatigue in OW (r²=0.59) but not YW (r²=0.11). **CONCLUSION:** These results indicate that muscle architecture, central fatigue, and excitation-contraction coupling did not explain the greater muscle fatigue in OW. Notably, $T_{1/2}$ at baseline was predictive of fatigue in OW only, suggesting that slowed torque relaxation may limit older muscle's ability to maintain power output during fast, repetitive contractions.

2286   Board #122   June 1 9:30 AM - 11:00 AM

Effects Of Lactate Administration On Intracellular pH And Contractile Performance During Rhythmic Muscle Contractions

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(No relevant relationships reported)

Skeletal muscle fatigue during heavy or severe intensity exercise is accompanied by decreased intracellular pH (pH_i) and accumulation of lactic acid. The role of these perturbations in the fatigue processes are hotly debated with evidence for and against a deterministic role for each in muscle contractile tolerance and intolerance. However, it is unknown whether extracellular lactate level during exercise affects pH_i and contractile performance especially within a mixed fiber type muscle that is a close analog of the human quadriceps with respect to fiber type and oxidative capacity. **PURPOSE:** Using an *in vivo* bioimaging model, we tested the hypothesis that extracellular high lactic acid levels would increase endurance performance without changing pH_i during sustained contractions. **METHODS:** The intact spinotrapezius muscle of adult male Wistar rats was exteriorized and loaded with the fluorescent probe BCECF-AM (10 μM). Isometric (ISO) twitch contractions were evoked at the optimal muscle length via electrical stimulation for 10 min (2 Hz, 9 V, stimulus duration 4 ms). The rats were divided into two groups: buffer solution loading group (CONT, n = 7) and lactate solution loading group (LAC; 20 mM, n = 6). The fluorescence ratio (F500 nm/F445 nm) for pH_i estimation was determined from images captured pre-contraction (-10 min, -5 min) and < 1 min, 5 min, 10 min, 15 min, and 20 min after contraction. **RESULTS:** Muscle tension decreased significantly with time in both CONT and LAC groups. However, LAC muscles elicited a higher tension over almost the entire bout and the time to significant tension reduction was substantially increased in the LAC group (CONT: 2.5 min vs LAC: 7.5 min, p < 0.05). In the CONT group, no significant change in pH_i was observed after contractions, whereas a significant decrease in pH_i was observed in the LAC group during 20 min from immediately after muscle contractions. **CONCLUSION:** Within this preparation extracellular high lactic acid and lowered pH_i improved contractile performance substantially.

2287   Board #123   June 1 9:30 AM - 11:00 AM

Exercise Induced SOD2 asa Predictor of Fatigability in Healthy Adults

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(No relevant relationships reported)

Acute aerobic exercise has been reported to increase antioxidant levels in response to an increase in exercise-induced oxidative stress. However, there is limited knowledge regarding the acute exercise effects of serum SOD2 levels on fatigability measures in healthy adults. **Purpose:** The purpose of this study was to determine if physiological determinants of fatigue (such as time to fatigue, TTF; peak oxygen consumption, VO_2; peak work rate, WR) are significantly correlated to serum SOD2 levels before, immediately after and 60 minutes after an acute bout of aerobic exercise. **Methods**: Subjects were 19 healthy, adults (13 females, 6 males; age 26.58±9.1 years; BMI 24.2±2.7 kg/m^{2}) enrolled in the National Institutes of Health Fatigue in Healthy Protocol Trial. Subjects completed a treadmill cardiopulmonary exercise test (CPET) to exhaustion during the first visit. On a subsequent visit, subjects performed a vigorous-intensity continuous work rate test on the treadmill to exhaustion, and serum samples were collected immediately before, immediately after and 60 minutes after exercise. Performance fatigability was represented by peak VO_2 and peak WR from the CPET, as well as TTF during vigorous exercise. A Human Oxidative Stress Multiplex panel was used to determine serum SOD2 levels. Pearson product-moment correlation analyses were performed on the identified physiologic determinants of interest and SOD2 at various time points. **Results:** Peak VO_2 (r = 0.57, p = 0.02) and peak WR (r = 0.62, p = 0.01) were significantly correlated to serum SOD2 levels immediately post exercise, while TTF was not significantly correlated to SOD2 at any time point. **Conclusions:** This study suggests that an exercise-induced increase in serum levels of SOD2 may be a predictor of fatigability in healthy adults. Further research and analysis of other physiological fatigability measures is needed to validate these findings. Funding: Intramural Funds from the National Institutes of Nursing Research

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2288   Board #124   June 1 9:30 AM - 11:00 AM

Cross Validation of Different Equations to Predict Knee Extensors Isokinetic Strength in Brazilian Older Women

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(No relevant relationships reported)

PURPOSE: to determine the accuracy of the equations in predicting knee extensors isokinetic strength in Brazilian older women. **METHODS:** A total of 453 elderly women aged 60 to 84 participated in the present cross-sectional study. Quadriceps isokinetic strength was measured using the Biodex System dynamometer, with participants performing two to three sets of four knee extensor contractions at 60°s[-1], with 30 seconds rest intervals between sets. The highest peak torque (PT) was recorded and compared to the PT predicted by two different equations (Neder et al. and Phillips et al.). Dependent t test, Pearson correlation (r), constant error (CE)/bias and standard error of estimate (SEE) were calculated to examine differences between the measured PT with values estimated by the equations. Concordance analysis was investigated using Bland-Altman technique. Statistical significance was set at p <.05. **RESULTS:** The Neder et al. (85.30 ± 18.60 Nm) and Gross et al. (85.00 ± 29.99 Nm) equations provided significantly lower estimates when compared with measured PT (92.26 ± 21.59 Nm) (p<.001 for both). Moderate correlations were observed for Neder et al. and Gross et al. in relation to actual values (0.53; 0.50, respectively). The mean ± SD CE/ Bias and SEE were high for the prediction equations (Neder et al. = 7.00 ± 19.70 and 18.36 Nm; Gross et al. = 7.30 ± 26.70 and 18.67 Nm, respectively). The 95% limits of agreement of the mean error were similar for the prediction equations, with values varying between 14.0 and 14.6 Nm. **CONCLUSION:** Because of the wide limits of agreement displayed by each studied equation and inflated values for error, the Neder et al. and Gross et al. equations were not accurate to predicting the knee extensors isokinetic strength in Brazilian older women. One possible reason for this finding is that these equations were derived from a wide age range (10 to 80 years), with limited data derived from older women. Future studies are necessary to develop a specific equation for elderly women, aiming to accurately predict isokinetic quadriceps muscle strength.

2289   Board #125   June 1 9:30 AM - 11:00 AM

The Effects Of Cross-education On Critical Torque And Time To Task Failure

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(No relevant relationships reported)

Debate exits regarding the extent to which resistance training may alter endurance performance. **PURPOSE:** To determine whether critical torque (CT) and time to failure (TTF) are influenced by a cross-education effect consequent to a 4-week unilateral isometric resistance training protocol. **METHODS:** A seven participant mixed-gender sample was tested prior to and following16 sessions of unilateral isometric resistance training. Sessions consisted of 6 sets of 6 maximal isometric contractions (MVCs) of the dominant plantar flexors. CT and TTF were assessed in the trained and the contralateral, untrained leg across 4 test days structured with a randomized pre-post design. CT was assessed from a 5-minute "all-out" test in which participants completed 60 MVCs at a 3:2 duty cycle. Time to task failure was defined at the point which a submaximal contraction set equal to 30% of the highest MVC could no longer be maintained. Changes in soleus muscle cross-sectional area (CSA) were calculated via peripheral quantitative computed tomography. When one-way repeated measures ANOVAs performed across the final 6 contractions of the CT tests were non-significant, these contractions were averaged to obtain the criterion CT value. Peak force, soleus CSA, CT, and TTF were evaluated independently in each limb using paired-samples t-tests. **RESULTS:** Peak force increased in the trained (25.5 ± 19.7%, p < 0.01) and the untrained limb (30.5 ± 16.3%, p < 0.01), indicating that cross-education occurred. There were no pre-post differences in soleus CSA in either limb; (trained: 5193 ± 1557 vs. 5139 ± 1504 mm[2], p > 0.05) or (untrained: 5246 ± 1432 vs. 5255 ± 1544 mm[2], p > 0.05). Peak force did not differ between the final 6 contractions during any CT test (p > 0.05). CT increased in the trained (322 ± 6 N to 402 ± 12 N, p < 0.01) and untrained (313 ± 12 N to 390 ± 13 N, p < 0.01) limbs, respectively, and TTF was reduced in the trained (410 ± 112 vs. 319 ± 85 s, p = 0.014), but not the untrained limb (424 ± 152 vs. 312 ± 79 s, p = 0.08). **CONCLUSIONS:** Improvements in strength and CT occurred in both the trained and untrained limbs indicating that strength training may play a role in improving endurance capacity and that this adaptation can occur in a contralateral limb. The decline in time to task failure may be a result of the increased absolute force output required to complete the task.

2290   Board #126   June 1 9:30 AM - 11:00 AM

Heightened Sensory Signaling Does Not Alter Critical Torque

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(No relevant relationships reported)

Peripheral metabolic perturbations have been shown to activate group III and IV sensory afferents and lead to a decrease in central motor drive and an earlier onset of fatigue. Critical power or its isometric analog, critical torque (CT), is an important parameter of aerobic metabolic function and a strong predictor of endurance performance. **PURPOSE:** This study sought to examine the effects of heightened afferent signaling on voluntary CT and electrically stimulated CT. **METHODS:** Eleven participants performed a voluntary (VOL) 5-min all-out and a 5-min stimulated (STIM) isometric knee extension test with contralateral blood flow occlusion (CBFO) following fatiguing exercise and without occlusion (CONTROL). Stimulated CT was also assessed with occlusion applied to the ipsilateral leg (IBFO). Both the VOL and STIM protocols were performed at a 3-sec to 2-sec work to rest cycle. Stimulated contractions were performed at 50 Hz at a current eliciting 25% of MVC. **RESULTS:** There was a significant effect of time (p < 0.001) for VOL in both the CBFO and CONTROL conditions with torque declining to a critical level. VOL CT did not differ between the two conditions (360 ± 119 vs. 343 ± 108 Nm; p = 0.28). A significant condition x time interaction (p = 0.009) was found for STIM. Initial torque did not differ among the conditions (p = 0.876), but CT values were lower (p < 0.001) in IBFO (19.2 ± 15.8 Nm) compared to CONTROL (57.7 ± 15.6 Nm) and CBFO (62.1 ± 17.7 Nm). The CONTROL and CBFO conditions did not differ (p = 0.347). **CONCLUSIONS:** Heightened group III and IV afferent signaling has been shown to increase central fatigue and reduce endurance capacity. Our findings indicate the reduced endurance capacity is not due to reductions in CT—suggesting participants were able to maintain central drive to skeletal muscle. Our findings that stimulated CT fell with IBFO provides further evidence validating our stimulated CT test and it demonstrates its sensitivity to oxygen delivery.

2291   Board #127   June 1 9:30 AM - 11:00 AM

The Effects of Repeated Shortening or Lengthening Muscle Actions on Knee Extensor Position Sense

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(No relevant relationships reported)

The effects of concentric, fatiguing muscle actions on muscle spindle function has been well studied. However, few studies have examined the effects of eccentric muscle actions on proprioceptive function. **PURPOSE:** Investigate the effects of fatiguing shortening or lengthening muscle actions on position matching (PM) tasks of the knee extensors. **METHODS:** Fifteen females (age = 21.67 ± 2.1 yrs.) participated in a familiarization trial, followed by two experimental sessions, separated by seven (± 1) days, consisting of either muscle- shortening (Concentric; CON) or lengthening (Eccentric; ECC) contractions of the right limb at $60° \cdot s^{-1}$ until 70% of peak torque (PT) could no longer be achieved. PM tasks included a randomly chosen limb fixed in a static position to serve as a reference of the contralateral test limb during active position matching tasks. Participants were asked to provide verbal feedback when they had matched the test limb with the reference limb, followed by a 2-second static hold. Four PM efforts were completed, with eyes closed, for each limb at two randomly assigned joint angles of 80° and 165° prior to the experimental protocols (Pre). Subsequent PM tasks were completed immediately after (Post 0) and ten (Post 10) minutes following the experimental protocols. Two separate, three-way repeated measure ANOVAs (condition [CON vs ECC] × limb [right vs left] × time [Pre vs Post 0 vs Post 10]) were used to analyze absolute PM error at 80° and 165°. An alpha value of $P \leq 0.05$ was considered statistically significant for all comparisons. **RESULTS:** A significant condition × limb interaction (p = 0.002) for 80° was observed in which PM error of the right limb was greater during the CON protocol compared to the ECC protocol (p = 0.011). Additionally, no differences in PT were observed for either experimental protocol between Pre and Post 10 (p = 0.097). **CONCLUSION:** These findings suggest that alterations in PM acuity may be more pronounced at joint angles in which passive muscle tension increases (80°), following concentric muscle actions. Furthermore, muscle spindle function may not be disrupted by repeated lengthening muscle actions when the protocol does not induce muscle damage.

2292   Board #128   June 1 9:30 AM - 11:00 AM

Muscle Acidification And Fatigue Kinetics During Intense Repeated Exhaustive Exercise

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(No relevant relationships reported)

Skeletal muscle and fatigue responses during single high intensity exercise bouts have been examined extensively, while scientific reports on repeated high intensity exercise are limited. **PURPOSE:** To examine effects of muscle acidification on fatigue kinetics during repeated intense exhaustive exercise. **METHODS:** Eight active male participants (age: 26 ± 3 ($\pm$SEM) yrs.; VO_{2max}: 58 ± 1 $mlO_2 \cdot kg^{-1} \cdot min^{-1}$) completed two exercise trials in random order. Trials consisted of five intense single leg knee-extensor exercise bouts to exhaustion (EX1-5) separated by 5 min recovery, with (ARM) and without (CON) previous intense intermittent arm crank exercise. ^{31}P-MRS measurements of the quadriceps muscle were undertaken to assess muscle pH and venous blood was drawn. **RESULTS:** Quadriceps muscle pH was lower (P=0.002) prior to the knee-extension exercise in ARM compared to CON (6.948 ± 0.018 vs 7.040 ± 0.010, respectively). In CON muscle pH dropped to 6.370 ± 0.038 in EX1 and was progressively higher (P<0.05) in the following four bouts reaching 6.705 ± 0.045 in EX5. However, in ARM muscle pH reached similar levels in EX1-4 (6.490-6.579) and was elevated only in EX5 (6.637 ± 0.062). Pre-exercise blood lactate concentration was increased (1467 ± 111%, p<0.001) and pCO_2 (27.8 ± 14.4%, p=0.045), with concomitant reductions in blood pH (-0.24 ± 0.02, p<0.001) and HCO_3^- (-38.1 ± 2.2%, p<0.001) in ARM compared to CON. Exercise performance was 69 ± 20% shorter (P<0.05) in ARM compared to CON. Performance was attenuated (P<0.05) in ARM during the three first bouts compared to CON. There was a progressive reduction (P<0.05) in exercise performance in CON trial, while no significant differences were observed between the five bouts in ARM. **CONCLUSION:** Prior arm exercise markedly alters fatigue kinetics and muscle acidification during repeated intense knee-extension exercise. Muscle acidification may provoke fatigue during single bout intense exercise scenarios, but appears to play a minor role, when exercise is repeated.

2293   Board #129   June 1 9:30 AM - 11:00 AM

Interference In Emphasis Of Muscle Actions In The Maximum Dynamic Strength And The Maximum Volume Of Repetitions

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(No relevant relationships reported)

PURPOSE: The present study aimed to investigate the influence of different speeds of muscle actions on the maximum volume of repetitions and maximum dynamic muscle strength. **METHODS:** The study included 9 women. At first, the volunteers performed the anthropometric assessment and the evaluation of maximum dynamic strength through the 1RM test; In the second moment, the volunteers performed three series with 60% of 1RM as many repetitions as possible, with an emphasis on concentric phase of the movement (CP); in the third moment it was conducted the same exercise with emphasis on the eccentric phase of the movement (EP); and in the fourth moment the same procedure was conducted without emphasis on any stage of the movement (CoP). At the end of 3 series of each execution protocol was added the maximum volume of repetitions (MVR), the maximum dynamic strength was assessed 72 hours after each protocol. **RESULTS:** The results showed no statistically significant difference in maximum number of repetitions and maximum dynamic strength among the protocols CP, EP and CoP. The dynamic strength decreased 6% after the EP, the MVR also showed fewer number of repetitions (34.77) compared to other protocols. **CONCLUSIONS:** It was possible to conclude that the realization of protocols of exercises with speed movement that emphasize different muscle actions causes decreased maximal dynamic muscle strength and shows tendency to decrease the MVR when the movement speed prioritizes eccentric actions.

E-33   Free Communication/Poster - Motor Control

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2294   Board #130   June 1 11:00 AM - 12:30 PM

The Effect of Exercise Intensity on the Kinematics of Reach Performance and Brain-Derived Neurotrophic Factor

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(No relevant relationships reported)

PURPOSE: Acute exercise paired with practice of a motor task has been shown to enhance motor learning beyond task practice alone. However, it is unknown how exercise intensity affects movement kinematics during motor learning. Furthermore, the brain-derived neurotrophic factor (BDNF) response to exercise intensity needs to be examined because increases in BDNF are thought to mediate exercise-enhanced motor learning.
METHODS: 48 participants (23.3 ± 3.2 yrs) practiced a 3-dimensional motor learning task, which involved reach movements made to sequentially presented targets. Before task practice, participants were randomized so that 16 participants exercised on a cycle ergometer at a high-intensity, 16 participants exercised at a low-intensity, and 16 participants rested. Exercise intensity was determined as a percentage of max resistance obtained on a cycle-based graded exercise test, and duration was individually modified so that each participant in the low and high intensity groups expended 200 kcals of energy. Blood samples were obtained from all participants before and after exercise (exercise groups) or rest (control group) to assess changes in BDNF.
RESULTS: All participants significantly improved performance, as indicated by shorter times to complete the task. In the rest group, shorter times were associated with decreased distance traveled between targets, a spatial component of performance. In contrast, the exercise groups improved by altering temporal components of performance. The high-intensity group had significantly higher reach speeds (peak velocity), and the low-intensity group had significantly earlier peak velocities, an important feature of motor learning ($p < 0.001$ for all group differences). The percent change of the BDNF response was greater for the high-intensity ($164.53\% \pm 465.56$)

and low-intensity (152.76% ± 324.75) groups compared to the rest group (37.8% ± 195.65). However, group differences were not significant because of high variability in individual BDNF responses.

CONCLUSIONS: An acute bout of exercise facilitates temporal changes in movement kinematics that are associated with improvements performing a sequential target task. Regardless of intensity, the BDNF response to exercise has high inter-individual variability, which needs to be further investigated.

2295   **Board #131**   June 1 11:00 AM - 12:30 PM

Agility of Adolescents with Attention Deficit Hyperactivity Disorder Compared with Normal Controls: A Preliminary Investigation

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(No relevant relationships reported)

PURPOSE: Motor delay (MD) has been shown in children with Attention-Deficit/ Hyperactivity Disorder (ADHD), such as agility. Agility is involved in everyday movements and is essential to the development of sports skills. Recent imaging studies have shown delayed of the cerebral cortex development of near three years in children with ADHD, which could explain MD. This study aims to evaluate Agility in ADHD male adolescents compare to normal controls, group-matched for age. Moreover, if MD in agility is still observable in ADHD, to determine which group age they can be compared with. **METHODS**: This study included 40 adolescents; 20 with ADHD (ADHD-gr; age 13.8 ± 0.9 yr) and 20 normal controls (Control-gr; age 13.5 ± 1.0 yr). First, both groups were compared using the UQAC-UQAM Gross motor tests battery for agility: Shuttle, Circle, Side-stepping, and Slalom run. Agility scores (sec.) were compared between groups using One-way ANOVA. Then, descriptive comparisons were performed using results of the 50th percentile in 8 yr children (P50-8) and in 12 yr (P50-12) for each agility tests. **RESULTS**: Adolescents with ADHD were significantly slower when compared to control in Shuttle Run (11.2 ± 1.3 vs. 6.6 ± 3.1 sec., p<0.001) and Circle Run (22.3 ± 2.9 vs. 19.5 ± 2.2 sec., p<0.001). Results tending to be slower for Side-stepping, and Slalom Run but did not reach significance. When compared to norms across age group, ADHD-gr scores (sec.) were aligned to P50-8 and slower then P50-12 for all agility tests. However, as expected, the scores (sec.) of Control-gr, were aligned or better to P50-12. **CONCLUSIONS**: In this study, motor delay in agility is still observable in a group of adolescents with ADHD. It seems to have a delay of about 5 years between groups (ADHD vs Control) for all tests measuring agility. Further research is needed to clarify motor delay in adolescents with ADHD for all determinants of gross motor skills (agility, coordination, segmental velocity, balance, and reaction time).

Agility Score Test of Adolescents with ADHD Compared to Normal Controls						
Agility Tests (sec.)	50th percentile for 8yrs	50th percentile for 12yrs	N	ADHD	Control	p
Shuttle Run	11.3	10.3	36	11.2±1.3	6.6±3.1	0.00*
Side-stepping Run	11.4	10.1	38	11.3±2.3	10.5±1.4	0.21
Circle Run	22.3	20.3	40	22.3±2.9	19.5±2.2	0.00*
Slalom Run	20.1	16.8	40	18.9±2.3	17.5±2.3	0.15

2296   **Board #132**   June 1 11:00 AM - 12:30 PM

A Muscle's Functional Role Influences Movement Accuracy Before and After Eccentric Exercise

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(No relevant relationships reported)

Eccentric muscle contractions, especially if unaccustomed and intense, can cause fatigue and muscle damage that contributes to acute decrements in motor performance. Because performance of motor tasks requires the precise coordination of agonist and antagonist musculature, the effect of the eccentric activity on accuracy will likely depend on the damaged muscle's function as an agonist or antagonist in the task. **PURPOSE:** To compare the effect of fatiguing eccentric exercise (EE) on the accuracy of aiming movements when the EE muscle group's function is that of an agonist or antagonist. **METHODS:** 16 untrained subjects (9 M, 7 F; 27 ± 3 yrs.) completed discrete horizontal pointing movements between 2 targets (13mm diameter)

that required 40° of elbow movement. Twenty elbow-extension and 20 elbow-flexion pointing movements were performed with their right arm before and immediately after eccentric exercise of the elbow extensor muscles standardized by isokinetic dynamometry. Movement accuracy was quantified by the incidence (overall accuracy) and duration to initiation (magnitude of error) of secondary submovements that were identified by zero crossings in the tangential velocity and acceleration profiles. **RESULTS:** When the exercised muscles performed the pointing task as the agonist (i.e. extension movements), movement times (MT) were longer and peak velocity (PV) decreased after EE compared with before EE (MT= 222 ± 40, 248 ± 37ms, p<0.05; PV= 3.4 ± 0.6, 3.1 ± 0.6m/s, p<0.05). However, when the exercised muscle was the antagonist (i.e. flexion movements), MT and PV remained unchanged. There were more trials with no corrective submovements (i.e. more accurate) for the extension compared with flexion movements before EE (92% vs. 62%, p<0.001), but there was a greater decline in accurate trials after EE for the extension movements (78% vs. 41% decline p<0.0001). Furthermore, although initially similar, the duration of the primary submovement was shorter (further from target) after EE for the movements in which the agonist was the exercised muscle compared with an antagonistic role (62% vs. 73% of total movement time, p<0.001). **CONCLUSIONS:** There is a greater effect of EE-induced muscle fatigue and damage on movement kinematics and accuracy when the muscle's functional role is agonistic.

2297   **Board #133**   June 1 11:00 AM - 12:30 PM

Alterations In Spinal Excitability And Descending Drive Following Cross-education

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(No relevant relationships reported)

For over a century, there has been considerable interest in the so-called cross-education phenomenon, whereby training one limb augments performance in the contralateral untrained limb. The underlying adaptation(s) in the nervous system have yet to be fully elucidated. **PURPOSE:** To investigate contralateral neural adaptations via evoked spinal and supraspinal reflexes, EMG amplitude (EMG_{rms}), and voluntary muscle activation (%ACT) following a 4-week unilateral isometric resistance training program. **METHODS:** Seven untrained men and women completed a unilateral resistance training program which consisted of 6 sets of 6 maximal voluntary isometric contractions (MVCs) across 4-weeks (16 sessions) using the dominant plantar flexor muscle group. Prior to and following training, a battery of tests were conducted in both limbs. Surface EMG was recorded from the soleus, medial gastrocnemius, lateral gastrocnemius, and tibialis anterior muscles while transcutaneous electrical stimulation was applied over the tibial nerve across a range of intensities to determine maximal H-reflex (H_{max}) and M-wave amplitudes (M_{max}). Participants then performed 3, 3-second MVCs. During each contraction, a single, 1-ms supramaximal stimulus (150% M_{max}) was applied 2.5 seconds into the contraction to evoke a V-wave and interpolated torque with control twitches occurring 2 and 4 seconds following relaxation. The V-M ratio and %ACT were measured simultaneously during each MVC. **RESULTS:** Peak torque increased 26 ± 20% (p < 0.01) and 31 ± 16% (p < 0.01) in the trained and untrained limbs, respectively. Following training, there was an increase in the soleus V-M ratio in the untrained (32 ± 21% vs. 38 ± 19%, p = 0.01), but not the trained limb (p > 0.05). %ACT was not altered post training in either limb—96.9 ± 3.9 vs. 95.5 ± 3.4 (p = 0.56) and 95.7 ± 3.7 vs. 92.9 ± 4.2 (p = 0.10) No differences were found in the MG, LG, or TA V-M ratio for either limb (p > 0.05). Additionally, there were no changes in H_{max}/M_{max} and EMG_{rms} from pre to post training in either limb (p > 0.05). **CONCLUSIONS:** Our findings indicate significant cross-education of the contralateral limb. It is likely that increases in supraspinal activity (i.e. descending drive), rather than changes in spinal excitability or voluntary activation, are responsible for the contralateral torque increase.

2298   **Board #134**   June 1 11:00 AM - 12:30 PM

Acute Effects of Unilateral Static Stretching on Contralateral Limb Range of Motion and Isometric Strength

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(No relevant relationships reported)

Static stretching (SS) is an effective exercise technique often used in sports performance and rehabilitation fields to improve one's range or motion (ROM). However, its effects on non-intervened contralateral limb's performance remain equivocal.**PURPOSE:** To examine the acute effects of unilateral hamstrings SS on the contralateral hip flexion passive ROM and the strength performance. **METHODS:** Twenty-three healthy young adults (male: n = 13, mean ± SD age = 26 ± 3 years; height = 176.9 ± 6.6 cm; body weight = 84.2 ± 12.5 kg; female: n =10, mean ± SD age

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= 27 ± 2 years; height = 164.1 ± 3.5 cm; body weight = 59.3 ± 11.4 kg) participated in a 2-visit investigation which consisted of a familiarization visit and an experimental visit. During the experimental visit, 10 sets of 30-second SS were performed with the subjects' dominant hamstring muscles. Before (Pre-) and after (Post-) the SS intervention, the contralateral hip flexion passive ROM, the isometric strength of the contralateral knee flexors, along with the surface electromyography (EMG) were measured. Separate paired sample t-tests were used to examine the potential changes in the dependent variables described above.
RESULTS: The SS significantly increased the contralateral hip flexion passive ROM (Pre = 64.70 ± 19.19º vs. Post = 73.48 ± 22.60º, $p < 0.001$). In addition, the isometric strength of the contralateral knee flexor significantly decreased (Pre = 326.63 ± 91.81 N vs. Post = 310.44 ± 92.08, $p = 0.004$). For both biceps femoris ($p = 0.065$) and semitendinosus ($p = 0.083$) muscles, there were decreasing trends toward significance for the normalized EMG amplitude.
CONCLUSIONS: Prolonged unilateral SS intervention improved the contralateral hip flexion passive ROM but decreased the strength performance. In addition to the possible increased stretch tolerance, the high intensity and duration static stretches might have also induced the crossover inhibition of the spinal motoneurons, thereby reducing the neuromuscular performance of the contralateral muscle.

2299   Board #135   June 1 11:00 AM - 12:30 PM
Symmetry Loading After Knee Injury Appear Different During Leg Press And Squat Activities

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(No relevant relationships reported)

Patients post ACL R or meniscal repair often display weight bearing asymmetry post surgically during movement performance. PURPOSE: To determine if real-time force feedback can be used to increase weight bearing symmetry post-surgery immediately and has delayed retention during a leg press and squat exercise. METHODS: Fourteen patients were tested using load sensors under each foot while exercising on a leg press machine and while performing weight bearing squats. These load sensors depicted the magnitude of force normal to the foot at 62.5 Hz. During the pre-test, data were collected as patients performed the leg press and squat exercises blinded to any feedback. During training, data were streamed in a bar graph to a display in front of the patient with therapist instructions to attempt to maintain equal weight on each leg. After the training, each patient performed a post-test with no feedback. One week later, they had a delayed retention. A two way repeated measures analysis of variance was used to examine mean weight bearing asymmetry for each exercise (leg press and squat) across time (pre-test, post-test, and delayed retention). RESULTS: There was a main effect for exercise (p<0.05), no main effects for time (p>0.05) and there was an exercise by time interaction (p<0.05). Overall, during the leg press there was more weight bearing asymmetry compared to the squat (30% greater). The interaction showed that the leg press had nearly 9% improvement over the time compared to pre-test while the squat showed symmetry improvement of 19% post-test but delayed retention was poor. CONCLUSION: Weight bearing asymmetry appears different for different tasks (leg press vs. squats). It appears the feedback can produce immediate changes in symmetry but retention appears different for different tasks.

2300   Board #136   June 1 11:00 AM - 12:30 PM
Is Aiming a Handgun Like Pointing a Finger?

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(No relevant relationships reported)

PURPOSE: In aiming at a target, humans produce small involuntary fluctuations in the aiming limb that may hamper performance. While often studied in the vertical axis, these fluctuations occur in all axes. The current study compared vertical (VT), mediolateral (ML), and anterior-posterior (AP) tremor amplitude during finger pointing and handgun aiming. **METHODS:** Twenty volunteers, in a counterbalanced order, pointed their finger or aimed a training handgun for 10 seconds at a bullseye target 6.4 meters away. Participants performed five trials per condition. Accelerometers were affixed to the upper arm (UA), forearm (FA), hand (HA), and finger/gun barrel (GF). Amplitude (RMS) and regularity (ApEn) of the acceleration signals were computed. **RESULTS:** Compared to finger pointing (RMS: 0.238±0.146, APEN: 1.373±0.138), accelerations at the distal segment were significantly lower and more regular during the handgun aiming condition (RMS: 0.202±0.111, APEN: 1.112±0.146). Significant interactions were present between condition (pointing, aiming) and limb segment in each direction. The amplitude of tremor in the UA and FA segments were similar for pointing and aiming in all three directions (p's>0.05). Handgun aiming resulted in smaller amplitude tremor at the GF in both VT and ML directions and HA in the ML direction, but larger amplitude at the HA in the AP direction (p's<0.05). Aiming

increased regularity (decreased ApEn) at the GF in VT direction, both FA and GF in ML direction, and at the UA and HA in AP direction (p's<0.05). Pointing was more regular than aiming only for the HA in the VT direction (p<0.05). For all other directions and segments RMS and ApEn were similar between pointing and aiming (p's>0.05). **CONCLUSION:** Aiming with the mass of a gun in the hand has primarily a damping effect on the amplitude of tremor in the distal segments as well as resulting in more regular movements. Greater regularity in the VT axis of the HA during pointing suggests increased control of VT across the wrist in this task. Overall, these results suggest that aiming with a gun and pointing with a finger are similar tasks except for the added mass.

2301   Board #137   June 1 11:00 AM - 12:30 PM
Motor Cortex Function in Symptomatic and Asymptomatic Individuals Following Mild Traumatic Brain Injury

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(No relevant relationships reported)

While most individuals who suffer a mild traumatic brain injury (mTBI) recover within 1-2 weeks, approximately 10-15% have symptoms persisting beyond 3 months. The underlying physiology of this difference in symptom recovery remains unknown. **PURPOSE:** The aim of this study was to determine if measures of motor cortex excitability, inhibition, and associated neurotransmitters differ between individuals with and without history of mTBI or chronic symptoms from mTBI. A secondary aim of this study was to investigate the occurrence of the APOE4 allele, a suggested predictor of mTBI outcome, in each group. **METHODS:** Thirty five participants were assigned to one of four groups: (i) without history of mTBI (Control, n=10), (ii) within 72-hours of diagnosis of mTBI (Acute, n=9), (iii) with history of mTBI and no remaining symptoms (Chronic Control, n=10), and (iv) with chronic symptoms from mTBI, lasting at least 3 months post-injury (Chronic, n=6). Measures of glutamate and GABA concentrations in the primary motor cortex were obtained using proton magnetic resonance spectroscopy (^{1}H-MRS). Transcranial magnetic stimulation (TMS) was used to assess corticomotor excitability with the amplitude of the motor evoked potential (MEP_{amp}), and intracortical inhibition through the duration of the cortical silent period (CSP). **RESULTS:** Glutamate (p=0.88) and GABA (p=0.11) concentrations in M1 did not differ across groups. MEP_{amp} and CSP duration did not differ across groups (p= 0.07 and p=0.15, respectively). Four of the 21 participants who provided a sample for APOE genotyping were carriers of the E4 allele (2 Controls and 2 Chronic Controls), while 17 were not (7 Control, 7 Acute, 7 Chronic Control, 1 Chronic). **CONCLUSION:** The lack of differences in glutamate, GABA, and corticomotor excitability and inhibition across groups suggests that motor cortex function may not explain the physiology underlying difference in symptom recovery post-mTBI. Further data are required to fully understand the role of APOE4 in recovery from mTBI.

2302   Board #138   June 1 11:00 AM - 12:30 PM
Physical Functionality In Mexican Elderly With Gerontological Care

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(No relevant relationships reported)

It has been reported that Mexico has 1,137,647 of elder people, out of approximately 120 million inhabitants. Of them 26.3% have limitation in their activities. Older adults have the greatest risk of falls, because of the physical functionality (PF) reduction, both associate with sarcopenia. PF is defined as the capacity of the person for daily life and instrumental activities. To our knowledge no studies on PF have been done in Mexican Elderly. **Purpose:** to evaluate physical functionality in older Mexican adults. **Methods:** this study was performed in a first served basis including older Mexican individuals affiliated to a public gerontological system of attention. Anthropometric evaluations were carried out, including weight, height, abdominal and hip circumferences. Additionally, electric bioimpedance was used to determine muscular and bone mass. Physical functionality was assessed through the Short Physical Performance Battery Protocol and Score Sheet (SPPB) test. The data were analyzed by descriptive statistics. Results are reported as mean ± SD. **Results:** 186 older people (60 years and over) were evaluated, 154 women and 32 men. The average age was 69.76 ± 6.31 years for females, and 71.31 ± 7.21 years for males. Women mean weight (in kg) was 66.25 ± 11.36; height (in m) 1.51 ± 0.05. By the other side, men weighted 71.63 ± 12.59 Kg, and 1.65 ± 0.07 m. The march speed (m/s) was 0.83 ± 0.23 for woman and 0.97 ± 0.18 for men. In the timed up and go test females got 9.43 ± 3.23 s while men 7.90 ± 3.26 s. Repeated chair stand reported in the same order 16.61 ± 5.92 s vs. 14.54 ± 3.85 s. The speed of march is reduced in 78.50% of women, as in 51.72% of men. The dynamic equilibrium test revealed 56.26% of men, and only 51.07%

women in normal values. **Conclusion:** older Mexican adults, with gerontological care exhibits reduced Physical Functionality, with similar levels to data reported from other populations.

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Relationship Between Muscle Activity And Isometric Force During Submersion In Shallow Water.

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(No relevant relationships reported)

Shallow and deep water running are used by athletes as either substitute or in addition to running on land. However, it is not clear if the relationship between the ability to generate force and electromyography (EMG) is influenced by water submersion. **PURPOSE**: Compare isometric force-EMG relationship during on land and submersion in shallow water. **METHODS**: Participants (n=4; 29.7±20.2 yrs, 1.80±0.1 m, 82.2±24.3 kg) were fit with leads to measure rectus femoris (RF) EMG using a telemetry EMG system (Noraxon, 1000 Hz) while wearing a drysuit. Participants sat in a chair with the ankle secured in a cuff and knee angle at 90 degrees of flexion. One end of the cable was attached to the cuff and the other to a linear force transducer which was always above water level. The transducer measured the tension force created with the cable that resisted knee extension. The chair was portable and was used on the deck of a pool and in shallow water. Force data were recorded concurrent with EMG data. Participants completed four 5-sec isometric knee extension conditions ranging from submaximal to maximal effort. The maximal effort condition was always done first with submaximal efforts targeting 25%, 50%, and 75% of maximal effort with real time verbal feedback provided. Participants always completed these conditions on land first then in water submerged to about the xiphoid process while sitting. Rest was provided as needed between conditions. EMG data were processed by removing any offset and full-wave rectifying. Force and EMG data were each averaged over the last 1-sec. Force-EMG plots were generated for each participant for on land and in water data sets and fit with linear lines of best fit. The y-intercepts and slopes were recorded and each compared between on land and in water using paired t-tests (α=0.05). A group line of best fit was also calculated for descriptive purposes. **RESULTS**: The group linear line of best fit for Force-EMG during Land was EMG=2.3005(Force) + 4.9007 (R^2 = 0.9819) and during water was EMG=2.1759(Force) - 4.7535 (R^2=0.9874). Using individual data sets, neither the slope (p=0.133) nor y-intercept (p=0.131) were different between on land and in water. **CONCLUSIONS**: The relationship between knee extension force and EMG was the same while on land and in the water.

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Muscle Activation and Motor Unit Behavior in the First Dorsal Interosseous of Children and Adults

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(No relevant relationships reported)

PURPOSE: To examine motor unit (MU) behavior in the first dorsal interosseous (FDI) in children (CH) and adults (AD) during submaximal contractions. **METHODS:** Nineteen CH (11 male age=9.0±0.8 years, 8 female age=9.0±0.9 years) and 13 AD (6 males age=21.0±2.53 years, 7 females age=24.6±5.9 years) completed three maximum voluntary contractions (MVC) and 2 repetitive isometric contractions at a force of 30% MVC that was held for 40 s with 6-10 s rest between contractions. Surface EMG amplitude values from the 30% MVCs were normalized (N-EMG) to peak EMG amplitude from the MVC. For each MU, recruitment thresholds (RT) and mean firing rates (MFR) were recorded. MFRs and N-EMG were averaged in 10 s epochs at beginning (T1), middle (T2), and end (T3) of repetition 1 and repetition 2 (T4, T5, and T6). For each subject, MFR vs. RT relationships were calculated for each epoch. Two-way mixed factorial ANOVAs (group [CH vs. AD] × time [T1 vs. T2 vs. T3 vs. T4 vs. T5 vs. T6]) were used to analyze N-EMG and the slopes and y-intercepts from the MFR vs. RT relationships. **RESULTS:** N-EMG was greater for CH than AD when collapsed across time (P=0.006). The MFR vs. RT relationships changed in a time-dependent manner such that the y-intercepts decreased (P=0.044), however, there was no change in the slopes (P=0.072). No between group differences for slopes (P=0.360) or y-intercepts (P=0.063) suggested that MFR vs. RT relationships were similar between groups. **CONCLUSIONS:** CH required twice the level of muscle activation in comparison to the AD to complete the task. However, the MFR vs. RT relationships were similar between groups and changed in a time dependent manner.

Table 1. Mean±SDs for each ANOVA. *Indicates a main effect for group. †Indicates a main effect for time.

Time point		T1	T2	T3	T4	T5	T6
N-EMG (%MVC)*	CH	59.6± 33.7	57.9± 35.6	60.3± 38.7	61.5± 33.3	58.7± 30.3	62.1± 34.8
	AD	26.6± 5.9	26.4± 5.9	27.0± 5.6	29.3± 5.5	27.4± 5.6	28.1± 4.6
MFR vs. RT							
Slope (pps/ %MVC)	CH	−0.804± 0.18	−0.776± 0.19	−0.771± 0.20	−0.704± 0.20	−0.686± 0.19	−0.676± 0.19
	AD	−0.707± 0.14	−0.671± 0.13	−0.667± 0.14	−0.699± 0.15	−0.673± 0.15	−0.670± 0.15
Y-intercept (pps)†	CH	31.6± 5.0	30.9± 5.1	30.8± 5.2	29.7± 6.8	29.2± 6.3	29.0± 6.3
	AD	26.7± 4.8	26.1± 4.5	25.6± 4.8	26.3± 5.6	25.9± 5.4	25.7± 5.4

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An Evaluation Of The Foot Tapping Test (ftt) In A Health Population

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(No relevant relationships reported)

Simple in nature, the foot tapping test (FTT) has potential as an objective measure of upper motor function. Despite this, the reliability of the FTT has not been well identified. Furthermore, it is uncertain as to how to best measure the FTT as number of foot taps may vary upon counting methods. In order to make the FTT more clinically relevant, more research must be done on the FTT in healthy individuals in order to determine if it is a reliable measure of foot tapping ability. **PURPOSE:** The purpose of the study was to investigate reliability measures of the FTT in a healthy population using a variety of different measurement and counting methods. By identifying the reliability of the different measurement methods we hope to be able to make recommendations for future FTT research. **METHODS:** 20 healthy individuals, ages of 18-31, completed a series of foot tapping trials over 4 visits. While seated, subjects tapped their foot repeatedly for 10 seconds while researchers counted the number of foot taps. Starting foot was randomized for each visit and tested twice with shoes ON and twice with shoes OFF (8 trials * 4 visits = 32 trials per subject). The number of foot taps was determined for each trial via visual inspection, video playback (slowed and normal speed), and with the use of a force plate. The mean values of the FTT trials were compared across days, dominant vs. non-dominant foot, the shoes ON/OFF conditions, and with the different counting methods. **RESULTS:** Significant differences were found in foot tapping rates in the shoes ON (mean: 54.3 taps) vs shoes OFF (mean: 53.4 taps) and dominate vs. non-dominant (mean: 51.1 taps) foot analyses (p<0.05). Furthermore it was found that a significant difference in the mean number of foot taps existed between visit 1 (mean: 51.2 taps) and visits 2, 3, and 4 (mean: 54.3, 53.5, and 46.7 taps respectively) (p>0.05). It was found that the FTT exhibited high test-retest reliability (Pearson r >0.80) and high Cronbach's alpha (alpha >0.80) across the live, slowed video counts, and force plate measurements. **CONCLUSION:** It was found that the FTT exhibits a high level of reliability across the live, slowed video, and force plate measures with both the shoes ON and shoes OFF. Given the observed reliability, the use of force plate with the FTT offers an attractive alternative to live counting or video playback methods.

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Association Between Motor Control Activation And Excitability Of The Quadriceps: An fMRI And TMS Study

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(No relevant relationships reported)

Various neurophysiological assessments indicate that musculoskeletal injury causes alterations in nervous system function. Functional magnetic resonance imaging (fMRI) and transcranial magnetic stimulation (TMS) have been used as non-invasive assessments of motor cortex activation and excitability, respectively. Each of these tools provide unique insight on neurophysiology and it is unknown how musculoskeletal injury may influence the relationship between nervous system activity and excitability. **Purpose:** Investigate relationships between motor cortex activation (fMRI) and motor cortex excitability (TMS) of the quadriceps muscle. **Methods:** Twenty participants volunteered; 10 healthy controls (age, 23.2±1.61y; height 167.92±9.46cm; mass 66.27±11.7kg) and 10 with a history of unilateral anterior cruciate ligament reconstruction (ACLR; age 22.4±1.95y; height 166.37±7.11cm;

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mass 65.62±12.10kg; yrs from surgery, 5.88±1.86). Motor cortex activation ($M1_{act}$) was assessed during unilateral knee extension-flexion using a 3T Siemens MRI and the peak voxel signal intensity was extracted for analysis. Motor cortex excitability was assessed during active contractions using motor evoked potentials (MEP) elicited at 120% of active motor threshold via TMS. Outcomes were assessed on the left limb of all participants. Pearson product moment correlations were performed to determine the association between $M1_{act}$ and MEP on the entire cohort, and individually for the healthy and ACLR groups. Alpha level was set at p ≤ 0.05. **Results:** For the entire cohort, $M1_{act}$ was significantly associated with MEP (r = 0.459, p = 0.04). For healthy controls, $M1_{act}$ was significantly associated with MEP (r = 0.707, p = 0.02). There were no significant relationships among the ACLR group (p > 0.05). **Conclusions:** Greater brain activation is associated with greater brain excitability in healthy controls, however no significant relationships were found for ACLR participants. For healthy individuals, cortical activity and excitability increase concurrently to engage the quadriceps during contraction. However, our ACLR data indicate that alterations in neural pathways following joint injury may influence the interaction between brain activation and excitability, providing an area for future investigation.

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A History Of Sports-Related Concussions Does Not Influence Oculomotor Control

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(No relevant relationships reported)

Recent research indicates that among those who have a history of multiple sport-related concussions (SRC) may have greater postural instability when compared to those that do not have a history of prior SRC. However, little is known regarding the effect on those who experienced multiple SRC on the visual system, specifically oculomotor control. **Purpose**: To investigate the effect that a prior history of SRC has on oculomotor control within 24-48 hours following SRC. **Methods**: Twenty-seven (13 female and 14 male; 20 ± 2 yrs) collegiate NCAA Division I athletes with SRC completed two trials of the sport-like antisaccade task (SLT) within 24-48 hours post-injury. Participants were sorted into three equal groups: no history SRC (NON), a history of one SRC (C1) and a history of two or more SRC (C2). During play of the SLT, all participants were instructed to minimize eye movements away from a central fixed area, while simultaneously swaying in a medial-lateral direction to direct an on screen avatar to meet the demands of the task. Raw ocular point of gaze coordinates were tracked using a monocular eye tracker (240Hz, Argus Science, H7, Medford, MA) that was synced with an 8 camera motion capture system (100Hz, Vicon Motion Ltd., Version 1.8.5, Oxford, USA) during the sport-like antisaccade task and further analyzed using a custom algorithm. A multivariate ANOVA analyzed resultant distance (RD), mean horizontal excursion velocity (HV) and prosaccade errors (PE) by groups (NON, C1, and C2). Mean and standard deviation values for RD, HV and PE were calculate for analysis. **Results**: No significant omnibus results were noted between the groups for RD (NON=5.780 pixels ± 1.527), (C1=4.953 pixels ±2.168), (C2=4.665 pixels ±1.305); p=0.370), HV (NON 9.912 pixels/second ±4.484), (C1= 7.250pixels/second ±2.458), (C2=8.05pixels/second ±2.363); (p=0.225), and PE (NON=3.370±3.924), (C1=1.629±1.635), (C2=2.167±2.324); (p=0.414). **Conclusion**: These data suggests that oculomotor control as measured by the SLT may not be sensitive to differentiated between those that have a prior history of SRC and those that do not have a prior history of SRC.

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Influence of Sex and Cross-Sectional Area on Motor Unit Recruitment Patterns of the Vastus Lateralis

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(No relevant relationships reported)

PURPOSE: Strong relationships have been reported between the increases in muscle cross-sectional area (mCSA) and motor unit action potential sizes ($MUAP_{SIZES}$) for the vastus lateralis (VL). To date, it is unknown if sex-related differences in muscle cross-sectional area are correlated with the slopes and y-intercepts for the $MUAP_{SIZE}$ vs. recruitment threshold (RT) relationships.
METHODS: Ten males (21.10±1.97 yrs) and ten females (23.70±6.27 yrs) with no participation in any form of structured exercise for the previous 3 years volunteered for this investigation. Ultrasonography was used to examine mCSA, muscle echo intensity (mEI), and subcutaneous fat (sFAT) for the VL. Surface electromyographic decomposition techniques were applied to assess $MUAP_{SIZE}$ in relation to RT of the VL during isometric muscle actions at 40% and 70% of maximal voluntary contraction (MVC). Linear regressions were performed for each subject for the 40% and 70% MVC to determine the y-intercepts (millivolts [mV]) and slopes (mV/%MVC) for

the $MUAP_{SIZES}$ vs. RT relationships. Separate two-way mixed factorial ANOVAs (sex [male vs. female] x intensity [40% vs. 70%]) were used to examine possible differences in the y-intercepts and slopes from the $MUAP_{SIZE}$ vs. RT relationships. In addition, independent samples *t*-tests were used to examine differences in mCSA, mEI, and sFAT between sexes. Furthermore, Pearson's product moment correlation coefficients were calculated comparing mCSA, sFAT, mEI of the VL with the slopes and y-intercepts from the 40% and 70% MVCs.**RESULTS**: The males had greater mCSA (P = 0.002) and slopes for the $MUAP_{SIZE}$ vs. RT relationships (P = 0.001), whereas the females had greater sFAT (P = 0.003) and mEI (P = 0.001) for the VL. In addition, all relationships between ultrasound parameters and the slopes for the 40% and 70% MUAP size vs. RT were significant (P < 0.001 - 0.020), with the greatest amount of variance explained by mEI (*r* = -0.657 to -0.687).
CONCLUSIONS: The slopes for the $MUAP_{SIZE}$ vs. RT relationships are dependent on the physical properties of the muscle as measured by ultrasound. In addition, the sex-related differences in mCSA, mEI, and $MUAP_{SIZE}$ in relation to RT suggests greater muscle fiber sizes of the higher-threshold MUs for the males.

2309   Board #145   June 1 11:00 AM - 12:30 PM

Simple Low-Cost Virtual Reality to Improve the Responsiveness of Clinical Balance Assessment

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(No relevant relationships reported)

Concussions commonly affect postural stability, which incorporates the visual, vestibular, and somatosensory system. Postural stability post-concussion is commonly quantified via the Balance Error Scoring System (BESS). However, the BESS may not sufficiently challenge postural stability in an athletic population allowing potential deficits to go unquantified. Virtual reality (VR) devices may be capable of providing an increased visual-vestibular integration challenge to improve BESS responsiveness.
PURPOSE: Determine if a low cost and clinically applicable VR modification to the standard BESS can provide a superior challenge to postural stability than the traditional BESS.
METHODS: Twenty-eight adults (mean age 23.36 ± 2.38 years, mean height 1.74 m ± 0.13, mean weight 77.95 kg ± 16.63) were recruited. All individuals performed the standard BESS test and a VR modified BESS (VR-BESS) on a force plate. All participants completed a familiarization session to practice the traditional BESS and VR-BESS. Participants then performed two trials of the traditional BESS or VR-BESS in a counter-balanced randomized order. The VR-BESS used a headset (Google Cardboard) and phone (LG V10) to display a rollercoaster ride (FIBRUM) to induce a visual and vestibular challenge to postural stability. BESS postural control errors and center of pressure (CoP) velocity were averaged for the two trials and used for analyses. Separate repeated measures ANOVAs were conducted for the BESS errors and CoP velocity. Post hoc testing was conducted for the condition by stance by surface interaction with an alpha level set at p<0.05 with a Bonferroni correction for multiple comparison analyses.
RESULTS: The overall repeated measures ANOVA was significant for BESS errors ($F_{(2,26)}$= 6.37, p=.003) and CoP velocity ($F_{(2,26)}$= 5.19, p=.008).The VR-BESS significantly increased total errors (20.93 vs. 11.42, p<0.05) and CoP velocity summed across all stances and surfaces (52.96 cm/s vs. 37.73 cm/s, p<0.05) beyond the traditional BESS.
CONCLUSION: VR-BESS provides a standardized, efficient, and effective way to challenge postural stability to a greater extent than the traditional BESS. With technology quickly advancing and becoming less expensive, this modification may be immediately incorporated into balance training and assessment.

2310   Board #146   June 1 11:00 AM - 12:30 PM

Movement Variability and Accuracy Within the Temporal and Spatial Domains When Provided a Vibrotactile Stimulus

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(No relevant relationships reported)

Different means of informing body movements can include visual, auditory, and vibrotactile (VT) stimuli. Each method may guide movements within the temporal (TEMP) and spatial (SPAT) domains in varying ways. As VT stimuli has become more accessible, it is important to understand how users interpret this method of instruction to promote patterned movements. **PURPOSE**: Determine the effects of VT stimulus pattern speed on TEMP and SPAT movement variability (VAR) and accuracy (ACC).
METHODS: Sixteen young healthy subjects were recruited. Participants completed a continuous wrist flexion and extension activity. The task involved matching wrist motion with two different VT pattern speeds (FAST, SLOW) provided via motors attached to the forearm. An electrogoniometer captured wrist movement. Five 20s trials with 2min rest periods were completed for the two speeds. Flexion/extension movements were combined for further analysis. Absolute (*STDEV*) and relative (*CV*) VAR, and ACC (mean absolute error) for TEMP and SPAT domains were calculated

within individuals. 5x2 linear mixed models accounting for repeated measures compared the variables across pattern speeds and trial numbers. Post-hoc Tukey HSDs identified differences for trial effects. **RESULTS**: No significant interactions were found in either domain. Significant pattern speed effects were observed in the TEMP domain for VAR (*STDEV*: FAST 0.07s, SLOW 0.13s, p < .05; *CV*: FAST 12.9%, SLOW 16.8%, p < .05), and ACC (FAST 0.05s, SLOW 0.10s, p < .05). VAR in the both domains and TEMP ACC changed significantly over the 5 trials (*all*, p < .05; ACC SPAT, p > .05). Post-hoc tests revealed trial 1 to be different from all subsequent trials for TEMP and SPAT VAR (*STDEV* TEMP: #1: 0.15s, #5: 0.08s, p < .05; *STDEV* SPAT: #1: 7.7deg, #5: 4.7deg, p < .05; *CV* TEMP: #1: 20.8%, #5: 13.2%, p < .05; *CV* SPAT: #1: 11.9%, #5: 5.9%, p < .05), and ACC TEMP (#1: 0.11s, #5: 0.07s, p < .05). **CONCLUSIONS**: VT stimulus appears capable of producing a desired continuous wrist movement at multiple pattern speeds. TEMP VAR was lower and TEMP ACC was higher for the FAST speed, while SPAT measures did not differ between speeds. Lower TEMP and SPAT VAR, and higher TEMP ACC were observed by trial 2, with improved performance maintained in the remaining trials. A lack of change in SPAT ACC may reflect limited SPAT guidance provided to subjects.

2311   Board #147   June 1 11:00 AM - 12:30 PM

The Effects of Resistance Training on Motor Unit Firing Rates and Muscle Activation

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(No relevant relationships reported)

PURPOSE: To examine the effects of lower body resistance training on motor unit (MU) firing rates and recruitment in the vastus lateralis.
METHODS: Seventeen recreationally active men (20.7 ± 1.9 years; 178.9 ± 7.8 cm; 76.8 ± 9.9 kg) completed three lower body resistance-training sessions per week for eight weeks. Exercise intensities and volumes were programmed according to a linear periodization model. Pre- and post-training, MU behavior of the VL was analyzed during isometric knee extensions performed at 40% maximal voluntary contraction (MVC) torque. Electromyographic (EMG) signals were collected via a 5-pin surface sensor array and decomposed to yield a mean firing rate (MFR) at steady torque and MU action potential amplitude ($MUAP_{AMP}$) for each MU. For each contraction, an exponential model was applied to the MFRs and $MUAP_{AMP}$s and the B and A terms were calculated. EMG amplitude (EMG_{RMS}) recorded during the steady torque region of the submaximal contractions was normalized to the peak EMG_{RMS} of the respective visit's MVC. Possible differences in the A and B terms of the MFR vs. $MUAP_{AMP}$ relationship and normalized EMG_{RMS} were analyzed via paired samples t-tests.
RESULTS: Post-training, subjects demonstrated similar B terms (p = 0.278; PRE: -4.06 ± 0.51 pps/mV; POST: -4.41 ± 1.36 pps/mV), which indicated a similar decline in MFR with increases in $MUAP_{AMP}$. However, there was an observed increase in the A terms (p = 0.005; PRE: 24.93 ± 2.79 mV; POST: 27.80 ± 4.57 mV) indicating an increase in MFRs for a given $MUAP_{AMP}$ post-training. Additionally, subjects demonstrated reduced normalized EMG_{RMS} post-training (p = 0.029; PRE: 37.9 ± 8.0% ; POST: 33.6 ± 8.7%) suggesting reduced muscle activation.
CONCLUSIONS: $MUAP_{AMP}$ is an indirect measure of MU size, thus the larger A terms suggest that similarly sized MUs had greater firing rates post-training. EMG_{RMS} is influenced by MU firing rates and recruitment, therefore, the decrease in normalized EMG_{RMS} despite increases in firing rates suggest decreased MU recruitment. Thus, resistance-training induced firing rate increases allowed subjects to produce the same relative torque with fewer active MUs. Given that later recruited MUs are more fatigable, the reduced MU recruitment could delay fatigue during submaximal contractions.

2312   Board #148   June 1 11:00 AM - 12:30 PM

Reproducibility Of Isokinetic Strength Assessment Of Knee Extensors And Flexors Adopting Concentric And Eccentric Contractions

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(No relevant relationships reported)

PURPOSE: The reproducibility of isokinetic strength assessment for testing knee extensors (KE) and knee flexors (KF) was determined. The examination was performed on single measurements (peak torques) and also on conventional and functional ratios obtained from concentric (cc) and eccentric (ecc) contractions of the above mentioned muscle groups.
METHODS: The sample was composed of 26 male adult athletes (aged 18.6-33.9 years) who completed two test sessions of five repetitions of reciprocal concentric and

eccentric extensions and flexions at 60°.s^{-1}. Intra-individual differences were tested using paired *t*-test and effect size was determined using cohen's d-value. Cefficients of variation (%CV) and Intra-class correlation (ICC) were also calculated.
RESULTS: Regarding peak torques, intra-individual mean differences were trivial for KEecc (t=0.176, p=0.86, d=0.08), small for KEcc (t=2.001, p=0.06, d=0.53) and KFecc (t=0.797, p=0.43, d=0.35) and moderate for KFcc (t=2.062, p=0.05, d=0.65). Although values of ICC (between 0.961 to 0.993), technical errors of measurement (TEM) ranged from 5.2 to 8.1 N.m and %CV fluctuated between 18.6% and 23.8%. Similar statistics were determined for conventional ratio (KFcc/KEcc: t=1.026, p=0.32, d=0.01, TEM=0.1, %CV=13.1%, ICC=0.956), functional extension ratio (KFecc/KEcc: t=1.911, p=0.07, d=0.01, TEM=0.1, %CV=14.9%, ICC=0.950 and functional flexion ratio (KFcc/KEecc: t=2.006, p=0.06, d=0.01, TEM=0.1, %CV=16.3%, ICC=0.977).
CONCLUSIONS: The current study showed an apparent reasonable reliability for the isokinetic peak torques of knee extensors and knee flexors. Derived ratios showed higher values for %CV. Note, however, that the composite scores were obtained from information of the extensors and flexors at different angles and future research is recommended to assess the reproducibility of functional ratios using the torque of the numerator (knee flexor) at the specific angle of the knee extensor peak torque angle (denominator). Funding (FCT): SFRH/BD/101083/2014, SFRH/BPD/100470/2014, SFRH/BD/121441/2016 and CIDAF (UID/DTP/04213/2016).

E-34   Free Communication/Poster - **Posture and Balance**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2313   Board #149   June 1 11:00 AM - 12:30 PM

Integration of a Complex Balance Task into a Concussion Management Protocol Specific to Dancers

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(No relevant relationships reported)

Mechanisms for concussions in dance include drops from lifting, falls from stage sets, and contact with the floor or fellow dancers that happen during class, rehearsal, or performances. Despite the recent awareness of sports-related concussions, there are gaps in knowledge regarding dance-specific concussions and what a "return to dance" protocol should look like for dancers. Although dance is not a high-impact sport like football or rugby, concussions still occur and can be calamitous for a collegiate and professional dancer's career. Balance tests, standard in concussion management protocols, are useful tools for evaluating the motor domain of balance functioning and are considered reliable and valid assessments of athletes suffering from concussions. **PURPOSE:** Develop and investigate a complex balance task to integrate into a concussion management protocol specific to dancers. **METHODS:** 31 participants, pre-professional dancers (n=12) and recreational dancers (n=19), completed an multipart evaluation to assess static and dynamic balance. They were tested using the Balance Error Scoring System (BESS) test which assessed static balance through performing 3 stances on 2 surfaces (ground and Airex Balance Pad). The modified Dance BESS (DBESS) test assessed static and dynamic balance of the participants through performing 10 dance movements on 3 surfaces (ground, Airex Balance Pad and foam balance beam). Participants were monitored and scored for errors on each balance test. **RESULTS:** Pre-professional dancers and recreational dancers were not significantly different for static balance on the BESS and DBESS (p>0.05). There was significant difference between the pre-professional dancers and recreational dancers (p<0.05) for the dynamic balance conditions in the Dance BESS. **CONCLUSIONS:** More skilled dancers show greater differences with dynamic balance conditions. Thus, creation of more dynamic balance tasks would be useful for baseline and post concussion testing and aid in the overall tracking during the concussion rehabilitation period for dancers.

2314   Board #150   June 1 11:00 AM - 12:30 PM

Effects of Backpack Load and Load Height on Arm Reaching Ability in Several Directions

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(No relevant relationships reported)

PURPOSE: The ability to reach with the arm has not been examined during load carriage with a backpack, or with the load distributed high or low in the backpack.
METHODS: Arm reach was tested using the Functional Reach Test (Forward), Multi-directional Reach Test (Backward, Right, Left), Upward Reach Test (Upward) at a 50° angle, and Forward Reach to the Floor Test (Low). Subjects were healthy males (n=7)

and females (n=2), 19-21 years, who wore a hiking backpack and performed using the dominant arm. Subjects were tested with no backpack, and then (in random order on different days) with the backpack empty, or load (weight) equivalent to 10, 30, and 50% of bodyweight in the bottom of the backpack. Trials were repeated with the load high in the backpack using a custom designed box. Three trials were completed for each reach. Mean values were analyzed with repeated measures ANOVA and Tukey's post-hoc test with significance level p < 0.05.
RESULTS: (Data are presented as reach in cm normalized for arm length, mean ± SD). When compared to no backpack, load high (30, 50% BW) in the backpack resulted in significant reductions in arm reach (all directions; Low = 140.5±13.8 vs 124.3±6.7, 115.5±7.7; Upward = 165.1±10.7 vs 159.9±9.3, 155.3±12.9; Left = 196.2±8.5 vs 181.6±7.3, 173.4±4.5; Right = 194.0±8.9 vs 181.7±8.0, 175.5±8.4; Backward = 180.2±9.1 vs 160.9±5.7, 153.5±7.9; Forward = 218.2±10.8 vs 208.9±8.1, 200.9±10.1) and load low (all loads) in the backpack resulted in significant reductions in arm reach for backward reach only (180.2±9.1 vs 176.8±8.1, 169.5±9.5, 164.5±1.3). When compared to empty backpack, load high (30, 50% BW) in the backpack resulted in significant reductions in arm reach (all directions; Low = 137.1±1.1 vs 124.3±6.7, 115.5±7.7; Up = 163.9±10.6 vs 159.9±9.3, 155.3±12.9; Left = 194.3±8.6 vs 181.6±7.3, 173.4±4.5; Right = 194.7±8.7 vs 181.7±8.0, 175.5±8.4; Backward = 177.9±7.4 vs 160.9±5.7, 153.5±7.9; Forward = 215.1±11.3 vs 208.9±8.1, 200.9±10.1) and load low (50% BW) in the backpack resulted in significant reductions in backward reach only (177.9±7.4 vs 164.5±1.3).
CONCLUSIONS: Backpack load weight and height differentially affects arm reach. This project was funded in part by the Douglas A. & Phyllis G. Smith Student Faculty Collaborative Research Fund.

2315   Board #151   June 1 11:00 AM - 12:30 PM

Muscle-specific Cortical Adaptations To Balance Training With Electromyographic Biofeedback In Able-bodied Individuals

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(No relevant relationships reported)

The use of electromyography biofeedback (EMG-BF) is frequently incorporated among patients with neurological and musculoskeletal injury to restore neuromuscular function and improve real-time awareness of muscle function. Its effects on central nervous system function are not well documented in lower leg models, leaving its efficacy in certain populations unclear. **PURPOSE**: This study aimed to measure reflexive and cortical excitability before and after a balance training intervention with and without EMG-BF. **METHODS**: Nineteen healthy participants volunteered for this study (183.0±20.1cm; 69.0±13.1kg; 21.1±2.3yrs). Reflexive excitability was assessed using the Hoffmann reflex from the tibialis anterior (TA), peroneus longus (PL), and soleus (SOL) through peripheral stimulation of the sciatic nerve in the popliteal fossa to obtain $H_{max}:M_{max}$ ratios. Cortical excitability was assessed via transcranial magnetic stimulation to quantify motor evoked potential (MEP) size at 110 percent of TA resting motor threshold. Neural excitability was measured before and after two 30-minute balance training sessions. The control group (n=9) performed only balance training while the experimental group (n=10) received balance training with EMG-BF to maintain 30 percent of maximal PL contraction. Differences before and after training across groups were assessed using factorial analysis of variance (α=0.05). **RESULTS**: No differences between groups were observed for reflexive excitability (F=0.00, p=0.96). No MEP size differences were observed for TA (F=0.63, p=0.45) or PL (F=0.53, p=0.48); but a significant time by group interaction was observed for SOL (F=4.315, p=0.044). EMG-BF decreased SOL MEP size after training (0.083%M_{max} to 0.048%M_{max}). **CONCLUSIONS**: EMG-BF with short-term balance training decreased cortical excitability to SOL compared to balance training alone, perhaps representing reciprocal inhibitory mechanisms for the postural plantarflexors. These findings may have implications when considering interventions for dystonic or spastic populations.

2316   Board #152   June 1 11:00 AM - 12:30 PM

Anthropometrics are Associated with Static Balance Performance in Intercollegiate Athletes

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(No relevant relationships reported)

Balance has been identified as a risk for lower extremity musculoskeletal injury (LEMSI). Anthropometric measurements (AM) may affect static balance (SB) performance. Understanding the relationship between AM and SB may affect how measures of balance are utilized in predicting risk of LEMSI. **PURPOSE:** To determine if sex and AM including height, mass, and BMI are predictive of SB performance in intercollegiate athletes. **METHODS:** A total of 190 intercollegiate athletes participated in the study (Males: 138, Females: 52; Age: 19.5 ± 1.3 years, Height: 181.9 ± 10.1 cm, Mass: 79.6 ± 15.2 kg). Ground reaction forces were collected utilizing a force plate during a test of single-leg SB under eyes open (EO) and eyes closed (EC) conditions. The variability (standard deviation) of the ground reaction

forces for each direction (anterior/posterior (AP), medial/lateral (ML), and vertical (V)) and the resultant (R) was calculated in order to explain the subject's overall static postural stability under each condition. Data from three trials for each condition were averaged for analysis. A stepwise regression analysis procedure was utilized to determine if AM and sex would significantly predict each of the calculated variables. Significance of <0.05 was set *a priori* for inclusion of predictor variables in the final regression equation. **RESULTS:** The final regression equations revealed that AM were predictive of performance (p<0.05 for all) across all the variables analyzed but sex was not. Height was predictive of worse EO SB performance (AP, ML, V, R). BMI was predictive of worse EO SB performance (AP, ML). Height was predictive of improved EC SB performance (AP, V, R). Mass was predictive of worse EC SB performance (AP, ML, V, R). BMI was predictive of improved EC SB performance (AP, ML, V, R). **CONCLUSION:** These findings indicate that AM predicts performance during SB measures with EO and EC. These results would indicate that prospective risk factor analysis studies may need to account for AM when determining if SB is a predictor of LEMSI.

2317   Board #153   June 1 11:00 AM - 12:30 PM

Cognitive Dual-tasking Augments Age-differences In Dynamic Balance While Walking On A Narrow Beam

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(No relevant relationships reported)

Beam walking is a measure of dynamic balance. We tested the idea that cognitive dual-tasking during beam walking could be an effective method to detect age-related differences in dynamic balance.**PURPOSE**: To determine the effects of age and cognitive dual-tasking on dynamic balance measured during narrow-beam walking. **METHODS**: 16 old (7M, 71.2 ±3.5 y, foot width: 9.2 ±0.5 cm, MMSE score ≥ 27) and 20 young (10M, 22.0 ±1.5 y, foot width: 9.3 ±0.8 cm) healthy volunteers participated in the study. Subjects walked on a 4-m long and 2-cm high beam with a width of 4, 8, and 12 cm, arms crossed in front of the chest. Subjects completed 3 walking trials with or without performing a calculation task. We recorded the gait trials from the subject's right side with a digital video camera at 60 Hz, and computed walking distance, step number, and average step length. Average of 3 was used for the statistical analyses. **RESULTS**: There was a Group (old, young) by beam width (4, 8, 12 cm) by task (dual task, no dual task) interaction (F = 4.0, P < 0.05). In the young group, beam-walking distance decreased similarly with descending beam width while no dual-tasking (12 cm: 3.88, 8 cm: 3.62, 4 cm: 2.49 m) and dual tasking (12-cm: 3.87, 8-cm: 3.76, 4-cm: 2.59 m). In the old group, beam-walking distance decreased substantially and most in the narrowest beam width during no dual-tasking (12-cm: 3.85, 8-cm: 3.72, 4-cm: 1.46 m) but decreased extremely in both narrower widths during dual-tasking (12-cm 3.91, 8-cm: 2.63, 4-cm 0.66 m). Further, only in the old group, the distance walked was shorter while dual-tasking compared with no dual-tasking at 8 and 4 cm beam widths (both P < 0.01). Depending on beam width, step length decreased in the young while both step number and step length decreased in the old group. **CONCLUSIONS**: Beam width but not dual-tasking affected young adults' dynamic balance whereas both beam width and dual-tasking affected substantially and interactively old adults' dynamic balance as quantified by beam distance walked and stride properties. These results suggest that, if validated and cognitive performance also quantified, dual task beam walking could be a sensitive measure of dynamic balance and motor-cognitive function in aging. Supported by JSPS KAKENHI Grant Number 16K21320.

2318   Board #154   June 1 11:00 AM - 12:30 PM

Association between Y Balance Test Performance and Noncontact Lower Extremity Injury in High School Athletes

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(No relevant relationships reported)

The Y Balance Test (YBT) is an assessment of dynamic balance that requires participants to maintain a single-leg stance while performing three lower extremity reaching tasks. Research has shown that an anterior reach distance difference ≥ 4cm and a normalized composite score (CS) ≤ 89.6% are associated with an increased risk of non-contact lower extremity (NCLE) injury in collegiate athletes; however, few studies have examined this relationship in high school (HS) athletes. **PURPOSE:** To determine the association between YBT performance (asymmetry and CS) and NCLE injury in HS athletes. **METHODS:** A total of 88 HS male athletes (16.3 ± 1.4yrs; 179.6 ± 6.9cm; 82.7 ± 15.2kg) underwent YBT prior to the start of the 2016 season: football (n=53), lacrosse (n=25), or baseball (n=10). An injury history questionnaire was completed to identify previous history of lower extremity injury. Incidence of NCLE injuries was tracked throughout the season. All participants performed 3

maximum anterior (ANT), posteromedial (PM) and posterolateral (PL) reaches on each leg. Right-to-left (R/L) side reach distance differences were calculated in cm while the CS was calculated for each leg as (ANT + PM + PL / (3 X limb length) X 100. Receiver Operating Characteristic (ROC) curves were first calculated by paring ANT, PM, and PL reach distance differences and CS with NCLE injury. Since ROC curves were unable to maximize sensitivity and specificity for any YBT measure, further analysis was conducted using cutpoints previously shown to be associated with injury. Logistic regression models adjusted for previous history of injury, sport, and age were used to examine the association between YBT measures and NCLE injury. **RESULTS:** Mean R/L reach differences for ANT, PM, and PL directions were 3.2 ± 2.9, 4.6 ± 3.5, and 4.7 ± 4.2cm, respectively. Mean CS was 86.8 ± 8.0%. No significant associations were found between NCLE injury and R/L side reach distance differences ≥ 4 cm for any direction or CS ≤ 89.6%. Though not statistically significant, the odds for sustaining a NCLE injury was 2.1 and 1.3 times higher for those with PM (95% CI = 0.45-2.11; p=0.34) or ANT (95% CI = 0.26-5.82; p=0.78) asymmetry ≥ 4cm in comparison with those with asymmetry < 4cm. **CONCLUSION:** YBT performance was not associated with the incidence of NCLE injury in this sample of HS athletes.

2319   Board #155   June 1 11:00 AM - 12:30 PM

Influence of Inflatable Anti-fatigue Mats on Center of Pressure Displacement during Prolonged Standing

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(No relevant relationships reported)

INTRODUCTION: Many workers are exposed to prolonged periods of standing, which has been linked to musculoskeletal pain, discomfort and other serious health conditions. Additionally, standing desks that do not promote regular bouts of movement may also lead to prolonged standing exposures and increase the risk for pain and discomfort. Traditional foam anti-fatigue mats have been shown to increase foot pressure displacement during prolonged standing and mitigate factors associated with pain and discomfort. However, the purported efficacy of novel inflatable anti-fatigue mats to promote foot pressure displacement has not been investigated. **PURPOSE**: The aim of this study was to evaluate the effect of inflatable anti-fatigue mats on center of pressure (COP) displacement compared to foam mat and hard surface conditions during prolonged standing. **METHODS**: 18 healthy individuals (Ht: 1.77±0.11m, Wt: 79.41±19.60kg, Age: 20.5±1.6yrs) stood for one hour on one of three floor conditions: Inflatable mat (IM, 3psi), foam mat (FM; EVA foam, 16mm), and hard surface (HS; force platform). Participants were instructed to stand normally at a standing desk and perform office work tasks with their feet inside the dimensions of the force platform. COP data were collected (1000Hz) for one minute at 0, 15, 30, 45 and 60min. COP data were normalized to foot position, and root mean square COP displacement (RMS) and velocity (RMSv) in the medial-lateral (x) and anterior-posterior (y) directions were calculated as the dependent variables (DV). For each DV a mixed ANOVA was conducted to investigate the between group (condition) and within group (time) differences. **RESULTS**: A significant main effect of condition was observed for RMSy variable [F (2, 15) = 8.24, p = .004, partial η^2 = .52]. Post-hoc tests revealed that IM (2.35±1.10mm) yielded significantly more RMSy than FM (1.13±0.47mm) (p=.016) and HS (0.92±0.32mm) (p=.005). **CONCLUSION**: The results reveal that inflatable anti-fatigue mats induce greater COP displacement in the anterior-posterior direction compared to hard surfaces and traditional foam mats during one hour of standing. Further research is needed to investigate the relationship between COP displacement and pain/discomfort measures when an inflatable mat is utilized during prolonged standing.

2320   Board #156   June 1 11:00 AM - 12:30 PM

Effects of Stroboscopic Vision on Reactive Balance

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(No relevant relationships reported)

Stroboscopic Vison (SV) is characterized by intermittent visual obstruction via the use of goggles with lenses that can switch between opaque and transparent. Recently, SV was found to disrupt balance during upright posture. However, the strength of this tool is that visual feedback can be perturbed during more complex reactive maneuvers that require environmental interaction, but no study has quantified the SV effect on reactive balance control. **PURPOSE:** To determine effects of SV on reactive balance. **METHODS:** Nineteen healthy subjects (9 males, age=22±2.2yrs, height=170.8±9.2cm, mass=68.9±14.2kg) participated. All participants performed the Motor Control Test (MCT) with and without SV (random order), created by specialized eyewear that intermittently cycled between opaque and transparent for 100 milliseconds at a time. MCT assesses reactive balance by measuring the time between onset of external perturbation and initiation of reaction to recover balance: the shorter reaction time equates to the better reactive balance. The 6 MCT tasks are completed in

a bilateral stance, and involve posture recovery after the support surface quickly moves in either anterior or posterior directions at 3 different distances: small, medium, large, which were scaled according to participant's height. Reaction time in milliseconds (ms) was averaged across three trials of all tasks for analysis. Separate two-way (2 visual conditions, 2 limbs) repeated ANOVAs were performed for each size of perturbation in either direction, with the alpha level set at <.05. **RESULTS**: There were no significant interactions across perturbation levels or directions: posterior-small (P=.99), posterior-medium (P=.42), posterior-large (P=.77), anterior-small (P=.99), anterior-medium (P=.75), anterior-large (P=.79). Similarly, there were no significant main effects for visual condition and limb (P>.05): for display of descriptive data for SV effects, posterior (SV:128.5±9.9, No-SV:131.6±12.0ms) and anterior (SV:131.6±15.9, No-SV: 130.2±16.6ms). **CONCLUSION**: SV did not significantly delay reactive balance to surface perturbations. This indicates that reactive balance is likely modulated by proprioceptive inputs and is less dependent on visual feedback than maintaining upright stance without surface perturbation.

2321   Board #157   June 1 11:00 AM - 12:30 PM

The Effects of Concussion History on Postural Control

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(No relevant relationships reported)

Postural deficits have been extensively noted in sport-related concussions. There have been postural instabilities in concussed athletes anywhere from 24 hours, up to six months. Altered postural control has been noted in those that have a history of concussion when compared to those that do not. However, there is sparse literature that assesses the effect of those with a history of concussion on postural control at the 24-48 hour mark post-concussion. **Purpose:** To investigate how postural control is affected by previous concussions in Division I athletes. **Methods:** Twenty-one Division I athletes (7 no history [NON], 7 with a previous concussion [CONC1], and 7 with 2 or more concussions [CONC2]) participated in this study. The participants performed 3 trials of quiet stance in the eyes open (EO) and eyes closed (EC) conditions for 30 seconds each on a force platform (1000 Hz). The Data were analyzed with Peak Excursion Velocity (PEV) and Root Mean Square (RMS) in the anteroposterior (AP) and mediolateral (ML) directions with a custom MATLAB software. The data was then statistically analyzed with SPSS *v.23*. Two 3x2 MANOVAs were run by direction for group comparisons. **Results:** Overall model showed significant differences for the AP direction (F(26,12) = 2.424; η^2 = 0.528; p = 0.029), but not the ML direction. Follow up assessments revealed that CONC2 (0.094 ± 0.021m*s^{-1}) swayed faster than both NON (0.057 ± 0.015m*s^{-1}; p < 0.01) and CONC1 (0.058 ± 0.011 m*s^{-1};p < 0.05) during EC. Also, NON (0.004 ± 0.001m) swayed less than CONC2 (0.006 ± 0.001m) in EC (p < 0.05). Furthermore, NON (0.003 ± 0.001m) swayed less than CONC1 (0.005 ± 0.001m) and CONC2 (0.005 ± 0.001 m; p < 0.05) in the EO condition. **Conclusion:** These data suggest that among those who have a history of 2 or more sport-related concussions (SRC) postural control is unstable when compared to those who do not have a history of SRC. The deficits in the AP direction may suggest that due to the increased degrees of freedom, the athletes that have multiple concussions may lack the ability to control their postural sway around their ankle.

2322   Board #158   June 1 11:00 AM - 12:30 PM

Both Slower Sensory Response Time and Electromechanical Delay Explain Age-related Differences in the Reactive Leg Drop

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(No relevant relationships reported)

The reactive leg drop (RLD) is a test designed to assess the rapid sensory-motor integration necessary to recover from a slip and avoid a fall. The lowest drop angle from the RLD has shown to be sensitive to age-related changes, but the underlying mechanisms for this are unknown. **Purpose:** The purpose of this study was to examine the various subcomponents of a RLD to elucidate the underlying mechanisms of age differences. **Methods:** Fourteen older adults (OA: mean 74 yr) and 15 young adults (YA: mean 24 yr) participated in a familiarization session followed immediately by a testing session. For the RLDs, each participant was seated with their leg passively raised to full extension and supported by an elastic band held by the investigator. Each participant performed the Jendrassik maneuver with the upper body while their eyes were closed. Once their leg was relaxed, the researcher would then abruptly release the band allowing the lower leg to free-fall. The participants were instructed to kick up to full extension as fast as possible once they felt the lower leg dropping. Drop angle, measured with an electro-goniometer secured to the knee, was measured

as the difference in angle between the start position and the lowest point achieved prior to kicking back up. Surface EMG was recorded from the vastus lateralis (VL) muscle during the RLDs. The RLDs were divided into 2 subcomponents: 1.) Sensory Response Time (SRT), calculated from the start of the drop (as shown in the goniometer signal) to the onset of VL EMG; and 2.) Electromechanical Delay (EMD), measured as the time between the onset of VL EMG to the time point when the leg started to move back up (i.e. onset of concentric portion). Separate independent t-tests with a Bonferroni correction (alpha: $p \leq 0.016$) were used to analyze the differences between YA and OA. **Results:** As expected, there were significant group differences in drop angle (p = 0.0006). Interestingly, both subcomponents, EMD (YA: 127.9 ± 22.8 ms, OA: 160 ± 24.9 ms; p = 0.0004) and SRT (YA: 94.9 ± 28.6 ms, OA: 140 ± 59.3 ms; p = 0.0004), showed significant differences between YA and OA. **Conclusion:** Both sensory response time and electromechanical delay are mechanisms that explained age-related differences in RLD performance. As such, both variables may separately play significant roles in slip recovery and fall avoidance.

2323   Board #159   June 1 11:00 AM - 12:30 PM

Postural Control of Voluntary and Involuntary Sway Movements in Healthy Young Adults

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(No relevant relationships reported)

PURPOSE: Control of postural sway is essential for high level sport performance. Structural and situational factors can affect involuntary sway, so a measure of voluntary sway movement sensitivity is needed. This study set out to evaluate the reliability of a novel device to measure voluntary lateral sway when standing, and to test the hypothesis that enhanced voluntary lateral sway discrimination ability is associated with better control of involuntary postural sway.
METHODS: 44 healthy young adults (21M, 23F, mean age 23.8) were recruited. During the voluntary lateral sway test, the participants were asked to discriminate between four possible medial-lateral sway extents. Movement extents were made commencing from the neutral standing position and moving either left or right until contact on a physical stop at the greater trochanter (Extent 1=4cm, Extent 2=4.5cm, Extent 3=5cm, and Extent 4=5.5cm). The involuntary postural sway control test required the participants to stand as still as possible on a force plate.
RESULTS: Voluntary lateral sway extent AUC discrimination scores (SD) for Day 1 and Day 8 were 0.679 (0.056) and 0.682 (0.040) for voluntary sway to the left, and 0.645 (0.059) and 0.644 (0.063) for sway to the right. There was no significant difference in AUC scores between Day 1 and Day 8 (p>0.05). ICC(3,1) values were 0.706 for sway to the left and 0.871 for sway to the right, representing good to excellent test-retest reliability. Left and right voluntary lateral sway discrimination scores were significantly correlated (r=0.669, p<0.01), however there was no significant relationship between voluntary lateral sway AUC scores and postural sway displacement scores (all r<0.14, p>0.05). Repeated Measures ANOVA showed significant linear deterioration in extent discriminability across the 3 pair-wise voluntary lateral sway AUC scores (F=6.094, p=0.019), indicating that as sway extent increases, discrimination sensitivity decreases.
CONCLUSIONS: Voluntary lateral sway measurement showed good to excellent test-retest reliability. Because of the low correlations, voluntary postural sway and involuntary postural sway appear to be subserved by different neural mechanisms. Voluntary lateral sway sensitivity is magnitude dependent, with greatest sensitivity in the most-used sway region.

2324   Board #160   June 1 11:00 AM - 12:30 PM

Relationship Between The Sport-like Antisaccade Task And Postural Control Following Sport-related Concussion

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(No relevant relationships reported)

Postural instability and visual system dysfunction are two of the most prevalent signs immediately following a sport-related concussion. However, little is known regarding the relationship between postural control and visual system assessments in a population of sport-related concussion. PURPOSE: To investigate the relationship between postural control center of pressure metrics and eye movements during the sport-related antisaccade task in a group of healthy matched controls (CON) and sport-related concussions (SRC) within 24-48 hours post-injury. METHODS: 37 SRC NCAA Division I athletes (23 females, 14 males) and 37 sport matched CON (23 females, 14 males) between the ages of 18-25 yrs completed two trials of the sport-like antisaccade task (SLT). During play, all participants were instructed to minimize eye movements away from a central fixed area, while simultaneously swaying in a

medial-lateral direction to direct an on screen avatar to meet the demands of the task. Monocular raw point of gaze coordinates (240Hz, Argus Science) where recorded in coordination with a synced 8 camera motion capture system (120Hz, Vicon) while raw center of pressure (1000Hz, AMTI) coordinates were collected simultaneously and further analyzed using a custom algorithm. Pearson product correlations examined the relationship between the gaze variables Resultant Distance (RD), Prosaccade Errors (PE), Mean Horizontal Velocity (HV), Microsaccades (MS) to center of pressure Root Mean Square (RMS) and Peak Velocity (PV) in the anteroposterior (AP) and mediolateral (ML) directions within each group. RESULTS: In the SRC group, a significant moderate positive correlation between RD (4.71±1.35 pixels) and RMS in the AP direction (0.011±0.002 meters) (r=0.361, p=0.028) was observed. No other significant relationships were observed between any other gaze and posture variables in the SRC group. In the CON group, no significant relationships were observed between any gaze and posture variables. CONCLUSION: These results suggest that as SRC gaze travels a greater RD, their postural sway increases in the AP direction during the SLT. However, the lack of any other significant relationship may indicate that these assessments are measuring two separate neuronal constructs.

2325   Board #161   June 1 11:00 AM - 12:30 PM

Repetitive Trunk Loading Leads to Faster Trunk Movement in Response to External Perturbation

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(No relevant relationships reported)

PURPOSE:The purpose of this study was to examine the responses of trunk movement patterns to mechanical perturbation before and after two different repetitive trunk flexion-extension loading schemes. Spatial and temporal biomechanical parameters were studied to further understand the ability of the trunk to recover from anterior directed perturbations.
METHODS: Eighteen male (n=9) and female (n=9) participants (21.7 ± 2.3 yrs, 1.75 ± 0.08 m, 72.5 ± 12.0 kg) were recruited. They participated in active and passive trunk flexion-extension loading, performed at least 7 days apart. Participants performed 60 trunk flexion-extension repetitions in each condition. Participants either volitionally moved their trunks (active condition) or relaxed during dynamometer controlled movements (passive condition). Trunk perturbations occurred before and immediately after two 30-repetition sessions. Temporal measures included perturbation onset to initial trunk movement (T_D), movement initiation to peak trunk velocity (V_P) (T_{MIPV}), and perturbation onset to V_P (T_{PPV}). Recovery measures included peak recovery velocity (V_{PR}), recovery time (T_R), velocity slope (V_S), and recovery slope (R_S). Repeated measures ANOVA was used to analyze the data. Alpha level was set at 0.05.
RESULTS: There was no sex by session interaction observed. Significant sex differences were present for T_{MIPV} (Male 112.4 ± 74.6 ms, Female 96.5 ± 44.6 ms, p < 0.02), V_{PR} (Male -12.0 ± 8.6 deg/s, Female -15.6 ±13.0 deg/s, p < 0.01), and V_S (Male -273.3 ± 215.9 deg/s/s, Female -332.4 ± 363.8 deg/s/s, p < 0.05) measures. Differences between loading sessions were present for T_{PPV} (Block1: 212.8 ± 239.6, Block2: 168.3 ± 46.7, Block3: 171.7 ± 82.1 ms, p < 0.039), and R_S (Block1: -6.65 ± 5.6, Block2: -4.76 ± 3.7, Block 3: -5.28 ± 5.2, p < 0.02).
CONCLUSIONS: Distinct sex and time-dependent modifications to the kinematics parameters are attributed to the altered mechanical behavior of the lumbar tissues as well as volitional loading by the trunk extensors. Overall, results indicate repetitive loading leads to lower resistance to perturbation, but faster recovery from perturbation although no differences to active or passive repetitive loading were observed.

2326   Board #162   June 1 11:00 AM - 12:30 PM

Construct Validity of Three Clinical Tests of Core Neuromuscular Control

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(Sponsor: Brian W. Noehren, FACSM)
(No relevant relationships reported)

PURPOSE: To determine construct validity of three clinical tests of core neuromuscular control (CNC). METHODS: 15 healthy adults (8 females, age = 26 ± 3 years, height = 1.69 ± 0.07 m, mass = 69.1 ± 10.2 kg) performed 3 clinical tests: unilateral hip bridge endurance (UHBE; mean time in position for left and right sides, 1 trial per side), double leg lowering (DLL; mean degree of hip flexion, 3 trials), and a newly developed seated trunk proprioception test using a wobble board (STP; mean time to first error, 5 trials). Biomechanical tests of static and dynamic CNC were assessed via an unstable chair on a force plate. Static control (SC) was determined by ability to maintain seated balance with eyes closed (3 trials), with performance assessed by a 95% confidence ellipse area (SC CEA; mm²) and mean velocity (SC MVEL; mm/s) of the center of pressure (COP). Dynamic control (DC) was assessed during 4 trials of a speed and accuracy target acquisition task where

targets were located along the vertices of an octagon. DC performance was assessed by precision control (movement around select targets prior to acquisition) (DC CEA; mm^2) and directional control (perpendicular distance off direct COP path to target) (DC OFF; mm). One-tailed Spearman's rho (ρ) was used to assess relationships between clinical and biomechanical variables. Interpretations of the correlations were as follows: 0.25 to 0.50 (fair) and 0.50 to 0.75 (moderate to good). **RESULTS:** Significant fair to good correlations were found between CNC clinical tests and both SC and DC biomechanical variables: SC CEA and UHBE and DLL; SC MVEL and UHBE; DC CEA and UHBE and DLL; and DC OFF and all clinical tests (Table). **CONCLUSION:** The data suggest the UHBE, DLL, and STP demonstrate construct validity for measurement of CNC, with individual clinical tests explaining 21-43% of the variance in performance on the biomechanical tests. These data provide preliminary support for the use of these clinical tests as measures of CNC.

Descriptive statistics and Spearman's ρ between clinical and biomechanical core tests					
--	--	Static Control		Dynamic Control	
--	Median $\pm$ IQR	CEA	MVEL	CEA	OFF
UHBE	24.3 $\pm$ 26.9 s	ρ = -0.50, p = 0.03	ρ = -0.61, p = 0.01	ρ = -0.56, p = 0.02	ρ = -0.47, p = 0.04
DLL	75 $\pm$ 28°	ρ = 0.49, p = 0.03	ρ = 0.04, p = 0.45	ρ = 0.66, p < 0.01	ρ = 0.54, p = 0.02
STP	3.7 $\pm$ 4.5 s	ρ = -0.43, p = 0.05	ρ = -0.11 , p = 0.35	ρ = -0.28, p = 0.15	ρ = -0.46, p = 0.04

E-35   Free Communication/Poster - **Injury**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2327   Board #163   June 1 9:30 AM - 11:00 AM

Descriptive Epidemiology Of Injuries In National Collegiate Athletic Association Water Polo: 2012/13 - 2015/16

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(No relevant relationships reported)

Water polo is a contact sport, but it also involves repetitive motion, increasing risk of overuse injuries. However, little is known about the injury incidence in water polo; previous reports have focused on specific diagnoses or a single tournament. **PURPOSE**: Describe injury incidence, common diagnoses, and outcomes in men's and women's National Collegiate Athletic Association (NCAA) water polo. **METHODS**: Athletic trainers reported injury and athlete-exposure (AE) data as part of the NCAA Injury Surveillance Program. Data for men's water polo were reported across 4 team-seasons from 2014/15 - 2015/16. Data for women's water polo were reported across 6 team-seasons from 2012/13 - 2015/16. Injuries occurred during a school-sanctioned practice or competition and required medical attention. Injury frequencies, rates per 1,000 AEs and 95% Confidence Intervals (CI) were calculated. **RESULTS**: In men's water polo, 26 injuries were reported in 9,964 AEs (2.61/1,000 AEs, 95% CI:1.61-2.61; 6.5 injuries/team/season). In women's water polo, 36 injuries were reported in 15,000 AEs (2.40/1,000 AEs, 95% CI:1.62-3.18; 6 injuries/team/season). The most common mechanism of injury for both men and women was player contact (men:13/26, women:18/36), followed by ball contact in women (9/36) and overuse in men (4/26). Among men, 23 of 25 injuries with a known outcome resulted in time loss >24 hours compared to 28/36 among women. Concussions comprised nearly half of reported women's injuries (17/36), but only 2/26 reported men's injuries were concussions. **CONCLUSIONS**: Although water polo is a contact sport with repetitive motion, preliminary data indicate that injury rates are low relative to other contact sports. Injury rates are similar between men's and women's water polo, but a larger proportion of reported women's water polo injuries are concussions. Further research is needed to determine if the reporting of injuries varies by gender or if there is a true difference in concussion incidence.
The Injury Surveillance Program is funded by the NCAA. The content of this abstract is solely the responsibility of the authors and does not necessarily represent the official views of the NCAA.

2328   Board #164   June 1 9:30 AM - 11:00 AM

Comparison of Orthopedic Injuries in American Flag Football to American Tackle Football.

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(No relevant relationships reported)

Purpose: Comparison of American Flag Football (AFF) to American Tackle Football (ATF) with respect to their injuries is not well documented. The purpose of this study was to compare Orthopedic injuries between the two sports.
Materials and Methods: A retrospective analysis of patients having injuries from AFF or ATF were identified from 2009 – 2016, using the Pearl Diver database (Pearl Diver Technologies, West Conshohocken, PA USA). International Classification of Diseases, ninth and tenth edition (ICD-9 and ICD-10) were used to query our cohort. Our query found patients having injuries in AFF (ICD-9-D-E0070;ICD-10-D-Y9361) and ATF (ICD-9-D-E0071;ICD-10-D-Y9362). The sample size was further narrowed searching for fractures of the upper (FUE) and lower extremities (FLE), dislocations (DI), sprains and strains (S&S), and concussions (CO). Statistical analysis was done between the sports.
Results: 7,896 (696 = AFF; 7,200 ATF) patients with injuries were found. 15-19 (n = 3,169) was the most injured age group in AFF and ATF. Fractures of middle or proximal phalanx/phalanges of hand was the most common FUE in AFF (n = 54), whereas fractures of distal end of radius was predominant in ATF (n = 263). Fractures of the ankle were the most common FLE in both groups (AFF = 11; ATF = 155), along with tear of the medial cartilage of the knee (AFF = 19; ATF = 170). Sprains of the cruciate ligament of the knee was commonly seen in AFF patients (n = 42); whereas in ATF patients, ankle sprains of unspecified sites were commonly seen (n = 383). Concussion rates were higher in the ATF group (n = 883) compared to AFF (n = 47), with 15-19 (n = 484) year olds comprising 54% of concussions in ATF, followed by 10- 14 years olds (n = 399, 46%). Statistical analysis found a p-value of 0.01 when comparing injuries between AFF and ATF.
Conclusion: Appropriate protection such as ACL injury prevention program, ankle taping or bracing, and training should be given when engaging in either sport. Children and adolescents interested in seeking to play either AFF or ATF should: be properly equipped, perform an injury prevention program prior to play, seek appropriate medical counseling prior to and after injury, and be educated of the potential sequelae from playing these sports.

2329   Board #165   June 1 9:30 AM - 11:00 AM

Sport-related Injuries In Elite Para Powerlifters: A Prospective Analysis Of 1410 Athlete-days At The Rio 2016 Summer Paralympic Games

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(No relevant relationships reported)

PURPOSE: To describe the injury epidemiology of Para powerlifters during the Rio 2016 summer Paralympic Games. METHODS: This cohort study was a sub-analysis of the comprehensive WEB-IISS study (WEB-based Injury and Illness Surveillance System) carried out at the Rio 2016 Paralympic Games by the International Paralympic Committee (IPC) Medical Committee. The WEB-IISS survey was administered to the Chief Medical Officers of each Para powerlifting federation daily. Injury data was prospectively collected and securely housed by the IPC. The main outcome measures were injury incidence rate (IR; number of injuries per 1000 athlete-days) and injury incidence proportion (IP; number of injuries per 100 athletes), assessed against demographic data, type of injury, and anatomic location of injury. RESULTS: 141 athletes participated in the 7-day Para powerlifting competition period, accounting for 1410 athlete competition days of exposure. Overall IR was 15.6/1000 athlete days (95% CI; 9.1 - 22.1) while IP was 15.6 injuries/100 athletes. Most injuries were chronic overuse in nature (63.6%). The most commonly injured anatomical region was the shoulder (45.5%; IR=10.1), followed by the neck (13.6%; IR=3.0), and the chest and elbow (each 9.1%; IR=2.0). There were no significant differences in injury patterns between male and female powerlifters [IRR=0.8 (95% CI; 0.3-2.0)]. The oldest age group (age 35-75) had the highest IR [IR=21.8 (95% CI; 11.4-32.2), followed by the middle age group (age 26-34) [IR=10.0 (95% CI; 1.2-18.8)]. CONCLUSIONS: Data from this study indicate that 1. IRs were lower than those reported at the London 2012 Paralympic Games, 2. chronic overuse injuries, as opposed to acute traumatic, remain most common among elite Para powerlifters at Games-time, 3. the shoulder remains the most commonly injured anatomical site, 4. age was a significant risk factor for injury in Rio, which was not shown in London. Comparative data can be collected at future Games' settings and in combination with current data, used to inform injury prevention programs. As upper extremity injuries impact Para powerlifters' ability

to participate in sport as well as activities of daily living, this study helps open an important door for the development of injury prevention protocols in this high-risk Para sport.

2330   Board #166   June 1 9:30 AM - 11:00 AM

Injuries Related To Fitness Trends: Is CrossFit The Newest Contributor?

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(No relevant relationships reported)

Purpose: Over the past decade, high intensity interval training (HIIT) and high intensity power training (HIPT) have become popularized by programs like CrossFit. The objective of this study was to determine injury incidence coinciding with increased popularity of CrossFit and identify ways physicians can advise patients prior to participation.

Methods: The National Electronic Injury Surveillance System (NEISS) was queried from 2007 through 2016 to estimate injury incidence related to exercise equipment most frequently utilized in programs like CrossFit. Injury incidences were calculated and compared between 2007-2011 and 2012-2016. Over the same time period, Google Trends was used to determine the popularity of CrossFit

Results: There were an estimated 3,988,903 injuries, mostly in males (58%) aged 20 to 39 years (39%). Most commonly, injuries were in the lower extremity (35.3%), trunk (28.5%), and upper extremity (19.6%). From 2012-2016 versus 2007-2011, there was a 144% increase in all injuries including a 159% increase in trunk injuries, a 137% increase in lower extremity injuries, and a 132% increase in upper extremity injuries. There was also a 127% increase in lower extremity strains and a 124% increase in upper extremity strains. Additionally, knee and ankle sprains increased 125%. These increases in injury incidence correlated with a 203% increase in CrossFit interest.

Conclusion: Given increases in injuries related to high-intensity workout programs like CrossFit, athletes should be educated on how to minimize preventable injuries. With particularly high rates of knee and ankle sprains and strains, neuromuscular training and pre-strengthening programs as previously demonstrated among young athletes may be particularly worthwhile in prospective participants. Physicians must be up to date with current fitness trends to best advise patients appropriately.
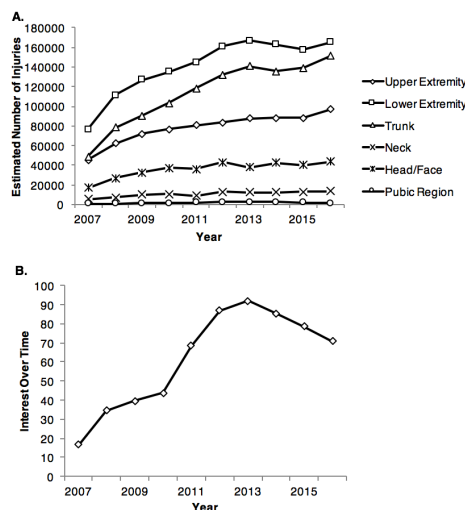
Figure 1. 1A shows the estimated number of injuries by body region caused by exercise, exercise equipment, and weight lifting by year recorded by the National Electronic Injury Surveillance System from 2007 through 2016. 1B shows the popularity of CrossFit by year using Google Trends data from 2007 to 2016.

2331   Board #167   June 1 9:30 AM - 11:00 AM

Epidemiology Of Upper Extremity Injuries In The National Collegiate Athletic Association: 2009/10 - 2015/16

Christy Collins, Erin B. Wasserman. *Datalys Center for Sports Injury Research and Prevention, Inc., Indianapolis, IN.*

(No relevant relationships reported)

Participation in sports places athletes at risk of sustaining an upper extremity injury. These injuries may be acute, resulting from a single traumatic event, or associated with repetitive motions and overuse. Previous studies have examined upper extremity injuries; however, most have focused on specific sports, body parts, diagnoses, or mechanisms of injury.

PURPOSE: To describe the epidemiology of upper extremity injuries in National Collegiate Athletic Association (NCAA) sports.

METHODS: Athletic trainers participating in the NCAA Injury Surveillance Program reported athlete-exposure (AE) and injury data for 25 collegiate sports during the 2009/10-2015/16 academic years. Upper extremity injuries, including those to the shoulder/clavicle, upper arm, elbow, forearm, wrist, and hand/finger, occurred during a school-sanctioned practice or competition, and required medical attention. Injury frequencies, rates per 1,000 AEs and 95% Confidence Intervals (CI) were calculated.

RESULTS: The overall rate of upper extremity injuries was 1.07 (95% CI:1.04-1.10) per 1,000 AEs. Men's ice hockey (2.88; 95% CI:2.73-3.04), wrestling (2.64; 95% CI:2.35-2.94), and football (2.11; 95% CI:2.03-2.18) had the highest rates while men's (0.00) and women's (0.02) cross country had the lowest. Overall, 57.9% of upper extremity injuries occurred during practice. Nearly half (46.6%) were to the shoulder/clavicle, followed by hand/finger (24.8%). The most common diagnoses were sprain (27.7%) and strain (18.4%). Player contact (36.9%) and overuse (18.6%) were the most common mechanisms. 17.7% of injuries resulted in a time loss of 7 or more days, and 10.6% were recurrent.

CONCLUSIONS: While upper extremity injuries occur across a wide variety of collegiate sports in both competition and practice, the sports with the highest rate of injury were contact/collision sports. Many upper extremity injuries were not severe; however, nearly one in five kept the athlete out of play for a week or more. More research is needed to determine how to effectively reduce the incidence of upper extremity injuries among all collegiate athletes. The Injury Surveillance Program is funded by the NCAA. The content of this abstract is solely the responsibility of the authors and does not necessarily represent the official views of the NCAA.

2332   Board #168   June 1 9:30 AM - 11:00 AM

Ten-year Trends In Major Trauma Or Death Resulting From Sport And Recreation In Victoria, Australia

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(No relevant relationships reported)

Sports injuries which result in major trauma or death are associated with significant health-care burden and societal costs. Understanding changes in injury trends, and their drivers, is needed to implement policy aimed at risk reduction and injury prevention. To date, there has been no population-level reporting on trends in serious sport and recreation injuries anywhere in Australia over such an extended period, nor any studies of this length capturing comprehensive data on all sports-related major trauma internationally. **PURPOSE**: The aim of this study was to describe the incidence of sport and active recreation injuries resulting in major trauma or death for a 10-year period from July 2005-June 2015 in Victoria, Australia. **METHODS**: All sport and active recreation-related major trauma cases and deaths in Victoria, a state of Australia, were extracted from the population-level Victorian State Trauma Registry and the National Coroners Information System, over a 10-year period. Poisson regression analysis was used to examine trends in the incidence of sport and active recreation-related major trauma and death.

RESULTS: There were 2,847 non-fatal major trauma cases and 614 deaths (including 96 in-hospital deaths) over the 10-year study period. The highest frequencies of major trauma cases and deaths were in cycling, motor sports and equestrian activities. The participation-adjusted major trauma and death rate was 12.2 per 100,000 participants per year. There was an 8% increase in the rate of major trauma (IRR=1.08, 95%CI, 1.06, 1.10; p<0.001), and a 7% decrease in the death rate (IRR=0.93, 95%CI: 0.90, 0.97; p<0.001). Out of all sports, there were significant increases in the rate of major trauma (including deaths) in equestrian activities, motor sports and cycling.

CONCLUSIONS: The rate of major trauma due to participation in sport and recreation has increased over the past 10 years in Victoria, which was largely attributable to equestrian activities, motor sports and cycling. Study findings highlight the need to prioritize investment in the prevention of trauma in these activities.

2333   Board #169   June 1 9:30 AM - 11:00 AM

Epidemiology of Lower Extremity Musculoskeletal Injury in US High School Girls' Soccer and Basketball

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(No relevant relationships reported)

Sports with rapid directional changes and the potential for player contact (e.g. soccer and basketball) have relatively high risk of lower extremity (LE) musculoskeletal

(MSK) injury. Effectively reducing the risk of LE MSK injury in high school girls' soccer and basketball may require sport-specific interventions, but minimal research has compared patterns of injury in these sports.

PURPOSE: Describe the epidemiology of LE MSK injuries in high school girls' soccer and basketball athletes.

METHODS: Data from the 2012/2013 through 2015/2016 academic years were collected from High School Reporting Information Online (HS-RIO). Certified athletic trainers (ATs) from participating high schools reported injury incidence and athlete exposures (AE). Injury was defined as an event causing an athlete to seek care from an AT or physician and resulting in at least one missed practice or competition. AE was defined as one athlete's participation in one practice or competition. Injury rates per 1000AE were calculated. Injury proportions were calculated to assess distributions of injuries by body part, diagnosis, injury mechanism, and time loss. Injury rate ratios (IRR) and injury proportion ratios (IPR) were calculated to compare differences between sports. IRRs and IPRs with 95% confidence intervals (CI) not including "1.00" were considered statistically significant.

RESULTS: The injury rate was higher in soccer than basketball (IRR = 1.31, 95%CI = 1.19, 1.44). The most common injuries for both sports were sprains and strains (73.86% basketball; 68.96% soccer); most injuries affected the ankle (47.20% basketball; 35.03% soccer) and knee (32.64% basketball; 29.38% soccer). The proportion of injuries affecting the hip (IPR = 1.74, 95%CI = 1.06, 2.88) or thigh/upper leg (IPR = 1.97, 95%CI = 1.44, 2.70) was greater in soccer than basketball. Injuries for both sports were most commonly caused by player contact (27.70% basketball; 40.80% soccer) or noncontact mechanisms (41.35% basketball; 34.15% soccer).

CONCLUSIONS: Injury patterns were similar between sports suggesting both sports should emphasize preventing sprains and strains affecting the ankle and knee, specifically those resulting from player contact or noncontact mechanisms. Additional efforts are needed to prevent hip and thigh/upper leg injuries in soccer.

2334   Board #170   June 1 9:30 AM - 11:00 AM

Opiate Knowledge Among High School Athletes

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(No relevant relationships reported)

Opiate use and abuse amongst adolescents has become an epidemic in the United States. Use of prescription pain medication is of particular concern for adolescent athletes due to their propensity for injury and need for pain control either acutely or post-surgically.

Purpose: To evaluate changes in opiate knowledge of high school (HS) athletes after a national opiate education program.

Methods: Fall (HS) sport teams separately attended 45-min, multi-media presentations, focused on opiate education. Athletes completed an anonymous survey before and after the educational program. Paired T-tests were performed.

Results: Overall, 491 of 504 HS athletes completed surveys (males= 310 and females=181). HS athletes represented 9-12 grades (n=126, 152, 115, and 111, respectively). Participating sports teams included football (n=174, M), cross-country (n=81, M&F), soccer (n=65, M), pompon (n=64, F), swimming (n=50, F), tennis (n=31, M), volleyball (n=30, F), and golf (n=9, F). During the last year, 42% of athletes reported an injury that prevented them from playing sports, 46% of athletes had taken a pain medication, and 41% have taken pain medication prior to a game. Prior to the program, 72%, 63%, 57%, and 78% of HS athletes correctly identified codeine, Norco, tramadol and heroin, respectively, as opiates, while 34%, 41%, and 44%, incorrectly classified marijuana, Tylenol, and Molly (street name for Methylenedioxymethamphetamine, or MDMA), respectively, as opiates. After the program, athletes had significantly improved their knowledge in recognition of common opiates (p<0.01) and opiate overdose symptoms (p<0.01). Prior to the program, 32% (SEM 2.4%) felt that they were aware of community resources available for those who misuse opiates vs. 88% (SEM 1.5%) (p<0.01) after the program.

Conclusion: HS athletes attending a brief opiate educational program significantly improved their knowledge in recognizing opiates and overdose symptoms, as well as community resources available for those who misuse opiates. Our results suggest, that increasing knowledge of opiates in teen athletes is critical to a successful prevention strategy.

2335   Board #171   June 1 9:30 AM - 11:00 AM

Anterior Cruciate Ligament Injuries in Missouri High School Male and Female Soccer Athletes

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(No relevant relationships reported)

Purpose: To investigate the incidence of anterior cruciate ligament (ACL) injury in Missouri High School male and female soccer players during the 2011-2013 seasons, using a retrospective method for calculating athletic exposures. **Methods**: A web-based survey was created and sent to every high school soccer coach in Missouri using the Missouri State High School Activities Association (MSHSAA) database. The survey investigated the number of athletic exposures over the course of the season and number of ACL injuries for each team in both the 2011-2012 and 2012-2013 seasons. The primary outcome measure was ACL injuries. Secondary endpoints included specific characteristics of each ACL injury including contact or non-contact, position, practice or game, school grade, and playing surface. **Results**: During the study period 330,062 athletic exposures (163,511 male and 166,551 female) were reported. 36 ACL tears (28 female and 8 male) occurred. ACL injury rates were calculated per 1000 estimated athletic exposures: Female: total, 0.17; match, 0.47; practice, 0.02. Male: total, 0.05; match, 0.18; practice, 0. Female high school soccer athletes had a 3.4 times greater risk of ACL tear than male high school soccer athletes. Female athletes were 27x more likely to tear their ACL in a match compared to practice. **Conclusions**: Female high school soccer athletes had an increased susceptibility to ACL tear compared to male athletes. For both female and male athletes, a large majority of ACL tears occurred during matches.

2336   Board #172   June 1 9:30 AM - 11:00 AM

Prevalence Of Musculoskeletal Injuries And Dysfunction Amongst Physical Education Teachers In Singapore

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(No relevant relationships reported)

Occupational demands in PE teachers (PETs) require them to cope with heavy workloads, subject their bodies to impact-loading activities like running and jumping, carrying loads, asymmetrical and stressful postural techniques. This subjects the PETs to a high risk of musculoskeletal (MSK) injuries and dysfunction-related problems that can affect PE teaching and quality-of-life in the long-term.**PURPOSE**: To determine the prevalence of injuries and MSK dysfunction in PETs in Singapore.

METHODS: A retrospective injury registration questionnaire and Short Musculoskeletal Function Assessment (SMFA) was used. 152 full-time PETs (116 male; 36 female) participated in the study.

RESULTS: 66 PETs reported 73 injuries over a 6-month recall period. In both males and females, knee was the most commonly injured body part, followed by the lower back and shoulder in males and foot and the patella in females. 21 (28.7%) new injuries, 22 (30%) recurrences of an old injury and 27 (36.9%) aggravations of pre-existing injuries were documented. Incomplete ligament sprain followed by muscle tendon strain were the most common injuries. 48 (65.7%) injuries did not lead to any absence from work, 11 injuries (15%) led to 1-2 days of absence while 14 cases (19.1%) led to 3-15 days of absence. 51 injuries did not affect teaching PE, while 15 injuries lead to some PE teaching time loss (range, 1-10 days). In five cases, the injuries were severe enough to require surgery and these PETs were unable to teach PE for the entire term. 31 PETs reported to be continuing to teach PE with some pain and discomfort due to effect of injuries.

On the SMFA, 132 PETs reported sub-optimal functional index while 112 reported sub-optimal bothersome index. 95 PETs had sub-optimal standardized mobility score, 132 had sub-optimal standardized functional score and 112 PETs had sub-optimal standardized bothersome score. Scores on all three scales were comparable between males and females. However, MSK dysfunction was more prevalent in primary PETs compared to secondary school PETs.

CONCLUSIONS: There is a high prevalence of injuries and MSK dysfunction amongst PETs in Singapore. Knee, shoulder and foot are at the highest risk of injury. This can adversely affect their PE teaching capacities as well as quality of life in both short and long-term.

2337   Board #173   June 1 9:30 AM - 11:00 AM

Evaluating the Concussed Athlete: Co-Occurring Psychiatric Conditions Predict Psychological Function and Recovery

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(No relevant relationships reported)

More than 35 million American children ages 5 to 18 and approximately 400,000 collegiate athletes engage in organized sports. Sport participation bears a risk of traumatic brain injury (TBI). The annual incidence of sport-related TBI exceeds 1.5 million and is increasing among youth athletes. Many sufferers of TBI present with co-occurring psychiatric conditions, such as anxiety, depression, and learning disabilities. The effect of these conditions on diagnosis and prognosis remains largely unexplored. **PURPOSE:** To assess the effect of co-occurring conditions on TBI symptoms in youth athletes. **METHODS:** We analyzed 80 student-athletes (primary education through college) who underwent comprehensive evaluation following a TBI. Medical histories were collected, neuropsychological tests were conducted, and co-occurring

psychiatric conditions were diagnosed. Co-occurring conditions were 1) attention deficit and hyperactivity disorders, 2) anxiety disorders, 3) depression and mood disorders, 4) adjustment disorders, and 5) learning disabilities. Tests of behavior and cognitive function were 1) the ImPACT test, and 2) the Behavior Assessment System for Children 2nd Edition (BASC). Linear regressions tested the effect of co-occurring conditions on psychological and behavioral outcomes. **RESULTS:** Subjects were 16.0 ± 2.6 years of age, 56.3% were male, and 72.5% were diagnosed with ≥1 co-occurring condition. Linear regressions revealed the number of diagnoses to predict poorer visual motor speed (p=0.031), poorer reaction time (p=0.010), and, summarizing speed and accuracy indices, poorer performance on the cognitive efficiency index (p=0.043). The number of co-occurring conditions was also a significant predictor (p<0.05) of 13 individual BASC categories and all BASC composite assessments, indicating poorer behaviors and attitudes. **CONCLUSION:** TBI associates with acute neural deficits and psychological changes. We found that co-occurring psychiatric diagnoses may compound these complications in youth athletes. When appraising the severity of a TBI in this population, a comprehensive psychiatric evaluation may be warranted to understand and accurately characterize the scope and prognosis of the condition.

2338   Board #174   June 1 9:30 AM - 11:00 AM

Seasonal Distribution Of Cold Weather Injuries In The U.s. Army

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(No relevant relationships reported)

The incidence of and risk factors for cold weather injury (CWI) in the US Army have been well characterized. Unlike the 'heat season,' when the risk of heat illness is highest and application of risk mitigation procedures is mandatory, there is no definition of the 'cold season' and the proportion of CWI that occur outside of a defined cold season is unknown. **PURPOSE**: To identify the cold season and to determine the within-year seasonal distribution of CWI at select Army installations. **METHODS**: The 10 US Army installations with the highest frequency of CWI from 1 July 2008-30 June 2013 were identified and used for analysis. In- and out-patient CWI data (ICD-9-CM codes 991.0-991.9, first, second or third diagnoses only) were obtained from the Defense Medical Surveillance System. Piecewise regression analysis was utilized to determine the critical cut points at which trends in CWI significantly increased or decreased, indicating the start and end, respectively, of the cold season. The proportional distribution of EHI within the cold season, overall and by installation, was determined. **RESULTS**: During the study period there were 1,012 CWI and the overall rate was 0.79 per 10,000 person-months. The highest rate occurred during the month of February (2.16 per 10,000 person-months) and the installation with the highest rate was Ft Drum, NY (5.40 per 10,000 person-months). There was at least one CWI during every week of the year during the 5 year study period. Piecewise regression analyses indicated that on average the cold season started during week 14 (Sept 30) and ended during week 39 (March 24). Using this definition, 83.2% (842/2012) of CWI occurred during the cold season. The longest cold season occurred at Ft Wainwright, AK (34 weeks) and the shortest at Ft Carson, CO (17 weeks), illustrating the considerable variability between locations. **CONCLUSIONS**: Our data suggest that the risk of CWI exists year round at select Army installations, though further research sub-grouped by type of CWI is warranted. Based on the piecewise regression analysis, we recommend that the 'cold season' starts 1 October and continues through March, as ~83% of CWI occurred during this period.

2339   Board #175   June 1 9:30 AM - 11:00 AM

Incidence and Severity of Game-Related College Football Thoracoabdominal Injuries on Artificial versus Natural Grass

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Reported Relationships: T.M. Gustaveson: *Contracted Research - Including Principle Investigator; Partial support by FieldTurf USA.*

In the past, serious injuries have been attributed to playing on artificial turf. Newer generations of artificial turf, however, have been developed to duplicate the playing characteristics of natural grass. No long-term studies have compared articular and muscle trauma of the thoracoabdominal region between the two surfaces. **PURPOSE:** To quantify incidence and severity of game-related thoracoabdominal collegiate football injuries on artificial turf vs natural grass. **METHODS:** A total of 24 universities were evaluated over 8 competitive seasons for injury incidence rates (IIRs) across injury severity, injury category, injury mechanism and situation, primary type of injury, anatomical location, type of tissue injured, elective imaging and surgical procedures, and turf age. **RESULTS:** Of the 1,237 collegiate games documented, 628 (50.8%) were played on artificial turf vs 609 (49.2%) played on natural grass. A total of 379 thoracoabdominal injuries were reported with 147 (38.8%) occurring on

artificial turf, and 232 (61.2%) on natural grass. MANOVAs per 10 games indicated a significant playing surface effect by injury severity ($F_{2,379}$ = 7.505; P = .001), primary type of injury ($F_{12,379}$ = 4.412; P = .000), tissue type ($F_{3,379}$ = 9.412; P = .000), elective imaging and surgical procedures ($F_{3,379}$ = 3.517; P = .007), and turf age ($F_{2,379}$ = 91.093; P = .000), but not by injury category ($F_{3,379}$ = 2.175; P = .089), injury mechanism ($F_{3,379}$ = 1.439; P = .133), or injury situation ($F_{8,379}$ = 1.329; P = .181). Univariate analyses indicated significantly lower (P = .05 - .0001) IIRs across severity, both in 1st degree, 2.1 (95% CI, 1.8-2.5) vs 2.9 (2.5-3.2), and 2nd degree IIRs, 0.1 (95% CI, 0.1-0.2) vs 0.7 (0.5-0.9); defensive positions, 0.8 (95% CI, 0.6-1.1) vs 1.4 (1.2-1.7); contusions, 1.3 (95% CI, 1.1-1.6) vs 2.0 (1.7-2.3); muscle, 2.0 (95% CI, 1.7-2.3) vs 3.0 (2.6-3.4); MRI, 0.1 (95% CI, 0.0-0.2) vs 0.2 (0.1-0.4); and turf lasting 4-7 years, 0.8 (95% CI, 0.6-1.1) vs 0.9 (0.7-1.2), and 8+ years 0.1 (95% CI, 0.1-0.2) vs 0.5 (0.4-0.8) when comparing artificial turf vs natural grass, respectively. **CONCLUSION:** Since minimal differences existed between artificial turf and natural grass over an 8-year period of competitive play, artificial turf is a practical alternative when comparing thoracoabdominal injuries in collegiate football.

2340   Board #176   June 1 9:30 AM - 11:00 AM

Racquet Sport-Related Injuries Treated in United States Emergency Departments, 2007-2016

Andrew McBride, Morteza Khodaee, 80045, FACSM. *University of Colorado - Denver, Aurora, CO.* (Sponsor: Morteza Khodaee, FACSM)

(No relevant relationships reported)

Title: Racquet Sport-Related Injuries Treated in United States Emergency Departments, 2007-2016
Authors: Andrew J. McBride, Morteza Khodaee, FACSM
Institutions: University of Colorado-Denver
Purpose: Racquet sports, especially tennis, have grown in popularity in the United States. There are limited studies analyzing injuries in badminton, squash, and other lesser-known racquet sports. We aimed to analyze the injury pattern in all racquet sports that resulted in the United States emergency department (USED) visits.
Methods: This was a retrospective analysis of National Electronic Injury Surveillance System data on racquet-sport related injuries that presented to the USEDs for the past 10 years.
Results: From 2007-2016, there were 8,024 cases of racquet-sports related injuries that presented to USEDs. The majority of these injuries were in men (61%). Caucasians had the highest percentage of injuries (47%) followed by African Americans (7%) and Asian Americans (3%). Sprain were the most common types of injuries (34%) followed by fracture (13%) and contusion/abrasion (12%) The body part most frequently injured was the ankle at 13% followed by facial injuries at 10%. Over 93% of injuries were treated and released from the USED while 5% of patients were admitted for hospitalization. Approximately two third of injuries occurred at a place of recreation or sport. Tennis was the most common sport of injury at 68% followed by one of squash, racquetball and paddleball at 17%. The summer months were the most common months of injury and adolescence was the most common age group injured. Women tennis players (75% compared to 63% in men) and men squash/racquetball/paddleball players (22% compared to 9% in women) were more likely to present to the USED with injuries.
Conclusion: Racquet sport-related injuries are varied in their presentation and body part involvement. Gender differences were seen in injury rates for tennis and squash/racquetball/paddleball. Tennis-related injuries make up two-thirds of racquet sport-related injuries making knowledge of other racquet sport injuries important.

2341   Board #177   June 1 9:30 AM - 11:00 AM

Incident and Severity of Lower Leg NCAA Women's Soccer Trauma on Artificial versus Natural Grass

Sarah Friend, Michael C. Meyers, FACSM. *Idaho State University, Pocatello, ID.* (Sponsor: Michael Meyers, FACSM)

Reported Relationships: S. Friend: *Contracted Research - Including Principle Investigator; Partial support by FieldTurf USA.*

Recently, artificial turf has been developed to duplicate the playing characteristics of natural grass. No long-term studies have compared game-related, NCAA women's soccer musculoskeletal trauma of the lower leg between surfaces. **PURPOSE:** To quantify incidence, mechanisms, and severity of game-related lower leg NCAA women's soccer injuries on artificial turf vs natural grass. **METHODS:** 13 universities were evaluated over a 5-year period for injury incidence rates (IIR) across injury category, severity of injury, primary type of injury, elective imaging/ surgery, type of tissue injured, field conditions, position played at time of injury, turf age, anatomical location, injury mechanism, and injury situation. **RESULTS:** In sum, 797 collegiate games were evaluated for women's soccer injuries sustained on artificial turf or natural grass, with 355 games (45%) played on artificial turf and 442 games (55%) played on natural grass. A total of 245 injuries were documented, with 91 occurring on artificial turf and, 154 occurring on natural grass. MANOVAs per 10 games indicated a significant playing surface effect by severity of injury ($F_{2,242}$ = 7.865; P < .001), field

conditions ($F_{3,241}$ = 6.862; P <.0001), skill position at time of injury ($F_{9,235}$ = 2.821; P = .002), turf age ($F_{3,241}$ = 13.612; P < .0001), injury situation ($F_{8,236}$ = 2.411; P = .006), but not by primary type of injury ($F_{87,238}$ = 0.997; P = .445), elective imaging/ surgical ($F_{34,239}$ = 4.183; P = .382), type of tissue injured ($F_{4,240}$ = 1.102; P=.333), lower extremity-joint/ muscle ($F_{10,234}$ = 0.810; P = .620)/ ($F_{3,231}$ = 0.331; P = .857). Post hoc analyses indicated significant IIRs (P =.05 =.001) across first degree, second degree, 0.0 (95% CI, 0.0-0.0) vs 0.1 (95% CI, 0.1-0.1); no precipitation/ dry field, 0.2 (95% CI, 0.2-0.3) vs 0.3 (95% CI, 0.2-0.3); center back/ sweeper/ libero, 0.0 (95% CI, 0.0-0.1) vs 0.1 (95% CI, 0.0-0.1); dual/ deep-lying striker, 0.0 (95% CI, 0.0-0.0) vs 0.0 (95% CI, 0.0-0.1); turf age of 1-3 yrs, 0.1 (95% CI, 0.1-0.1) vs 0.1 (95% CI, 0.1-0.1); and turf age of 8+ yrs 0.0, (95% CI 0.0-0.0) vs 0.1 (95% CI, 0.0-0.1). **CONCLUSION:** Although similarities existed between artificial turf and natural grass during competitive play, artificial turf is a practical alternative for natural grass when comparing this specific artificial surface and level of play.

2342   Board #178   June 1 9:30 AM - 11:00 AM

Head Impacts In Female Professional Mixed Martial Arts

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(No relevant relationships reported)

Mixed martial arts (MMA) is a full-contact combat sport, which in recent years has experienced an increase in participation of female athletes. Previous research has indicated knockouts (KO) and technical knockouts (TKO), which are typically associated with head trauma, are frequent occurrences (46.2% of match outcomes are determined by KO and TKO) in male MMA competitions. However, the occurrences and context of KOs and TKOs have not been investigated in female MMA competitions. **PURPOSE**: To characterize the occurrences and context of KOs and TKOs in female professional MMA competition. **METHODS**: Publicly available score card and video data of female Ultimate Fighting Championship (UFC) competitions that occurred between November 2014 (UFC 180) and July 2016 (UFC 200) were analyzed. Score card information from www.ufc.com and www.sherdog.com was used to determine the occurrences of KOs and TKOs of female UFC fights. The MMA Knockout Tool was used to analyze video of the female UFC fights that ended in KO or TKO. The MMA Knockout Tool allows for coding of the context of a KO and TKO as well as coding the number of head and body strikes sustained by the loser in the 30 s prior to the KO or TKO. **RESULTS**: Two out of a total 29 matches ended in KO while 4 ended in TKO due to repetitive strikes. One other TKO was due to a musculoskeletal injury and was not included in the analysis. The combined incidence of KOs and TKOs from head trauma was 103.4 per 1000 athlete exposures (AEs). Video analysis of the KOs and TKOs revealed that in 5 of the 6 KO/TKOs the loser was standing and not clinched with the winner, and in 1 fight the loser was on the ground. In the 30 s prior to TKO the loser sustained a mean of 15.5 ± 7.6 impacts to the head with a mean 8.0 ± 3.6 strikes to the head occurring in the final 10 s. The head regions that sustained the greatest number of strikes within the 30 s prior to KO or TKO were the mandibular and temporal regions, which received 34.7 and 30.7 % of all head strikes, respectively. **CONCLUSIONS**: KO and TKO events may represent a conservative estimate of concussive events in MMA competition. The incidence of 103.4 TKO/KOs per 1000 AEs is less than that observed for professional female boxing and male MMA competitions. Furthermore, our data suggest that engaging in a standup versus ground fight is associated with greater incidences of KO/TKOs.

2343   Board #179   June 1 9:30 AM - 11:00 AM

Injuries Resulting From Checking In United States High School Boy's Lacrosse, 2008/09-2015/16 School Years

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(No relevant relationships reported)

High school boys' lacrosse allows for intentional contact through body and stick checking. Recently, rules further limiting body checking were implemented to reduce injury risk. Yet, there is limited research focused on the epidemiology of injuries resulting from being checked.**PURPOSE:** Describe the epidemiology of injuries resulting from being body and stick checked in high school boys' lacrosse during the 2008/09-2015/16 school years. **METHODS:** Athletic Trainers (ATs) collected injury and athlete-exposure (AE) data via the High School Reporting Information Online system. Injury was defined as: (1) occurring from participation in a school-sanctioned completion or practice; (2) requiring medical attention by an AT or physician; and (3) resulting in time loss of at least 24 hours (although all concussions, dental injuries, fractures were included). Analyses were restricted to injuries occurring from being

body and stick checked. Injury counts, rates per 10,000AE, and injury rate ratios (IRR) with 95% confidence intervals (CI) were reported. Linear regression estimated annual average changes in injury rates. **RESULTS**: ATs reported 160 "body checked" and 137 "stick checked" injuries. These injuries occurred during 933,165AE, leading to injury rates of 1.71 and 1.47/10,000AE, respectively. A decrease in injury rate was found for "body checked" injuries (annual average change of -0.18/10,000AE; 95%CI: -0.23, -0.13; P<0.001) but not for "stick checked" injuries (annual average change of 0.02/10,000AE; 95%CI: -0.07, 0.11; P=0.68). The injury rate was higher in competitions than practices for both "body checked" (4.35 vs. 0.56/10,000AE; IRR=7.82; 95%CI: 5.40, 11.34) and "stick checked" injuries (3.40 vs. 0.62/10,000AE; IRR=5.51; 95%CI: 3.81, 7.96). Most "body checked" injuries were to the head/face (47.5%) and shoulder (16.9%), and diagnosed as concussions (43.8%). In contrast, most "stick checked" injuries were to the hand/wrist (29.2%) and head/face (21.2%), and diagnosed as fractures (32.8%) and contusions (27.7%). **CONCLUSION:** "Body checked" and "stick checked" injuries occurred at higher rates in competitions than practices, but varied in body part and diagnosis distributions. Reductions in the "body checked" injury rate across time may be associated with rule changes limiting body checking.

2344   Board #180   June 1 9:30 AM - 11:00 AM

The Epidemiology Of Dii Baseball, Basketball, And Soccer Injuries And Potential Preventive Strategies

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(No relevant relationships reported)

Baseball (B), basketball (K), and soccer (S) are among the top-five sports causing injury in males. To date, no published studies have prospectively investigated the epidemiology of sporting injuries. **PURPOSE:** To design and implement a prospective injury surveillance system to describe B, K, and S injuries, and devise potential preventive measures to help reduce injury risk. **METHODS:** Participants were recruited from Bloomsburg University's B, K, and S teams. Sport-specific injury reporting forms were developed, and injury details were recorded by athletic trainers. Information was collected on the injury and circumstances surrounding the injury, with injury defined as "damage to the body that occurs as a result of competing, practicing and/or participating in an athletic activity". **RESULTS:** The B, K, and S teams consisted of 32, 11, and 25 players respectively. There were 73 injuries sustained (B = 34, K = 12, S = 27), with significant differences (p ≤ 0.001) in all injury parameters between sports. Excluding those who were unsure, in all sports, soft tissue injuries were most common (66.6%), with B having more non-contact injuries, and K and S having more contact injuries (p ≤ 0.001). There were similar numbers of head and torso injuries among sports, however B had more upper extremity injuries (p ≤ 0.05), while K and S had more lower extremity injuries (p ≤ 0.001). B and K had more competition injuries (p ≤ 0.05), while S had more training injuries (p ≤ 0.001). **CONCLUSION:** Due to the high injury prevalence, this study reinforces the need for injury prevention strategies, and further highlights that all sports require unique injury prevention strategies, as well as tailoring these strategies to players' positions. For all sports, undertaking a suitable warm-up, evaluating and correcting improper mechanics, and enforcing competition rules may reduce injury risk. Proper conditioning to provide strength and flexibility to the lower extremities in K and S, and upper extremities in B also seems warranted. In S specifically, modifying training intensities and investigating footwear worn and surfaces where games and trainings are conducted might be useful. Whereas in K, plyometric training could be used to improve landing techniques. Lastly, in B, proper preseason conditioning, particularly in pitchers should be investigated.

2345   Board #181   June 1 9:30 AM - 11:00 AM

Descriptive Epidemiology of Injuries AmongRecreational Mountain Bikers

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(No relevant relationships reported)

Introduction:
Although mountain biking is an inherently dangerous activity, participation in the sport is steadily rising. To date, there are very few publications on mountain biking injuries. Further investigation of mountain biking injuries can improve medical care and lead to the development of safety initiatives.
Purpose:
The aim of this study was to describe injury patterns among recreational mountain bikers in the United States.
Methods:
Mountain biking injury data between the years 1996-2016 were gathered from the National Electronic Injury Surveillance System (NEISS). Any injury sustained while mountain biking that resulted in an emergency department visit to one of the 96 NEISS

participating facilities was included in this study. The NEISS database is designed to represent a probability sampling of emergency departments nationwide. Data analysis was performed using descriptive statistics, a χ^2 test, and a logistic regression model. **Results:**
A total of 2,621 mountain biking injury cases were identified in the NEISS database in the past 11 years. Fracture was the leading diagnosis (26.86%), followed by contusion/abrasion (19.11%), strain/sprain (14.88%), laceration (14.42%), internal injury (6.87%), dislocation (3.97%), and concussion (3.93%). The most commonly injured body part was the shoulder (17.44%), followed by head (11.10%), upper trunk (10.07%), and knee (6.64%). Males had a significantly higher proportion of shoulder injuries than did females (20.3% of males vs. 8.7% of females, Rao-Scott χ^2 = 30.66, p < 0.001). On the other hand, a significantly higher proportion of females than males sustained elbow injuries (4.7% of males vs. 11.0% of females, Rao-Scott χ^2 =25.46, p < 0.001) and wrist injuries (4.8% of males vs. 8.5% of females, Rao-Scott χ^2 = 9.55, p < 0.011). The logistic regression model showed that these results held true even after adjusting for age.
Conclusion:
The results of this study suggest mountain biking injuries are commonly seen in emergency departments, and injuries are often severe. The shoulder is the most commonly injured anatomic location, with different injury patterns seen among males and females. Further research is needed to determine specific mechanisms of injury that might inform injury prevention strategies.

2346   Board #182   June 1 9:30 AM - 11:00 AM

Incidence and Severity of College Football Hand and Wrist Injuries on Artificial versus Natural Grass

Marissa R. Chase, Michael C. Meyers, FACSM, Shad K. Robinson. *Idaho State University, Pocatello, ID.*

Reported Relationships: M.R. Chase: *Contracted Research - Including Principle Investigator; Partial support by FieldTurf USA.*

Over the past two decades, newer generations of artificial turf have been developed to duplicate the playing characteristics of natural grass. Few turf-related studies have been published comparing hand and wrist trauma. **PURPOSE:** To quantify incidence and severity of game-related collegiate football hand and wrist injuries on artificial turf vs natural grass. **METHODS:** 24 universities were evaluated over 8 competitive seasons for injury incidence rates (IIRs) across injury severity, injury category, injury mechanism and situation, primary type of injury, anatomical location, type of tissue injured, elective imaging/surgery, field conditions, and turf age. **RESULTS:** Of the 1,237 collegiate games documented, 628 (50.8%) were played on artificial turf vs 609 (49.2%) played on natural grass. A total of 536 hand and wrist injuries were reported with 212 (39.6%) occurring on artificial turf, and 324 (60.4%) on natural grass. MANOVAs (Wilks' λ) indicated a significant playing surface effect by injury severity ($F_{2,533}$ = 8.053; P < .0001), primary type of injury ($F_{11,524}$ = 5.254; P < .0001), body part injured ($F_{4,531}$ = 3.294; P = .006), tissue type ($F_{3,532}$ = 12.421; P < .0001), elective imaging/surgery ($F_{4,531}$ = 2.798; P = .039), field conditions ($F_{3,532}$ = 13.991; P < .0001) and turf age ($F_{3,532}$ = 90.901; P < .0001), but not by injury category, position played, injury mechanism, or situation. Post hoc analyses indicated significantly lower IIRs (P < .05 to .0001) observed across 2nd degree trauma, 0.2 (95% CI, 0.1-0.3) vs 0.6 (0.4-0.8); ligament sprains, 1.4 (95% CI, 1.2-1.7) vs 2.0 (1.7-2.3), and subluxations, 0.4 (95% CI, 0.3-0.6) vs 0.3 (0.3-0.5); joint, 2.1 (95% CI, 1.8-2.4) vs 2.5 (2.2-2.9), and muscle trauma, 0.6 (95% CI, 0.5-0.9) vs 2.0 (1.7-2.3); MRIs, 0.0 (95% CI, 0.0-0.1) vs 0.2 (0.1-0.3), and x-rays ordered, 1.7 (95% CI, 1.4-2.0) vs 2.2 (1.8-2.5); during adverse weather conditions, 0.3 (95% CI, 0.2-0.6) vs 1.2 (0.8-1.6); and turf lasting 4-7 yrs, 0.9 (95% CI, 0.7-1.2) vs 1.3 (1.1-1.6), and 8+ yrs, 0.1 (95% CI, 0.1-0.2) vs 0.8 (0.7-1.1) when comparing artificial turf to natural grass, respectively. **CONCLUSION:** Although similarities existed between both surfaces over an 8-year period of competitive play, artificial turf is in many cases safer than natural grass when comparing hand and wrist trauma in college football.

2347   Board #183   June 1 9:30 AM - 11:00 AM

Medical Attention Injury Rates in U.S. Women Rugby-7s Players by Positions

Christian Victoria[1], Victor Lopez Jr[2], Richard Ma[3], Meryle G. Weinstein[4], James L. Chen[5], Arun T. Gupta[6], Samuel Y. Haleem[7], Answorth A. Allen[8]. *[1]New York University, New York, NY. [2]Rugby Research and Injury Prevention Group, Inc, Hospital for Special Surgery, New York, NY. [3]University of Missouri, Missouri Orthopaedic Institute & Thompson Laboratory for Regenerative Orthopaedics, Columbia, MO. [4]New York University, Steinhardt School of Culture, Education and Human Development, New York, NY. [5]University of California, San Francisco, San Francisco, CA. [6]University of Calgary, Calgary, AB, Canada. [7]City College of New York of the City University of New York, New York, NY. [8]Hospital for Special Surgery, New York, NY.*
(Sponsor: Robert Cantu, FACSM)
(No relevant relationships reported)

PURPOSE: There is a lack of injury data on women's rugby, and less on the Olympic format of Rugby-7s. Reporting medical-attention injuries may provide a more complete picture of the true burden of injury and illness in sport. The aim was to determine medical attention (no time-loss) injury incidence in U.S. women's Rugby-7s. **METHODS**: A prospective epidemiology study of U.S. women Rugby-7s (6,768 players; 564 teams), in multi-level *USA Rugby* and *USA Sevens LLC* tournaments (2010-2014). Incidence (per 1000 player-hour (ph)) and biomechanism of medical attention injuries were captured via the Rugby Injury Survey & Evaluation (RISE) Report methodology. **RESULTS**: Medical attention injury rate was found at 84.4/1000 ph (n=356). Amongst positions, injuries were found at similar rates (backs: 60%, 59.3/1000ph, n=143; forwards: 40%, 53.6/1000ph, n=97; RR=1.11; P=0.447). Most injuries were acute (95%) occurring during the tackle (67%). Most match injuries were from a shoulder tackle (70%) (backs 72%; forwards 62%; RR=1.32; P=0.113). Recurrent injuries occurred at 25%. Lower extremity ligament sprains (53%) were most common, among injury types, muscle/tendon injuries were most common overall at 41% (backs 41/1000ph; forwards 42/1000ph; P=0.998). Knee injuries occurred more frequently in forwards (23%) than backs (16%; P<0.213). Head/neck injury rates, were 22% of all injuries. The sub-acute head contusion rate, where players were physician-cleared to return to sport was 6% (3.5/1000ph). **CONCLUSIONS**: Documentation of medical-attention incidents is recommended in the literature, as this is likely to capture a far greater number of ailments, than time loss injuries alone and will therefore, provide a more inclusive picture of the true burden of injury and illness in a population. A panoptic view of rugby-7s injury rates, provides fundamental gender injury data, to guide injury prevention protocols by stakeholders to guide player welfare. Head/neck and upper extremity injury rates (both at 21%) support an emphasis on tackling techniques for injury reduction. A program, including contact-based-awareness, for women newly introduced to this collision-sport, would nurture injury prevention. Furthermore, adherence on return to play protocols would decrease recurrent injury rates seen in this gender-specific cohort.

2348   Board #184   June 1 9:30 AM - 11:00 AM

The Epidemiology of Female Golfing Injuries

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(No relevant relationships reported)

Golf is a popular sport worldwide, however, the tendency of players to be older and in poor physical condition contributes to its injury risk. Although golf has a moderate injury incidence, few studies have illustrated the extent of golfing injuries, and only one study has focused on female golf injuries. **PURPOSE:** To examine the injury profile of female golfers and investigate differences in injury epidemiology by age, handicap, experience, and participation. **METHODS:** Female golfers over 18 years with a registered handicap documented their 12-month injury status and associated golfing demographics. **RESULTS:** 1803 female golfers (median age: 51.3 years; handicap: 12.4; experience: 13.7 years) reported 671 injuries (37.2%) over a 12-month period, with the majority of injuries sustained during play (72.9%). The most common injury sites were the shoulder (23.2%), lower back (22.9%), and elbow (18.1%). Strains were the most frequent type of injury (43.0%), with overuse injuries most prevalent (32.2%), followed by a technical error (24.8%). Over half of all injuries required treatment from a healthcare professional (57.8%), and 1358 (75.3%) of the injured golfers reported an impact on their performance or participation. Over two-thirds of the injured golfers missed participation time due to their injury, and 187 of the injured golfers (10.4%) needed time off school or work. Chi-square analysis showed golfers' handicap (χ^2_4 = 23.747, p ≤ 0.001), hours of play (χ^2_8 = 35.735, p ≤ 0.001), hours of practice (χ^2_8 = 30.137, p ≤ 0.001), and experience (χ^2_9 = 28.003, p ≤ 0.001) were significantly associated with their injury status. Handicap, hours of play, and experience level were also significant independent predictors of injury. The Hosmer and Lemeshow test indicated acceptable goodness of fit (p = 0.905).

CONCLUSION: This study confirms the common occurrence of, and impact injuries have on golfers. Lower handicap golfers were more likely sustain an injury than higher handicap golfers, potentially due to increased exposure time required to obtain lower handicaps. This is further supported as exposure time and experience level were found to be significant predictors of injury. Before suggesting limits to golf participation, other prevention avenues focusing on specific female golfer characteristics must be investigated.

2349   Board #185
Abstract Withdrawn

2350   Board #186   June 1 9:30 AM - 11:00 AM
A Cross-sectional Look At Injuries Among Individuals Engaged In Crossfit Training: A Four-year Study.

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(No relevant relationships reported)

Little epidemiological data exist to describe the incidence of injury among individuals engaged in CrossFit training. **PURPOSE**: To examine the prevalence and incidence of injury among individuals engaged in CrossFit training over a four-year period. **METHODS**: Between 2013-2017, individuals (Females = F; Males = M) engaged in CrossFit training were asked to complete a survey designed to examine variables related to their participation in CrossFit training and their injury history over the previous 12 months (survey was distributed at the end of each year). **RESULTS**: A total of 3,079 individuals responded to the online survey. Data was only analyzed for the cases that had complete data (N = 3,049; F = 48.6%, M = 51.4%). Overall, 30.5% (n = 931) of individuals reported experiencing an injury, with no difference between F and M [14% (n = 436); 16.2% (n = 495), respectively; $\chi2$= 1.65, $p = 0.1989$]. Of those who experienced an injury, 62.4% (n = 581) reported an injury to a single body part, while 37.6% (n = 350) reported injuries to multiple body parts; in addition, there were significant differences between males and females ($\chi2$=8.43, p=0.0037) in the number of body parts injured. The shoulders (39%), back (36%), knees (15%), elbows (12%), and wrists (11%) recorded the highest prevalence of injury. Based on the assumed maximum number of workout hours per week, the injury rate was 0.27 per 1,000 hours (F = 0.28, M = 0.26); whereas, the assumed minimum number of workout hours per week resulted in an injury rate of 0.74 per 1,000 hours (F = 0.78, M = 0.70). **CONCLUSIONS**: To our knowledge, this is the first study to examine the prevalence and incidence of injury in a multi-year large sample of individuals participating in CrossFit training. Our findings support the notion that CrossFit training has similar rates of injury than other forms of exercise training.

2351   Board #187   June 1 9:30 AM - 11:00 AM
Incidence And Severity Of Collegiate Men's Soccer Lower Leg Injuries On Artificial Versus Natural Grass

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Reported Relationships: S.M. Blessing: *Contracted Research - Including Principle Investigator; Partial support by FieldTurf USA.*

Recently, artificial turf has been developed to duplicate the playing characteristics of natural grass. No long-term studies have compared match-related, collegiate men's soccer lower leg trauma between the two surfaces. **PURPOSE:** To quantify incidence, mechanisms, and severity of match-related lower leg collegiate men's soccer injuries on artificial turf versus natural grass. **METHODS:** 11 universities were evaluated over 6 seasons for injury incidence rate (IIR) across injury severity, lower leg joint/muscle, elective imaging/surgery, type of tissue injured, injury mechanism/situation, player position, injury category, field conditions, cleat design, and turf age. **RESULTS:** Overall, 380 games (49.7%) were played on artificial turf versus 385 games (50.3%) played on natural grass. A total of 256 injuries were documented, with 109 occurring on artificial turf and 147 on natural grass. MANOVAs per 10 games indicated a significant playing surface effect by lower leg trauma-joint/muscle ($F_{11,256} = 5.668$; $P < .0001$/$F_{4,256} = 17.931$; $P < .001$), elective imaging/surgery ($F_{3,256} = 18.129$; $P < .0001$), type of tissue injured ($F_{5,256} = 12.413$; $P < .0001$), injury mechanism/situation ($F_{16,256} = 2.305$; $P < .001$/$F_{8,256} = 5.592$; $P < .0001$), injury category ($F_{6,256} = 40.251$; $P < .0001$), and cleat design ($F_{3,256} = 2.258$; $P < .047$), but none observed by severity injury, player position, and field conditions. Significantly lower IIRs (P = .05-.0001) across distal tibiofibular joint, 0.3 (95% CI, 0.2-0.5) vs 0.5 (95% CI, 0.3-0.8); lower leg muscles combined, 1.4 (95% CI, 1.1-1.8) vs 2.2 (95% CI, 1.8-2.6); total medical procedures combined, 0.8 (95% CI, 0.6-1.1) vs 1.2 (95% CI, 0.9-1.6); ligament sprains, 1.4 (95% CI, 1.1-1.8) vs 1.5 (95% CI, 1.2-1.9); muscle-tendon strain/spasm/tears, 0.6 (95% CI, 0.4-0.9) vs 0.3 (95% CI, 0.2-0.5); tackled from the side/behind, 0.7 (95% CI, 0.5-1.0) vs 1.2 (95% CI, 0.9-1.5); player-turf impacts, 0.2 (95% CI, 0.1-0.3) vs 0.4 (95% CI, 0.2-0.6); adverse weather conditions combined, 0.5 (95% CI, 0.3-0.8) vs 1.3 (95% CI, 1.0-1.7) between artificial turf and natural grass, respectively. **CONCLUSION:**

Although similarities exist between both surfaces during competitive play, artificial turf is in many cases safer than natural grass when comparing this specific artificial surface and level of play.

2352   Board #188   June 1 9:30 AM - 11:00 AM
Epidemiology Of Sports-related Facial Injuries Treated In The United States Emergency Departments Between 1997-2016.

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(No relevant relationships reported)

Purpose: Worldwide, facial injuries in sports make up a large number of emergency room visits each year. The purpose of this study was to describe the epidemiology of sports related facial injuries that presented to the United States emergency departments (EDs). **Methods:** This was a retrospective analysis of the data of facial injuries in the ED related to sports from the National Electronic Injury Surveillance System (NEISS) from 1997-2016. **Results:** A total of 183,985 people presented to US EDs for sports related facial injuries from 1997-2016. The average age was 19 years. About three quarters of patients were male. The most common injury was facial laceration (50%), followed by contusion/abrasion (27%), fracture (12%), followed by eyeball injuries (10%). The majority did not require admission and were discharged from the ED (97%). The most common sports associated with facial injuries were biking (19%), basketball (16%), baseball (11%), football (6%), softball (4%), and soccer (4%). The most common sport associated with male facial injuries was biking (19%), followed by basketball (18%), baseball (12%), football (8%), and soccer (4%). The most common sport associated with female facial injuries was biking (21%), followed by softball (10%), basketball (8%), baseball (7%), and soccer (5%). **Conclusion:** This study identifies common facial injuries in sports and which sports are more likely to cause them. Biking and basketball have the highest incidence of facial injuries overall though softball is the second most common sport associated with female injuries. Most injuries occurred in males. Most injuries were minor in nature and did not require hospitalization. <!--EndFragment-->

2353   Board #189   June 1 9:30 AM - 11:00 AM
Profile Of Non-time-loss Conditions/injuries In U.s. Men'S Rugby-7s Players

Richard Ma[1], Victor Lopez Jr[2], Meryle G. Weinstein[3], Christian Victoria[4], James L. Chen[5], Arun T. Gupta[6], Martena T. Mettry[7], Answorth A. Allen[8]. [1]*University of Missouri, Missouri Orthopaedic Institute & Thompson Laboratory for Regenerative Orthopaedics, Columbia, MO.* [2]*Rugby Research and Injury Prevention Group, Inc., Hospital for Special Surgery, New York, NY.* [3]*New York University, Steinhardt School of Culture, Education and Human Development, New York, NY.* [4]*New York University, New York, NY.* [5]*University of California, San Francisco, San Francisco, CA.* [6]*University of Calgary, Calgary, AB, Canada.* [7]*City College of New York of the City University of New York, New York, NY.* [8]*Hospital for Special Surgery, New York, NY.* (Sponsor: Robert C. Cantu, FACSM)

Reported Relationships: R. Ma: *Contracted Research - Including Principle Investigator; USA Rugby New England and Empire GU Rugby Football Unions and the National Operating Committee on Standards for Athletic Equipment grant (ID 44-16), Chapel Hill, NC, USA.*

PURPOSE: Rugby-7s, on the Olympic program, over the next decade, has a dearth of injury data, limiting injury prevention. Most injury reporting focuses on time-loss injuries with little or no data on medical attention injuries. The aim was to determine the match non-time-loss injury incidence in U.S. men's Rugby-7s. **METHODS**: A prospective epidemiology study of 17,770 U.S. men Rugby-7s players (1,474 teams), in multi-level *USA Rugby* and *USA Sevens LLC* tournaments (2010-2014). Incidence (per 1000 player-hour (ph)) and biomechanism of non-time-loss injuries were captured via the Rugby Injury Survey & Evaluation (RISE) Report methodology. **RESULTS**: Non-time-loss injuries were found at 66.1/1000 ph (n=686). Positionally, backs encountered more injuries (63%; 67.4/1000ph; n=400) than forwards (36%; 52.4/1000ph; n=233; RR=1.3; P=0.002). Most injuries were acute (93%), occurring in the tackle (67%). Shoulder tackles resulted in most non-time-loss injuries (63%) (backs 65%; forwards 58%; RR=1.7; P<0.001). Recurrent injuries (23%) occurred frequently. Main injuries were lower extremity ligament sprains (14.2%). Overall head/neck injury rates were 23%, and found higher with incorporation of tackles (26%). The sub-acute head trauma/contusion rate, where players were physician-cleared to return to sport (non-time loss) was 4.9% (3.2/1000ph). **CONCLUSIONS**: Recording non-time-loss (medical attention) injuries will provide a true burden of injury and illness among the growing U.S. Rugby-7s population. Most injuries occur to the lower extremity (41%), reflective of the greater amount running, acceleration and deceleration in the Rugby-7s format. Head/neck non-time-loss injury rates were found lower than the "all medical attention injuries (30%)" in community international male Rugby-15s. Most injuries

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were related to tackling amongst the upper extremity (35%), and head/neck (26%), making these areas a focus to reduce risk in the U.S. and support tackle-technique evaluations especially with head positional focusing and its target area (lateral hip). Proper medical assessments, need to scrutinize return to play post-tournaments to reduce recurrent injury risk in the U.S. men's cohort. Investigations such as this will aid in understanding the current needs and allocation of medical resources for Rugby-7s.

2354   Board #190   June 1 9:30 AM - 11:00 AM

Perfectionist Concerns Predict Injury Risk In Collegiate Distance Runners - Preliminary Findings From A Prospective Study

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(No relevant relationships reported)

Distance runners have a high incidence of running-related injury (RRI). While anatomical, biomechanical, and training load have been associated with RRIs, psychological factors like perfectionism may also contribute to injury risk. Perfectionist strivings (high personal standards [PS]) can be adaptive, but perfectionist concerns (concerns over mistakes [COM] and doubts about actions [DAA]) are considered maladaptive. The combination of high PS with high COM and DAA is considered unhealthy perfectionism and may increase a runner's risk of RRI. **PURPOSE:** To determine whether perfectionist concerns were associated with RRI occurrence in distance runners. We hypothesized that runners with higher PS and COM and/or DAA would have a higher incidence of RRI during the season. **METHODS:** Thirty-four NCAA Division III collegiate cross country runners (18 males, 16 females; mean age of 19.6±1.2 years; BMI of 20.6±1.8) completed the Sport Multidimensional Perfectionism Scale-2 (Sport-MPS-2) on the first day of their competitive season. Runners were followed prospectively during the first 8 weeks of their season for any RRIs resulting in limited or missed practices or competitions. Fifteen runners (44.1%) experienced a time loss RRI. Independent t-tests were used to compare mean differences of PS, COM and DAA scores between runners who experienced a RRI and runners without RRI. Odds ratios (OR) and 95% confidence intervals (CI) assessed the risk of RRI between runners with and without perfectionist concerns. **RESULTS:** Injured runners rated their COM higher (23.5±4.9 points) than uninjured runners (19.9±5.3 points) (p=0.05). Injured runners also rated their DAA higher (14.5±4.2 points) higher than uninjured runners (11.4±3.6 points) (p=0.03). Runners with perfectionist concerns (high PS and high COM and/or DAA) were 17 times more likely to experience a RRI during the season (OR=17.0, 95% CI 2.8-104.5, p=0.001). **CONCLUSIONS:** Runners reporting Sport-MPS-2 scores classifying them as having unhealthy perfectionism were more likely to incur a RRI than runners with lower Sport-MPS-2 scores. Further study is needed to determine whether interventions can modify perfectionist concerns and whether training load modifications for those with unhealthy perfectionism affect injury rates.

2355   Board #191   June 1 9:30 AM - 11:00 AM

Video Corroboration Of Player Incurred Impacts Using Trunk Worn Sensors Among National Ice-hockey Team Members

Aaron Pilotti-Riley, Davor Stoyanov, Muhammad Sohaib Arif, Stephen J. McGregor. *Eastern Michigan University, Ypsilanti, MI.* (Sponsor: Mark Peterson, FACSM)
(No relevant relationships reported)

Wearable sensors (WS) have been increasingly used to quantify training loads in team sports but can also be used to identify impacts. Helmet worn sensors have been used to identify head impacts, but there is currently no data with regard to whole-body impacts incurred by players in ice hockey using trunk-worn sensors.
PURPOSE: To use video to corroborate impacts identified by trunk-worn WS and determine validity of player incurred impacts (PII) among elite national ice hockey team members.
METHODS: 23 players on the U.S. National Team Development Program (NTDP) U18 team consented to procedures approved by EMU Human Subjects Committee. Players wore a BH-3 (Zephyr, MD) WS to measure occurrences of PII during games. Of the 23 players, 8 with the top activity levels each game determined by WS, were observed using video. Game video was collected by NTDP staff and synchronized with accelerometer data. Previous pilot work determined only impacts of > 6 g were relevant, so, impacts identified by WS of 6 - 7.9 g (Z3), 8 - 9.9 g (Z4) and 10+ g (Z5) were used to corroborate PII. Magnitude and duration of each identified impact were compared by category using MANOVA with Tukey *post hoc* (α= 0.05; SPSS 22.0, IBM, NY).
RESULTS: WS logged 419 on-ice impacts, 358 were confirmed true PII (85.5%), 60 were confirmed as other non-PII (14.3%) and 1 false positive (0.2%). For 358 PII, 17 (4.1%) were categorized as 1) Board contact/no check, 74 (17.7%) as 2) Board contact/

check, 202 (48.2%) as 3) Open ice check, 65 (15.5%) as 4) Player fall. For the 60 Non-PII, 19 (4.5%) as 5) other form of player to player event, 16 (3.8%) as 6) Hard Stop, 19 (4.5%) as 7) Slapshots and 6 (1.4%) as 8) other identifiable player events. 140 of the 200 Z3 events were confirmed PII (80%), 103 of 110 Z4 events (93.6%) and 95 of 109 Z5 events were PII (92.2%). The magnitude of impacts was not different by category, but the duration of category 6 (Hard stop; .058 s) was lower than categories 2, 4 and 7 (.112, .112, .133 s, respectively, p<.05).
CONCLUSION: These data show that using some limited criteria (e.g. impact magnitude and duration), PII can be identified with relatively high accuracy in ice hockey using trunk-worn wearable sensors. Use of these devices should allow a more complete understanding of the whole-body impacts incurred by players participating in ice hockey.

2356   Board #192   June 1 9:30 AM - 11:00 AM

Pain and Overuse in High School Baseball Pitchers During a Season

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(No relevant relationships reported)

Over half of adolescent baseball pitchers retrospectively recall throwing arm pain during a baseball season, leading to the institution of pitch count regulations across high school baseball; however, how pain varies throughout the season is unknown. PURPOSE: The purpose of this study was to determine the prevalence of pain and overuse symptoms occurring in high school baseball pitchers throughout a high school baseball season. METHODS: 97 pitchers were enrolled in the research study from eight central and southern Ohio high schools. Weekly surveys were sent via text message to assess overuse and pain using a validated questionnaire throughout the season (11 weeks). 44 of the 60 participants who met all inclusion criteria responded a minimum of 80% of the time and were included in the analysis. Descriptive statistics and prevalence of overuse and pain were calculated weekly throughout the season. RESULTS: The final participant pool maintained an average weekly completion rate of 91.8±0.2%. 34.8±7.9% of participants reported symptoms of overuse each week, with peak prevalence occurring in the 4th week of practice (45.5%), and trending downwards with 26.2% reporting overuse in the final week of the season. Prevalence of severe overuse, determined by a report of moderate or greater effect on training or performance, was low throughout the season (4.0±1.8%). Of those who did experience any symptom of overuse, the mean weekly overuse score was 22.0±3.1 out of 100 (mild overuse). Pain prevalence showed similar trends, with 28.5±7.6% of participants reporting pain during the season, with the peak occurring in week 4 of practice (40.9%), and trending down with 19.0% experiencing pain in the final week. The majority who experienced pain reported mild pain (81.3±7.1%), with few experiencing moderate pain (18.0±7.1%), and only one report of severe pain occurring in week 3. CONCLUSION: Prevalence of pain and overuse symptoms varies over the course of a high school baseball season, peaking within the first five weeks of the season, though most pain is mild. Further research is needed to determine whether increases in pain at this time are preceded by an initial period of chronic overuse or more acute changes in workload.

2357   Board #193   June 1 9:30 AM - 11:00 AM

Evaluating Methods For Utilizing Time-loss Data In Sports Settings Using A Sample Of US Collegiate Soccer-related Injury Observations

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(No relevant relationships reported)

Time-loss has featured heavily in assessments of sports-related injury severity, and has been helpful in identifying sport-specific injury severity patterns.
PURPOSE: To compare inferences from distinct approaches for conditional, multifactorial modeling of time-loss due to injury in sports settings.
METHODS: Data from the NCAA-ISS for the 2004/05-2013/14 years, were used for this analysis. For unadjusted analyses, time-loss was considered a count outcome, following a Poisson distribution with some underlying intensity λ_j. Time-loss was examined across categories of potential time-loss determinants, by assuming a distribution-free random effect that accounted for the heterogeneity introduced by latent 'injury severity.' Then, the random effect was incorporated into multifactorial Poisson models. A second approach was considered for building multifactorial models of time-loss, where time-loss was considered a continuous outcome and Accelerated Failure Time (AFT) models were built with frailties to capture latent 'injury severity.' Both approaches for regression modeling were used to derive conditional parameter estimates. **RESULTS:** In both modeling approaches, injury site, injury mechanism

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and injury history had the strongest overall associations with time lost due to injury. The direction and magnitudes of conditional estimates obtained from both regression approaches were also comparable. For example, in the Poisson approach, time-loss due to a contact injury was significantly lower than time-loss due to a 'similarly severe' non-contact injury (Adj. TLR= 0.835, 95% CI= [0.787, 0.885]). Similarly, in the AFT approach, a non-contact injury seemed more (~17%) deleterious (in terms of time spent injured) than a 'similarly severe' contact injury (β= -0.1906, p<0.0001). Importantly, post-hoc residual analyses (for the Poisson approach), and examinations of AICs (for the AFT approach) revealed that the random-effects based models fit these time-loss data better than models with only fixed-effects. **CONCLUSIONS:** Although using time-loss as an indicator to define 'injury severity' may be justifiable, comparing time lost due to 'similarly severe' injuries to 2 different sites, or resultant of 2 different mechanisms using the approaches described here, may be more scientifically salient.

2358   Board #194   June 1 9:30 AM - 11:00 AM
Perception about Running and Knee Joint Health among the Public and Healthcare Practitioners

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(No relevant relationships reported)

PURPOSE: There is conflicting evidence surrounding the effect of running on knee joint health, particularly as it relates to knee osteoarthritis (KOA). The perception about running and knee joint health could affect choices of activities, but remains undocumented in the population. Given the uncertainty in the literature, the objective of this study was to evaluate the perception of the public and healthcare practitioners (HCP) with respect to running and KOA.
METHODS: A total of 397 public respondents (mean age=53.1 years, 163 females; 79 non-runners [NRUN]; 318 runners [RUN]) and 176 HCP (mean age=39.2 years, 68 females) completed an online cross-sectional survey. The survey included multiple-choice questions about perceptions of running as it relates to knee joint health, and about the appropriateness of maintaining running by individuals with KOA. The HCP subgroup was also asked about clinical recommendations to runners with KOA. Proportions (agree, uncertain, disagree) were compared between subgroups using chi-squared tests.
RESULTS: In general, 11% of respondents perceived running as detrimental for knee joint health (NRUN=43.0%, RUN=5.0%, HCP=6.3%; *p*<0.001) while 21.1% were uncertain. Frequent running was perceived as a risk factor for KOA by 6.3% of respondents (NRUN=24.1%, RUN=2.2%, HCP=5.7%; *p*<0.001) and 26.5% were uncertain. Running long distances (marathons, ultra-marathons) was perceived by 15.5% as a risk factor (NRUN=32.9%, RUN=9.1%, HCP=19.3%; *p*<0.001), but 38.7% were uncertain. As for continuation of running in the presence of KOA, 14.7% of respondents agreed that it would lead to greater cartilage damage (NRUN=40.5%, RUN=10.2%, HCP=11.1%; *p*<0.001). However, 31.3% were uncertain about the appropriateness of running in the absence of symptoms (NRUN=34.2%, RUN=38.7%, HCP=16.4%; *p*<0.001). The subgroup of HCP reported having recommended to 76.1% and 30.7% of runners with KOA to modify training parameters and to quit running, respectively.
CONCLUSION: These results suggest that many non-runners perceive running as detrimental to knee joint health. High rates of uncertainty warrant further studies to guide the population and HCP about the appropriateness of running for individuals with KOA, as it may influence choices of physical activity and clinical recommendations.

2359   Board #195   June 1 9:30 AM - 11:00 AM
Concussion and Mental Health among United States Service Academy Cadets

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(No relevant relationships reported)

Purpose: Few studies have evaluated the association between pre-participation psychological symptoms and concussion. The purpose of the current analysis was to evaluate the relationship between previous concussions, incident concussions, and Brief Symptom Inventory-18 (BSI-18) among U.S. military service academy cadets.
Methods: Data were analyzed from the Concussion Assessment, Research and Education (CARE) Consortium at three U.S. Service Academy sites. Between August 2014 and June 2017, 10,603 participants were enrolled and completed the BSI-18 assessing three psychological domains: somatization, depression, and anxiety. The total number of previous concussions (diagnosed or undiagnosed) was extracted from participant self-reports at baseline screening. Incident concussions were captured prospectively via the CARE protocol. Pearson correlations assessed associations between total number of prior concussions and BSI-18 scores. Analyses controlling for sex, age, service academy, previous concussions, and freshman status evaluated the association between baseline BSI-18 total score and odds of incident concussion.
Results: Total concussions and "diagnosed" prior concussions did not have a significant correlation with baseline BSI-18 scores. Statistical but not clinically significant correlations were observed between the total prior undiagnosed concussions and somatization (r = 0.05, p < 0.01), depression (r = 0.05, p < 0.01), anxiety (r = 0.04, p < 0.01), and total BSI-18 score(r = 0.06, p < 0.01). While significant, each of the correlations are small. Multivariable analyses estimating the odds of incident concussion based on BSI-18 total score were significant (X^2(7) = 271.68; p < 0.01). BSI-18 total score was a significant estimator of incident concussion odds (p = 0.02) even after controlling for all covariates (all p's < 0.01). For each point increase in BSI-18 score, the odds for incident concussion increased 2% (OR = 1.02; 95% CI: 1.01-1.03).
Conclusions: Univariate analyses demonstrate a limited association between previous self-reported undiagnosed concussions and BSI-18 scores. Pre-participation BSI-18 scores may be predictive of subsequent concussion likelihood. These results highlight the interaction between the functional concussive and psychological health.

E-36   Free Communication/Poster - **Walking for Better Health**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2360   Board #196   June 1 9:30 AM - 11:00 AM
Classification Accuracy Of A Moderate Intensity Cadence (steps/min) Threshold During Overground Walking

Zachary R. Gould[1], Elroy J. Aguiar[1], Scott W. Ducharme[1], Christopher C. Moore[1], John M. Schuna[2], Tiago V. Barreira[3], Stuart R. Chipkin[1], Catrine Tudor-Locke, FACSM[1]. *[1]University of Massachusetts Amherst, Amherst, MA. [2]Oregon State University, Corvallis, OR. [3]Syracuse University, Syracuse, NY.* (Sponsor: Dr. Catrine Tudor-Locke, FACSM)

(No relevant relationships reported)

A walking cadence of 100 steps/min has been established as a heuristic (evidence-based, rounded) threshold for absolutely defined moderate intensity (3 Metabolic Equivalents, METs). This threshold was calibrated during treadmill (TM) walking, however few studies have assessed its classification accuracy during overground (OG) walking. **PURPOSE:** To evaluate the classification accuracy of the 100 steps/min cadence threshold originally established during TM walking to OG walking. **METHODS:** Participants (n=75, 50.7 % men, 21-40 years of age, mean±SD age:

30.3±5.8 years, BMI: 24.8±3.4 kg/m^2) performed a 13 m overground corridor walk back and forth at a self-selected pace for 5-min. Cadence was hand-tallied and METs were obtained using indirect calorimetry. Receiver Operating Characteristic curves were used to determine the optimal OG cadence threshold associated with moderate intensity (Youden's index). Classification accuracies (counts and percentages for true positives and negatives, false positives and negatives) for the optimal OG and original TM heuristic (100 steps/min) thresholds were compared. **RESULTS:** Table 1 reports the classification accuracies of optimal OG and original TM heuristic cadence thresholds for identifying moderate intensity. The optimal OG threshold displayed an overall accuracy (i.e., correctly classified bouts; true positives and negatives) of 74.6%, compared to 73.3% for the TM heuristic threshold. The positive predictive value (i.e., probability of achieving ≥3 METs at ≥100 steps/min) was 80.3%. **CONCLUSION:** Optimal OG and original TM heuristic thresholds produced similar classification accuracies. The probability of achieving a moderate intensity when walking at a cadence ≥100 steps/min was >80%. The original TM heuristic (100 steps/min) threshold remains a valid heuristic threshold for achieving moderate intensity during overground walking.

Table 1: Classification accuracy of optimal OG and original TM heuristic cadence thresholds for corr					
	Cadence (steps/min)	True Negative	False Negative	True Positive	False Positive
Optimal OG	103	10 (13.3%)	11 (14.7%)	46 (61.3%)	8 (10.7%)
Heuristic (TM-based)	100	6 (8.0%)	8 (10.7%)	49 (65.3%)	12 (16.0%)

2361 Board #197 June 1 9:30 AM - 11:00 AM

Aerobic Physical Activity Does Not Mediate the Association of Neighborhood Walkability with Overweight/Obesity in Latino Adults

Rosenda Murillo, Layton M. Reesor, Daphne C. Hernandez, Ezemenari M. Obasi. *University of Houston, Houston, TX.*

(No relevant relationships reported)

PURPOSE: To examine whether aerobic physical activity mediates the association between neighborhood walkability and overweight/obesity among Latino adults. **METHODS:** We used cross-sectional 2015 National Health Interview Survey data on Latino participants 18 years of age and older (n=4,765). Neighborhood walkability was assessed based on self-reported measures of built environment (e.g., presence of sidewalks, presence of paths/trails) and neighborhood safety (e.g., presence of traffic, crime). A neighborhood walkability score was created by combining the built environment and neighborhood safety items, with a higher score indicating higher walkability. Self-reported height and weight were used calculate body mass index categories (overweight/obesity versus normal weight). Aerobic physical activity was measured continuously based on self-reported total minutes of moderate-to-vigorous aerobic activity per week. Multivariate logistic regression models, accounting for the complex survey design, were used to estimate the association between neighborhood walkability and overweight/obesity, with covariates adjusting for age, sex, education, and acculturation. Indirect effects were assessed using bootstrap methods outlined by Preacher and Hayes, to quantify the extent to which aerobic physical activity mediates the association of neighborhood walkability with overweight/obesity (BMI≥25 kg/m^2). **RESULTS:** On average the sample was 44 years old, 56% were female, 36% had less than a high school education, and 58% were foreign-born. After adjusting for covariates, a one-unit higher neighborhood walkability score was associated with significantly lower odds of overweight/obesity (OR: 0.98; 95% CI: 0.93, 0.99), relative to normal weight. Results indicated that aerobic physical activity accounted for 0.7% of the total effect of neighborhood walkability on overweight/obesity among Latino adults, but was not significant (p=0.46). **CONCLUSION:** These findings suggest neighborhood walkability contributes to overweight/obesity among Latino adults. However, mediation results indicate aerobic physical activity does not account for the impact of neighborhood walkability on overweight/obesity, suggesting other factors may play a role.

2362 Board #198 June 1 9:30 AM - 11:00 AM

Physical Activity Levels of Students Walking Shelter Dogs in anActivity Course: A Pilot Study

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(No relevant relationships reported)

While it is becoming less and less common for four-year colleges and universities to require physical activity courses as part of student curricula, many schools continue to offer elective physical activity courses. These elective courses are important given the benefits associated with physical activity and the low levels of physical activity found within the college student population. College and universities also stress the importance of community engagement within their courses, suggesting that addressing the physical activity needs of others, such as shelter dogs, within activity-based courses may benefit multiple entities. **PURPOSE:** The purpose of this study was to assess the physical activity levels of students enrolled in a service-learning fitness walking course in which students walk local shelter dogs. **METHODS:** Ten college students (age = 20.8 years (SD = 1.23); 80% female; 90% White), enrolled in a fitness walking course that met at the county animal shelter, were asked to wear NL-1000 pedometers twice a week for 50 minutes for a duration of 10 weeks. Students will complete a survey about their experience at the end of the semester. **RESULTS:** Preliminary results indicate that, on average, students acquired approximately 4726.5 steps (SD = 299.14; range 2167-6212 steps) per walking session and walk an average of 2.26 miles (SD = .14; range 1.06-3.23 miles). Of the time spent on these walks, approximately 28.5 minutes (SD = 2.4; range 11.32-43.44 minutes) was moderate physical activity. **CONCLUSIONS:** Students enrolled in this course are currently reaching approximately 40% of their recommended daily physical activity requirements during class time. To date, student perceptions of the course have been overwhelmingly positive suggesting that incorporating shelter dogs into a physical activity elective course at a college or university can promote physical activity amongst college students. The local shelter dogs also benefitted from being physically active demonstrating the utility of community engagement when seeking new and fun ways to promote physical activity among college students.

2363 Board #199 June 1 9:30 AM - 11:00 AM

The Effect ofa Web-based Physical Activity Promotion Program on Sedentary Behavior: The Walk 2.0 Trial

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(No relevant relationships reported)

Time spent engaging in sedentary behavior represents a growing public health concern, with many national physical activity guidelines now also including recommendations on reducing sedentary time. Sedentary behavior contributes to a range of poor health outcomes. Web-based interventions are increasingly used in health promotion given their broad reach and ability to engage participants through Web 2.0 technologies. The WALK 2.0 intervention (a Web 2.0-based physical activity intervention) has demonstrated effectiveness in increasing physical activity, yet its impact on sedentary behaviour is unknown. **PURPOSE:** To investigate the effectiveness of the WALK 2.0 intervention on sedentary behaviour. **METHODS:** Participants were 504 (328 female and 176 male, mean age 50.8±13.1 years) adults randomised to one of two web-based interventions or a paper-based Logbook group. Those in the Web 1.0 group participated in the existing 10,000 Steps program and those in the Web 2.0 group participated in a Web 2.0-enabled physical activity intervention that included social networking capabilities. Sedentary behaviour was assessed using ActiGraph GT3X activity monitors and was recorded in terms of total minutes of sedentary time per day and number of bouts (> 10 minutes) of sedentary time per day. **RESULTS:** For total daily minutes of sedentary behaviour, repeated measures analysis showed no significant group x time interactions in either the unadjusted model (p=0.46) or the model adjusted for gender, age at baseline, BMI, education, and accelerometer wear time (p=0.58). No significant group x time interactions were shown for daily bouts of sedentary time in either the unadjusted (p=0.21) or adjusted (p=0.21) models. There were no significant changes in total minutes or number of bouts of sedentary behaviour within groups or across time. **CONCLUSIONS:** The WALK 2.0 intervention is not effective in reducing sedentary behavior. Specific behavior strategies targeting both sedentary behaviour and physical activity are necessary and their implementation requires careful consideration in the design phase.

2364   Board #200   June 1 9:30 AM - 11:00 AM

Effects of One Session of Treadmill Desk Walking on Free-Living Physical Activity

Rebecca R. Rogers, Erica Disbrow, Kendra Skenderi, John K. Petrella, FACSM, Mallory R. Marshall, Christopher G. Ballmann. *Samford University, Birmingham, AL.*

(No relevant relationships reported)

PURPOSE: Treadmill desks are being implemented in office and classroom settings to counteract long durations of sedentary behavior. The purpose of this study was to examine the effects of one treadmill desk walking session on daily physical activity patterns outside of work or school in healthy individuals. **METHODS**: Male and female participants (age = 38 yrs ± 8.0, weight = 166.2 lbs ± 47.5, height = 62.0 in ± 71.5) were recruited for this study. To assess baseline free-living physical activity patterns, all participants wore an Actigraph GT9X link accelerometer for one week during waking hours. Participants completed one session of treadmill desk walking at a speed of 2.0 mph for a total of 3 hours. During the 3 hours, participants performed typical office or school related tasks. Physical activity patterns were then recorded via accelerometer for 2 additional days following the treadmill workstation bout. **RESULTS**: Participants classified as "low active" (mean steps/day = 7368.0 steps ± 540.4) did not show a significant difference in average steps/day (p=0.190) or activity counts (p=0.204) between the 2 days prior and after the treadmill desk session. No significant differences in average steps/day (p=0.233) or activity counts (p=0.119) were observed pre and post treadmill desk session in participants classified as "somewhat active" to "active" (mean steps/day = 9538.5 steps ± 578.7) indicating there was no change in daily physical activity levels. **CONCLUSIONS**: This study suggests that treadmill desk walking does not influence free-living physical activity regardless of activity classification.

2365   Board #201   June 1 9:30 AM - 11:00 AM

Obesity and Walking Efficiency in Survivors of Acute Lymphoblastic Leukemia: Report from St. Jude Life

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(No relevant relationships reported)

Treatment for childhood acute lymphoblastic leukemia (ALL) is associated with an increased risk of being overweight/obese, having neuromusculoskeletal impairment and mobility limitations. Obesity may contribute to mobility limitations by increasing the physiologic cost/effort associated with movement. **PURPOSE:** To evaluate associations between obesity and walking efficiency in adult survivors of childhood ALL. **METHODS**: ALL survivors (N=351, mean±SD age: 28.5±6.0 years, 51.6% male) and 342 age-, sex- and race-matched controls (N=342, 29.0±7.5 years, 51.2% male) were assessed for body mass index (BMI: kg/m^2), body fat percentage (%BF) using dual x-ray absorptiometry, and completed the six minute walk test. Walking efficiency was characterized with the physiological cost index (PCI). PCI is calculated using the formula: (Maximal heart rate (HR) during walking – HR at rest)/distance walked; expressed as beats per meter (normal range 0.13-0.49 in adults). **RESULTS:** ALL survivors with BMI ≥40 kg/m^2 had higher PCI values compared with normal weight survivors (0.63±.040 vs. 0.50±0.019, p<.01), adjusting for age, sex, physical activity, and cranial radiation exposure. ALL survivors with excess %BF (defined as > 25% for men and > 33% for women) also had higher PCI values compared to survivors with normal %BF (0.54±.013 vs. 0.47±0.017, p<.01). No associations between obesity and PCI were evident among controls. **CONCLUSIONS:** Obesity is associated with reduced walking efficiency in ALL survivors but not in healthy controls, suggesting that ALL survivors do not have the same capacity to compensate for excess body weight as their peers with no cancer history. Weight loss interventions may have a significant impact on daily activity in this population.

2366   Board #202   June 1 9:30 AM - 11:00 AM

Evaluation of Step Rate of Walking Corresponding to Moderate Intensity

Woo Ram Bae[1], So Mi Yun[1], Yun Bin Lee[1], Min Gi Jung[1], Da Hye Lim[1], Ah Reum Jung[1], Woong Hee Lee[1], Eun Jin Hwang[1], Ik Jin Kwon[2], Dae Taek Lee[1]. *[1]Kookmin University, Seoul, Korea, Republic of. [2]Chung-Ang University, Seoul, Korea, Republic of.*

(No relevant relationships reported)

PURPOSE: Walking at 100 steps per min is assumed to be the moderate exercise intensity in most cases. But it may not be universally accepted. This study evaluated how the overground walking at different step rates would elicit exercise intensities, and aimed to provide a cut-point of step rate which corresponds to a moderate walking intensity.

METHODS: Twenty-three young men (25±2 yrs, 175±6 cm, 76±14 kg) completed four overground walking trials. At the first trial, participants were asked to walk freely for 6-min at an intensity they felt moderate. Subsequently, they walked another 3 occasions for 6-min of each at 100, 120, and 140 beat/min while matching to a metronome beat. During the walking, oxygen consumption (VO_2), walking speed (WS), step rate (SR), and ratings of perceived exertion (RPE) were measured. On a separate occasion, their resting VO_2 and maximal aerobic capacity (VO_2max 41±6 ml·O_2/kg/min) on a treadmill using Bruce Protocol were measured. **RESULTS**: The actual SR at free walking and 100, 120, and 140 beat/min was 117±9, 101±2, 120±1, and 138±4 step/min, respectively (p<0.01). SR they felt moderate during free walking was higher than 100 step/min (p<0.01). Based on the intensity parameters such as WS (4.9±0.5, 3.9±0.3, 5.2±0.4, and 6.4±0.5 km/h), %VO_2 reserve (31±8, 24±6, 33±9, and 45±9 %), and RPE (7.6±1.5, 7.4±1.5, 9.4±2.0, and 12.3±1.9 at free walking and, 100, 120, and 140 beat/min, respectively), the criteria of a moderate intensity of walking (100 step/min) was not satisfied. Regression analysis revealed that a cut-point of SR representing a moderate intensity (about 40%VO_2 reserve) was 128 step/min based on %VO_2 reserve, while it was 88.2 step/min based on metabolic equivalents. When grouped by aerobic fitness level, the less fit participant (VO_2max 32±3 ml·O_2/kg/min) met the moderate intensity at SR of 120 step/min while the more fit (VO_2max 50±2 ml·O_2/kg/min) did at 140 step/min. **CONCLUSIONS**: Based on the relative intensity index (%VO_2 reserve), the cut-point corresponding to a moderate intensity was 128.9 step/min. But this estimation also has to be widened by the aerobic fitness level of the walkers. In general, approximately 120-140 step/min of overground walking can be considered as a moderate walking intensity for those of healthy population.

2367   Board #203   June 1 9:30 AM - 11:00 AM

Process Evaluation of a Multi-Component "Sit Less, Walk More" Workplace Intervention for Office Workers

Yun-Ping Lin[1], Shu-Hua Lu[1], Wei-Fen Ma[1], Kwo-Chen Lee[1], Chiu-Chu Lin[2], Meei-Maan Chen[3]. *[1]China Medical University, Taichung, Taiwan. [2]Kaohsiung Medical University, Kaohsiung, Taiwan. [3]National Taipei University of Nursing and Health Sciences, Taipei, Taiwan.*

(No relevant relationships reported)

Sit Less, Walk More (SLWM) workplace intervention was designed for office workers with demonstrated efficacy in improving walking and some cardiometabolic biomarkers. However, little is known about the participants' perceptions of the program and each program component's contribution to observed program effects. **PURPOSE:** To evaluate participants' perceptions of and engagement with the program components in the SLWM to understand program effects. **METHOD:** Process evaluation data were collected during and immediately after the 12-week intervention period. The SLWM included multi-components: three monthly newsletters, six biweekly motivational tools, a team-based 10,000 steps challenge, environmental prompts, and walking routes and resources. A survey contained both closed and open-ended questions assessing frequency of use and perceptions of program components; factors that hindered the use of program components; and recommendations for improving program components. Qualitative data were analyzed using content analysis. **RESULTS:** Fifty-one (100%) intervention participants completed the post-intervention survey. Their ages ranged from 30 to 62 (mean = 52.1, SD = 6.57). The majority of participants were married (92.2%) and highly educated (60.8% had a college or graduate degree). Most participants were satisfied with the SLWM program (84.3%) and thought the program to be beneficial (78.4%) and effective (74.5%) to them in increasing physical activity and decreasing sitting behavior. Participants reported the 10,000 steps challenge to be the most helpful component because of the motivation and encouragement elicited by the pedometer and Step Log (79.6%), goal setting (45.5%), and the use of the support group approach as well as rewards and recognition for group competition (29.6%). The walking route was not received well by the participants. The reasons for this included time constraints due to work or family obligations (54.1%), physical environment issues primarily due to weather (21.6%), and using their own preferred methods of exercise or walking routes (13.5%). **CONCLUSIONS:** The findings provide a better understanding of the use and preference for different program components and how future SLWM workplace intervention for office workers could be provided.

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Abstracts were prepared by the authors and printed as submitted.

2368　　Board #204　　　　　June 1 9:30 AM - 11:00 AM

Application Of The ActiGraph GT9X IMU For The Assessment Of Turning During Walking And Running

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(No relevant relationships reported)

Rotational movements, such as turning, can significantly increase energy expenditure (EE) during ambulatory activity. Gyroscope and magnetometer sensors can quantify rotational motion, which provides additional information on movement beyond linear acceleration that is provided by only using an accelerometer. **PURPOSE:** The purpose of this study was to examine the use of the ActiGraph GT9X gyroscope and magnetometer for detecting turns and quantifying turn degree during walking and running. **METHODS:** Participants (N=17) completed pivot trials, treadmill walking and running (TM; 3 to 6 mph) and four turn conditions (i.e. 45°, 90°, 135°, and 180°) during over-ground walking and running (OG). Pivot and TM trials were completed for 1-min and 6-min, respectively. Turn frequency was constant (10 turns/min) for all OG trials. A GT9X was placed on the left hip and a Cosmed K4b[2] was used to measure EE. Raw GT9X gyroscope and magnetometer data were processed through various low-pass filter frequencies (0.25 Hz to 2.0 Hz). TM and pivot trials were used to develop thresholds for turn detection using the gyroscope and magnetometer data and the OG trials were used for cross-validation. K4b[2] data (VO_2) were averaged over 30-s periods and converted to relative VO_2 (ml/kg·min). Linear mixed models were used to compare actual and predicted number of turns, measured and predicted turn degree, and differences in VO_2 across OG conditions. **RESULTS:** There were no main effects for speed or turn condition on turn detection when filtering the gyroscope at 0.25 Hz (p>0.05). A speed main effect was present when filtering the magnetometer at 0.75 Hz (p<0.001). 0.25 Hz (gyroscope) and 0.75 Hz (magnetometer) filters resulted in 100.5%±4.4% and 96.9%±45.4% of turns detected, respectively. Using the gyroscope, turn degree was estimated to within approximately 2.2° for all turn conditions (p<0.001). In general, the VO_2 of walking and running was significantly greater during 135° and 180° turn conditions compared to 0-90° turn conditions (p<0.05). **CONCLUSION:** The GT9X gyroscope, when low-pass filtered at 0.25 Hz, can be used to detect the number of turns and estimate turn degree. The magnetometer was only useful for detecting the number of turns. Future work should explore the gyroscope use for turn detection during activities other than walking and running.

2369　　Board #205　　　　　June 1 9:30 AM - 11:00 AM

Peak Torque, Rate Of Velocity Development And Walking Performance: The Baltimore Longitudinal Study Of Aging

Yusuke Osawa, Stephanie A. Studenski, Luigi Ferrucci. National Institute on Aging/ NIH, Baltimore, MD.
(No relevant relationships reported)

PURPOSE: Efficiency of movements depends on both muscle strength and movement velocity. Men have higher muscle strength than women but whether strength and velocity contribute differently to walking performance in men and women remains unclear. Using data from the Baltimore Longitudinal Study of Aging, we investigated whether knee extension rate of velocity development (RVD) and peak torque differently contribute to walking performance measures in men and women. **METHODS**: We assessed the effect of sex on associations of RVD and peak torque with physical performance independent of demographics, body composition and subjective knee pain in 868 BLSA participants (48.2% women; aged 26 to 96 years; women, 64.1 ± 13.6 years; men, 68.6 ±14.4 years). We measured peak torque and RVD by isokinetic, concentric knee extension at 180 deg/sec. RVD was determined from the slope of the velocity-time relationship from the onset of movement to the time point that angular velocity first reached target velocity. Walking performance tests included gait speed during a 6m walk at usual and fast pace (6m-usual and fast) and during a 400m walk at fast pace (400m), and the distance covered in a 2.5-minute walk at normal pace (2.5min). Sex-specific generalized linear regression models were adjusted for age, race, body height, appendicular lean mass, whole body fat mass, and knee pain. A term testing whether the interaction between RVD and peak torque significantly improves the model fit was also included. **RESULTS**: In men, RVD was associated with 6m-usual (p<0.0001), while higher peak torque was significantly associated with better performances in 2.5min walk, 6m-fast, and 6m-fast (p<0.05). A significant interaction between RVD and peak torque was observed in 6m-usual (p<0.0001). In women, higher RVD was significantly associated with better performances in all measures independent of peak torque, and a significant interaction between RVD and peak torque was observed in all measures (p<0.05). **CONCLUSIONS**: RVD predicts walking performance in women but less in men. These results suggest that sex-specific strategies to accomplish motor tasks exist. Future studies are needed to identify the mechanisms underlying this sex difference.

2370　　Board #206　　　　　June 1 9:30 AM - 11:00 AM

Comparison of Physical Activity Levels of College Students after a Five Week Walking Class

Julio Morales. Lamar University, Beaumont, TX.
(No relevant relationships reported)

Physical Activity (PA) of college students has been the focus of much study because of its decline when students enter college. Efforts are consistently made to provide strategies to foment college students' engagement in PA**.**
PURPOSE: To compare the level of PA of college students before and after participation in a walking class containing information on PA and exercise.
METHODS: Participants in the study were sixty nine (25 males, 44 females; ages 19 to 26) college students enrolled in three different five week summer walking classes held during the same period over three different summers. Participants were administered the International Physical Activity Questionnaire-Short Form during the first and last class meeting to assess their leisure time physical activity. An experienced investigator read the questions and answered any questions during the administration of the questionnaire. He also made clear during the second administration that students should only report the PA done outside class. Walking (WMET), Moderate (MMET), Vigorous (VMET) and Total (TMET) METS levels were calculated following the IPAQ scoring guidelines. Paired samples t tests were conducted by gender for the pre and post administration for all MET levels. Independent samples t tests were conducted between genders to examine differences pre and post class.
RESULTS:Females showed a significant increase in TMET form pre (M = 5665.01, SD = 5580.14) to post (M = 8229.76, SD =7121.46), $t(31)$ = -2.21, p<.034 (two tailed). In the gender post comparison, females had significantly higher MMET values (M = 2584.38, SD = 3542.06) than males (M = 724.44, SD = 843.81), $t(37$ = 2.83, p <007 (two tailed).
CONCLUSIONS: Findings may suggest that there are possibilities for the use of content driven college activity courses could offer another avenue to foment participation in physical activity.

2371　　Board #207　　　　　June 1 9:30 AM - 11:00 AM

Association Between the National Walkability Index and Sidewalk Features

Kathleen B. Watson, Susan A. Carlson, Kristine Day, Janet E. Fulton, FACSM. Centers for Disease Control and Prevention, Atlanta, GA. (Sponsor: Janet E. Fulton, FACSM)
(No relevant relationships reported)

Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities calls on Americans to work together to increase walking and improve walkability. Well-connected, safe, and attractive sidewalks is one common feature of walkability. The Environmental Protection Agency National Walkability Index (NWI) provides a composite index of walkability at the block group level but does not include a direct measure of sidewalks. Knowing the associations between the NWI and sidewalk presence and quality may help assess the utility of the NWI to facilitate the planning of walkable communities. **PURPOSE** To determine the association between a nationwide geographic measure of walkability and features of sidewalks. **METHODS** We surveyed adults from 20 Community Transformation Grant sites. Respondents (n=20,918) reported on the presence of individual sidewalk features in their neighborhood (present; well maintained; separated from traffic by parked cars; separated from streets by grass/dirt strips). Sidewalk data were merged with the NWI - a nationwide geographic measure of walkability that encompasses density, land use mix, and proximity to transit. Associations of the NWI score with sidewalk presence and features were assessed by correlations and by comparing NWI mean scores by individual sidewalk features, tested with pairwise comparisons. **RESULTS** The correlation between the NWI and sidewalk presence was moderate (r=0.52) while correlations between NWI and individual sidewalk features were weak (r=0.04-0.19). Among adults who reported sidewalks present (73%), the mean (± standard deviation) NWI scores were higher (p<0.05) for those reporting (versus not reporting) sidewalks on most streets (11.6±0.1 vs. 9.6±0.1), well-maintained sidewalks (11.5±0.1 vs. 11.1±0.1), and sidewalks separated from traffic by parked cars (11.9±0.1 vs. 10.3±0.1). The NWI was lower (p<0.05) for sidewalks separated from street by grass/dirt (11.2±0.1 vs. 11.8±0.1). **CONCLUSIONS** The NWI was moderately associated with sidewalk presence; however, associations with individual sidewalk features were weak. The NWI may be not be useful to identify individual features of sidewalk quality or locations where sidewalks are lacking. Future studies may want to assess its utility to facilitate planning in other locations.

E-37   Free Communication/Poster - **Ergogenic Aids I - Proteins, Amino Acids, Peptides**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2372   Board #208   June 1 11:00 AM - 12:30 PM

Creatine Hcl In Elite Gymnastic Athletes

Caroline Ayme Yoshioka[1], Renata Furlan Viebig[2], Paulo Carrara[3], Jeferson Oliveira Santana[1], Diana Madureira[1], Elias de França[1], Iris Callado Sanches[1], Erico Caperuto[1]. [1]*São Judas Tadeu University, São Paulo, Brazil.* [2]*Mackenzie Presbiterian University, São Paulo, Brazil.* [3]*São Paulo University, São Paulo, Brazil.*

(No relevant relationships reported)

PURPOSE: The objective of this study was to compare the effects of creatine HCl and monohydrate supplementation on performance and body composition markers in weight-dependent elite athletes. **METHODS**: Elite athletes from the Artistic Gymnastics Brazilian top team (11 males, 15 to 25 years old), were randomly divided into the randomized cross-over model into two conditions: Placebo (PG), Creatine Monohydrate Supplement (CMG) and Creatine HCl Supplement (HClG). In a 30-day period (Pre and Post), including experimental protocols and gymnastics training, variables related to body composition were measured (IN BODY Bioimpedance), maximum strength (1RM test), and RPE (Physical Self-Efficacy Scale (RPE)). **RESULTS**: The results showed that lean mass increased in both moments when intragroup values were compared (CMG Pre 53.81 ± 6.67 and Post 54.98 ± 6.28 p=0.000025; HClG Pre 54.81 ± 5.96 and Post 55.29 ± 6.07; p=0.002). Regarding fat percentage, creatine hydrochloride supplementation showed significant decrease (HClG Pre 5.28 ± 1.44 and Post 4.37 ± 1.32; p=0.0001). There were similar strength gains between the two supplements in the post-period (CMG Pre 93.09 ± 16.86 and Post 96.64 ± 16.20 p=0.00014; HClG Pre 96.91 ± 15.35 and Post 102.00 ± 14.94; p=0.0018). Finally, the psychophysiological analysis (RPE) showed changes in the athletes' perception regarding the training only at the end of the creatine hydrochloride period (HClG Pre 3.27 ± 0.90 and Post 2.18 ± 0.75; p=0.003). **CONCLUSIONS**: We concluded that both creatines were effective in relation to muscle mass gains (p<0.05), but only HCl creatine was able to promote body composition and self efficacy perception changes.

2373   Board #209   June 1 11:00 AM - 12:30 PM

Preliminary Analysis - Moderating the Stress Perception of Collegiate Distance Runners Using Branched-Chain Amino Acids

Tara K. Whiton, Kimitake Sato, Asher Flynn, Joseph Walters, Caleb Bazyler, Michael H. Stone, Brad DeWeese. *East Tennessee State University, Johnson City, TN.*

(No relevant relationships reported)

Exercise-induced fatigue may be caused by increases in cerebral serotonin resulting in symptoms of central fatigue (i.e. decreased mood, and increased stress and sleepiness). Branched-chain amino acid (BCAA) supplementation is one intervention that can reduce symptoms of central fatigue by competing for the tryptophan transporter reducing serotonin synthesis. Psychological monitoring tools such as The Daily Analysis of Life Demands for Athletes (DALDA) Questionnaire can be used to study symptoms of central fatigue by identifying sources of general and sport-specific stress as well as an athlete's reaction to stressors. **PURPOSE:** To examine the response of BCAA on stress perception of trained collegiate distance runners using DALDA. **METHODS:** 8 collegiate distance runners (men n=4, women n=4) took BCAA supplement (SUP) (0.08g/kg) or placebo (PLA) daily for 6 weeks, alternating conditions week to week. Each morning athletes filled out the 34-item DALDA prior to training by selecting one of 3 answers corresponding to stress symptoms: A = "feel worse than normal", B= "feel normal", C= "feel better than normal". Response ratios were generated for each of the 3 answers for each condition (SUP or PLA) by taking total number of responses for each answer over number of answers overall. Response ratios were calculated as weekly mean ± SD and MANOVA was used for analysis. The alpha criterion was set to p<0.05. **RESULTS:** Statistical significance was found (p<0.01), and further analyses were done to examine changes from week to week. On average, athletes reported fewer 'A' responses in SUP weeks than PLA weeks (SUP: $9.27\% \pm 2.21\%$; PLA: $13.46\% \pm 7.29\%$), while response percentage for 'C' was the same between both conditions (SUP: $11.78 \pm 2.12\%$; PLA: $11.24\% \pm 2.32\%$). Changes from SUP weeks to PLA weeks produced noticeable changes in 'A' responses (e.g.: 14.36% SUP week to PLA week; -9.95% from PLA week to SUP week). **CONCLUSIONS:** Results from DALDA revealed a noticeable change in the stress response of the athletes from condition to condition. The athletes reported higher instances of feeling "worse than normal" during PLA weeks and fewer instances of

feeling "worse than normal" during SUP weeks. These results indicate that BCAA supplementation seems to be an effective means of reducing the stress perception in these collegiate distance runners.

2374   Board #210   June 1 11:00 AM - 12:30 PM

Effect Of B-Hydroxy B-Methylbutyrate Supplementation On Sprint Kinetics Across A Collegiate Rugby Season

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(No relevant relationships reported)

During a collegiate rugby season, players practice and compete for 1-2 hours on multiple days per week for 3-4 months per year. Practices and matches consist of multiple activities (e.g. sprinting, hitting, etc.) that could result in accumulated damage and affect performance. β-Hydroxy β-Methylbutyrate (HMB) is thought to speed protein synthesis which in turn could maintain performance. **PURPOSE:** To determine the effect of HMB supplementation on sprint kinetics throughout a rugby season. **METHODS:** In this cross-over design investigation, 13 collegiate male rugby players were assigned to consume one of two supplementation regimens: 5 g HMB + 5 g creatine per day (HMB) or 5 g creatine + 5 g placebo per day (PLB) for six weeks. During the fall season, players were matched for lean body mass and randomly assigned to HMB (n = 7; 21.1 ± 1.1 y; 88.2 ± 16.5 kg; 176.3 ± 7.9 cm) or PLB (n = 6; 21.5 ± 2.4 y; 88.8 ± 15.4 kg; 179.3 ± 5.2 cm). The supplementation regimen was switched for athletes who returned and completed the spring season (n = 7; 22.5 ± 1.3 y; 96.4 ± 14.7 kg; 179.6 ± 4.5 cm). Prior to and following each supplementation period (i.e., fall or spring), 40-m sprinting kinetics were assessed in all athletes while tethered to a robotic sprinting device. Peak ($_{PK}$) and mean sprinting power (P), force (F), and velocity were assessed against minimal (1 kg) and heavy (15 kg) resistance. Since only 7 of the original 13 athletes returned and completed the spring season, separate 2×2 repeated measures analyses of variance (RMANOVA) with Bonferroni adjustments were used to assess group differences in each variable during the fall, while a 2×4 RMANOVA was used to assess the cross-over sub-sample throughout the fall and spring. **RESULTS:** While no group differences were observed in sprint kinetics during the fall, a significant group × time interaction was observed for P_{PK} at 1kg (F = 4.85, p = 0.020, n_p^2 = 0.55) across the fall and spring seasons, where during the spring, P_{PK} at 1kg decreased for PLB_{SPRING} ($-6.9 \pm 1.2\%$, p = 0.020) but not for HMB_{SPRING} ($+7.5 \pm 10.7\%$). No other differences were observed. **CONCLUSION**: Our data suggest a potential benefit from HMB supplementation for maintaining sprinting power in rugby players.

2375   Board #211   June 1 11:00 AM - 12:30 PM

Effect Of β-hydroxy-β-methylbutyrate And Creatine Supplementation On Muscle Recovery In Elite Rowers As Measured By Anabolic And Catabolic Hormones.

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(No relevant relationships reported)

PURPOSE: The aim of the present study was to experimentally investigate the effect of supplementation with creatine (Cr) and / or β-hydroxymethyl-β-hydroxy (HMB) on muscle recovery in elite rowers using anabolic and catabolic hormones. The hypothesis was that supplementation with both HMB + Cr for 10 weeks would improve muscle recovery, as measured by testosterone and T/C ratio, to a greater degree than would each individual supplements alone.
METHODS:
Twenty-four elite rowers (27.0 ± 5.6 years) who participated in the 10-week non-placebo-controlled trial were randomized to one of the following 4 groups: GC: Control group; GCR: Group supplemented with Cr (0.04 g / kg / day); GHMB: Group supplemented with HMB (3 g / day); and, GCR + HMB (supplemented with the same doses as individual).
RESULTS:
There were significant differences in testosterone behavior, as well as in the Testosterone / Cortisol ratio (T/C) between groups. Higher testosterone levels were observed in GCR + HMB than in the others (p <0.05). A smaller decrease in the T / C ratio in the GCR + HMB than in the others was also observed (p <0.05).
CONCLUSIONS:
This study indicates that combined supplementation with Cr (0.04 mg / kg) together with β-hydroxymethyl-βutyrate (HMB) (3 g / kg) in elite rowers favors endogenous recovery through an increase in total testosterone and maintenance of the T / C ratio.

2376   Board #212   June 1 11:00 AM - 12:30 PM

Effect of Preand Post-Exercise Creatine Supplementation on Bone Mineral in Aging Adults

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(No relevant relationships reported)

PURPOSE: Creatine supplementation before and after resistance training may be an important strategy for increasing aging muscle health; however, it is unknown whether the timing of creatine ingestion influences aging bone health.
METHODS: Using a double-blind, repeated measures design, aging adults were randomized to one of two groups: Creatine-Before (CR-B: n=15; 53.2 ± 2.5 yrs, 170.1 ± 9.9 cm, 77.1 ± 15.6 kg; creatine [0.1g·kg^{-1}] immediately before resistance training and placebo [0.1g·kg^{-1} corn-starch maltodextrin] immediately after resistance training) or Creatine-After (CR-A: n=12; 55.2 ± 3.5 yrs, 173.4 ± 8.2 cm, 86.8 ± 20.1 kg; placebo immediately before resistance training and creatine immediately after resistance training). Resistance training (11 exercises) was performed 3 days/week for 8 months. Prior to and following training and supplementation, bone mineral content (BMC) and density (BMD) of the whole-body, femoral neck, lumbar spine, and hip was measured by dual energy x-ray absorptiometry.
RESULTS: There was a time main effect (p=0.04) for femoral neck BMD (CR-B: pre 0.80 ± 0.11g, post 0.79 ± 0.11g; CR-A: pre 0.87 ± 0.15g, post 0.86 ± 0.13g) and a group x time interaction for hip BMD (p=0.02). Hip BMD was preserved in the CR-A group over time (pre 1.01 ± 0.15g/cm², post 1.01 ± 0.15g/cm²) whereas the CR-B experienced a slight reduction (pre 0.98 ± 0.12g/cm², post 0.96 ± 0.12g/cm²). There were no other differences (p>0.05).
CONCLUSIONS: Creatine supplementation immediately following resistance training helps preserve hip BMD. Creatine supplementation only on training days has no effect on bone mineral in aging adults.

2377   Board #213   June 1 11:00 AM - 12:30 PM

No Impact of HMB Supplementation on Muscle or Strength Gains During an Undulating Periodized Resistance Training Program in Trained, Young Men

Josie S. Jakubowski[1], Edwin P. Wong[1], Everson A. Nunes[2], Josh Vandeweerd[1], Kenneth S. Noguchi[1], Kevin T. Murphy[1], Robert W. Morton[1], Steven K. Baker[1], Stuart M. Phillips, FACSM[1]. *[1]McMaster Univeristy, Hamilton, ON, Canada. [2]Federal University of Santa Catarina, Florianoplóis, SC, Brazil.* (Sponsor: Stuart Phillips, FACSM)

(No relevant relationships reported)

PURPOSE: We examined the effect of whey protein enriched with leucine compared to whey protein plus calcium-β-hydroxy, β-methylbutyrate (HMB) on skeletal muscle strength, mass, and recovery during 12 weeks of an undulating periodized resistance training (RT) program in young men. **METHODS:** Twenty-six recreationally trained men (≥2x/wk RT, aged 23±2y, lean mass 63.0±7.2kg) performed 12 weeks of a 3-phase RT program. Participants underwent 8 weeks of undulating periodized RT (Phase 1), followed by a 2-week overreaching period (Phase 2), and a 2-week taper (Phase 3). During the 12-week RT program, participants were randomized to ingest: whey protein (25g) with added HMB (1.5g) (Whey+HMB;n=13) or whey protein (25g) with added leucine (1.5g) (Whey+LEU;n=13), twice daily. One-repetition maximum (1-RM) strength tests were conducted throughout Phase 1, Phase 2 and upon completion of Phase 3. Fat and bone-free mass (FBFM) was measured with dual-energy X-ray absorptiometry (DXA) scans at weeks 0,4,8,10,12. B-mode ultrasound was preformed to assess muscle thickness (MT) and cross sectional area (CSA) at weeks 0,8,12. Systemic hormone concentrations were measured at weeks 0,4,8,9,10,12. **RESULTS:** In response to RT, participants increased their 1-RM for squat, bench-press and deadlift (p≤ 0.01), with no significant differences between groups. FBFM increased similarly in Whey+HMB and Whey+LEU (2.3±1.2kg and 2.6±1.9kg, respectively; p=0.59). Following RT, *Vastus lateralis* MT increased by 5±6% and 5±6%, with no difference (p>0.05) between groups. Both groups exhibited comparable changes in CSA, Whey+HMB; 2.2±1.4cm2 (6±4% increase) and Whey+LEU; 2.3±1.4cm2 (7±4% increase). Following overreaching, both groups experienced similar changes (p>0.05) in 1-RM strength for squat (HMB 2±4%, LEU -1±5%) bench-press (HMB -1±4%, LEU -1±3%) and deadlift (HMB -2±5%, LEU -3±7%). Circulating creatine kinase and cortisol concentrations increased significantly (p≤0.05) from week 0 at phase 2, in both groups. There were no between-group differences in these blood markers during any phase of the study. **CONCLUSION**: These data demonstrate that there are no additional effects of Whey+HMB supplementation on muscle strength or size following 12 weeks of RT in young healthy men when compared to a leucine-fortified supplement Whey+LEU.

2378   Board #214   June 1 11:00 AM - 12:30 PM

Body Composition And Muscular Performance Following 8-weeks Of Resistance-training And Protein Supplementation: Pilot Study

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(No relevant relationships reported)

Increased protein intake in the diet decreases fat mass (FM) and increases lean mass (LM). Resistance training increases LM, as well as increases muscular strength. Together, protein supplementation and resistance exercise work synergistically when taken prior to or following exercise. **PURPOSE**: The purpose of this pilot study was to investigate the effects 8 weeks of protein supplementation and Autoregulatory Progressive Resistance Exercise (APRE) training had on measures of body composition and muscular performance. **METHODS**: Untrained males (*n* = 22; 42.1 ± 7.1 years) participated in this pilot study. LM and FM were measured via Dual Energy X-ray Absorptiometry (DEXA), while strength was measured utilizing one repetition maximum (1RM), and endurance measured using maximum repetitions completed (REPS) at 75% 1RM for the bench and leg press. Subjects were randomly placed into one of four groups: control (CON), protein (PO), APRE, or protein plus APRE (PAPRE). Subjects repeated testing for the DEXA, 1RM, and REPS every four weeks for 8 weeks. Both PO and PAPRE groups ingested 25g of supplemental protein twice daily. Subjects in the exercise groups completed a resistance training program, 3 days per week, for 8 weeks, or 24 training sessions. **RESULTS:** Repeated measures ANOVA indicated a significant group by time interaction for LM, bench press 1RM, and leg press 1RM (*p* < .05). LM increased by 4% (+2.3 ± 0.2kg) in the PAPRE group, while increases in bench and leg press 1RM were 23% (+14.7 ± 0.7kg) and 50% (+132.1 ± 13.9 kg), respectively. There were no other group by time interactions for any of the variables assessed (*p* > .05). LM (*p* < .05), bench press 1RM (*p* < .001), and leg press 1RM (*p* < .001) indicated a significant time effect (+0.93 ± 0.02kg, +6.3 ± 0.9kg, and +68.2 ± 2.5kg, respectively). Body fat percentage showed a trend for decreasing over time (*p* = .05), while FM was significantly reduced over the 8-week training period (*p* < .05). Bench press increased 20% (+13.0 ± 2.0kg) from baseline for the APRE group, while leg press increased 13% (+32.9 ± 7.3kg), 18% (+43.1 ± 8.5kg), and 20% (+64.6 ± 28.8kg) for CON, PO, and APRE groups, respectively. **CONCLUSION**: The synergistic effects of protein plus exercise can be seen with the PAPRE group out-performing all other groups given the significant increases in LM and muscular strength over 8 weeks.

2379   Board #215   June 1 11:00 AM - 12:30 PM

Branched-chain Amino Acid Supplementation May Produce Marginal Reductions in Muscular Soreness in CollegiateDistance Runners

Asher Flynn, Tara Whiton, Kimitake Sato. *East Tennessee State University, Johnson City, TN.*

(No relevant relationships reported)

Branched-chain Amino Acid Supplementation May Produce Marginal Reductions Muscular Soreness in Collegiate Distance Runners
Asher Flynn, Tara Whiton, Kimitake Sato
East Tennessee State University
INTRODUCTION: A normal response to a rigorous training program is delayed onset muscle soreness (DOMS) often characterized by painful, tender, and swollen muscles with reduced range of motion and strength loss. These symptoms can take 24-48 hours to appear and dissipate within 5 to 7 days. Ingesting branched-chain amino acids (BCAA) has been shown to mitigate symptoms of DOMS by reducing muscle damage factors, sparing protein, and increasing muscle protein synthesis. **PURPOSE:** The purpose of this study was to investigate the influence of BCAA on perception of muscular soreness in collegiate distance runners. **METHODS:** 8 collegiate distance runners (men n=4, women n=4) took BCAA supplement (SUP) (0.08g/kg) or placebo (PLA) daily for 6 weeks, alternating conditions each week. Each morning prior to training, athletes filled out a 10-point scale Soreness Chart in which they rated soreness levels for each major muscle group on both anterior (ANT) and posterior (POST) body segments (1= no pain at all and 10= excruciating pain). Responses were totaled for each condition (SUP or PLA) and body segment (ANT or POST). After preliminary analyses for data, upper extremity data were excluded. Data were analyzed using paired-samples T-test to compare soreness levels between PLA and SUP weeks. **RESULTS:** Statistical significance ranged from p=0.09 – 0.89 depending on lower extremity segments. Based on descriptive analyses, athletes reported higher ratings of soreness in the ANT segment of the lower body. Overall soreness ratings were lower in SUP weeks vs PLA in both ANT and POST (SUP: ANT= 98.01% ± 34.86%; POST= 97.18% ± 39.72% and PLA: ANT= 108.52% ± 38.41%; POST = 110.32% ± 38.60%) but did not reach statistical significance. **CONCLUSION:** Although significance was not met, some note-worthy changes were captured. For instance, leg muscles, the primary movers involved in running, had a greater tendency to be less sore while

on the supplement. Since gains in athletic performance can often be marginal, it is possible that marginal reductions of DOMS can eventually lead to an improvement training experiences.

2380   **Board #216**   **June 1 11:00 AM - 12:30 PM**

The Effects of Creatine Loading on Dynamic Balance, Mobility and Strength in Older Adults

Joseph Reale, John Petrizzo, John Wygand, FACSM, Melhaney Reichelt, Glen Reid, Robert M. Otto, FACSM. *Adelphi University, Garden City, NY.* (Sponsor: Robert M. Otto, FACSM)

(No relevant relationships reported)

Aging often attenuates balance and strength regardless of activity profile, thus resulting in an increased risk of falling. Older populations taking part in a resistance training program tend to minimize the loss of lean body mass, but still may suffer decrements. Creatine (Cr) supplementation has been studied extensively for almost 20 years and is a popular supplement of choice by athletes. Cr purportedly provides an enhancement of the phosphocreatine energy system allowing users to maintain a greater work intensity for an extended time. **Purpose:** To determine if acute Cr supplementation (20g of Cr/day for 5 days) improves balance, mobility, and strength in older adult populations. **Methods:** Ten subjects (age 64.4 ± 5.2 yr, ht. 168 ± 5.6 cm, body mass 76.3 ± 8.1 kg, ♀6) participated in familiarization trials conducted on the Biodex Balance SD [four conditions: normal stance w/ eyes open (NEO), N w/ eyes closed (NEC): and closed stance w/ eyes open (CEO), and C w/ eyes closed (CEC)], isokinetic knee extension (KE) and knee flexion (KF) peak torque (ft/lbs) and the Timed Up and Go Test (TUG) expressed in seconds. The battery of tests were conducted in the same sequence for each of the four assessments (pre control [PC], post control [PoC], pre Cr [PCr], and post Cr [PoCr]). Subjects were randomly assigned to 5 days of either 20 g of Cr or a matched placebo in a double blind protocol with a washout period of 14 days between treatments. Cr and placebo were indistinguishable in volume, taste, flavor, texture and color. **Results:** Statistical analysis by ANOVA revealed NSD (p>.05) between treatments.

	KE	KF	TUG	NEO	NEC	CEO	CEC
PC	30.3±20	47.1±22	8.8±1.5	15.9±24	40.0±83	27.7±30	83.7±114
PoC	30.2±17	61.6±43	8.2±1.1	11.5±15	21.9±33	23.1±30	68.6±99
PCr	30.5±14	64.7±34	8.2±1.2	23.9±26	46.3±79	46.4±38	102.6±90
PoCr	27.9±12	55.0±21	8.1±1.1	21.8±21	38.5±36	43.0±40	101.1±100

Conclusion: The acute use of Cr loading for individuals aged ≥60 was ineffective in altering muscular strength, balance or mobility for moderately active adults. It may require a longer period of loading or larger doses for creatine to be effective in older populations.

2381   **Board #217**   **June 1 11:00 AM - 12:30 PM**

The Effect of Pre-sleep Protein Supplementation After Resistance Exercise on Next Day Performance and Recovery

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(No relevant relationships reported)

PURPOSE: To evaluate the effect of pre-sleep protein supplementation after an acute bout of resistance training on performance and post-exercise recovery the following day. **METHODS:** Eighteen athletic men performed a single bout of eight sets of eight repetitions of weighted barbell squats and weighted barbell chest press immediately followed by an exercise recovery drink (60g carbohydrate, 20g whey protein). The participants received either a pre-sleep protein supplement (PRO) containing 40g of casein protein (n=10; mean ± SD; age = 24.00 ± 3.86yrs; height = 1.81 ± 0.08m; weight = 84.91 ± 9.45kg) or a non-caloric, flavor matched placebo (PLA; n=8; age = 28.38 ± 9.97yrs; height = 1.81 ± 0.07m; weight = 86.68 ± 10.93kg) 30 min before sleep (1 hour after recovery drink). Blood samples were obtained at baseline (BL), pre- and post-exercise, prior to pre-sleep supplementation, and the following day to assess creatine kinase and C-reactive protein. Visual analog scales were utilized to assess perceived pain, hunger, and recovery. One-RM tests for bench and squat were performed at BL and the day following resistance exercise. Jump performance was assessed at BL, immediately post-exercise, and the day following resistance exercise. Statistical analyses were performed using SPSS (V.23) and p ≤ 0.05 was considered statistically significant; values reported as mean ± SD. **RESULTS:** PRO reported significantly less hunger the following day compared to PLA, which represented a moderate and probably beneficial effect (PRO:4.21 ± 2.85, PLA: 6.94 ± 2.22; 95% C.I. = 0.1, 2.0; p=0.04; d = 1.1; 95% C.I. = 0.1, 2.0). Although perceived recovery was not significantly different (p=0.14), the effect of PRO was interpreted as moderate and possibly beneficial (PRO:7.36 ± 1.71, PLA: 5.76 ± 2.13; d = 0.8; 95% C.I.=

-0.1, 1.8). There were no significant differences between groups in post-exercise recovery biomarkers or muscular performance assessments. Jump squat power was significantly higher in PLA immediately post exercise compared to PRO (29.7 ± 16.4 W.kg^{-1}, 22.9 ± 18.4 W.kg^{-1}, respectively; p=0.02). **CONCLUSIONS:** Pre-sleep protein supplementation after resistance exercise may improve perceived rate of recovery and hunger the following day with no effect on next day performance. This study was supported by Dymatize Nutrition.

2382   **Board #218**   **June 1 11:00 AM - 12:30 PM**

The Effects Of Leucine-enriched Branched-chain Amino Acid Supplementation On Exercise-induced Muscle Damage

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(No relevant relationships reported)

A significant degree of efficacy of branched-chain amino acid (BCAA) supplements in attenuating the symptoms of exercise-induced muscle damage (EIMD) and accelerating recovery from intense exercise have been demonstrated. Of the BCAA, leucine is evidently most contributory to the anabolic and anti-catabolic properties of BCAA in skeletal muscle. The speculation that supplementary leucine alone would likewise attenuate the symptoms of EIMD is within scientific reason. However, whether a leucine-enriched BCAA supplement (LBCAA) or a free-form leucine supplement (LEU) further attenuates EIMD when compared to a conventional BCAA supplement remains of significant debate. PURPOSE: To examine the effects of LBCAA and LEU supplementation on select markers of EIMD elicited by a bout of damaging exercise. MEHODS: Participants completed a bout of damaging eccentric-based resistance exercise (ECRE) following a 7-day supplementation period with either a conventional BCAA supplement (BCAA), LBCAA, or LEU. Muscle soreness, mean average power (MAP), mean peak power (MPP), lower body flexibility, and pressure-pain threshold were measured immediately before ECRE (0 hours) and at 24, 48, and 72 hours following ECRE. RESULTS: MAP ($45 \pm 56\%$, p=0.01) and MPP ($41 \pm 20\%$, p<0.05) decreased at 48 hours post-ECRE in LEU only. Additionally, at 48 hours post-ECRE, MPP in LEU was significantly lower than BCAA ($41 \pm 20\%$ vs. $98 \pm 15\%$, p=0.05). During resting conditions, LBCAA reported increased soreness from 0 to 48 hours post-ECRE (p<0.05), while LEU reported increased soreness from 0 to 24 hours post-ECRE (p<0.05), and BCAA exhibited no changes from 0 hours. During a contracted state, both LBCAA and LEU demonstrated increased soreness from 0 to 24 and 48 hours post-ECRE (p<0.05) while BCAA only exhibited an increase from 0 to 48 hours post-ECRE (p<0.05). All groups returned to baseline soreness levels at 72 hours post-ECRE. There were no other differences in lower body flexibility and pressure-pain threshold among supplementation groups. CONCLUSION: LBCAA and LEU failed to afford any discernible advantages to recovery from a bout of damaging exercise over BCAA.

2383   **Board #219**   **June 1 11:00 AM - 12:30 PM**

BCAA Supplementation Improves Mental Performance Following a Soccer-Specific Conditioning Session

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(No relevant relationships reported)

The efficacy of branched-chain amino acid (BCAA) supplementation on exercise performance has been researched extensively, but influence on post-exercise mental performance remains understudied. **PURPOSE**: The present study sought to determine the efficacy of BCAA supplementation on cognitive and psychomotor performance after a high-intensity conditioning session, as well as on post-exercise rating of perceived exertion (RPE). **METHODS**: In a double-blind manner, 14 male Division I collegiate soccer players performed a smartphone-based Stroop test (EncephalApp) immediately before and after a conditioning-heavy, 80-minute soccer practice. Before and during practice, subjects ingested a water-based solution containing either BCAAs (SUPP; n=7) or an isocaloric amount of maltodextrin (PLAC; n=7) at fixed time intervals. The SUPP treatment beverage contained a total of 18 grams of BCAA, with a 3:1:1 ratio of leucine, isoleucine, and valine, respectively. Paired t-tests were used to assess within-group differences. Session RPE was assessed 30 minutes post-exercise, and between-group comparisons were made via a Mann-Whitney U test. **RESULTS**: Subjects in the SUPP group had significantly ($p < 0.05$) improved performance on the EncephalApp following exercise (11.1 ± 1.5 s) as compared to before exercise (13.4 ± 3.6 s). There was not a significant difference ($p > 0.05$) between pre-exercise (12.5 ± 2.2 s) and post-exercise (11.0 ± 1.4 s) performance in the PLAC group. No between-group difference was found for session RPE ($p > 0.05$). **CONCLUSIONS**: This evidence suggests that BCAA supplementation before and during exercise may improve certain aspects of post-exercise cognitive and psychomotor performance, but without influencing session RPE.

2384   Board #220   June 1 11:00 AM - 12:30 PM

Effects of Creatine Monohydrate Timing Supplementation on Isometric Strength In Male College Soccer Players

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(No relevant relationships reported)

PURPOSE: To compare the effects of timing supplementation with creatine monohydrate in isometric strength in male college soccer players.
METHODS: Fifteen male college soccer players were supplemented with creatine monohydrate for 26 days with a load phase (5 days 20 g creatine/d) and a maintenance phase (21 days 5 g creatine/d). In the maintenance phase subjects were assigned, in a randomized and double blind form, to either consume 5 g of creatine before training and 5 g of maltodextrin after training (CRB) or 5 g of maltodextrin before training and 5 g of creatine after training (CRA) diluted in flavored water. At the same time a physical conditioning program was carried out (resistance training + soccer training 2 d/week; soccer training only 3 d/week). Before and after intervention, isometric strength in biceps, back, legs and forearms. were evaluated through dynamometry. Similarly, nutritional intake was evaluated (before and after) through 24-h dietary recalls. The strength and nutritional variables were compared by group (CRB vs CRA) and by time (PRE vs POST).
RESULTS: There were no significant differences in strength variables between groups at the beginning nor at the end of the study. However, CRB group had a significant increase in leg strength at the end of the study. The CRA group also had significant changes at the end of the study; an increase in back strength and leg strength were observed (Table 1). No other strength variable had significant changes. In the nutritional variables, there were no significant differences between groups at the beginning nor at the end of the study. Nonetheless, CRA group showed a significant decrease in energy and total protein intake (Table 1).
CONCLUSIONS: Both CRA and CRB showed similar strength gains in legs but CRA helped to increase strength in back, considering that energy and protein intake for players in CRA group decreased and they still had a significant increase in strength.

Table 1. Strength and nutritional variables compared by group (CRB vs CRA) and by time (PRE vs POST)								
		PRE			POST			p CRB by time	p CRA by time
		CRB	CRA	p group	CRB	CRA	p group		
Strength	Biceps	37 ±4	35 ±4	0.49	38 ±3	36 ±4	0.50	0.42	0.68
	Back	99 ±19	93 ±14	0.55	97 ±18	102 ±13	0.58	0.75	0.05
	Legs	85 ±16	85 ±12	0.88	104 ±17	100 ±7	0.60	0.04	0.02
	Right forearm	43 ±8	44 ±6	0.86	43 ±6	42 ±6	0.80	0.62	0.28
	Left forearm	42 ±7	40 ±7	0.73	41 ±6	39 ±6	0.31	0.68	0.72
Nutrition	Kcal	3312 ±1137	3541 ±783	0.65	2558 ±428	2793 ±813	0.51	0.10	0.02
	CHO (g/day)	479 ±181	443 ±86	0.64	359 ±85	345 ±79	0.73	0.09	0.07
	Protein (g/day)	94 ±41	123 ±60	0.65	64 ±19	95 ±64	0.86	0.55	0.05
	Fat (g/day)	155 ±57	167 ±46	0.26	135 ±41	132 ±32	0.23	0.07	0.10
	CH (g/kg/day)	7.1 ±3	6.6 ±2	0.69	5.4 ±2	5.0 ±1	0.68	0.10	0.10
	Protein (g/kg/day)	1.4 ±1	1.9 ±1	0.79	0.9 ±0.3	1.4 ±1	0.94	0.49	0.07
	Fat (g/kg/day)	2.3 ±1	2.5 ±1	0.33	2.0 ±0.5	1.9 ±1	0.56	0.07	0.10

2385   Board #221   June 1 11:00 AM - 12:30 PM

Chronic (24 weeks) Beta-alanine Supplementation Does Not Affect Muscle Taurine Or Blood Clinical Chemistry

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Reported Relationships: B. Saunders: *Salary; Natural Alternative Inc..*

PURPOSE: To investigate the effects of chronic beta-alanine (BA) supplementation on muscle taurine content, blood clinical markers and sensory side-effects.
METHODS: Twenty-five healthy male participants (age 27 ± 4 y, height 1.75 ± 0.09 m, body mass 78.9 ± 11.7 kg) were supplemented with 6.4 g·day^{-1} of sustained release BA (N = 16; CarnoSyn™, NAI, USA) or placebo (PL; N = 9; maltodextrin) for 24 weeks. Muscle biopsies of the *m. vastus lateralis* were taken at 0, 12 and 24 weeks and analysed for taurine content using high-performance liquid chromatography. Resting venous blood samples were taken in the supine position every 4 weeks and analysed for markers of renal, hepatic and muscle function (aspartate transaminase; alanine aminotransferase; alkaline phosphatase; lactate dehydrogenase; albumin; globulin; creatinine; estimated glomerular filtration rate and creatine kinase). Data were analysed using mixed model ANOVA. **RESULTS:** There were no significant differences in taurine content at Week 0 (BA: 33.67 ± 8.18 mmol·kg^{-1}dm, PL: 27.75 ± 4.86 mmol·kg^{-1}dm; $p = 0.21$). There was a significant main effect of group ($p = 0.04$) on muscle taurine, with overall lower values in PL, although there was no main effect of time or interaction effect (both $p > 0.05$; BA, Week 12: 35.93 ± 8.79 mmol·kg^{-1}dm and Week 24: 35.42 ± 6.16 mmol·kg^{-1}dm; PL, Week 12: 27.67 ± 4.75 mmol·kg^{-1}dm and Week 24: 31.99 ± 5.60 mmol·kg^{-1}dm). There was no effect of treatment, time or any interaction effects on any blood marker (all $p > 0.05$) and no self-reported side effects in these participants throughout the study. **CONCLUSION:** The current study showed that twenty-four weeks of BA supplementation at 6.4 g·day^{-1} did not affect muscle taurine content, clinical markers of renal, hepatic and muscle function, nor did it result in chronic sensory side-effects, in these healthy individuals. Since athletes are likely to engage in chronic supplementation, these data provide important evidence to suggest that supplementation with BA at these doses for up to 24 weeks do not adversely affect these markers in healthy individuals.

E-38   Free Communication/Poster - Ergogenic Aids II - Beetroot and Nitrates

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2386   Board #222   June 1 11:00 AM - 12:30 PM

Sucrose But Not Nitrate Ingestion Reduces High-intensity Exercise-induced Gut Injury

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(Sponsor: Professor Janice L Thompson, PhD, FACSM)

(No relevant relationships reported)

Purpose: During high-intensity exercise many athletes suffer from gastrointestinal (GI)complaints, which are likely related to splanchnic hypoperfusion, resulting in intestinal injury. Intestinal perfusion may be improved by increasing circulating nitric oxide (NO) levels or inducing postprandial hyperemia, potentially attenuating intestinal injury during exercise. Therefore we investigated the effects of both dietary nitrate and sucrose ingestion on splanchnic perfusion and intestinal injury induced by high-intensity exercise.
Methods: In a randomized cross-over manner, 16 well-trained male athletes (age: 28 ± 7 y; W_{max}: 5.0 ± 0.3 W·kg^{-1}) cycled 60 min at 70% W_{max} following acute ingestion of: sodium nitrate (NIT; 800 mg NO_3), sucrose (SUC; 40 g) or water placebo (PLA). Splanchnic perfusion was assessed using gastric air tonometry. Plasma intestinal fatty-acid binding protein (I-FABP) concentrations, reflecting enterocyte damage, were assessed every 20 min during and up to 60 min post-exercise.
Results: The exercise protocol resulted in hypoperfusion, as gap$_{g-a}$pCO$_2$ levels increased during exercise ($P<0.001$), with no differences between treatments ($P=0.47$ for time x treatment interaction). Although plasma I-FABP concentrations increased during and post-exercise for all treatments ($P<0.001$), the increase was attenuated following SUC ($P=0.007$ for time x treatment interaction). In accordance, total I-FABP

area under curve (AUC) tended to be different between treatments (P=0.061), and I-FABP AUC was significantly different in the post-exercise period (P=0.006). Post hoc testing showed significantly lower I-FABP AUC in SUC vs PLA (1096±2182% vs 3900±3731%, P=0.022). No differences were observed between NIT and PLA (P=1.0).
Conclusions: Sucrose but not nitrate ingestion lowers gut injury evoked during high-intensity exercise. These results suggest that sucrose, but not nitrate, may prevent hypoperfusion-induced GI damage during exercise and, as such, may prevent or lower exercise-related GI complaints.
Supported by a grant from the Dutch Technology Foundation STW

2387   Board #223   June 1 11:00 AM - 12:30 PM

The Effect Of Nitrate Supplementation Through Powdered Beetroot Juice In Endurance Athletes Over The Time Required To Complete A 10-km Bicycle Time-trial.

Alexia Wiegandt Rohde. *Universidad Iberoamericana Mexico City, Mexico City, Mexico.*
(No relevant relationships reported)

It has been found that nitrate supplementation in the diet of athletes may have ergogenic effects, such as a decrease in the cost of oxygen when exercising at low or moderate intensity. Significant improvement has also been observed in the results of several time trials or incremental exercise tests after nitrate supplementation. Nitrate supplementation is achieved through beetroot consumption, since it is one of the nitrate-richest foods, containing over 250 mg. of nitrate per 100 g gross weight.
PURPOSE: Analyze if a group of amateur endurance athletes reduce their time to complete a 10Km time-trial on a stationary bicycle after a 5-day supplementation period with powdered beetroot juice.
METHODS: Amateur runners, cyclists and triathletes who participate regularly in sports events in any of the disciplines mentioned before participated in this study. Two tests were performed, the subjects arrived at the laboratory having taken the last dose of either placebo or supplement 2 hours earlier. This supplement should have been taken daily during the previous four days. After remaining seated for 10 minutes blood pressure and cardiac rhythm was be measured. A 10 kilometer time-trial on the stationary bicycle was performed, during which oxygen volume, cardiac rhythm and pedaling power was measured. Subjects were asked periodically at what level in the Scale of Perceived Exertion they felt to be. At the end the time taken for their cardiac frequency to be restored to its initial value was measured. **RESULTS**: Participants were able to increase their power significantly after supplementation with beetroot juice 159.2 (27,3-287.3) Watts, as compared to the placebo 130.85 (26.7-260.3) Watts (p=0.041). A significant reduction of approximately 56 (15:12-22:34) seconds was also achieved in the time the participants required to cover 10 Km on the stationary bicycle (p=0.41).
CONCLUSIONS: Beetroot juice in powder or liquid form may improve athlete's performance, since it increases considerably the power that may be exerted during a sub maximal exercise test, such as that of 10 Km by bicycle. It still remains to be determined whether these effects are consistent with those in professional athletes, since there are no studies to prove it, and whether these effects are just as efficient in longer distances.

2388   Board #224   June 1 11:00 AM - 12:30 PM

The Effects of Beetroot Juice Supplementation on Cycling Time-Trial Performance in Normoxia and Moderate Hypoxia

Samantha Fessler. *East Stroudsburg University, East Stroudsburg, PA.* (Sponsor: Shala Davis, FACSM)
(No relevant relationships reported)

Recent research has shown that Beetroot Juice (BR) ingestion assists in Nitric Oxide (NO) production and may increase exercise efficiency, decrease muscular fatigue, increase mitochondrial respiration, increase calcium handling, elevate glucose uptake, and aid vasodilatation. Also, given evidence for the detrimental effects of environmental hypoxia on exercise due to decreases in partial pressure of arterial oxygen (P_aO_2), as well as hypoxia-induced reductions in NO, increases in NO production via dietary nitrate supplementation may serve to enhance performance in hypoxia. **PURPOSE:** To investigate the effects of 3 day supplementation of beetroot juice on oxygen consumption (VO_2), arterial oxygen saturation (SpO_2), and average workload (W) during 15 minute time trial (TT) in both normoxic and simulated hypoxic (F_iO_2 = 15.3%) conditions in active males, aged 18-24. **METHODS:** Ten recreationally active healthy males participated in the study. Subjects were assigned in a double-blind randomized, crossover design consuming 140 mL of beetroot juice (2 shots) containing ~8.4mmol of nitrate (NO_3^-) and nitrate depleted placebo (PL) for 2 days prior to testing and 2.5 hours prior to testing in both normoxic and hypoxic conditions. A 72 hour washout was utilized during the crossover. Prior to testing all subjects completed a maximal effort protocol to determine Maximal Power Output (W_{max}).During testing, subjects completed a 5 minute warmup, a 15 minute steady state normoxic preload at 50% W_{max}, and finished with a 15 minute cycling time trial (TT) at

70% W_{max}, in either normoxia or simulated hypoxia (F_iO_2=15.3% O_2). **RESULTS:** No significant difference was found for BR or PL group by condition in mean workload (164.5±20.7 vs. 166.5±18.7 watts in normoxia and 162.6±13.9 vs. 161.0±22.1 watts in hypoxia, p=.769). **CONCLUSION:** The present research found no significant differences in average workloads during a 15 minute cycling TT performed in either normoxia or moderate simulated hypoxia after chronic supplementation of beetroot juice (1.4 mL X 3 days) vs. placebo. A 3-day chronic dosing protocol of 8.4 mmol NO_3^- per day in the form of BR may not be beneficial to athletes competing in cycling time trials of ~15 minutes in duration at either sea level, or following acute altitude exposure at ~2500m.

2389   Board #225   June 1 11:00 AM - 12:30 PM

Effect Of Inorganic Nitrate Supplementation On O_2 Uptake And Quadriceps Deoxygenation During The Onset And Offset Of Exercise.

Brynmor Breese[1], David Poole, FACSM[2], Dai Okushima[3], Stephen Bailey[4], Andrew Jones, FACSM[5], Narihiko Kondo[6], Tatsuro Amano[7], Shunsaku Koga[3]. [1]*Plymouth University, Plymouth, United Kingdom.* [2]*Kansas State University, Manhattan, KS.* [3]*Kobe Design University, Kobe, Japan.* [4]*Loughborough University, Loughborough, United Kingdom.* [5]*Exeter University, Exeter, United Kingdom.* [6]*Kobe University, Kobe, Japan.* [7]*Niigata University, Niigata, Japan.*
(No relevant relationships reported)

PURPOSE: To investigate the effect of inorganic nitrate (NO_3^-) supplementation on O_2 uptake (VO_2) and deoxyhemoglobin/myoglobin (i.e. deoxy-[Hb + Mb]) kinetics at contrasting muscle depths during the onset and offset of submaximal cycle exercise.
METHODS: In a randomized, cross-over study, eight males completed step cycle tests at a work rate equivalent to 50% of the difference (Δ) between the gas exchange threshold and peak VO_2 over 4-day supplementation periods with NO_3^--rich beetroot juice (BR; providing 8.4 mmol NO_3^-·day⁻¹) and NO_3^--depleted (placebo; PLA) beetroot juice. Pulmonary VO_2 was measured and absolute deoxy-[Hb + Mb] was determined in the superficial and deep vastus lateralis (i.e. VL-s and VL-d, respectively).
RESULTS: Whereas primary VO_2 kinetics (i.e. on versus off) were symmetrical, the primary deoxy-[Hb + Mb] mean response time (MRT_p) slowed within the VL-s during the off- compared to on- transient ($P < 0.05$). There were no significant differences ($P > 0.05$) between the PLA and BR trials in the deoxy-[Hb + Mb] MRT_p within the VL-s at exercise onset (PLA: 21 ± 5 vs. BR: 22 ± 5 s) or offset (PLA: 32 ± 4 vs. BR: 32 ± 9 s). Likewise, whilst the primary deoxy-[Hb + Mb] amplitude was asymmetrical within the VL-d (i.e. off > on, $P < 0.05$), there were no significant differences ($P > 0.05$) between supplement conditions at exercise onset (PLA: 27 ± 34 vs. BR: 16 ± 20 μM) or offset (PLA: 37 ± 44 vs. BR: 24 ± 26 μM).
CONCLUSIONS: Dietary NO_3^- supplementation does not affect the dynamic asymmetry of muscle deoxy-[Hb + Mb] kinetics (and by extension the matching between O_2 delivery to O_2 utilization) within deep and superficial sites during intense submaximal exercise.

2390   Board #226   June 1 11:00 AM - 12:30 PM

Beetroot Juice Supplementation Lowers Oxygen Cost of Vigorous Intensity Aerobic Exercise in Trained Endurance Athletes

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(No relevant relationships reported)

Nitric oxide (NO) plays a critical role in regulating blood flow to skeletal muscle. NO production in humans is 1) oxygen-dependent via NO-synthases that convert L-arginine to NO and 2) oxygen-independent via the nitrate-nitrite-NO pathway. The latter can be augmented via beetroot juice supplementation (BR). **Purpose**: The purpose of this study was to investigate the effect of BR during vigorous intensity aerobic exercise. **Methods**: Using a double-blind, repeated measures crossover design, 11 Division III collegiate distance runners (mean ± SD: age = 20.3 ± 1.1 yr; VO_2peak = 55.5 ± 8.1 ml·kg⁻¹·min⁻¹) consumed either 120 mL·day⁻¹ of BR or placebo (PL) for 4 days. On day 5 of each 4-day supplementation period, subjects completed an exercise trial on a motorized treadmill consisting of five minutes of running at 65%, 85%, and 100% of volume of oxygen uptake reserve (VO_2R) separated by 2 minutes each. BR and PL supplementation protocols were separated by a 7-day washout period. Two-way repeated measures ANOVAs were used to determine the effect of treatment (BR or PL) and exercise intensity (65%, 85%, and 100% VO_2R) on VO_2, heart rate (HR), respiratory exchange ratio (RER), and rating of perceived exertion (RPE). **Results**: There were no statistically significant interactions between treatment and exercise intensity for VO_2, HR, RER, or RPE. The main effect of treatment was not statistically significant for HR, $F(1, 10) = 0.514$, $p = 0.490$; RER, $F(1, 9) = 0.590$, $p = 0.462$; or RPE $F(1, 10) = 0.562$, $p = 0.471$. However, the main effect of treatment was statistically significant for VO_2, where BR (2.43±0.18 L·min⁻¹) was lower compared

to PL (2.49±0.17 L·min⁻¹), *p* = 0.029. **Conclusions**: These results suggest that a 4-day protocol of 120 mL·day⁻¹ of BR reduces VO₂ during vigorous intensity aerobic exercise in trained endurance athletes.

2391   Board #227   June 1 11:00 AM - 12:30 PM

Acute Dietary Nitrate Supplementation has no Significant Effect on Wasted Left Ventricular Energy in Young Healthy Individuals

Jozelyn Rascon[1], Francisco J. Morales[1], Brycen J. Ratcliffe[2], Caleb D. Harrison[2], Evan J. Bockover[2], Sierra Crowe[2], Colin R. Carriker[3], Alvaro N. Gurovich, FACSM[1]. *[1]The University of Texas at El Paso, El Paso, TX. [2]Indiana State University, Terre Haute, IN. [3]High Point University, High Point, NC.*
(No relevant relationships reported)

Cardiovascular disease is the leading cause of death worldwide and is associated with low levels of Nitric Oxide (NO) bioavailability. NO is a vascular protective agent, which bioavailability could increase through dietary nitrate supplementation. Wasted left ventricular energy (LVEw) represents the added workload the ventricle must produce during the duration of the reflecting pressure wave within a cardiac cycle. This energy is wasted because there is no blood flow gain produced by the extra work being exerted by the ventricle. LVEw is associated with arterial stiffness, left ventricular hypertrophy, and refractory angina syndrome. Higher levels of NO are associated with lower cardiovascular disease risks. Therefore, an increase in NO through dietary nitrates might reduce LVEw.
Purpose: To determine the response of an acute dietary nitrate supplement in LVEw via noninvasive pulse wave analysis (PWA).
Methods: A double-blind, cross-over study design was performed in 17 young, healthy subjects (18 to 24 years old). Four lab visits were schedule within 10 days; the first 2 visits in back to back days and the last 2 visits one week after. Subjects were asked to follow a low-nitrate diet for 3 days (NHLBI: 7 East Low-Nitrate Diet), starting two days prior to the first and third lab visits. Two hours before visits 2 and 4, subjects were asked to drink 800 mg of nitrate or placebo (solutions randomly assigned). LVEw was calculated using LVEw $=((\pi/4) \times (Ps-Pi) \times (ED - \Delta Tp) \times 1.333)$ where ED is ejection duration, Ps and Pi represent central systolic pressure and the central incident pressure from reflecting pressure wave, respectively, and ΔTp is the round trip travel time of the reflecting pressure wave. PWA was measured non-invasively with a cuff-based PWA device (SphygmoCor Xcel®). A two-way repeated measurements ANOVA (time x sex) was performed and significance was set at alpha=0.05.
Results: LVEw ranged from 736 ± 644 dyne•s•cm⁻² at baseline in males to 997 ± 917 dyne•s•cm⁻² after placebo, also in males and there was no significant interaction (time x sex).
Conclusions: These results show that an acute dose of dietary nitrate supplement has no effect on LVEw in young healthy individuals. Further studies including the elderly or patients with hypertension should be performed to assess more clinical effects of dietary nitrates.

2392   Board #228   June 1 11:00 AM - 12:30 PM

Changes in Oxidative Stress and Resting Metabolic Rate after Acute Dietary Nitrate Supplementation

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(No relevant relationships reported)

BACKGROUND: Cardiovascular disease is the leading cause of preventable death in the United States and the Western world. A major component of cardiovascular disease is the deterioration of the cardiovascular system by increased oxidative stress. Dietary nitrate supplementation could increase nitric oxide bioavailability, decreasing oxidative stress.
PURPOSE: The purpose of the present study is twofold: 1) to determine the impact of an acute dietary nitrate supplementation on oxidative stress and 2) to assess the oxygen dependent nature of a dietary nitrate supplementation.
METHODS: Eighteen (7 females and 11 males) apparently healthy subjects, aged 18-30 years of age, participated in a randomized, double blind, placebo-controlled crossover study. Following a 12-hour fast and adherence to an NIH-approved low-nitrate diet for 48 hours, subjects visited the lab on 4 occasions (identical procedures) within 2 weeks. A resting blood draw preceded 15 minutes of supine rest followed by a 20-minute period of metabolic gas analysis for determination of resting metabolic rate; RMR (True One, ParvoMedics, Sandy, Utah, USA). Visits 2 and 4 served as baseline controls for the placebo or dietary nitrate treatments (negligible and 800mg nitrate, respectively) which were consumed 2.5 hours prior to visits 3 and 5. The resting concentration of the oxidative stress marker 8-isoprostane (8-ISO) was determined by

ELISA testing using a commercial available kit (Cayman Chemical, USA). A 2-way repeated measures ANOVA was used to determine differences between protocols and over time, with an alpha of 0.05.
RESULTS: There was no significant difference between placebo and dietary nitrate supplementation in oxidative stress (Placebo: 158±59 vs. 181±62 pg/ml; Active: 176±74 vs. 171±59 pg/ml, p=0.84) or in RMR (Placebo: 1839±308 vs. 1790±307 kcal/day; Active: 1828±318 vs. 1859±324 kcal/day, p=0.20).
CONCLUSION: These data showed that acute dietary nitrate supplementation does not decrease resting oxidative stress. The conversion of nitrate to nitrite to nitric oxide has been previously described to be oxygen-independent. Our data supported this statement, as RMR did not change following the dietary nitrate supplementation.

2393   Board #229   June 1 11:00 AM - 12:30 PM

Effect of Increased Nitric Oxide Bioavailability on Endothelial Function and Pulse Wave Velocity

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(No relevant relationships reported)

BACKGROUND: Dietary nitrate supplementation is believed to increase the long-term bioavailability of nitric oxide (NO) within the body. This increase in NO bioavailability should lead to a decrease in arterial stiffness and an increase in endothelial function due to the vasodilator characteristics of NO.
PURPOSE: The purpose of this experiment was to evaluate whether an increased NO bioavailability, achieved through dietary nitrate supplementation, improves pulse wave velocity (PWV) and flow-mediated dilation (FMD).
METHODS: In a randomized double blind, placebo-controlled crossover design, eighteen (7 females, 11 males) apparently healthy subjects aged 18-30 years old visited the lab 4 times within 2 weeks. All subjects were required to fast for 10 to 12 hours prior to testing and each visit consisted of a resting blood draw followed by peripheral blood pressure acquisition, PWV and assessment of brachial FMD. Visits 2 and 4 (separated by a 1-week washout) were baseline controls and, 24 hours after, on visits 3 and 5 participants consumed a concentrate nitrate beverage or placebo (800mg and negligible nitrate, respectively) 2.5 hours prior to testing. Plasma nitrate/nitrite (NOx) concentration was determine by ELISA testing using a commercially available kit (Cayman, USA). A 2-way repeated measures ANOVA was used to determine differences between conditions and over time, with an alpha of 0.05.
RESULTS: There was an acute increase in NOx concentration after dietary nitrate supplementation compared to the baseline control (1.2±1.3 vs. 27.1±10.8 μmol/l, p<0.01) while no difference was seen following consumption of the placebo: 1.7±1.5 vs. 1.7±1.1 μmol/l, p=0.311). No changes were observed for PWV (Placebo: 6.2±0.6 vs. 6.2±0.7 m/s; Active: 6.1±0.6 vs. 6.1±0.8 m/s, p=0.81), or FMD (Placebo: 9.7±6.6 vs. 9.0±10.2 %; Active: 10.4±5.0 vs. 9.9±7.3 %, p=0.96) between nitrate and placebo conditions.
CONCLUSION: The data from this experiment illustrates that the dietary nitrate supplementation did provide an acute increase of NO bioavailability. However, this acute increase in NO bioavailability did not result in acute benefits to arterial stiffness or endothelial function measured via PWV and FMD, respectively.

2394   Board #230   June 1 11:00 AM - 12:30 PM

Effects of Beet Juice on Anaerobic Exercise Performance

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(No relevant relationships reported)

Research suggests dietary nitrate contained in beet juice is beneficial during aerobic exercise. Its impact during anaerobic (i.e. short duration, high power) exercise has received much less attention. **PURPOSE:** To determine the effects of acute beet juice supplementation on anaerobic performance during 30-s and 60-s maximal effort cycling sprints. **METHODS:** Fourteen male hockey players participated in this study. The exercise protocol included maximal effort 30-s and 60-s tests (Wingate), on a stationary bike with a fixed amount of resistance applied relative to body weight. In addition to two familiarization trials, each participant completed in random order 30-s placebo and beet juice trials and 60-s placebo and beet juice trials. The beet juice supplement contained ~8mmol/496 mg of dietary nitrate. Apple-cherry-cranberry juice served as the placebo, containing a negligible amount of dietary nitrate. Paired t-tests were run to compare performance in both the 30-s and 60-s trials, analyzing peak and mean power (W), peak and mean RPM, relative power (W/kg), total work (J), and fatigue index (FI, %). A one-way ANOVA was utilized to compare the change between the beet juice and placebo trials of the 30-s test, to the change between beet juice and placebo trials of the 60-s test. **RESULTS:** Beet juice supplementation yielded no statistical differences in any of the measured variables during the 30-s or 60-s tests

($p > 0.05$). A trend occurred during the 30-s test ($p = 0.059$), showing a decreased FI (53.44 vs. 56.01%), suggesting less fatigue occurred after beet supplementation, while there was no statistical difference in FI during the 60-s trials. The percent change for FI was significantly different between the 30 and 60-s tests (30-s: -5.24 9.70, 60-s: 0.50 5.94, $p = 0.032$). No other significant differences emerged between the 30-s and 60-s tests. **CONCLUSIONS:** A dose of ~8 mmol of beet juice did not improve anaerobic exercise performance during a 30-s or 60-s maximal effort cycling sprint. The performance differences were similar when comparing the 30-s and 60-s bouts after beet juice supplementation. Beet juice supplementation during high power, anaerobic exercise does not produce similar improvements in performance that have been reported during aerobic exercise.

2395　　Board #231　　　　　June 1 11:00 AM - 12:30 PM

Effect of Beet Root Juice on Delayed Onset Muscle Soreness Following Eccentric Loading.

Charles R. Jedlicka, Hailey M. Richter, Abigail E. Geislinger, Gianna E. Scala, Adrienne T. Tryan, Katelyn D. Olson, Shannon M. Bodily, Kaitlyn A. Anderson, Kent C. Hansen. *winona state university, Winona, MN.*

(No relevant relationships reported)

The increase in prevalence of super foods, such as beet root, in popular culture has necessitated research into their effectiveness. Betalains, a prominent phytonutrient in beet root, have proven to have both antioxidant and anti-inflammatory properties. Due to these qualities, betalains have the potential to augment the natural process of healing delayed onset muscle soreness (DOMS) from eccentric loading. **Purpose**: To determine if beet root juice provides benefit in DOMS recovery. **Methods:** 13 healthy college aged males were recruited into a double-blind crossover design study using a beet root concentrate. Participants were randomly assigned to a beet root juice (BRJ) or a placebo (PLA) group. Prior to eccentric loading, participants were dosed twice daily (2x70mL) for six days. They were then subjected to an eccentric only load protocol (5 sets of 10 repetitions) on the biceps brachii using a Biodex Dyanamometer. Several variables reflective of DOMS were measured including: maximal isometric voluntary contraction (MIVC), flexed arm angle (FAA), relaxed arm angle (RAA), subjective pain, point tenderness, and maximal contractile force. The indicators were measured at baseline and three time points following eccentric loading (24, 48, and 72 hrs). Dosing continued through the 72hr time point. **Results:** A significant treatment effect (p=0.03) was seen in reducing the angle at the elbow while being flexed (FAA) at all post exercise timepoints (24, 48, and 72 hrs) while being dosed with beet root juice concentrate. A trend toward a significant treatment effect (p=0.09) was observed in increasing isometric biceps brachii strength (MIVC). A significant time effect was observed (p<.001) for all measured variables. **Conclusion**: This evidence suggests that BRJ has the potential to provide improvement in recovering from exercise induced muscle damage.

2396　　Board #232　　　　　June 1 11:00 AM - 12:30 PM

Nitrate Supplementation Influences Contraction-Relaxation Rates During Ischemic Exercise in Post-Menopausal Women

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(No relevant relationships reported)

Purpose:
Recent studies suggest that dietary nitrate supplementation can increase contractile force development and relaxation rates in electrically-stimulated human and rodent muscles, particularly at low stimulation frequencies (i.e., conditions associated with enhanced SR Ca^{++} release). In the present study we retrospectively examined handgrip force recordings from a prior study in which we observed a nitrate-associated enhancement of ischemic exercise tolerance in older women. We hypothesized that rates of handgrip force development and relaxation would be increased during their nitrate supplement visit relative to their placebo visit.
Methods:
Nine healthy, normotensive, post-menopausal women (57-64 years) performed intermittent handgrip exercise (10% of MVC, 30 per min) during progressive upper arm cuff inflation (+20 mmHg per min) on 3 study visits, with 7 to 10 days between visits. Approximately one week following visit 1, participants randomly consumed 140 ml of nitrate-concentrated (0.6 g of nitrate; $BrJ_{nitrate}$) or nitrate-depleted ($BrJ_{placebo}$) beetroot juice (James White Beet-It Organic; IND#119978), with handgrip exercise beginning two hours post-consumption. Grip force recordings (1,000 Hz sampling rate) were subsequently analyzed and time to 90% peak force (t90%) as well as half relaxation time (hrt) were determined.
Results:

Compared to responses observed during the $BrJ_{placebo}$ visit, $BrJ_{nitrate}$ consumption increased time to volitional fatigue (526±46 vs. 567±50 sec) (p<0.05). Significant Δ (BRJplacebo - BRJnitrate) effects were noted for Δ t90% (mean 27.7 ± 31.8 msec, p <0.03) as well as Δ hrt (27.8 ± 31.6 msec, p<0.03), indicating a faster rate of force development as well as a faster relaxation rate with $BrJ_{nitrate}$ consumption. Visit order (i.e., practice) did not influence exercise tolerance. **Conclusion:** Acute dietary nitrate supplementation increases rates of muscle force development and relaxation during ischemic, voluntary exercise in older women, possibly implicating improved calcium handling as a mechanism underlying their enhanced fatigue resistance under these conditions.

2397　　Board #233　　　　　June 1 11:00 AM - 12:30 PM

The Integrative Benefits Of Oral Nitrate Supplementation On Supra-Maximal Cycling Work Demands

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Reported Relationships:　C.E. Broeder: *Contracted Research - Including Principle Investigator; Corporate grant.*

PURPOSE: This study investigated the effects beet nitrate supplementation had on cycling performance (power, force, cadence (Cad) speed (Spd), distance, time to fatigue, kJ expended) during repeated high intensity intervals (HIIT). **METHODS:** Eight cyclists participated (Age: 41.4 ± 9.1; WT: 83.3 ± 9.6 kg; BF%: 21.7 ± 0.1; VO2 max: 4.20 ± 0.58 L/min, functional threshold power (FTP): 245.4 ± 43.6 watts). This study was a randomized, double-blind, crossover, matched pair design. Prior to the HIIT sessions, subjects consumed for 7-days placebo (PL) or an oral beet nitrate (BN) supplement. On the day of testing, after completing baseline measurements & 45-mins prior to the HIIT session, 10g of the treatment week's supplement was consumed by each rider. The HIIT workload was set at a wattage 1.5 times greater than a cyclist's baseline FTP, e.g., FTP = 200 watts; HIIT work interval = 300 watts. Each HIIT segment was 75-secs and followed by a 2-min recovery at 50% of FTP. Cyclists were instructed to do as many intervals as possible. A matched paired t-test was used to compare each treatment for the summary data (i.e., total secs completed under the placebo versus beet supplementation conditions), HIIT trial total work data, and HIIT trial total recovery data. When a significant difference was observed, Cohen's d effect size (ES) procedures were used to determine the magnitude. **RESULTS:** BN supplementation improved time to exhaustion (PL: 1,251 ± 562 secs, BN: 1,475 ± 504 secs; p = 0.02; ES = 0.423) and total energy expended (PL: 251.3 ± 48.6 secs, BN: 306.6 ± 55.2 kJ; p = 0.01; ES = 1.079) compared to PL. Subjects during the BN trials completed more intervals (BN = 8.14 ± 2.4, PL = 7.00 ± 2.5, p = 0.03, ES = 0.42) and cycled 23.9% further (BN = 13.5 ± 3.9 km, PL = 10.9 ± 4.0 km, p = 0.01, ES = 0.65). During the work segments, BN enhanced cadence and speed by 2.0% at the same force compared to PL (Cad: p = 0.02; ES = 0.20; Spd; p = 0.02; ES = 0.20). During recovery, comparing BN to PL, force was lower (PL: 68.2 ± 15.6 N, BN: 65.5 ± 13.7 N, p = 0.01, ES = 0.23), Cad was higher (PL: 91.8 ± 10.9 rpm, BN: 93.9 ± 7.4 rpm, p = 0.01, ES = 0.23), Spd was greater (PL: 30.7 ± 3.3 kph, BN: 31.4 ± 1.9 kph, p = 0.02, ES = 0.27). **CONCLUSIONS:** BN enhanced HIIT work and recovery performance allowing a more efficient maintenance of Cad, force, & Spd.

2398　　Board #234　　　　　June 1 11:00 AM - 12:30 PM

Nitrate and Nitrite Content of Beet Juice Products Marketed to Athletes

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(No relevant relationships reported)

The consumption of beet juice has become particularly popular among athletes, due to the fact that dietary nitrate has been shown to enhance exercise capacity. This has resulted in many companies creating and marketing beet-based products to meet consumer demand. Depending on growing conditions, however, the nitrate content of beets can vary significantly. This makes it difficult for athletes to know how much nitrate they are actually ingesting. **PURPOSE**: To determine the quantity of nitrate (and nitrite) present in beet juice products marketed towards, or easily available to, athletes. **METHODS**: Samples from 26 different lots of 11 different beet juice products produced by 10 different companies were purchased locally or via the internet. After reconstituting (if necessary) and diluting each sample 1000x in water, nitrate and nitrite concentrations were measured using a dedicated high performance liquid chromatography system. The amount of nitrate and nitrite per serving was then calculated based on the measured concentrations and either 1) the manufacturer's recommended serving size (for prepackaged/single dose products) or 2) a volume of 500 mL (for beet juice sold in bulk containers). **RESULTS:** There was moderate-to-large variability in nitrate content between samples of the same product, with a mean coefficient of variation of 14.9±21.2% (range 2.3 to 60.6%). However, there was even

greater variability between products, with nearly a 20-fold range in nitrate content between the lowest (1.0±0.6 mmol/serving) and highest (17.9±0.8 mmol/serving). The amount of nitrite in all products was very low (i.e., <0.5% compared to nitrate), except for one that contained 10.2±1.1%. Over half of the products contained less nitrate (or nitrite) per serving than appears necessary to enhance exercise capacity in most individuals. Interestingly, among bulk juices there was no difference between certified organic and non-organic products in terms of nitrate content (i.e., 9.2±6.0 vs. 8.4±3.4 mmol/serving). **CONCLUSIONS:** The present results may be useful to athletes or coaches contemplating which (if any) beet juice product to utilize. These data may also offer some insight into variability in the literature with the respect to the effects of beet juice on exercise performance.

2399   Board #235   June 1 11:00 AM - 12:30 PM
Effects Of Tetrahydrobiopterin On Limb Blood Flow And Muscle Metabolism In Patients With COPD

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(No relevant relationships reported)

Exercise intolerance is a frequent complaint and an important predictor of mortality in patients with Chronic Obstructive Pulmonary Disease (COPD). Though several factors have been implicated in the development of muscle dysfunction with COPD, chronic oxidative stress and reduced nitric oxide (NO) bioavailability have been previously suggested to be key factors involved in impaired muscular function. Thus, restoration of the redox balance and NO bioavailability using tetrahydrobiopterin (BH_4), an essential cofactor involved in the production of NO and free-radicals, appears to represent a novel therapeutic target for improving muscle oxygenation and metabolism in patients with COPD. **PURPOSE:** The aim of this study was to determine the effects of an acute BH_4 supplementation (10 mg·kg^{-1}) on peripheral O_2 delivery and muscle metabolism in the plantar flexor muscles of patients with COPD. **METHODS:** 5 patients with clinically diagnosed COPD performed dynamic plantar flexion exercise at 40% of maximal work rate with phosphorus magnetic resonance spectroscopy (^{31}P-MRS), near-infrared spectroscopy (NIRS), and vascular Doppler ultrasound assessments following oral supplementation of BH_4 or placebo (PL). **RESULTS:** Following BH_4 supplementation, exercise-induced changes in Phosphocreatine (PL: 35.4% ± 11.7%; BH_4: 26.8% ± 10.7%, P<0.01), inorganic phosphate (PL: 8.4% ± 2.2%; BH_4: 6.1% ± 1.4%, P<0.05), and pH (PL: 6.89 ± 0.12; BH_4: 6.97 ± 0.04, P=0.10) showed attenuated responses. In contrast, end-exercise limb blood flow was not significantly different between BH_4 and PL. **CONCLUSION:** Acute oral BH_4 supplementation in patients with COPD appears a promising therapy to, at least partially, restore skeletal muscle metabolism, thus potentially contributing to improved exercise tolerance and quality of life.

E-39   Free Communication/Poster - **Ergogenic Aids III - Bicarbonate and Caffeine**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2400   Board #236   June 1 11:00 AM - 12:30 PM
The Acute Effect of Energy Shots on 5K Run Performance

Aashaun Khedaru, Matthew Marra, John Petrizzo, Lauren Yanni, Jessica Machaby, John Wygand, FACSM, Robert M. Otto, FACSM. *Adelphi University, Garden City, NY.* (Sponsor: Robert M. Otto, FACSM)
(No relevant relationships reported)

Caffeine (CF) is the most widely used psychotropic drug in the world and has wide spread use in sport performance. The benefit in short, powerful activities may be questionable, but the benefit to endurance performance is well studied. Generally this central nervous system stimulant is believed to delay the perception of fatigue and may improve performance. CF can be ingested in isolation or in combination with other substances. Energy shots (60-90 mL volume) with less sugar, carbohydrates, and carbonated water than traditional energy drinks are gaining popularity for CF delivery with less gastrointestinal distress. **Purpose:** The purpose of this study was to determine the effect of an acute ingestion of two types of energy shots on 5K treadmill time-trial run performance. **Methods:** In a double-blind crossover study, 17 recreational or intercollegiate runners (body mass 64.3 ± 16 kg, height 172.9 ± 4 cm, age 23.9 ± 3.6 yr, run 40 ± 8 km/wk, 10♂) performed three randomly assigned 5K trials preceded by abstaining from CF for 48 hrs and ingesting a matched fluid from an opaque container, 30 minutes pre-trial. Trials A and B both contained 5 mg CF/kg, but A contained a popular energy shot, while Trial B contained naturally occurring CF derived from

plants with additional minerals, vitamins, and anti-oxidants. Trial C (placebo) contained only the same lemon-lime taste in water absent of CF. Subjects performed their own consistent warm-up, controlled their pace throughout each trial, and were informed of splits at each mile. Statistical analysis by ANOVA (p<.05) was applied to these data. **Results:** Time trial performance for Trials A, B, and C were 1393 ± 274 sec, 1368 ± 287 sec, and 1403 ± 295 sec, respectively with NSD among all trials. The analysis of mile split times revealed NSD among each mile of the 5K distance, as well. **Conclusion:** The use of CF at 5 mg/kg was insufficient to improve run performance in moderate duration endurance activity during self-modulated treadmill running for recreational through intercollegiate runners. CF tolerance, initiated by the chronic ingestion of CF, is acquired gradually and dissipates over a similar time course. It may be possible that the 48 hour abstinence from CF was insufficient for some of the runners to reduce their CF tolerance, and thus the acute effect of CF was attenuated.

2401   Board #237   June 1 11:00 AM - 12:30 PM
Optimising Sodium Bicarbonate Supplementation: Are Gastro-resistant Capsules The Answer?

Luana F. Oliveira, Bryan Saunders, Guilherme Yamaguchi, Bruno Gualano, Hamilton Roschel, Guilherme G. Artioli. *University of São Paulo, Sao Paulo, Brazil.*
(No relevant relationships reported)

PURPOSE: To investigate the effects of sodium bicarbonate (SB) delivery method (gastro-resistance or gelatin capsules) and dosage on bicarbonate increase and side-effects incidence. **METHODS**: Fourteen healthy men (age 27 ± 5 y; body mass [BM] 76.1 ± 11.4 kg; height 1.75 ± 0.06 m) participated in a double-blind and crossover study, composed of five laboratory visits. During each visit they received a different treatment: 0.3 g•kg^{-1} BM of SB in gastro-resistent (RES3) and gelatine capsules (GEL3); 0.1 g•kg^{-1} BM of SB in gastro-resistent (RES1) and gelatine capsules (GEL1); and 0.3 g•kg^{-1} BM of corn flour (PLA). Following an overnight fast, participants consumed a standardised breakfast one hour before ingesting the supplements. Blood samples were taken before and every 10-min following supplement ingestion for 3 h and then every 20 min for a further 1h and were analysed for bicarbonate concentration (RAPIDLab 348, Siemens). Area under the curve (AUC), and peak bicarbonate were recorded. Side-effects were assessed using a modified questionnaire. Data were analysed using mixed-model ANOVA for blood variables and Friedman test for side-effects. **RESULTS**: There was a significant main effect of treatment on AUC and peak bicarbonate (both p < 0.001), with greater values in RES3 (AUC: 1594.5; peak: 36.4 mmol•L^{-1}) and GEL3 (AUC: 1641.6; peak: 35.1 mmol•L^{-1}) compared to RES1 (AUC: 1069.6; peak: 31.8 mmol•L^{-1}), GEL1 (AUC: 888.7; peak: 31.5 mmol•L^{-1}) and PLA (AUC: 849.3; peak: 29.7 mmol•L^{-1}); there were no differences between types of capsules. Side-effects were significantly different between treatments (X^2=13.545; p=0.009), with higher incidence in RES3 and GEL3 than RES1, GEL1 and PLA, with no differences between capsule types. **CONCLUSIONS**: The current study showed thatblood variables were not different when SB was delivered in gastro-resistant and gelatine capsules, nor were any associated side-effects. The only differences shown were due to dose and not the type of capsule. SB supplementation in gastro-resistent capsules did not lead to greater increases in circulating bicarbonate or less side-side effects compared to gelatine capsules.

2402   Board #238   June 1 11:00 AM - 12:30 PM
Double-blind, Placebo Controlled, Randomized Crossover Pilot Study Evaluating The Impacts Of Sodium Bicarbonate in a Transdermal Delivery System on Physiological Parameters and Exercise Performance

Mark Kern[1], Lisa M. Misell[2], Andrew Ordille[1], Madeline Alm[1], Brookell Salewske[1]. *[1]San Diego State University, San Diego, CA. [2]Ampersand Biopharmaceuticals, LLC, Thousand Oaks, CA.* (Sponsor: Michael Buono, FACSM)
Reported Relationships: M. Kern: *Contracted Research - Including Principle Investigator; Ampersand.*

Oral sodium bicarbonate has been used for decades as an ergogenic aid by buffering muscle acid production during exercise and subsequently delaying the onset of fatigue in athletes. However, gastrointestinal side effects limit the use of sodium bicarbonate. **PURPOSE**: This study evaluated the efficacy of a commercially available topical transdermal sodium bicarbonate (TSB) lotion (Topical Edge™) which is claimed to be delivered through the skin using a novel patent-pending transdermal delivery system for impacting exercise metabolism and performance.
METHODS: 20 trained cyclists (Category 1-3) and a professional triathlete participated in this randomized, cross-over, double-blinded, placebo-controlled study. After application of TSB or placebo lotions, subjects completed a variety of exercise and performance tests. On one day subjects completed a high-intensity series of exercise tests which included a ramped protocol until reaching a rating of perceived exertion (RPE) of 17 out of 20, a 30-second sprint performance test, and a 5-minute

time trial performance test, with 5 minutes of recovery between tests. On a separate day subjects completed a 1-hour time trial. Heart rate, RPE, blood lactate and pH were assessed before, during, and after performance testing.
RESULTS: Heart rate and RPE were significantly (p<0.05) lower for TSB compared to placebo at the 15-min mark of the 1-hour time trial, but not at other time points. When TSB was applied, lactate was higher (p<0.05) after the high-intensity ramp, sprint and 5-min time trial series (10.8±3.2 mmol/L versus 9.7±3.1 mmol/L for TSB and placebo, respectively). Similar effects were not observed after the 1-hour time trial. Significance was not reached when examining performance differences (p>0.05).
CONCLUSIONS: Overall, the findings from this study provide evidence that TSB can significantly impact blood lactate, heart rate and RPE during performance tests of varying intensity/length. These significant findings support the ability of this lotion to tradermally deliver sodium bicarbonate, which could allows athletes to avoid the side-effects of oral bicarbonate use. Further research is warranted to substantiate these findings and determine the most effective use for this commercially available transdermal sodium bicarbonate lotion.

2403   Board #239   June 1 11:00 AM - 12:30 PM
Double-blind, Placebo Controlled, Randomized Crossover Pilot Study Evaluating the Impacts of Sodium Bicarbonate in a Transdermal Delivery System on Delayed Muscle Onset Soreness

Lisa Misell[1], Mark Kern[2], Andrew Ordille[2], Madeline Alm[2], Brookell Salewske[2]. [1]*Ampersand Biopharmaceuticals, LLC, Thousand Oaks, CA.* [2]*San Diego State University, San Diego, CA.* (Sponsor: Michael Buono, FACSM)
Reported Relationships: M. Kern: *Contracted Research - Including Principle Investigator; Ampersand.*

Sodium bicarbonate/alkalinization may reduce muscle mitochondrial damage caused by reactive oxygen species during intense exercise. Such damage can induce post-exercise inflammation and pain, which may be linked to delayed onset muscle soreness, or DOMS. However gastrointestinal side effects limit the use of oral sodium bicarbonate. **PURPOSE**: This study evaluated the efficacy of a commercially available, topical transdermal sodium bicarbonate (TSB) lotion (Topical Edge™), which is claimed to be delivered through the skin using a novel patent-pending transdermal delivery system for impacting DOMS.
METHODS: 20 trained cyclists (Category 1-3) and professional triathletes participated in this randomized, cross-over, double-blinded, placebo-controlled study. After application of TSB or a placebo, subjects completed a variety of exercise and performance tests varying in duration. On one day subjects completed a series of high-intensity exercises which included a ramped protocol to a rating of perceived exertion (RPE) of 17 out of 20, a 30-sec sprint performance test, and a 5-min time trial with 5 minutes of recovery between tests. On a separate day subjects completed a 1-hr time trial. Subjects completed DOMS questionnaires 24- and 48-hours after exercise sessions. Muscle soreness was rated on a scale of 0-100 where 0 = "no soreness", 25 = "mild pain", 50 = "moderate pain", 75 = "severe pain" and 100 = "the worst pain you can imagine".
RESULTS: DOMS was reduced following the high-intensity series with TSB compared to placebo. Similar effects were not observed following the 1-hr exercise bout. From the first to second day following the high-intensity exercise series, subjects using TSB experienced a 54% reduction in DOMS versus an increase in DOMS of 34% with placebo (p=0.007). **CONCLUSIONS**: Findings from this study suggest that TSB can significantly shorten recovery from DOMS following high-intensity exercise. Findings also support the effectiveness of the transdermal system in delivering sodium bicarbonate topically and may allow athletes to achieve these results while avoiding the side-effects of oral bicarbonate. Furthermore, we believe this study is the first to provide a direct link between sodium bicarbonate use and DOMS in athletes. Additional research is underway to further substantiate these findings.

2404   Board #240   June 1 11:00 AM - 12:30 PM
Effects of a Thermogenic Pre-Workout Supplement on Fat Oxidation Rates During Moderate-Intensity Running in Females

Jamie Erickson[1], Andrew Jagim[2], Glenn Wright[1], Carl Foster, FACSM[1], Clayton Camic[3]. [1]*University of Wisconsin-La Crosse, La Crosse, WI.* [2]*Lindenwood University, St. Charles, MO.* [3]*Northern Illinois University, DeKalb, IL.* (Sponsor: Carl Foster, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of the present study was to examine the effects of acute doses of a thermogenic, pre-workout supplement on fat oxidation rates during moderate-intensity treadmill running in females.
METHODS: Twelve aerobically-trained females (mean ± SD: age = 25.3 ± 9.4 years; body mass = 61.2 ± 6.8 kg) volunteered to visit the laboratory on four occasions. For the first visit, each subject completed an incremental treadmill test to exhaustion to determine their ventilatory threshold (VT) using a metabolic cart. On the second visit, each subject consumed a standardized meal following overnight fasting (8 hours) 30 minutes prior to ingestion of one (S1) or two servings (S2) of the supplement or placebo (P). One serving of the supplement contained caffeine anhydrous (150 mg), beta alanine (1600 mg), arginine AKG (1000 mg), as well as tyrosine, L-carnitine, green coffee bean extract, and velvet bean extract at unspecified quantities. The placebo was a non-caloric mix that was matched for flavor and consistency. Thirty minutes post-ingestion, the subjects performed a 30-minute constant-velocity treadmill run at 90% of their VT with ventilatory parameters expressed as 5-min averages. The subjects then returned to the laboratory for their third and fourth visits to ingest the remaining conditions (S1, S2, or P) and underwent the same testing procedures (including time of day) as the second visit. A two-way ANOVA with repeated-measures was used to compare the rates of fat oxidation among the conditions (S1, S2, P) at the common time points (5, 10, 15, 20, 25, 30 min) of the 30-minute run.
RESULTS: For the rates of fat oxidation, there was no significant ($P > 0.05$) condition x time interaction or main effect for condition, but there was a main effect for time. Specifically, the marginal means (collapsed across conditions) for fat oxidation rates were significantly ($P < 0.05$) greater at 5-min (0.35 ± 0.20 g·min^{-1}) and 30-min (0.35 ± 0.16 g·min^{-1}) than 10-min (0.28 ± 0.13 g·min^{-1}), 15-min (0.29 ± 0.13 g·min^{-1}), 20-min (0.28 ± 0.14 g·min^{-1}), and 25-min (0.31 ± 0.15 g·min^{-1}).
CONCLUSIONS: The present findings indicated that one or two servings of the pre-workout supplement had no significant effect on rates of fat oxidation during 30 minutes of moderate-intensity treadmill running in aerobically-trained females when compared to placebo.

2405   Board #241   June 1 11:00 AM - 12:30 PM
The Effects Of Caffeine On Time-trial Performance And Associated Physiological Responses: a Meta-analysis

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(No relevant relationships reported)

PURPOSE: The aim of this study was to carry out a systematic review and meta-analysis of the effects of caffeine supplementation on moderate to high-intensity closed-loop time-trial performance and associated physiological responses. METHODS: 32 studies met the inclusion criteria of adopting double-blind, randomized, crossover designs that included a closed-loop time-trial of moderate to high-intensity aerobic exercise performed under a standard caffeine dose of 3-6 mg·kg^{-1} administered 30 – 90 minutes prior to performance. Meta-analyses were completed using a random-effects model, with effects on time-trial performance presented as standardized mean difference (δ) and with physiological responses presented as raw mean difference (D). 95% confidence limits (CL_{95}) were calculated for all estimates. RESULTS: Relative to placebo, caffeine had a significant positive effect on time-trial performance ($\delta = 0.43$; CL_{95} [0.26,0.60]; $p < 0.00001$; $n = 329$). Moreover, the effects of caffeine on time-trial performance corresponded with significant increases in heart rate ($D = +3.1$ b·min^{-1}; CL_{95} [+1.6, +4.6]; $p < 0.0001$; $n = 164$), blood lactate ($D = +1.53$ mmol·L^{-1}; CL_{95} [+1.21, +1.84]; $p < 0.00001$; $n = 209$), and blood glucose ($D = +1.12$ mmol·L^{-1}; CL_{95} [+0.80, +1.43]; $p < 0.00001$; $n = 95$). In contrast, caffeine had no effect on time-trial measures of oxygen uptake ($D = +0.07$ L·min^{-1}; CL_{95} [-0.02, +0.15]; $p = 0.13$; $n = 96$), respiratory exchange ratio ($D = +0.01$; CL_{95} [-0.01, +0.03]; $p = 0.37$; $n = 78$), or ratings of perceived exertion ($D = +0.06$; CL_{95} [-0.14, +0.26]; $p = 0.54$; $n = 196$). CONCLUSION: The results of this analysis reveal a clear effect of caffeine on moderate to high-intensity time-trial performance; an effect which is accompanied by significant increases in heart rate, blood lactate, and blood glucose. When considered in conjunction with research using fixed-intensity exercise, the caffeine-induced increase in time-trial intensity likely explains all of the associated increase in heart rate, and part of the increase in blood lactate and blood glucose.

2406   Board #242   June 1 11:00 AM - 12:30 PM
Caffeine Mouth Rinsing in the Fed State Does Not Enhance 3-km Cycling Performance

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(No relevant relationships reported)

PURPOSE: A prior investigation from our laboratory reported that a caffeine mouth-rinse (CMR) enhanced 3-km cycling performance during trials conducted in the early morning (before 10:00), but not in the late-morning. However, interpretation of these findings was complicated by the fact that early-morning trials were predominantly completed after an overnight fast, whereas late-morning trials were all post-prandial. Thus, the purpose of the present study was to assess the effects of a CMR on cycling performance in the fed-state, at different times of day. **METHODS**: 12 recreational cyclists (VO_{2peak} = 51 ± 8 ml/kg/min) completed a simulated 3-km time trial on four occasions; twice in the morning (before 10:00) and twice in the afternoon (after 16:00). 25 ml of a mouth-rinse solution, containing either 300 mg of caffeine (CMR), or a placebo (PL) was swirled in the mouth for 5 s on three occasions during a 10 min

period prior to each time-trial. All trials were completed two hours after ingestion of a standardized meal (~ 500 kcal, consisting of cereal with milk, yogurt, and juice). A randomly counterbalanced, double blind design was implemented to examine the efficacy of the CMR (versus PL) in the morning and the afternoon. Magnitude-based inferences were used to evaluate treatment effects on performance time. **RESULTS**: CMR did not improve cycling performance in the morning [PL = 343 ± 33 s; CMR = 348 ± 32 s; 'possibly' impaired performance (62% likelihood)] or in the afternoon [PL = 346 ± 42 s; CMR = 349 ± 41 s; 'possibly' impaired performance (43% likelihood)]. Treatment effects were similar between the morning and afternoon trials, with no clear effect of time of day. **CONCLUSIONS**: CMR provided in the fed state did not improve 3-km cycling performance, and responses were similar during trials conducted in the morning and the afternoon. When considered in the context of our prior study, these findings suggest that the efficacy of CMR on cycling performance may be influenced by feeding state, but not time of day.

2407   Board #243   June 1 11:00 AM - 12:30 PM

Acute Caffeine Ingestion Enhances Upper and Lower Body Torque During Isometric and Isokinetic Muscle Actions

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(No relevant relationships reported)

A comprehensive meta-analysis reported caffeine ingestion (CI) produces greater maximal voluntary contraction (MVC) force in lower body (LB) versus upper body (UB) musculature (Warren et al., Med. Sci. Sports Exerc. 42:1375-1387, 2010). However, research is lacking on direct comparisons between UB versus LB force production, particularly comparing these muscular strength measures across the same subjects. **PURPOSE**: To compare the effects of caffeine supplementation in subjects who self-report low (LOWCS) vs. moderate/high (MHCS) sensitivity to caffeine during isokinetic and isometric muscle actions for the forearm flexor (FORE) and knee extensor (KNEE) muscle groups. **METHODS:** Sixteen recreationally trained males volunteered to participate in the study (M±SD, age=20.6±1.73 y, height=180.1±6.87 cm, mass=83.5±11.48 kg, body fat=10.6±3.04 %). Subjects were randomly assigned to either CAF (5 mg·kg⁻¹) or placebo (NOCAF) treatments using a double-blind design with at least 48 h between testing sessions. Testing was conducted using a HUMAC NORM for both KNEE and FORE at 60°·sec⁻¹ and two-6 sec isometric muscle actions. Testing began immediately after 45 min of either CAF or NOCAF treatments. **RESULTS:** Statistical analysis indicated for isokinetic strength, there was a greater response for KNEE (CAF=213.84 ± 25.38 Nm; NOCAF 201.47 ± 28.56 Nm) versus FORE (CAF= 62.29 ± 6.41 Nm; NOCAF= 58.46 ± 8.27 Nm). For isometric peak torque, the results revealed significantly (p<0.05) greater torque for CAF (M±SD=150.44 ± 22.9Nm) compared to NOCAF (140.39 ± 29.7 Nm) collapsed across upper/lower body and group. **CONCLUSION:** Our data indicates caffeine (5 mg·kg⁻¹), consumed approximately 45 min before performance improves isokinetic and isometric peak torque in both lower and upper body muscle groups and, has a significantly greater effect on dynamic LB vs UB force production in recreationally resistance trained men, regardless of self-reported habitual caffeine consumption. This suggests that ingestion of moderate doses of caffeine 45 min prior to sports and physical activity performance may enhance muscular strength independent of habitual caffeine use.

2408   Board #244   June 1 11:00 AM - 12:30 PM

The Effects of Caffeine Gum Administered in a Divided Dose on Cycling Performance

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(No relevant relationships reported)

PURPOSE: Previous work in our lab has demonstrated that a single bolus of caffeine gum (300mg) enhanced cycling performance.The purpose of the present study was to determine the effects of caffeine gum administered in a divided dose on cycling performance. **METHODS**: Seven apparently healthy, younger (27 ± 10 years) adults of modest fitness (42 ± 10 ml·kg⁻¹·min⁻¹) participated in three separate laboratory sessions. During the first visit, subjects underwent a graded exercise test on a Lode cycle ergometer to determine maximal oxygen consumption (VO$_{2max}$). For the next two visits (experimental testing) subjects arrived at the Exercise Science Laboratory in the fasted state between 0600 and 1200 hours. Subjects consumed a light breakfast consisting of a plain bagel and a sports drink then rested for 10 min. Thereafter two pieces of Military Energy Gum [caffeine (CAFF) or placebo (PLA)] were administered in a double blind manner. Subjects were instructed to chew the gum for 5 min then expectorate. Following a standard warm-up, subjects cycled at 70% VO$_{2max}$ (constant Wattage) for 15 min. Subjects rested for 20 min and were then instructed to chew two additional pieces of Military Energy Gum for 5 min. Following the second

administration, the ergometer was set to linear mode and subjects were instructed to complete as much work as possible in a 15-min performance ride. Total work (kJ) completed was used as the primary outcome variable. Each piece of caffeinated Military Energy Gum has 100mg of CAFF and the order in which the subjects completed the experimental trials was counterbalanced.
RESULTS: Performance data were analyzed using a two-way paired samples t-test. Total work completed did not differ between trials (CAFF = 157.8 ± 45 kJ, PLA = 157.6 ± 40 kJ) and no main effect of treatment was evident (t = 0.035, p = 0.97). **CONCLUSIONS**: These data demonstrated that caffeine gum administered in a divided dose does not improve total work completed during a 15-min performance ride in physically active adults.

2409   Board #245   June 1 11:00 AM - 12:30 PM

Neither Coffee Nor A Stimulant Containing "Pre-workout" Drink Alter Cardiovascular Drift During Walking In Young Men

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(No relevant relationships reported)

Caffeine is a widely used stimulant that is often consumed in coffee. Caffeine is also the main ingredient in many "pre-workout" drinks, which are purported to enhance exercise performance. Due to the stimulatory effects of caffeine on the heart and the potential diuretic effects of caffeine, drinking coffee or a pre-workout drink before exercise may exacerbate cardiovascular drift**. PURPOSE**: The purpose of this study was to compare the effects of coffee and a commercially available pre-workout drink on cardiovascular drift during prolonged moderate intensity walking. **METHODS**: Eight healthy, recreationally active males consumed coffee (containing 120 mg caffeine), decaffeinated coffee, a pre-workout drink (containing 120 mg caffeine), or a placebo in a randomly assigned cross over design one hour before walking for 40 minutes on a treadmill at a workload that corresponded to 50% of their VO$_2$ max. **RESULTS**: Heart rate gradually increased (P<0.05) from 123.2 ± 5.5 beats/min at 10 minutes to 132.8 ± 8.6 beats/min for all treatments, but there was no main effect of treatment or interaction effect of treatment X time on heart rate. Respiratory exchange ratio (RER) gradually decreased (P<0.05) from 0.76 ± 0.02 at 10 minutes to 0.73 ± 0.04 for all treatments, but there was no main effect of treatment or interaction effect of treatment X time on RER. Similarly, there was no main effect of treatment or interaction effect of treatment X time on oxygen consumption. **CONCLUSIONS**: The gradual increase in heart rate in the present study demonstrates cardiovascular drift during 40 minutes of walking at 50% VO$_{2max}$, with no changes due to consuming coffee or a pre-workout drink 1 hour prior to exercise. Furthermore, the ingestion of coffee or a pre-workout drink 1 hour prior to exercise did not alter the RER indicating no effects on fat or carbohydrate use. The lack of difference in oxygen consumption indicates that ingesting coffee or a pre-workout drink 1 hour prior to exercise does not alter energy expenditure. Overall, the lack of effects of coffee or a pre-workout drink in the present investigation suggest that while the caffeine dose does not present additional challenges to cardiovascular function, the caffeine dose does not influence exercise performance during 40 minutes of walking at 50% VO$_2$max.

2410   Board #246   June 1 11:00 AM - 12:30 PM

Effects of Varying Caffeine Dosage on Free Throw Accuracy Before and After Exhaustive Intermittent Exercise

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(No relevant relationships reported)

PURPOSE: This study evaluated the effects of varying caffeine dosage on free throw accuracy before and after exhaustive intermittent exercise.
METHODS: Fourteen NCAA Div 2 collegiate female basketball players participated (mean ± SD; age = 19.9 ± 1.04 yrs; body mass = 67.25 ± 8.17 kg; height = 171.45 ± 8.41 m; BMI = 22.85 ± 1.72; percent body fat = 22.45 ± 4.16%). Participants each completed baseline tests with a familiarizing session and three randomized double-blind experimental trial sessions in the course of this study. The experimental trials included ingestion of placebo (0 mg•kg•BW⁻¹), of caffeine at 1.5 mg•kg•BW⁻¹, and of caffeine at 3 mg•kg•BW⁻¹. Each trial was administered following 12h overnight fasting, separated by at least one week, and with no moderate to heavy exercise 48h prior to the trial. At the lab, subjects consumed a standard breakfast and 500ml of fluid, with a varying caffeine dose or placebo. Subjects performed 20 free throws, rested 1 min, then ran ten 20m sprints at full speed, with 20 sec recovery. They rested 1 min, and performed 20 free throws again. All free throws were performed with a soundtrack playing music and recorded crowd noise at high volume in the background.
RESULTS: Our results found that only the 3 mg•kg•BW⁻¹ caffeine dosage showed significant improvement (Δ=7.17%) in free throw performance following exhaustive intermittent exercise (P<0.05). No change was observed in free throw performance with 1.5 mg•kg•BW⁻¹ caffeine dosage and placebo (P>0.05).

CONCLUSIONS: This study demonstrated that a moderate dose of caffeine can improve free throw ability following exhaustive intermittent exercise compared to low dose and placebo conditions in NCAA Division 2 female basketball players.

2411　　　Board #247　　　　June 1 11:00 AM - 12:30 PM

Caffeine and Citrate Aurantium Supplementation Alter Resting Cardiac Autonomic Function but Not During Recovery

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(No relevant relationships reported)

Purpose: To examine the combined effects of the pre exercise complex Citrate Aurantium and Caffeine (CA+C) on cardiac autonomic activity following ingestion and immediately after high-intensity anaerobic exercise in habitual caffeine users. **Methods:** Ten physically active males (25.1± 3.9 years; mass 78.7± 9.5kg) who habitually consume caffeine ($\geq$ 1 serving a day [95mg] 4 days a week) participated. This was a double-blind crossover design, where either a CA+C or a placebo capsule was consumed followed by a 45-min ingestion period, a repeated Wingate protocol, and a 45-min recovery period. Cardiac autonomic activity was assessed through Heart Rate (HR), plasma epinephrine (E) and norepinephrine (NE), and markers of Heart Rate Variability (HRV): root mean squared of successive R-R differences (RMSSD); Standard Deviation of R-R intervals (SDNN); High-Frequency (HF); Low-Frequency (LF); and its ratio (LF:HF). Markers were taken at four time points: pre-Ingestion (PRE-ig), 40-45-min post (Post-ig); Wingate recovery (PRE-rcv), 40-45-min post recovery (Post-rcv). **Results:** Markers that violated normality were naturally log transformed prior to further analysis (ln). Pre-planned comparisons were performed to assess differences between pre and post time points as well as the corresponding time point of the other trial within their respected phase. During the CA+C trial, an increase in HR, lnSDNN, lnLF, EPI, and NE were observed at Post-ig when compared to Pre-ig (p≤0.05). Significant differences were observed in all markers, except LF:HF, during the CA+C and PLA trials from the Pre-rcv to Post-rcv (p≤0.05). **Conclusion:** The consumption of CA+C stimulates sympathetic activity during rest (e.g. ingestion phase) without influencing parasympathetic activity. CA+C provides no influence over cardiac autonomic recovery.

2412　　　Board #248　　　　June 1 11:00 AM - 12:30 PM

Effects of Energy Drinks on Resting Cardiovascular Measures

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(No relevant relationships reported)

The use of energy drinks among athletes has risen greatly. Reviews of energy drink related health complications have highlighted adverse cardiovascular events. **PURPOSE:** To examine the effects of three commercially available energy drinks on resting cardiovascular measures prior to exercise. **METHODS:** Twenty-five healthy subjects participated in this study. Subjects reported to the laboratory on four separate occasions where they ingested a placebo or one of three commercially available energy drinks (energy drink 1, energy drink 2 and energy drink 3). Trials were conducted subject blinded and counterbalanced. During each trial blood pressure and heart rate were measured at three key points: prior to beverage ingestion, at 30 minutes post ingestion and at 60 minutes post ingestion. Subjects remained seated and in a relaxed state for the duration of the 60 minute trials. Means for dependent measures were analyzed using repeated measures ANOVA with an alpha of 0.05 to determine significance. **RESULTS:** Heart rate was found to be significantly increased from pre-ingestion measures to 60 minute measures for both energy drink 2 (Pre = 65.12 ± 9.81 bpm and 60 min = 73.08 ± 10.82 bpm at p=0.010) and energy drink 3 (Pre = 65.76 ± 8.44 bpm and 60 min = 73.52 ± 11.25 bpm at p=0.005). Systolic blood pressure was found to be significantly increased from pre-ingestion to 60 minutes for energy drink 1 (Pre = 114.84 ± 9.33 mmHg and 60 min = 120.80 ± 9.43 mmHg at p=0.003), energy drink 2 (Pre = 113.56 ± 8.55 mmHg and 60 min = 121.44 ± 8.86 mmHg at p=0.004), and energy drink 3 (Pre = 113.24 ± 7.09 mmHg and 60 min = 119.40 ± 10.58 mmHg at p=0.037). **CONCLUSION:** These findings demonstrate that energy drinks impact cardiovascular measures by increasing both heart rate and blood pressure during a resting state. While the demonstrated increases may not be dangerously high, users should be aware of the impact of these drinks on cardiovascular measures.

2413　　　Board #249　　　　June 1 11:00 AM - 12:30 PM

Menstrual Phase Influence and Oral Contraceptive Use on the Ergogenic Effects of Caffeine during Cycling

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(No relevant relationships reported)

It is suggested that inter-individual differences in the ergogenic effects of caffeine may be attributed to individual variability in caffeine absorption and metabolism. It is known that menstrual status and oral contraceptive (OCS) use affects caffeine metabolism, but it is not clear whether these factors mediate the ergogenic effects of caffeine consumption. **Purpose:** To determine whether menstrual phase or OCS use influence the effects of caffeine ingestion on 3-km cycling performance. **Methods:** Sixteen recreational cyclists completed two 3-km time trials (TT) during both the follicular (early) and luteal (late) phases. Riders ingested either a placebo or 6mg/ kg caffeine capsule one hour prior to each trial. Subjects were divided into a non-OCS users group (n = 8; age, 20.9 ± 2.1 yr; VO2max = 50.9 ± 7.8 ml/kg/min) and an OCS users group (n=8; age = 21.4 ±1.4 yr; VO2max = 48.0 ± 4.0 ml/kg/min). Magnitude-based inferences were used to evaluate the effects of treatment (placebo versus caffeine), menstrual phase (follicular versus luteal) and group (OCS users versus non-users) on power output during the cycling TT. **Results:** Overall, caffeine improved power output during the TT, regardless of menstrual phases or OCS use. Among non-OCS users, caffeine 'likely' improved power output in the follicular phase (6.7 ± 6.1%), and 'very likely' improved power output in the luteal phase (6.7 ± 4.8%). In the OCS users, caffeine 'likely' increased power output in the follicular phase (4.7 ± 5.6%), and 'very likely' improved power output during the luteal phase (7.2 ± 3.7%). Differences in the ergogenic effects of caffeine between the two groups (OCS users versus non-users) and between menstrual phases were 'unclear'. **Conclusion:** Caffeine ingestion improved power output during a 3-km cycling TT. However, the magnitude of the ergogenic effects of caffeine were not affected by OCS use, or menstrual phase.

2414　　　Board #250　　　　June 1 11:00 AM - 12:30 PM

The Influence Of Caffeine And A CYP1A2 Polymorphism On The Ventilatory Threshold - A Pilot Study

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(No relevant relationships reported)

Previous research suggests acute caffeine supplementation may alter substrate utilization and/or ventilatory responses that influence the ventilatory threshold (VT). Caffeine metabolism is influenced by a single nucleotide polymorphism at intron 1 of the cytochrome P450 (CYP1A2) gene, which may influence the ergogenic effects associated with caffeine use. **PURPOSE:** The purpose of this study was to examine the influence of caffeine on exercise responses at the VT, and determine the effect of the CYP1A2 polymorphism on those responses. **METHODS:** 17 healthy men (age 24.8 ± 2.7 yrs; weight 79.5 ± 9.2 kg) participated in this study. Subjects performed graded maximal exercise tests on a cycle ergometer after consuming either 6 mg/kg of caffeine or placebo. Subjects were categorized as possessing the C allele (C allele carriers) (n = 8) or being homozygous for the A allele (AA homozygotes) (n = 9). VT was determined using the V-slope method. The effects of caffeine (CAF) vs placebo (PL), genotype, and treatment x genotype were assessed using a two-factor ANOVA. **RESULTS:** At the VT, caffeine significantly augmented workload (CAF= 220 ± 43 Watts, PL= 211 ± 46 Watts), VO_2 (CAF= 33.5 ± 8.2, PL= 32.2 ± 7.7 ml/kg/min), VO_2 as a % of VO2max (CAF= 69.0 ± 8.2%, PL= 64.8 ± 9.6%), RER (CAF= 0.98 ± 0.06, PL= 0.95 ± 0.07), and HR (CAF= 155 ± 16, PL= 151 ± 16 bpm), compared to placebo (all p<0.05). A significant treatment x genotype interaction was observed for RER (AA group: CAF= 0.99 ± 0.07, PL= 0.91 ± 0.08; C allele: CAF= 0.97 ± 0.07, PL= 0.97 ± 0.09). A non-significant between group trend was observed for VO_2 as a % of VO2max (AA group 62.5 ± 6.6%, C allele = 67.2 ± 9.6% p=0.10, eta^2=0.17) and workload (AA group 196.4 ± 37.7, C allele = 214.1 ± 40.0 Watts, p=0.10, eta^2=0.17). **CONCLUSION:** Caffeine enhances exercise performance at the VT. The CYP1A2 polymorphism likely modulates substrate utilization and exercise intensity at the VT. Additional research is needed to verify these preliminary findings.

Abstracts were prepared by the authors and printed as submitted.

FRIDAY, JUNE 1, 2018

2415   Board #251   June 1 11:00 AM - 12:30 PM

Caffeine Does Not Increase Heat Stress during Endurance Exercise in a Hot, Humid Environment

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(No relevant relationships reported)

The diuretic effects of caffeine and its subsequent role on fluid balance have been highly debated for years. Given the lack of mechanistic understanding behind many of its effects, it is important to determine if caffeine presents a risk to normal thermoregulatory patterns during exercise in hot, humid conditions. **PURPOSE**: To determine if caffeine (CAFF) ingestion increases core body temperature in physically active subjects exercising in a hot, humid environment during repeated endurance exercise tests (EET). **METHODS**: This study used a placebo-controlled, double-blind, cross-over experimental design to investigate the effects of caffeine ingestion on heart rate (HR) and core body temperature in physically active males when exercising in a hot and humid environment. Twenty-one healthy male subjects (age 27.70±2.90yrs; height 1.76±0.10m; weight 74.19±7.10kg) performed a maximal graded exercise test (GXT) and two endurance exercise tests (EET) separated by at least 48hrs. Subjects were randomly assigned to consume either 6mg/kg of body weight of a placebo (PLAC) or CAFF supplement for one EET and the opposite substance (PLAC or CAFF) for the second test. In addition, the subjects consumed a CorTemp® core body temperature sensor to measure core body temperature throughout each test. Each EET consisted of cycling on a cycle ergometer at 65% of their VO_{2max} for 40min in a controlled hot, humid environment (36.37±0.58°C; 59.46±5.14%RH). **RESULTS**: Results indicated no significant difference between groups for core body temperature or heart rate at any time point, with the exception of an elevated HR 5min post-exercise in the CAFF group when compared to PLAC (136.82±7.51 vs. 127.65±3.17, respectively; p=0.011). A significant increase in HR from pre-exercise to 40min was observed in both groups (CAFF: 84.27±4.19 to 164.50±5.13, PLAC: 79.23±3.47 to 162.71±3.26; p<0.01), but CAFF consumption elicited no synergistic effects on HR or core body temperature before, during, or after exercise. Interestingly, CAFF consumption did elicit a diminished HR recovery within the first 5min of recovery, potentially indicating a greater degree of heat stress in the CAFF group. **CONCLUSION**: Based upon this evidence, caffeine consumption does not impair normal thermoregulatory patterns during exercise in a hot, humid environment.

2416   Board #252   June 1 11:00 AM - 12:30 PM

Caffeine Intake Maintains 3-km Cycling Time Trial Performance the Morning Following Sleep Restriction

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(No relevant relationships reported)

Athletes are at an increased risk for acute sleep loss due to the physiological and psychological tolls of heavy training and competition. We recently reported that a single night of sleep restriction (SR) following heavy exercise impaired 3-km cycling performance the next morning. Because caffeine can mitigate fatigue and enhance physical and cognitive function, caffeine is a logical candidate to offset the negative impact of sleep restriction on next-day performance. **PURPOSE:** The primary aim of this project was to determine the effects benefit of caffeine supplementation for exercise performance following one night of SR in trained cyclists. **METHODS:** Ten (8 male; 2 female) cyclists (age, 21 ± 3 yrs; VO2max, 61 ± 8 ml/kg/min) completed four experimental phases. Each phase consisted of an evening of heavy exercise (EX1; 3-km cycling time trial followed by 60 min of high intensity cycling intervals) followed by a morning session (EX2) to evaluate perceived fatigue and 3-km TT performance. EX1 and EX2 were separated by an assigned sleep condition [FULL, ~6.4 hrs vs. Sleep Restriction (SR), ~3 hrs]. Each sleep condition was implemented twice with cyclists receiving 6 mg/kg of caffeine (CAF) and placebo (PLA) 60 min prior to EX2 after FULL and SR. Magnitude-based inferences were used to compare perceived fatigue and subsequent 3-km TT performance (mean power output) between each of the following conditions: FULL/PLA, FULL/CAF, SR/PLA, and SR/CAF. **RESULTS:** Surprisingly, 3-km TT power output was 'possibly' [44% Likelihood (LH)] greater following SR/PLA vs. FULL/PLA (+0.9%). Power output was 'likely' higher (94% LH) following SR/CAF vs. SR/PLA (+6%), with no systematic differences between SR/CAF and FULL/CAF. Perceived fatigue was rank ordered as SR/PLA>SR/CAF>FULL/PLA>FULL/CAF. **CONCLUSION:** The current data suggests that caffeine has the ability to offset performance impairments that may result from a single night of SR compared to a full night of sleep. However, in contrast to our previous report, this interpretation is weakened by the fact that EX2 performances were similar between SR and FULL. Regardless, athletes may want to consider caffeine supplementation as a viable strategy to offset the negative impact of occasional sleep restriction.

2417   Board #253   June 1 11:00 AM - 12:30 PM

Acute Effect of Different Doses of Caffeine on Strength and Calcium Release

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(No relevant relationships reported)

Although the benefits of caffeine on aerobic performance have been well-established, knowledge about the effect of different doses of caffeine on strength and mechanisms related to calcium release, such as inhibition of specific phosphodiesterases and antagonistic actions at the level of adenosine receptors are lacking. We aimed to analyze these effects on resistance exercises. PURPOSE: Analyze the acute effect of different doses of caffeine on strength and calcium release in recreationally trained men. METHODS: The effect of different doses of caffeine on strength, calcium release, RPE, and TG were assessed in 13 recreationally active young adults (age 19 ± 2 yrs), who performed three tasks on three different occasions with a washout of 14 days between sessions. Day one involved collecting baseline data and acclimating participants to the protocol to determine the weight loads at each subject's 10 RM. Participants were instructed to avoid food or beverages that may contain caffeine two days before the tests. The effect of different doses of caffeine on strength was evaluated in three different resistance exercises: bench press (BP); deadlift (DL); and squats (SQ). Blood samples were collected immediately upon arrival to the laboratory, followed by consumption of a standardized isocaloric shake along with capsules containing different doses of caffeine: 6mg • kg $^{-1}$ (CF1); 8mg • kg $^{-1}$ (CF2); or placebo (CG). A additional blood samples were collected 45 minutes after caffeine/placebo consumption and immediately after the execution of each exercise. The supplementation followed a double-blind, randomized model. RESULTS: The strength on BP, DL and SQ statistically improved between CG and CF2 (BP 94.3 ± 5.2 to 101.4 ± 3.4; DL 120.7 ± 7.7 to 136.3 ± 7.09; SQ 119.4 ± 7.4 to 132.1 ± 5.2 p<0.05). Although a strength increase was found at CF2 compared to CF1, no other statistical differences were found (BP 98.1 ± 3.8 to 101.4 ± 3.4; DL 130.2 ± 8.3 to 136.3 ± 7.09; SQ 129.5 ± 8.01 to 132.1 ± 5.2 p=0.001). Calcium release statistically improved in CF2 in comparison to CF1 and CG (10.9 ± 0.2 to 8.9 ± 0.4 and 10.9 to 8.3 ± 0.2 p=0.001). CONCLUSION: An 8 mg • kg $^{-1}$ dose of caffeine seems to be more effective than 6 mg • kg $^{-1}$ for improving strength levels in the BP, DL and SQ; these enhancements were directly related to improvements in calcium release during CF2.

E-40   Free Communication/Poster - Endocrinology

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2418   Board #254   June 1 9:30 AM - 11:00 AM

The Associations Between metabolic Syndrome and Thyroid Function In U.S. Adolescents: Nhanes Iii

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(No relevant relationships reported)

The global prevalence of metabolic syndrome (MetS) and its associated components (high fasting glucose, waist circumference, blood pressure, triglycerides, and low HDL) have increased over the past few decades. In addition, abnormal thyroid hormone levels have been found to manifest in a cascade of metabolic dysfunction, which may be linked to MetS in youth. **PURPOSE:** The purpose of the study is to investigate the association between MetS, its components, and markers of thyroid function in a nationally-representative sample of adolescents. **METHODS:** The National Health and Nutrition Examination Survey III (1988-1994) collected data on the components of metabolic syndrome and thyroid function in 1,322 adolescents aged 12-18.9 years (613 males and 709 females). Participants were grouped based on MetS status, number of MetS components, and markers of thyroid function using age- and sex-specific reference values (including thyroid stimulating hormone [TSH], thyroxine [T4], antimicrosomal antibody [AMA], and anti-thyroglobulin antibody [TgAb]. Logistic models were used to predict the status of the thyroid markers (as high/low) from MetS status, controlling for age, sex, and race/ethnicity. **RESULTS:** The prevalence of metabolic syndrome was 5.4% in the full sample. The logistic models indicated the MetS positive group had a significantly lower odds of having a low TSH (OR = 0.06, 95%CI [0.01, 0.5], p = 0.005) compared to the MetS negative group. However, follow-up analyses revealed adolescents with ≥ 2 MetS components were more likely to have high TSH (OR = 5.0, 95%CI [1.4, 18.2], p = 0.013) and be

positive for AMA (OR = 2.6, 95%CI [1.1, 6.7], p = 0.042), while being less likely to have low TSH (OR = 0.07, 95%CI [0.01, 0.31], p < 0.001) compared to those with 1 or 0 components. No associations were found between high/low T4 or TgAb and MetS or MetS components (all p > 0.05). **CONCLUSION:** In this nationally-representative sample of adolescents, those with multiple MetS components were more likely to have elevated TSH and be positive for AMA, while being less likely to have low TSH. T4 and TgAb values were similar, regardless of MetS status. Even in adolescence metabolic dysfunction appears to be associated with some markers of thyroid function.

2419   Board #255   June 1 9:30 AM - 11:00 AM

Evidence of Hypothalamic Regulation by AVP and CRH on Running-Induced Stress Response

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(No relevant relationships reported)

Moderate exercise with an intensity near the lactate threshold (LT) is beneficial to human health and one of the possible underlying mechanisms of this may be exercise-induced activation of the hypothalamus with enhanced stress and metabolic responsiveness. In general, adrenocorticotropic hormone (ACTH) secretion, a potential systemic stress marker, is regulated by the hypothalamic corticotropin-releasing hormone (CRH) through the CRH type 1 receptor (CRH1R), which is enhanced by hypothalamic arginine vasopressin (AVP) via the AVP V_{1b} receptor (V_{1b}R). Conversely, it has been suggested that ACTH secretion during exercise above the LT is mainly regulated by AVP, not CRH. However, to date there is no clear evidence for how exercise-induced ACTH secretion is enhanced *via* these factors. **PURPOSE**: To elucidate whether AVP and/or CRH regulates exercise-induced ACTH secretion using specific receptor antagonists.
METHODS: Rats acclimatized to treadmill running were randomly divided into four groups: Vehicle, SSR (V_{1b}R antagonist), CP (CRH1R antagonist), and SSR+CP injection groups, based on i.p. injection of these drugs before running on a treadmill at just above LT (21.5 m/min) for 30 min. Blood was collected from a catheter inserted into the right external jugular vein before the injection and pre- and post-running to measure blood lactate and plasma ACTH levels.
RESULTS: Baseline lactate and ACTH levels in all groups were unaffected irrespective of drug treatment. Post-running blood lactate levels were significantly higher than pre-running (p<0.0001, all groups) with no inter-group difference. Plasma ACTH levels did not increase after running in the SSR+CP group (p>0.05 for SSR+CP group, cp. p<0.0001 for Vehicle, SSR and CP groups). Post-running ACTH levels were lower in all antagonist groups compared to the Vehicle group (p<0.0001 for SSR, CP, and SSR+CP vs. Vehicle group). ACTH levels for the SSR+CP group decreased compared to those for the SSR and CP groups (p<0.05 for SSR+CP vs. SSR and CP, respectively).
CONCLUSIONS: We revealed for the first time that exercise-induced ACTH secretion is regulated by both AVP and CRH with concomitant blood lactate increase. Further, our results suggest that AVP and CRH cooperatively enhance exercise-induced ACTH response independent of metabolic response.

2420   Board #256   June 1 9:30 AM - 11:00 AM

Changes in Muscle Strength Following Cross-sex Hormone Treatment in Transgender Individuals

Anna Wiik, Tommy R. Lundberg, Mats Lilja, Daniel P. Andersson, Stefan Arver, Thomas Gustafsson. *Karolinska Institutet, Stockholm, Sweden.*

(No relevant relationships reported)

Many biological differences seen in men and women are driven by relative differences in estrogen and testosterone levels. In transgender individuals, gender-affirming treatment includes inhibition of endogenous sex hormones and subsequent replacement with the cross-sex hormones. Yet, the effect of this treatment on functional muscle strength remains poorly described. **PURPOSE**: The aim of the current study was to assess the effects of an altered sex hormone pattern on muscle strength.
METHODS: Twelve transgender individuals, 6 male to female (tranwomen) and 6 female to male (transmen) who had been accepted to start gender-affirming medical intervention, were recruited. Knee extensor and flexor muscle strength was assessed using isokinetic dynamometry at three different angular velocities (0, 60 and 90 °/s). The assessments were made at four time points: (T1) before treatment initiation, (T2) four weeks after initiated gonadal hormonal down regulation but before hormone replacement, (T3) three months after hormone replacement therapy and (T4) eleven months after hormone replacement therapy.
RESULTS: There were significant (P<0.05) group x time interactions at each angular velocity. Thus, while the transmen increased their strength over the four time points, strength levels were generally maintained in the transwomen. When averaging the three strength tests, knee extension (16%) and knee flexion (34%) strength increased from T1 to T4 in transmen. The corresponding changes in the transwomen group were -6% and 0%, respectively.

CONCLUSIONS: These results show that ~1 year of cross-sex hormone treatment results in increased muscle strength in transmen. However, transwomen maintain their strength levels throughout the treatment period. We conclude that the altered sex hormone pattern induced by gender-affirming treatment differentially affect muscle strength in transmen vs. transwomen.

2421   Board #257   June 1 9:30 AM - 11:00 AM

Soy Protein Supplementation Is Not Adipogenic Or Estrogenic In Young Men When Combined With Resistance Training

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(No relevant relationships reported)

PURPOSE: : Sex hormone physiology (e.g., estradiol, testosterone) may be affected by soy and/or whey protein consumption. Alterations in sex hormones due to resistance training (RT) and/or protein supplementation may explain meaningful variation in adipocyte and skeletal myocyte size alterations. Consequential molecular signaling in these cell types remain unclear. Therefore, we examined effects of RT and soy (SPC), whey (WPC), or placebo (PLA) supplementation in young men.
METHODS: 47 healthy, young men were partitioned into PLA, SPC, or WPC groups and completed 12 weeks of RT. Body composition, serum hormones, androgen signaling markers in myocytes, and estrogen signaling markers in adipocytes were examined using DXA, ELISA, western blotting, PCR, and immunohistochemistry.
RESULTS: Testosterone increased over time, but more so in subjects consuming WPC (p<0.05). Adipocyte mRNA expression of the estrogen receptor alpha increased (p<0.05), as did hormone sensitive lipase over time (p<0.05). Skeletal muscle androgen receptor mRNA expression increased while ornithine decarboxylase mRNA decreased over time (p<0.05). Alterations in body composition, adipocyte, and myocyte morphology were not significantly different between groups (p>0.05). Changes in 17β-estradiol and testosterone explained <3% of alterations in adipocyte and myocyte size.
CONCLUSIONS: These data suggest primarily RT-mediated effects with little influence of protein type and hormonal changes.

2422   Board #258   June 1 9:30 AM - 11:00 AM

Relationship Between Wnt Signaling Inhibitors And Muscle Function In Young And Middle-aged Premenopausal Women

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(No relevant relationships reported)

The Wnt signaling pathway, an important regulator of skeletal development, is inhibited by several glycoproteins including sclerostin and Dickkopf -1 (DKK-1). Animal studies have reported Wnt 7a plays an important role in skeletal muscle growth and improving strength. However, to date, no studies have examined relationships between circulating levels of sclerostin and DKK-1 and muscle function in humans. **PURPOSE:** This study investigated the relationship between sclerostin and DKK-1 with jump and strength variables in young (20-30 yrs, n=25) and middle-aged (35-45 yrs, n=25) women. Further, the effects of age group and physical activity level on muscle function variables were evaluated. Physical activity levels were based on the International Physical Activity Questionnaire. **METHODS:** Serum sclerostin and DKK-1 levels were measured in fasting morning blood samples by ELISA. Lower body strength and power were assessed by a two-leg press maximal strength test (1RM) and a vertical jump test (Just Jump Mat, Tendo Sports Machine), respectively. **RESULTS**: Two-way ANOVA showed a significant age group effect for JH, relative jump power (RJP), and 1RM (p<0.05), which were higher in young women (Table 1). There were no significant differences in muscle performance variables based on physical activity levels. Jump height (JH) was negatively correlated (r= -0.27, p< 0.05) with sclerostin levels. **CONCLUSION:** Lower muscle strength and jump height in middle-age women supports an age-related decrease in muscle function. Generally, sclerostin and DKK-1 were not related to muscle performance variables.
Table 1. Muscle Function Variables based on Age Group and Physical Activity Levels (Mean ± SD)

Variables	Young (n=25)		Middle-aged (n=25)	
	Low-Moderate (n=13)	HEPA-Active (n=12)	Low-Moderate (n=12)	HEPA-Active (n=13)
JH (inches) **	13.43 ± 3.10	14.13 ± 2.69	11.12 ± 2.52	11.20 ± 3.33
Velocity (m/s)	0.99 ± 0.13	1.04 ± 0.09	0.94 ± 0.13	0.94 ± 0.09
Jump Power (watts)	647.40 ± 107.99	698.13 ± 141.61	622.91 ±142.39	593.20 ± 127.62
RJP (watts/ kg)*	9.85 ± 1.30	11.44 ± 3.69	9.22 ± 1.49	9.17 ± 1.02
1RM (kg)*	125.17 ± 25.07	144.29 ± 36.90	113.24 ± 20.18	121.67 ± 29.23

** $p<0.01$, * $p<0.05$ Significant age group effect; HEPA-Health enhancing physical activity

2423   Board #259   June 1 9:30 AM - 11:00 AM

Acute Resistance Exercise on Bioactive and Immunoreactive Growth Hormone in Women.

Emily M. Post[1], Matthew K. Beeler[1], William H. Dupont[1], Lydia K. Caldwell[1], John P. Anders[1], Vincent H. Hardesty[1], Emily C. Barnhart[1], Emily C. Borden[1], Jeff S. Volek[1], Wesley C. Hymer[2], William J. Kraemer, FACSM[1]. [1]*The Ohio State University, columbus, OH.* [2]*The Pennsylvania State University, University Park, PA.* (Sponsor: Dr. Wiliiam J. Kraemer, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose was to determine the differences between trained and untrained women for concentrations of BGH and IGH in response to acute resistance exercise.
METHODS: Untrained recreationally active women (UT) (N= 12), mean ± SD: 24 ± 2.4 yr, 167 ± 6.3 cm, 68.8 ± 7.3 kg, 27.3 ± 4.0% body fat, and trained women (TW) (N= 12), 25 ± 3.4 yr, 168 ± 7.3 cm, 69.8 ± 6.3 kg, 19.3 ± 2.7% body fat gave informed consent. Trained status was determined by participation in aerobic/resistance training programs for at least 1 year. The women were tested for 1 repetition maximum strength (1 RM) in the squat and were familiarized with the squat test protocol that consisted of 6 sets of 10 repetitions at 75% of their 1 RM with 2 minutes rest between sets. Testing was performed during the early follicular phase between 0630 and 1100 after an 8- to 12-h fast. Pre-exercise blood samples were obtained via standard venipuncture 15 min before the test and post-exercise samples were obtained immediately after the resistance training test protocol. Plasma was collected and assayed for IGH using polyclonal and monoclonal assays. Total BGH was assayed using the rat tibial line *in vivo* bioassay. A two-way analysis of variance (2 X 2) for group and time were used to analyze the data, with $p \leq 0.05$ defined as significance.
RESULTS: The TW were significantly stronger than the UT in the squat. Both groups significantly increased their IGH concentrations post-exercise, with the monoclonal assay showing significantly higher values than polyclonal assays and TW showing greater post-exercise values than UT [Monoclonal: (TW: 5 ± 2 to 19 ± 3 µg/L-1, UT: 4.9 ± 2 to 10.2 ± 3.0 µg/L-1)]. BGH did not increase pre to post exercise in either group, yet TW had significantly higher pre-exercise and post-exercise BGH (3900 ± 233 to 4100 ± 323 µg/L-1) than UT women (2500 ± 333 to 2100 ± 223 µg/L-1). BGH was significantly higher than IGH assays at all time points.
CONCLUSIONS: Resistance training impacts both the BGH and IGH secretion patterns from the anterior pituitary gland. IGH is acutely increased in response to resistance training in women, with an even higher response in trained women. BGH is chronically higher in trained women than untrained, but shows no response with acute resistance training. These findings may be more responsible for GH's role in chronic resistance training adaptations.

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2424   Board #260   June 1 9:30 AM - 11:00 AM

The Reliability And Criterion Validity Of A Novel Dorsiflexion Range Of Motion Screen

Kyle B. Kiesel[1], Kate Schwartzkopf-Phifer[1], Bethany Huebner[1], Garrett S. Bullock[2], Mary Beth Garner[1], Joshua Hayden[1], Kyle Matsel[1], Risa Ricard[1], Phillip J. Plisky[1]. [1]*University of Evansville, Evansville, IN.* [2]*Mountain River PT, Chatham, VA.*
(No relevant relationships reported)

Purpose: Limited ankle dorsiflexion (DF) is associated with abnormal biomechanics as well as lower extremity injuries. Identifying and correcting restricted ankle DF may be a viable preventative strategy to normalize motor control and reduce injury. A reliable ankle screen may help clinicians to identify decreased ankle range of motion (ROM). The purpose of this study was to determine the reliability and criterion validity of a novel standing ankle dorsiflexion screen (SADS). It is proposed that the SADS will demonstrate strong inter-rater reliability and criterion validity. **Methods:** 37 healthy subjects (74 ankles) participated in the study. Ankle DF ROM was measured using an electronic inclinometer by 2 raters. Four raters measured ankle DF using the criteria of the SADS. The SADS is performed in a heel-to-toe position. Subjects performed DF by dropping their back knee forward as far as possible without lifting their back heel. The back-ankle DF is scored by identifying the position of the anterior knee in relation to the medial malleolus of the front limb. It scored as either beyond the front of the malleolus (pass), or behind the front of the malleolus (fail). Measurements were obtained by four raters, two times per ankle, with 5 minutes of rest between measurements to prevent a treatment effect. Reliability was calculated using an ICC between the 2 raters using the electronic inclinometer and using a Kappa coefficient between the 4 pairs of raters for the SADS. **Results:** The ICC values from the electronic inclinometer were reported as mean values for the 3 trials at 0.95 (0.92-0.97). The Kappa values were calculated for a single trial for SADS and ranged from 0.61-0.81 with percent agreement ranging from 86%-94%. There was a statistically significant difference ($p<0.001$) in ankle DF ROM between the behind category (mean DF = 41.3° SD 4.7°) and the beyond category (mean value was 51.8° SD 6.1°). **Conclusions:** This novel ankle screen can be considered reliable for screening ankle DF ROM. Criterion validity, as compared to a standard goniometric measure, can also be considered meaningful. The screen may provide clinicians an effective tool to screen for ankle DF ROM deficits.

2425   Board #261   June 1 9:30 AM - 11:00 AM

Validation of a Modified Functional Movement Screen Test for Division III Female Soccer Players

Tiffany R. Widseth, Ana B. Freire Ribeiro. *Augsburg University, Minneapolis, MN.* (Sponsor: Dr. Mark Blegen, FACSM)
(No relevant relationships reported)

Abstract
Background: The Functional Movement Screen (FMS) is comprised of seven tests to identify compensatory movement patterns that may increase injury risk and reduce performance. A modified FMS (MFMS) was created by Augsburg Athletic Trainers to improve screening efficiency and includes three original FMS tests: shoulder mobility, active straight leg raise, trunk stability pushup, and a newly added test; the vertical drop jump (VDJ), all scored on a simplified 0-2 scale.
Objective: This study aimed to validate the MFMS for DIII female soccer players.
Methods: Sixteen NCAA DIII soccer players and twenty non-athlete controls were recruited and completed two trials of FMS and MFMS. Reliability was calculated as Pearson Product Moment. Concurrent validity was calculated between FMS and MFMS scores, using R Statistical Software.
Results: Mean age of soccer group was 21 (SD=1.37) and control 21.05 (SD=1.61). Mean FMS score for soccer group was 14.38 (SD=1.54) and control 13.35 (SD=2.39). Mean MFMS score for soccer was 5.62 (SD=0.96) and control 4.95 (SD=0.69). Soccer scores for the first MFMS trial were significantly larger than controls' (p=0.02). FMS reliability coefficient was 0.99 and MFMS' was 0.88.
Discussion: There were moderate positive correlations between FMS and MFMS for the
soccer group (r=0.51) and for controls (r=0.46), but they were not large enough to validate the MFMS. When the MFMS was rescored on the original 0-3 scale (excluding VDJ) it was valid for both groups (soccer r = 0.79, controls r= 0.83).
Conclusion: The MFMS is not valid, suggesting potential issues with the new scoring system.

Keywords: Functional Movement Screen (FMS), validity, reliability, DIII Female soccer players

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2426   Board #262   June 1 9:30 AM - 11:00 AM

Effect of Instability in Legpress Testing on Strength & Muscle Activity in Functional Ankle Instability

Mina Khajooei, Chiao-I Lin, Müller Steffan, Frank Mayer. *Potsdam University, Potsdam, Germany.*

(No relevant relationships reported)

Compensating instable situations is an important functional capability to maintain joint stability, to compensate perturbations and to prevent (re-)injury. Therefore, a reduced maximum strength and altered neuromuscular activity is expected by inducing instability to high loading test situations. Possible effects are not clear for induced instability during maximum legpress tests in healthy and furthermore in subjects with functional ankle instability (FAI).

PURPOSE: First, to compare maximum strength and lower leg muscle activity between stable (S) and unstable (UN) maximum legpress tests. Second, to evaluate the association between FAI and effect of instability during testing. 18 male subjects (12 healthy/6 subjective FAI, age: 28±4yrs, height: 180±8cm, weight: 80±9kg, physical activity: 6±5h/wk) were included and their ankle function was quantified by the Foot and Ankle measure (FAAM) questionnaire. Five maximum strength test with leg press isokinetic device in concentric (CON) and eccentric (ECC) mode were measured. Muscle activity were recorded by EMG of m. tibialis anterior (TA), m. peroneus longus (PL) and m. soleus (SOL). Peak force (F_{Peak}, Nm) for maximum strength and root mean square (RMS, Hz) for EMG amplitude of TA, PL and SOL were calculated. Comparisons of conditions (S vs UN) were analyzed descriptively and with paired T-tests. For association, Pearson correlation was applied using FAAM score and RMS differences (condition UN − S). **Results:** UN lead to a significant peak force reduction of 10.1% (CON) and 13.7% (ECC) significantly (p<0.001). RMS of PL in CON and TA in CON and ECC mode were 26.2%, 59.7% and 35.8% respectively significant higher in UN footplate in comparison with S (p<0.01). In addition, no correlations between FAI and loss of strength or changes in muscle activity have been found. **Conclusion:** Reduction in peak force and increased muscle activity confirmed the expected increased effort to compensate instability. The missing association between FAI and amount of altered strength or muscle activity might be attributed to a low level of FAI in the included subjects.

2427   Board #263   June 1 9:30 AM - 11:00 AM

Comparing The Possible Ankle Dorsiflexion Effects Of The Mulligan Ankle Dorsiflexion Mwm In Weight-bearing To The Mulligan Fibula Mwm For Dorsiflexion In Non-weight-bearing

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(No relevant relationships reported)

Decreased ankle dorsiflexion can be a factor that limits participation in activities and predisposes individuals to chronic issues. Traditionally, stretching protocols, strengthening of muscles, balance training, and traditional joint mobilizations have been used to increase ankle dorsiflexion. Although current methods have been successful at mitigating ankle dorsiflexion restrictions, alternative treatments should be researched. **Purpose:** Determine the possible effect of two Mulligan Mobilization with Movement (MWM) Techniques on ankle dorsiflexion **Methods:** Individuals were recruited at three college athletic training clinics around the United States. Participants were randomly allocated into two groups, the Mulligan Ankle Dorsiflexion MWM in weight bearing and the Mulligan Fibula MWM for Dorsiflexion in non-weight-bearing. Once allocated, clinicians applied a single treatment of three sets of ten. Distance from wall and Tibial angle for the weight-bearing dorsiflexion lunge test was collected pretreatment, post treatment, at a 48-hour follow up, and at a one week follow up. **Results:** Significant effect was found for WBLT Distance ($F(2,11) = 54.8$, $p < .001$), WBLT Angle ($F(2,11) = 77.5$, $p < .001$) Y-Balance Composite ($F 2,11) = 6.1$, $p < .004$), and WBLT PSFS ($F(2,11) = 12.9$, $p < .004$). **Conclusions:** The results support the use of both the Mulligan Concept techniques to increase ankle dorsiflexion ROM. The immediate increases in ankle dorsiflexion ROM were maintained at one week follow-up.

2428   Board #264   June 1 9:30 AM - 11:00 AM

Early Sport Specialization and Bilateral Tissue Differences in Overhead Athletes

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(No relevant relationships reported)

Early sport specialization is a growing concern because it may lead to repetitive stress and excessive joint loading. Current data indicate that early specialization leads to injury, but its role in producing underlying tissue changes has not been examined. **PURPOSE:** To determine effects of sport specialization on upper extremity tissue characteristics. **METHODS:** Seventy-five collegiate baseball, softball, and tennis players (36 male, 39 female; age = 19.8 ± 1.4 years, height = 175.3 ± 10.4 cm; weight = 76.0 ± 13.9 kg) participated. Subjects completed surveys and were grouped based on age when they chose a primary sport and started competing for more than 8 months/year. Shoulder range of motion was measured with an inclinometer. Posterior capsule thickness, humeral retrotorsion, and ulnar collateral ligament (UCL) thickness were collected via ultrasound. For each measurement, non-dominant arm values were subtracted from dominant arm. Data were analyzed with hierarchical multiple regression, which determined group differences while controlling for sport played. **RESULTS:** Sport specialization criteria were met by 21 athletes before age 11 (Early), 28 athletes between the ages of 11-14 (Middle), and 25 athletes age 15 or older (Late). Shoulder internal (Early = -9.7 ± 5.6°; Middle = -8.8 ± 7.0°; Late = -8.2 ± 6.2°) and external (Early = 9.6 ± 11.1; Middle = 10.4 ± 11.8; Late = 9.9 ± 8.1) rotation produced clinically significant variations bilaterally but no statistically significant group differences (Internal: $R^2 = .08$, p = .23; External: $R^2 = .07$, p = .26). No group differences were noted for posterior capsule thickness ($R^2 = .07$, p = .28), humeral retrotorsion ($R^2 = .16$, p = .07), or UCL thickness ($R^2 = .11$, p = .09). Mean humeral retrotorsion (10.2 ± 6.1°) and UCL thickness (0.42 ± 0.61 mm) were greater on the dominant arm. **CONCLUSIONS:** Early sport specialization does not appear to exacerbate the bilateral tissue differences naturally present in collegiate overhead athletes. Therefore, sport specialization may be less concerning at the tissue level than the stress of overhead sport for the average athlete. Since the magnitude of tissue maladaptation associated with injury remains unknown, more data should be collected to determine connections among specialization, tissue characteristics, and injury rates in this population.

2429   Board #265   June 1 9:30 AM - 11:00 AM

Preseason Physicals, Are Important Factors Missing?

Garth Babcock. *Eastern Washington University, Cheney, WA.* (Sponsor: Wendy Repovich, FACSM)

(No relevant relationships reported)

Research shows NFL football players are at increased risk for Metabolic Syndrome (MetS) but it is unclear when MetS develops or whether additional tests in a sports pre-particpation (PPE) exam might identify risk factors (RF). **PURPOSE:** To identify MetS RF and their associations using the National Cholesterol Education Program Adult Treatment Panel (NCEP ATP) III standards and measures of abdominal fat in college players. **METHODS:** Forty-seven freshmen from a Division 1 FCS (n = 15), and a Division 3 (n = 32) football team volunteered to be tested during their PPE. Tests included fasting Triglycerides (TG), High Density Lipoprotein (HDL), blood glucose (BG), blood pressure (BP), supra-iliac (SIWC) and umbilical (UWC) waist circumference, percent body fat (%BF), and subcutaneous (SCAT) and visceral (VAT) fat depth. All NCEP ATP guidelines were followed and %BF, SCAT, and VAT were measured using a BodyMetrix™ Ultrasound. Statistical analysis using SPSS (v24) included descriptive statistics, a Pearson Correlation, and a Stepwise Multiple Regression to determine RF present, and the relationship between all clinical measures. **RESULTS:** Ten players (21%) met the criteria for MetS (n = 2 with 3, n = 6 with 4, and n = 2 with 5 RF). Division 1 had a higher percent of players (n = 5, 33%, 3 were offensive linemen) meeting the criteria compared to Division 3 (n = 5, 16%, 1 was an offensive lineman). All NCEP ATP III risk factors except BG were correlated (all positive except HDL) with meeting the criteria for MetS, with the SWC being the highest (r = .77, p = .001). Using non NCEP ATP III RF, significant positive correlations were found between %BF (r = .65, p = .0001, SCAT (r = .35, p = .013),and VAT (r = .49, p = .001). Lineman meeting the criteria for MetS had a %BF >21. Five variables (SIWC, TG, HDL, BG & VAT) were statistically significant in predicting MetS (p = .001, $R^2 = .83$). The stepwise multiple regression reported that SIWC accounted for the greatest variance on the MetS prediction (p < .000, ß = .65, $R^2 = .65$), and when combined with TG accounted for 73% of variance. **CONCLUSIONS:** The data suggests that freshmen football players have a high incidence of MetS RF. Waist circumference, specifically at the supraliac location, TG, and %BF should be included in PPE evaluation with follow up for early intervention as necessary.

2430   Board #266   June 1 9:30 AM - 11:00 AM

Ultrasound Imaging to Evaluate Acute Adaptations of the Medial Elbow Joint Complex

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(No relevant relationships reported)

Musculoskeletal ultrasound imaging (MSKUI) has become an increasing studied assessment tool in orthopedic sports medicine. Several studies have investigated ulnar collateral ligament (UCL) integrity and morphology in the throwing arm of baseball players with MSKUI. Research data has indicated that UCL thickening and medial joint space (MJS) widening occurs in athletes during sustained competition. **PURPOSE**: To examine acute UCL thickness and MJS adaptations in the throwing arm of Division I collegiate baseball pitchers with MSKUI following one in-game performance. **METHODS**: Ten NCAA Division I collegiate baseball pitchers (mean age 20.4 ± 1.4 yrs) with no history of significant upper extremity injuries participated. Musculoskeletal ultrasound images were obtained with a GE LOGIQ e ultrasound unit before and immediately after (< 15 minutes) pitching performance during each subject's first game of the season. A 3 kg valgus force was applied with a handheld dynamometer (Hoggan Scientific microFET 2) 20 cm distal to the medial epicondyle of the throwing arm during imaging. Post-imaging ligament thickness measurements were performed at the mid-substance of UCL and at the apex of the trochlea. Moreover, post-imaging measurements were performed from the apex of the trochlea to the apex of the ulna to evaluate MJS. Changes to UCL thickness (mid-substance and apex of the trochlea) and MJS were analyzed using paired samples t-tests. **RESULTS**: There was no significant difference in mid-substance UCL thickness width before (5.72 ± 0.7mm) and after performance (5.70 ± 0.7mm; t (9)= .36, p = .73). With respect to apex of trochlea UCL width, no significant differences were found before (2.67 ± 0.7mm) and after (2.61 ± 0.6mm; t (9)= 1.30, p = .23) performance. When assessing MJS, a significant change of ~4% was observed before (6.30 ± 1.5 mm) and after [6.60 ± 1.5; p= .005). Controlling for the innings pitched [F (1,7) = .11, p = .75] and pitch count [F (1,7) = .21, p = .66] did not affect the change in MJS. **CONCLUSIONS**: A significant MJS widening did occur after one pitching outing at the start of the season; whereas, no changes were observed in UCL thickness measured at two different locations. Further research is needed to understand the etiology of increased medial elbow joint widening in pitchers at the start of the collegiate baseball season.

2431   Board #267   June 1 9:30 AM - 11:00 AM

Does Shoulder Joint ROM Predict Medial Elbow Joint Space and UCL Thickness?

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(No relevant relationships reported)

Baseball athletes, especially pitchers, are prone to ulnar collateral ligament (UCL) injuries of the elbow. It is well documented that baseball athletes typically exhibit an increase in shoulder external rotation range of motion (ERRM) and a decrease in internal rotation range of motion (IRRM) while maintaining total rotational range of motion (TROM) in the throwing extremity. Furthermore, loss of TROM and ERRM may be associated with increased risk for UCL injury. Ultrasound imaging allows clinicians to evaluate UCL thickness and medial joint space (MJS) opening non-invasively. **PURPOSE**: To examine if shoulder joint motion (ERRM, IRRM, TROM), predicts medial elbow joint space (MJS) opening and UCL thickness in asymptomatic collegiate baseball pitchers at the start of the pre-season. **METHODS**: Nineteen asymptomatic NCAA Division I collegiate baseball pitchers (age 20.4 ± 1.45 yrs) participated in this study. Ultrasound images were obtained of the medial joint space and UCL on the participant's throwing arm using a GE LOGIQ e ultrasound unit. Participants were placed supine with a wedge placed underneath their pitching hand to maintain elbow position at 30 degrees. A 3 kg valgus force, as measured by a hand held dynamometer, was applied 20 cm distal to the medial epicondyle. Ligament thickness measurements were performed at the mid-substance of UCL and at the apex of the trochlea. Imaging measurements to evaluate MJS opening were performed from the apex of the trochlea to the apex of the ulna. Standard goniometric procedures were performed with the athlete supine to obtain ERRM, IRRM, and TROM values. Three stepwise linear multiple regression analyses were performed to determine if shoulder joint motion could predict UCL thickness and MJS. **RESULTS**: Shoulder joint range of motion did not significantly predict MJS [R² = .05, F (2,16) = 0.44, p=0.65,], UCL thickness at the mid-substance [R² = .01, F (2,16) = 0.12, p=0.89], or UCL thickness at the apex of the trochlea [R² = .04, F (2, 16) = 0.36, p=0.70].

CONCLUSIONS: Measures of shoulder joint ROM do not predict MJS or UCL thickness in asymptomatic baseball pitchers at the start of the season. Further research is recommended to perform multiple imagining sessions throughout the competitive season to further evaluate relationships between shoulder ROM and medial elbow structures.

2432   Board #268   June 1 9:30 AM - 11:00 AM

Do Biomarkers Play A Role On Tendinopathy?

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(No relevant relationships reported)

PURPOSE: It is estimated that lower extremity tendinopathy (LE) affects 1.4% of the population and that prevalence increases with the type of sport, level of performance, and body part involved. Achilles and patellar tendon are two sites commonly associated with tendinopathy in the LE. In the upper extremity (UE), the shoulder and elbow are the most frequent locations. The pathophysiology of tendinopathy is thought to be secondary to repetitive use leading to injury. However, medical risk factors such as diabetes have been associated with higher prevalence of the disease. Our goal in this study was to understand the impact of biomarkers and medical risk factors on the prevalence of tendinopathy. **METHODS**: Retrospective chart review of the medical charts of patients evaluated in the ambulatory clinics at the University of Chicago Medical Center from 2006 to 2016 were reviewed for the ICD9/10 codes for tendinitis. Biomarkers (HbA1c, TSH, 25-Hydroxy-VitaminD[VITD], Hemoglobin[Hbg], ANA, ESR, CRP, and Creatinine) were considered valid if obtained within 3 months prior to the diagnosis. Chi-Square Analysis and Independent T-Tests were completed using R, with p<0.05 indicating significance. **RESULTS**: Among 19,682 patients that were found to have biomarkers fulfilling the study criteria, 1648 had the diagnosis of tendinopathy. VITD as a continuous variable (shown on table) as well as categorical (<30 or ≥ 30 ng/dl) was not significantly different between groups. However, quartile-based analysis revealed a higher prevalence of tendinopathy in patients with VITD 18-26 ng/dl (p=0.025). Lower ESR, CRP, and HbA1c were also associated with higher prevalence of tendinopathy. **CONCLUSIONS**: VITD between 18-26 ng/ml was associated with higher prevalence of tendonitis. Tendinopathy was more prevalent in individuals with lower inflammatory markers and fewer comorbidities. VITD deficiency appears to play a role in tendon disease.

Association of Biomarkers and Tendinopathy			
Biomarkers	With The Diagnosis of Tendinopathy	WithoutThe Diagnosis of Tendinopathy	P-Value
25-hydroxy-Vitamin D(ng/ml), mean±SD	26.2 ±9.2 ng/ml	26.5±12.4 ng/ml	0.7966
Hemoglobin A1c, mean±SD	6.5±1.21 %	7.5±1.75 %	<0.01
ESR ≥30 mm/hr (n/%)	63(40%)	684 (53%)	0.0021
CRP ≥ 6 mg/L (n/%)	61 (36%)	747 (47%)	0.006
Hbg(Abnormal) men: <13.5 mg/dl or > 17.5 mg/dl / women:<11.5mg/dl or > 15.5 mg/dl (n/%)	138 (32%)	3854 (48%)	<0.01

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Acceptability of Personal Sensing to Develop a Digital Biomarker of Stress-Related Injury Risk in Athletes

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(No relevant relationships reported)

Stress is a dynamic internal risk factor for musculoskeletal injury but existing monitoring tools are not well-suited for triggering just-in-time adaptive interventions to reduce risk during times of vulnerability. People carry smartphones with a rich array of sensors as they go about their daily lives. Data collected from these sensors offer unprecedented opportunities for developing digital biomarkers to improve health and wellbeing. Realizing the full potential of such data for reducing musculoskeletal injury risk is contingent upon the willingness of individuals to permit the collection and analyses of such data. This may depend on a variety of factors, e.g., those having to do with the target population, intended use of the data, specific types of information being collected, the individuals with whom the information is to be shared and the conditions under which it will be shared, etc. **PURPOSE:** This study examined the willingness of athletes to permit the collection and analyses of their smartphone sensor data to develop digital biomarkers that reliably predict the risk of stress-related musculoskeletal injuries. **METHODS:** College student-athletes (n=75)

completed a 46-item online questionnaire about their interest in a digital biomarker for monitoring stress-related injury risk, and their willingness to share data from specific smartphone sensors to develop that digital biomarker. **RESULTS:** Most athletes (82%) expressed an interest in a digital biomarker for monitoring their stress-related injury risk; however interest was significantly lower if medical staff (73%), coaches (64%), or administrators (60%) would have access to the biomarker (all $p < .01$). Most were willing to share data from sensors capturing motion (88%), environment (93%), location (73%), connections (77%), and usage (65%). Keyboard input was the least accepted source of data with almost 40% reporting they would never share that data to create a digital biomarker. **CONCLUSION:** Athletes generally find it acceptable to share their smartphone sensor data if the data will be used to identify digital biomarkers of stress-related injury risk and to recommend just-in-time stress management interventions for injury prevention.

2434   Board #270   June 1 9:30 AM - 11:00 AM

The Development of a Single Leg Hurdle Test to Assess Return to Sport Readiness

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(No relevant relationships reported)

Few tests of dynamic quadriceps muscle asymmetry exist for return to sport testing. Such a test would be beneficial, as quadriceps asymmetries are associated with higher injury levels once athletes return to play. Current hop tests emphasize horizontal progression, which previous studies have shown recruits the gluteal muscles much more than the quadriceps. Implementing an assessment, such as jumping over a hurdle, into a hop test may require increased demands of the quadriceps. As a first step, we sought to determine the reliability of a new type of hop test using a series of hurdles. **PURPOSE:** The objective of this study was to assess the between and within session reliability of a new single leg hurdle test. **METHODS:** 20 healthy subjects (11 M, ages 22.4 ± 3.1, BMI 22.9 ± 3.0) with no prior lower extremity injuries completed a single leg hop over a series of four consecutive 30.5 cm high hurdles. The distance between the hurdles was equal to the subject's leg length with 2 trials preformed on each leg. Performance was measured as the time it took to complete the hurdle series and how many attempts it took them to complete successfully. An error occurred if the subject knocked over a hurdle, hopped to the side of the hurdle or did not stick the landing on the final hop. Reliability between raters as well as within and between days was assessed using an Intraclass Correlation Coefficient (ICC). **RESULTS:** The average time to complete the hurdle test was (3.63 ± 1.59 seconds), and the average difference between days was (0.66 ± 0.95 seconds). Between rater reliability (ICC>0.99), between day reliability (ICC=0.90), and within rater same day reliability (ICC=0.98) were all excellent. **CONCLUSION:** The single leg hurdle test shows excellent within and between day reliability to complete the task. These results indicate that the test is a reliable assessment and establishes its face validity. The greater vertical component associated with this test may bias the hop towards greater quadriceps activation and help screen individuals for asymmetries. Having established the tests reliability, subsequent studies should assess its use for determining return to sport for patients following an injury.

2435   Board #271   June 1 9:30 AM - 11:00 AM

Development of a Lateral Hop Endurance Test

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(No relevant relationships reported)

Functional tests for patients attempting to return to sports, typically focus on sagittal plane movement such as a hop test. Additionally, most functional tests do not have an endurance component to them. Many injuries involve aberrant frontal plane control and occur later in a game situation. The development of a lateral endurance hop may prove useful to identify at risk athletes. As a first step, we sought to determine the reliability of a newly developed lateral hop test. **PURPOSE:** The purpose of this study was to evaluate the reliability of a new lateral hop endurance test. **METHOD:** 19 healthy subjects (11 M, ages 22.4 ± 3.1, BMI 22.9 ± 3.0) with no prior lower extremity injuries completed 30 second intervals of single legged lateral hopping with the targets separated by 15.24 centimeters. Performance was measured by counting the number of times the subject was able to hop completely over and back. An error was classified as putting a foot down or landing on the target and not counted. Reliability between raters as well as within and between days was assessed using an Intraclass Correlation Coefficient (ICC) and Pearson Product Moment Correlation. **RESULTS:** The average number of successful hops was (29.20 ± 6.35 hops). Between rater reliability (ICC>0.99), between day reliability (ICC=0.94), and correlation between days (r=0.89, p=<0.001) were all excellent.

CONCLUSION: The 30 second lateral hop endurance test had excellent reliability between raters and between days as well as a strong correlation between days. Having established the reliability of this test between days and rater, subsequent studies will evaluate differences within injured athletes.

2436   Board #272   June 1 9:30 AM - 11:00 AM

Jump Training Improves Psychological Impairments and Facilitates Greater Sports Participation in Athletes with ACL Reconstruction

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(No relevant relationships reported)

PURPOSE: About 35% of athletes with anterior cruciate ligament (ACL) reconstruction fail to return to their preinjury level of sports participation. Psychological factors, such as fear of reinjury, often prevent athletes who wish to return to their sport from achieving their goal. Limited evidence is available to direct patient care to target these psychological impairments. Most ACL injuries are non-contact in nature and typically occur during a deceleration task such as jump landing. We propose that training focused on improving jump landing performance will improve psychological factors and facilitate increased sports participation. **METHODS:** Forty-eight athletes completed screening tests an average of 2 years after unilateral ACLR (Wk0). Testing included the ACL-Return to Sport after Injury (ACL-RSI) scale as measure of psychological readiness for sports participation. Athletes (n = 25, 9 men, age = 23 ± 5 yr) who scored below normative ACL-RSI recovery standards (<65%) completed 8 weeks of twice-weekly jump landing training. Retesting occurred at midtraining (Wk4), posttraining (Wk8), and 2 months after training (Wk16). Athletes answered a survey measuring perceived changes in sports participation at the end of training. Changes observed during training were determined via repeated measures ANOVA. **RESULTS:** ACL-RSI scores improved substantially throughout treatment (mean ± SD; Wk0: $53 \pm 18\%$, Wk4: $67 \pm 15\%$, Wk8: $76 \pm 16\%$; p<0.001). Treatment benefits were maintained over the retention period (Wk16: $81 \pm 15\%$; p=0.052). Four out of 5 athletes trained report that they were more likely to participate in their sports activities after training and two thirds of the cohort described at least a moderate increase in their sports participation. **CONCLUSIONS:** Progressively dosed jump training that focuses on correcting aberrant landing movements is effective at addressing psychological factors in athletes who self-identified as having limited readiness for sport. The training was also effective at facilitating increased sports participation. Clinicians should consider implementing similar jump training interventions to help athletes who are struggling to return to their desired sports participation because of limited confidence or high fear of reinjury. Funded in part by the Foundation for Physical Therapy.

2437   Board #273   June 1 9:30 AM - 11:00 AM

An Evaluation of Star Excursion Balance Test In Identifying Athletes At Risk For Injury

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(No relevant relationships reported)

PURPOSE: The use of the Star Excursion Balance Test (SEBT) is to screen deficits in dynamic postural control due to musculoskeletal injuries and to identify athletes at greater risk for lower extremity injury. However, the use of the SEBT has not proved reliably in female soccer populations in identifying potential lower extremity injury when assessed during pre-participation physical examinations. **METHODS:** 23 healthy NCAA Division I female soccer athletes; 20.3 (1.2) years, 165.1 (7.62) cm, 59.8 (8.6) kg, participated in this study. Prior to the start of the season, the anterior, posteromedial, and posterolateral SEBT reach distances were measured bilaterally. Each reach distances were normalized for lower limb length. Throughout the season, injury record was maintained by the certified athletic trainer. The athletes were grouped into injured (INJ) and non-injured (N-INJ) athletes. Composite scores for all three reach distances were also calculated. **RESULTS:** Independent t-test was conducted to compare reach distances for the SEBT between INJ and N-INJ athletes. There were no significant differences between the INJ and N-INJ group for normalized reach distances, nor composite scores of the SEBT. However, there was a significant difference in anterior reach asymmetries for those that sustained an injury (M= 6.06, SD=4.5); t(21)=2.78, p= 0.011) and those that did not sustain a lower extremity injury (M=2.5, SD=1.3). **CONCLUSIONS:** In this study, the SEBT showed differences for lower extremity injury in the female soccer population when assessing the anterior asymmetries. Our results suggest that portions of the SEBT can be incorporated into pre-participation physical examinations to identify soccer athletes who may have a significant difference between limbs and potentially be at an increased risk for lower extremity injury.

2438   Board #274   June 1 9:30 AM - 11:00 AM

Limb Asymmetries in Post-ACL Reconstruction Patients

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(No relevant relationships reported)

The reinjury rate of young athletes post anterior cruciate ligament reconstruction (ACLR) is 23%. Return to sport (RTS) testing, assessing limb asymmetries between the affected limb (AL) and unaffected limb (UAL), is utilized with hopes of preventing injury. **PURPOSE** To compare performances of the AL and UAL ≥ 12 months post ACLR to the dominant limb (DL) and non dominant limb (NDL) of healthy controls during common RTS tests. **METHODS** 11 ACLR (9 females, 2 males, 22.4±3.7 years old, 5.4±4.2 years post op) and 11 healthy BMI matched controls (9 females, 2 males, 21.7 ±2.1 years old) were recruited. Tests included: Y excursion (anterior, posteriolateral, posteriomedial), hop tests (single hop, triple hop, and triple cross over hop, timed 6m hop), weight bearing lunge and isokinetic concentric peak flexion and extension torque at 60, 120 and 300deg/sec (Biodex System 4 Dynamometer MVP). 3 Acceptable trials for each test and limb were recorded. The limb symmetry index (LSI) equaled 100(AL/UAL) and 100(DL/NDL) for ACLR and control groups respectively and was compared between groups using MANOVA (p<.05). LSI ≤ 85% and LSI ≥ 115% were deemed clinically important differences. Pearson correlation coefficients were calculated between peak isokinetic torques and functional tests. **RESULTS** No statistically significant differences between ACLR and control LSIs were observed (F=1.691, p=0.293, η^2=0.844, Power=0.289). A clinically significant difference was observed in peak flexion torque at 120deg/s (118.7±55.3%) for controls. There were no clinically significant differences for the ACLR group (93.4±8.8% - 113.4±35.9%). Primarily small correlations were shown between isokinetic and RTS tests. One strong correlation presented between NDL triple hop and 60deg/s peak extension torque for controls (r=0.74). **CONCLUSION** For athletes ≥ 12months post ACLR, no statistically or clinically important asymmetries were found for RTS tests compared to controls. These findings question the sensitivity and validity of the current RTS assessment. 3D motion analysis has shown kinematic asymmetries that affect function 2 years post ACLR. Future studies should investigate the role of 3D biomechanical analyses in RTS testing, with hopes to improve injury prevention.

2439   Board #275   June 1 9:30 AM - 11:00 AM

The Relationship Between The Half Kneeling Ankle Dorsiflexion And A Novel Weight Bearing Lunge Tests

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(No relevant relationships reported)

Purpose: Decreased ankle dorsiflexion has a relationship to lower extremity injury. Utilizing screens to effectively identify decreased dorsiflexion can help improve clinicians' efficiency. The purpose of this study was to compare ankle dorsiflexion range of motion (ROM) using an ordinal scored modified weight bearing lunge test (MWLT) and the established half kneeling ankle dorsiflexion test (HDT). It is proposed that there will be a relationship between MWLT dorsiflexion ordinal scoring and the HDT ROM measurements. **Methods:** 30 healthy subjects (60 ankles) participated in this study. Ankle dorsiflexion ROM was measured using the MWLT and HDT. The MWLT was completed in a standing heel to toe position. The dorsiflexion of the back ankle was scored in relation to how anterior the back knee aligns relative to the medial malleolus of the front ankle. The MWLT is scored on an ordinal scale: behind, within, or beyond the malleolus. The HDT was performed with the patient in a half kneeling position, placing a digital inclinometer just inferior to the tibial tuberosity on the forward leg. Subjects were instructed in both the HDT and MWLT to bring their knee as forward far as possible without lifting their heel off of the ground. All measurements were obtained two times per side, with 5 minutes of rest between measurements to prevent a treatment effect. Statistical analysis was completed using a series of ANOVAs. Tukey post-hoc were used to identify specific group-to-group differences (*p*<0.05). **Results:** Significance was found between HDT and MWLT (*p*<0.001). The mean HDT measurement for the MWLT score of behind was 33.5±2.0 degrees, within was 38.6±1.2 degrees, and beyond was 43.0±0.78 degrees. Tukey post hoc analysis showed that there was a significant difference comparing MWLT score of beyond and behind (*p*<0.001) and beyond and within (*p*=0.0097). No differences were found comparing MWLT score of within and behind to HDT (p=0.0760). **Conclusions:** There was a distinct difference in ankle dorsiflexion ROM between the MWLT scores of beyond and behind and beyond and within, when comparing to HDT. There was no difference in the MWLT scores of behind and within when compared to HDT. Future studies should compare goniometric measure of the MWLT to the ordinal scale and further elucidate the differences and underlying causes in the MWLT ordinal scores.

2440   Board #276   June 1 9:30 AM - 11:00 AM

Assessing Psychological Readiness After ACL Reconstruction: Is It Possible With One Questionnaire?

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(No relevant relationships reported)

Purpose: The return to sport following anterior cruciate ligament reconstruction (ACLR) may be impeded by psychological factors such as high fear of re-injury (kinesiophobia) or low confidence (self-efficacy). Screening psychological readiness for sport can identify individuals in need of additional intervention. The Anterior Cruciate Ligament Return to Sport after Injury (ACL-RSI) is a 12-item questionnaire to assess psychological readiness for sport in domains of Emotions, Confidence, and Risk Appraisal. The ACL-RSI contains 2 fear of re-injury items (Emotions domain) and 5 confidence items (Confidence domain). Fear of re-injury has lower representation in the ACL-RSI total score and may not be identified to the same extent as confidence level. The purpose of this study was to examine during return to sport after ACLR 1) the relative ranking of ACL-RSI fear of re-injury item scores compared to other item scores and association with ACL-RSI total score, and 2) the association of ACL-RSI domain and total scores with kinesiophobia and self-efficacy questionnaire scores. **Methods:** Participants were 21 patients with ACLR (mean 17.4 years, 11 males) enrolled in a 5 week (10 visit) group-based return to sport training program. ACL-RSI, Tampa Scale for Kinesiophobia-11 (TSK-11) and Knee Activity Self Efficacy (KASE) questionnaires were administered before and after training. **Results:** All questionnaire scores improved from pre- to post-training (ACL-RSI: 63.2 to 73.8, TSK-11: 21.4 to 17.3, KASE: 78.5 to 92.5; p < .01). Both ACL-RSI fear of re-injury items ranked in the lowest 3 item scores at pre- and post-training, but had moderate to high correlation with ACL-RSI total score (range: r=.56 to .83, p<.01). ACL-RSI Confidence domain score and total score were positively correlated with KASE score at pre-training, post-training, and in the pre- to post-training change (range: r=.50 to .73, p <.05). ACL-RSI Emotions domain score and total score were not significantly correlated with TSK-11 score at any time point (p>.05). **Conclusions:** Athletes with high fear of re-injury should be appropriately identified by their ACL-RSI score. It appears necessary to administer the TSK-11 separately to identify high kinesiophobia, whereas a separate questionnaire for knee self-efficacy does not appear warranted.

2441   Board #277   June 1 9:30 AM - 11:00 AM

Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) in DIII Collegiate Baseball and Softball Players

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(No relevant relationships reported)

PURPOSE:
The Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) has been used as an alternative to the push up test to examine upper extremity stability and function. However, no studies have investigated its use in division III collegiate baseball (BB) and softball (SB) players. The purpose of this study was to describe the normative values, power and normalized scores for the CKCUEST for this population.
METHODS:
Seventy four division III collegiate athletes (SB n=24; BB n=50) between 18-21 years old signed an approved informed consent. Participants assumed a push-up (male) or a modified push-up (female) position and were instructed to alternately touch two pieces of tape placed on the ground 36 inches apart as many times as possible for 15 seconds. After one submaximal warm-up, the average number of lines touched (CKCUEST value) from three trials was calculated. Power and a normalized score were calculated based on the CKCUEST value and the participant's weight or height, respectively. Additionally, shoulder strength was measured bilaterally for internal and external rotation using a handheld dynamometer in the standard testing position.
RESULTS:
There was a significant difference (p<.001) between the power of BB (71.35±14.4) and SB (55.37±11.6) players. However, there was no significant difference between the two groups in in the CKCUEST value or the normalized score. There were small and nonsignificant correlations between the CKCUEST and shoulder internal (IR) or external rotation (ER) strength.
CONCLUSIONS:
This study reported the normative values for the CKCUEST for division III SB and BB players with representation from all positions. The significant differences in power between BB and SB players may be linked to sex, training regimens and/or the physical requirements of each sport. The small correlation of shoulder IR and ER strength and the CKCUEST value may be related to the rotator cuffs primary stabilization function; which may not influence the CKCUEST value as much as the strength of the prime movers of the shoulder during the motion prescribed by the test. Strength of the pectoralis major and deltoid may better correlate with the values of the CKCUEST for this population and should be considered in future research.

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Asymmetry Of Knee Extension Strength And Single-leg Landing Impact In ACL reconstructed Athletes

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(No relevant relationships reported)

PURPOSE: Excessive magnitude, speed, and asymmetry of single-leg landing impacts contribute to re-injury risk in athletes after ACL reconstruction (ACLR). The limb symmetry index (LSI) of knee strength tends to decrease after ACLR even after return to sport. We analyzed relationships between the asymmetry of vertical ground reaction force (VGRF) parameters during single-leg jump landings and the knee isokinetic extension strength in athletes after ACLR. **METHODS:** Twenty-six participants were recruited based on the inclusion criteria: age 16-40 years at time of measurement; primary or one-sided ACL injury; >150 and <240 days since anatomical double-bundle ACLR using a hamstring tendon autograft; completed athletic rehabilitation within the same protocol; and agreement to participate in single-leg hop exercise and basic noncontact practice of jump-landings and cutting sports. The isokinetic strength of the quadriceps was tested at an angle of 60°/sec. Participants were subdivided into groups according to LSI for quadriceps strength (low quadriceps [LQ], <85% LSI, N10; high quadriceps [HQ], >90% LSI, N12). A 20-cm step was placed 60 cm from the center of a force plate. The participants stood on one leg on the step with their arms crossed, then jumped forward without any intended upward action and landed as naturally as possible on the same leg in the center of the force plate. The VGRF was collected at a sampling rate of 1000 Hz, filtered using a low-pass Butterworth filter with a cut-off frequency of 50 Hz, and normalized by body weight. Loading rate was calculated as peak VGRF (pVGRF) divided by the time from initial contact to pVGRF. The LSI of pVGRF and loading rate were compared between groups using non-paired t-tests. **RESULTS:** The quadriceps strength LSI of the LQ and HQ groups were 76±6.7% and 96.5±7.2%, respectively. The pVGRF LSI were 104.0±1.3% and 98.0±8.7%, respectively. Loading rate LSI were 115.9±23.6% and 98.8±21.7%, respectively. Loading rate LSI of LQ was significant larger than HQ ($p=0.041$). The pVGRF LSI of LQ tended to be larger than HQ ($p=0.074$). **CONCLUSIONS:** Smaller asymmetry in knee extension isokinetic strength is important for symmetrical landing impact during single-leg anterior jump-landings performed by athletes after ACLR. Supported by JSPS KAKENHI Grant number 26350606.

2443   Board #279   June 1 9:30 AM - 11:00 AM

Relations Between Return to Play Unilateral Knee Extension Strength and Triple-Hop Tests

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(No relevant relationships reported)

Unilateral assessments are used to monitor the restoration of strength and strength symmetry following unilateral injury, such as an anterior cruciate ligament (ACL) tear. **PURPOSE:** To assess the relation between unilateral isokinetic knee extension (KE) strength and triple hop distance in post-operative ACL reconstruction patients at the time of return to sport (RTS). **METHODS:** Thirty patients (15 male; 18 ± 6 y; 1.75 ± 0.13 m; 76 ± 19 kg) were assessed for unilateral isokinetic KE strength at 180° s[-1] and triple hop distance. Peak KE strength on the involved leg (IL) and uninvolved leg (UIL) were averaged to obtain an overall strength value and strength asymmetry was calculated between legs as a percentage. Participants were stratified into four groups based on the cohort's overall median strength and strength asymmetry values (low strength low asymmetry, low strength high asymmetry, high strength low asymmetry, and high strength high asymmetry). Pearson correlations were used to determine the relation between KE strength and triple hop distance. One-way analysis of variance was used to assess the effect of group on triple hop distance on IL and UIL. T-tests were used to determine the source of identified effects and to compare IL to UIL in each group. **RESULTS:** For all patients, the mean IL and UIL KE strength was 1.52 ± 0.59 Nm kg^{-1} and 1.68 ± 0.61 Nm kg^{-1}, respectively, and the median KE strength asymmetry was 13.2%. The mean IL and UIL triple hop distance was 4.27 ± 1.09 m and 4.26 ± 1.27 m, respectively. No significant correlations were identified between UIL KE strength and triple hop distance ($r = 0.34$; $p > 0.05$), but were identified for IL KE strength and triple hop distance ($r = 0.40$; $p = 0.03$). No significant effect of group for IL was identified ($p > 0.05$) but was identified for UIL ($p = 0.03$), though individual comparisons were not significant ($p > 0.05$). Among all groups, triple hop distance was not significantly different between IL and UIL ($p > 0.05$). **CONCLUSION:** The low explained variance between KE strength and triple hop distance suggests these test shouldn't be used in isolation during RTS testing. Groups may have demonstrated similar triple hop distance because demand may be shifted to proximal or distal joints during unilateral hopping, which masks unilateral KE strength deficits and results in symmetrical unilateral function.

2444   Board #280   June 1 9:30 AM - 11:00 AM

Knee Extensor Strength In The Uninjured Leg Following Anterior Cruciate Ligament Reconstruction: A Meta-analysis

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(No relevant relationships reported)

PURPOSE: After anterior cruciate ligament reconstruction (ACLR), the uninjured leg is often used for comparison to determine knee extensor (KE) strength deficit in the ACLR leg. This meta-analysis examined the KE strength of the uninjured leg when compared to healthy controls.
METHODS: 1702 studies conducted between 2010 and 2016 were collected from 10 databases and screened for the following inclusion criteria: 1) unilateral ACLR and 2) KE strength reported for ACLR patients' uninjured legs and healthy controls. Studies were excluded if they were non-English or if the strength was measured only at ≥10 years post-ACLR. A total of 20 studies with 636 ACLR subjects and 504 healthy controls met the selection criteria and resulted in 73 Cohen's d effect sizes (ESs) for analysis. A positive ES equates to the KE of the patients' uninjured legs being stronger than those of healthy controls.
RESULTS: While the overall ES revealed no difference between the uninjured legs and healthy controls (ES = 0.089, $P = 0.305$), high between-study variance was observed ($P < 0.001$). Meta regressions indicated a significant association of the time post-ACLR with the study ES ($P = 0.037$). Based on the regressions, the uninjured legs would be predicted to be stronger than healthy controls (i.e. ES > 0) after 9 months post-ACLR. For the first 44 months post ACLR, the ES in studies using patella tendon autografts was greater than that in studies using hamstring tendon autografts ($P < 0.001$). The ES from studies involving patients with concomitant injuries (e.g., meniscus tears) was smaller than that from those without concomitant injuries ($P = 0.012$). Regressions also indicated a greater study ES as the isokinetic testing speed increased ($P = 0.040$).
CONCLUSIONS: Time post-ACLR, graft type, concomitant injuries, and isokinetic testing speed may explain some of the between-study variability in the KE strength of ACLR patients' uninjured legs when compared to healthy controls. Future studies are needed to examine the causal effects of these identified variables on the uninjured leg's KE strength post-ACLR. Current practice using the uninjured leg as the reference for recovery post-ACLR may need to be implemented with caution, particularly in patients in the early stages of rehabilitation, with hamstring tendon autografts, and/or with concomitant injuries.

2445   Board #281   June 1 9:30 AM - 11:00 AM

Comparison of Handheld and Human Norm Dynamometry for Lower Extremity Muscle Strength Measurements

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(No relevant relationships reported)

Purpose: The use of hand held dynamometry is commonplace in research and clinical practice when an isokinetic unit is not available for muscle strength testing. However, the use of a hand-held dynamometer alone or in conjunction with a patient stabilization strap has not been thoroughly examined and compared to the isokinetic machine. **Methods:** Nine healthy convenience sample volunteers (2 males, 7 females; age: 24.40(5.78) years; height: 67.0(4.0) inches; mass: 72.30(17.25) kg) participated in the study. The participants randomly completed isometric strength tests of knee flexion and extension with the handheld dynamometer (HD), handheld dynamometer with patient stabilization strap (SHD), and HUMAC NORM Dynamometer (HN; CSMi, Stoughton, MA). The average of three trials was normalized by body weight and the ratio between knee flexion and extension strength was recorded for analysis. **Results:** A repeated measures ANOVA was performed to determine significant differences (P < .05 a priori) between variables; F(2) = 19.352 p < .01. Post hoc comparison showed SHD (mean = 2.7070.245) was significantly greater than HD (1.3960.065) and HDS was significantly greater than HN (mean=1.649 0.164). HD and HN produced similar results. **Conclusion:** Results indicated that using a hand-held dynamometer without the use of a patient stabilization strap produced similar measurements to the HUMAC NORM dynamometer. Using the patient stabilization strap overestimated the patients' strength. Using a handheld dynamometer for these measurements may be used to produce similar results without the time obligation and expense of using a Humac Norm dynamometer unit.

2446   Board #282   June 1 9:30 AM - 11:00 AM

Quantification of Three Clinical Tests for the Assessment of the Femoroacetabular Impingement : Preliminary Results

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(No relevant relationships reported)

Femoroacetabular impingement (FAI) is a growing orthopedic condition among athletes and general population. It has been reported as being a precursor of hip pain and osteo-arthritis development. Many orthopedic manual (OM) tests are currently used to assess FAI. The cause of their low reliability is related to the variability between practitioners in their approach. **Purpose:** To quantify three tests commonly used to diagnose FAI (FABER, FADIR and the impingement sign). **Methods:** A sample of twenty healthy participants (10 men, 10 women) without hip, knee, or back pain will be recruited. Presently, measurements were performed on the thirteen first participants during two sessions (one day apart) by three raters. We quantified the FABER height (Distance of the tibial tuberosity to the table) and ROM (in millimeter and degree), FADIR ROM and impingement sign ROM (magnitude in internal rotation in degree) using four conditions for each test: (C1) classic, (C2) using an algometer to document pressure variability between tests and raters, (C3) under a hip positioning personalized according to a specific functional task and (C4) including the two last one. Reliabilities of measurements were determined using mean intraclass correlation coefficient (min-max) and the confidence intervals. **Results:** Regarding intra-rater reliability (Table 1), impingement sign and FADIR tests had higher ICC values thru all the conditions when compared to FABER. Concerning the use of an algometer, intra-rater reliability increased for the three tests in comparison to C1 and C2 (mean values). Concerning inter-rater reliability, the analysis showed best mean value for C1. The use of an algometer did not increase ICC between C1 and C2. **Conclusion:** Impingement sign, with a simpler hip positioning, had the highest intra and inter reliability values. Using an algometer while performing OM tests seems to be helpful to improve reliability of test measurements. However, FABER test still needs improvement.

TABLE 1. Mean Intra-class Correlation Coefficients (ICC 2.1)

	Intra-rater ICC ; mean (min-max)				
	FABER		**Impingement**	**FADIR**	
	HEIGHT	*ROM*	*ROM*	*ROM*	*MEAN (CI 95%)*
C1	0.53 (0.41-0.66)	0.52 (0.36-0.75)	0.79 (0.73-0.85)	0.77 (0.73-0.81)	0.65 (±0.08)
C2	0.56 (0.41-0.68)	0.67 (0.55-0.75)	0.81 (0.69-0.90)	0.79 (0.70-0.91)	0.71 (±0.06)
C3	0.42 (-0.34-0.81)	0.55 (0.47-0.68)	0.68 (0.52-0.90)	0.72 (0.61-0.82)	0.59 (±0.07)
C4	0.57 (0.30-0.70)	0.57 (0.42-0.70)	0.70 (0.58-0.89)	0.63 (0.51-0.79)	0.62 (±0.03)
	Inter-rater ICC				
	FABER		**Impingement**	**FADIR**	
	HEIGHT	*ROM*	*ROM*	*ROM*	*MEAN (CI 95%)*
C1	0.50	0.57	0.85	0.45	0.59 (±0.10)
C2	0.42	0.59	0.68	0.61	0.57 (±0.06)
C3	0.48	0.58	0.63	0.47	0.54 (±0.04)
C4	0.46	0.73	0.70	0.41	0.57 (±0.09)

E-42   Free Communication/Poster - **Obesity and Exercise**

Friday, June 1, 2018, 7:30 AM - 12:30 PM
Room: CC-Hall B

2447   Board #283   June 1 9:30 AM - 11:00 AM

Interindividual Variability For Change In Waist Circumference And Body Weight In Response To Standardized Exercise

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(No relevant relationships reported)

Substantial interindividual variability in response to a standard dose of exercise exists independent of the trait under investigation. Whether interindividual variability attributed to exercise exists after accounting for random variability is unknown. **PURPOSE**: To determine the magnitude of the interindividual variability in response to exercise for waist circumference (WC) and body weight (BW) after accounting for random variability and, the extent to which the variability is explained by lifestyle behaviors. **METHODS**: Participants were 181 (61% female) sedentary, abdominally obese adults (mean, (SD)) 53, (7.5) years) who completed a 24-week

intervention. Participants were randomly assigned to: control (n=44) or 5 weekly sessions of low amount, low intensity (LALI) (180 and 300kcal/session for women and men respectively at 50% V02peak, n=46); high amount, low intensity (HALI) (360 and 600kcal/session for women and men respectively at 50% V02peak, n=53); or high amount, high intensity (HAHI) (360 and 600kcal/session for women and men respectively at 75% V02peak, n=38). Adherence was ≥ 80% in all exercise groups. Physical activity (PA) performed outside of the prescribed exercise was measured by accelerometer. Daily self-report diet records were used to derive energy intake (kcal) and diet quality (Canadian-Healthy Eating Index-2010, Mediterranean Score). The variability in response to exercise (SDR) was determined by separating the random variability from the intervention variability using the standard deviations (SD) from both the control and intervention groups. **RESULTS**: WC and BW were substantially reduced at 24 weeks in all exercise groups compared to control (P<0.01). The variability due to exercise (SDR) for change in WC was 3.1, -0.3 and 3.1 cm for LALI, HALI and HAHI groups respectively. Corresponding values for BW were 3.8, 2.0 and 3.5 kg for LALI, HALI and HAHI respectively. No dietary or PA variable was identified as a determinant of the individual variability in response to exercise for WC or BW (p>0.05). **CONCLUSIONS**: A substantial individual variability in response to exercise was observed for change in WC and BW after accounting for the random variability. The determinants of the heterogeneity in response to exercise remain to be determined. Supported by CIHR Grant OHN-63277.

2448   Board #284   June 1 9:30 AM - 11:00 AM

Effects Of Exercise Training On Strength And Functionality In Obese Subjects Undergoing Bariatric Surgery: Preliminary Findings

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(No relevant relationships reported)

PURPOSE: To examine the effects of exercise training on strength, functionality and physical activity level in women undergoing bariatric surgery. **METHODS**: Twenty-nine obese women were randomly allocated into one of two groups: bariatric surgery (BAR: BMI = 46.5±6.2 kg/m²) and bariatric surgery plus exercise training (BAR+EX: BMI = 48.3±5.2 kg/m²). Patients were assessed at baseline, three (3mo), and nine months (9mo) after surgery. The 6-month exercise intervention started 3 months after surgery for BAR+EX while BAR follow standard care. Lower- and upper-limb 1RM, functionality [timed-up-and-go (TUG) and timed-stands (TST) test], and physical activity level [light activity (LA) and moderate to vigorous activity (MVPA)] were assessed. A mixed-model for repeated measures with Tukey adjustment was used. Significance level was set at p<0.05. **RESULTS**: Both groups presented with reduced lower- (BAR = 31% and BAR+EX = 25%, p<0.01) and upper-limb 1RM (BAR = 27% and BAR+EX = 31%, p<0.01) at 3mo. Importantly, BAR+EX increased lower- and upper-limb 1RM at 9mo in comparison to 3mo (45 and 13%, respectively; both p<0.01). In contrast, no significant differences were observed in BAR group at the same points (3 and 5% for lower- and upper-limb 1RM, respectively; both p>0.05). Additionally, lower-limb 1RM was significantly greater in BAR+EX when compared with BAR at 9mo (p<0.01). No significant changes on TUG and TST were observed in any of the groups at 3mo (all p>0.05). BAR+EX showed improved TUG and TST scores in comparison to 3mo (8 and 22%, respectively; p<0.01) while no significant differences were observed in BAR (3 and 7%, respectively, both p>0.05). Finally, TUG and TST scores were significantly greater in BAR+EX when compared with BAR at 9mo (all p<0.01). No significant changes in physical activity level were noted at any time point (all p>0.05). **CONCLUSIONS**: Our data suggest that a 6-month exercise training program is effective in counteracting strength and functionality impairments observed after bariatric surgery without any changes in physical activity-related behaviors.

2449   Board #285   June 1 9:30 AM - 11:00 AM

Modifications Taken in a Yoga Practice in Overweight versus Normal Weight Individuals

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(No relevant relationships reported)

Vinyasa yoga has demonstrated to elicit energy expenditure that is comparable to brisk walking. Whether overweight adults need to modify their yoga practice compare to normal weight adults, and whether this elicits a difference in energy expenditure is unclear. **PURPOSE:** To compared the number of modifications taken by participants, and the energy expenditure, during a yoga session between overweight and normal weight individuals. **METHODS:** Forty adults (men=20; women=20) participated in this study, with 21 classified as normal weight (BMI=22.0±1.6 kg/m²; age=30.8±8.8 years) and 19 classified as overweight (BMI=27.2±2.3 kg/m²; age=30.8±8.8 years). Participants engaged in a 60-minute Vinyasa yoga session that included a yoga sequence on a video that contained the instructor's cues along with a

person demonstrating the sequence. Participants were instructed to follow the verbal cues, but were permitted to take modifications of the poses to match their skill level. A trained instructor of Vinyasa yoga monitored whether each pose was performed in a manner consistent with the video or whether the individual modified the pose. Heart rate was assessed with a chest-worn monitor and energy expenditure was assessed with a portable metabolic indirect calorimetry device. **RESULTS:** The number of modifications to the asanas did not differ between overweight (4.5±3.7) vs. normal weight (4.6±3.3) across the yoga session (p=0.93). Total energy expenditure during the yoga session was greater in overweight (315.3±68.1) vs. normal weight (190.1+51.3) (p=0.80). However, energy expenditure relative to body weight (kcal per kg) did not differ between overweight (3.8±0.5) vs. normal weight (3.7+0.7) (p=0.80), and mean METs per minute did not differ between overweight (3.6±0.6) vs. normal weight (3.6±0.5) (p=0.85). **CONCLUSIONS:** In a 60-minute yoga session, the number of modifications to the asanas and the relative energy expenditure did not differ between overweight and normal weight participants. These findings may suggest that yoga is a viable form of exercise for both normal weight and overweight adults, which may have implications for enhancing energy expenditure and for body weight regulation.

2450   Board #286   June 1 9:30 AM - 11:00 AM

Cardiac Autonomic Modulation Following Acute Aerobic Exercise in Young Obese Adults

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(No relevant relationships reported)

INTRODUCTION: Obesity is associated with cardiac autonomic dysfunction at rest and may also influence the ability to recover from acute aerobic exercise (AE), but this still remains unclear. This is important, because acute AE induces a shift in autonomic balance towards sympathetic dominance, especially at moderate to vigorous intensities, which places greater stress on the cardiovascular system. The inability to return this balance to homeostatic levels quickly and efficiently after AE is an important indicator of risk. **PURPOSE:** To evaluate cardiac autonomic function at rest and during exercise recovery using heart rate variability (HRV) analyses in young, otherwise healthy obese vs. lean adults. **METHODS:** Seventeen lean (female=6; 26±5 yrs; 22.7±1.7 kg/m²) and 17 obese adults (female=7; 27±4 yrs; 32.3±2.2 kg/m²) performed moderate-intensity cycling exercise for 60 min. HRV was assessed at baseline, and at 30, 60, and 90-min post-exercise in both the frequency (total power (TP), low frequency (LF), high frequency (HF), and LF/HF ratio) and time domains (Root mean square of successive differences (RMSSD)). Frequency data were log-transformed (Ln) to create normally distributed data. **RESULTS:** No baseline differences were observed for any variable (p>0.05). During recovery, heart rate and LnLF/LnHF ratio increased from baseline, whereas all other HRV parameters decreased from baseline similarly in both groups (p<0.05). In both groups, LnHF, LnLF, and RMSSD returned to baseline at 90-min post-exercise, whereas heart rate and LnLF/LnHF remained above and LnTP remained below baseline at 90-min post-exercise (p<0.05). **CONCLUSION:** Our findings suggest that compared with lean counterparts, young otherwise healthy obese adults did not exhibit altered cardiac autonomic modulation following acute AE. Furthermore, our findings highlight that it may take longer than 90 min for both groups to recover from the autonomic shift induced by acute moderate-intensity AE.

	Group	Baseline	30-min	60-min	90-min
Heart Rate (bpm) *	Lean	63±2	78±3	75±3	76±3
	Obese	60±2	76±3	74±3	73±3
LnTP (ms²) *	Lean	7.98±0.21	7.16±0.28	7.60±0.25	7.67±0.27
	Obese	8.35±0.21	7.77±0.28	7.77±0.25	8.02±0.27
LnHF (ms²) *	Lean	6.61±0.27	5.24±0.39	5.83±0.34	6.61±0.27
	Obese	6.82±0.27	5.94±0.39	5.84±0.34	6.82±0.27
LnLF (ms²) *	Lean	6.84±0.25	6.11±0.27	6.41±0.25	6.84±0.25
	Obese	7.15±0.25	6.67±0.27	6.63±0.25	7.15±0.25
LnLF/LnHF *	Lean	1.05±0.03	1.22±0.08	1.12±0.06	1.13±0.07
	Obese	1.06±0.03	1.22±0.08	1.20±0.06	1.20±0.07
RMSSD (ms) *	Lean	65±8	35±7	42±8	65±8
	Obese	74±8	50±7	51±8	74±8
Data are mean±SE. *p<0.05, time effect.					

2451   Board #287   June 1 9:30 AM - 11:00 AM

The Effects of HIIT on Maximal Oxygen Uptake and Peak Power in Sedentary, Obese Women

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(No relevant relationships reported)

Globally, 1.9 billion adults are overweight, with 600 million classified as obese which creates a serious public health problem (World Health Organization 2015). In 2008, only 20 % of adults in the United States met the CDC physical activity guidelines. Low levels of physical activity contribute to obesity, and a sedentary lifestyle along with obesity is related to higher risk of cardiovascular disease, type 2 diabetes, hypertension, and dyslipidemia (Abate 2000). High intensity interval training (HIIT) induces rapid increases in maximal oxygen uptake (VO₂max) in the initial weeks of exercise training, which is essential in obese populations, and is a more time efficient and enjoyable form of exercise than endurance training (Bartlett et al. 2011). Yet, few studies have investigated the effects of different HIIT regimes on change in VO₂max in obese, sedentary individuals.
PURPOSE: To investigate effects of two HIIT regimes on VO₂max and peak power output (PPO) in obese, sedentary women.
METHODS: 17 obese sedentary women (age and BMI=37.5±10.5 yr and 39.0±4.7 kg/m²) participated in a six-week exercise intervention with three training sessions per week. Participants were randomized to low volume HIIT (LOW) (n=9, VO₂max=21.5±3.2 mL/kg/min) or periodized HIIT (PER) (n=8, VO₂max=17.3±2.4mL/kg/min). VO₂max was measured on a cycle ergometer at baseline and at 3 and 6 weeks using a ramp exercise test. Women in LOW completed repeated 60 s bouts of HIIT at 70-85% PPO; whereas, women in PER performed a different number of bouts and intensities each week.
RESULTS: There was a significant difference in relative (p=0.001; LOW: 21.5±3.2 vs. 22.5±3.2 mL/kg/min; PER: 17.3±2.41 vs. 18.0±2.2 mL/kg/min) and absolute (p=0.002; LOW: 2.1±0.3 vs. 2.2±0.3 L/min; PER: 1.9±0.4 vs. 2.0±0.3 L/min) VO₂max across time, but no interaction (p>0.05). PPO also increased in response to training (p=0.01; LOW: 178.4±21.1 vs. 193.7±30.7 W; PER: 169.0±21.2 vs. 174.8±24.1 W) but there was no interaction (p>0.05).
CONCLUSION: Although there were no significant differences between regimes, HIIT elicits significant changes in PPO and VO₂max in sedentary obese women, which are beneficial to
health. The magnitude of change in VO₂max is lower than previously-reported values which raises the question if morbid obesity diminishes VO₂max response to training.

2452   Board #288   June 1 9:30 AM - 11:00 AM

Apelin Secretion In Overweight/obese Adults Following A Single Bout Of Exhaustive Exercise

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(No relevant relationships reported)

Obesity and associated metabolic dysfunction has reaching epidemic levels. Physical activity is beneficial for preventing metabolic symptoms, of which myocytes secreted during exercise play a major role. In this study, the circulatory level of apelin, one of the myokines, was assessed in patients with obesity and metabolic diseases.
PURPOSE: To examine the effects of body composition, metabolic parameters, and physical fitness on apelin secretion following a single bout of exhaustive exercise.
METHODS: A total 60 subjects [34 women (21 lean and 13 overweight/obese) and 26 men (8 lean and 18 overweight/obese)], age 30-59 years, with body max index (BMI) of 18-30 kg/m² were recruited based on the guidelines for overweight (BMI of 23-24.9 kg/m²) and obesity (BMI of over 25 kg/m²) in Korean. Body composition, clinical parameters, and physical fitness test were conducted. During an acute treadmill exercise following Bruce protocol, the blood before and 0, 15, 30 min after exercise were collected for analyses of apelin, lactate, lactate dehydrogenase (LDH), and creatine kinase (CK). Relationships among exercise-induced apelin, metabolic factors, and physical capacity were then analyzed. All measurements were conducted using independent, paired *t*-test between groups/time points, and *Pearson* correlations.
RESULTS: There are significant positive correlations in post-exercise apelin level and skeletal muscle mass (r = 0.350, P = 0.006), homeostatic model assessment of insulin resistance (HOMA-IR; r = 0.366, P = 0.004), HOMA insulin secretion (HOMA-%B; r = 0.360, P = 0.005), and isokinetic flexion and extension tests in 60° and 240°/sec (all variables, P < 0.05), but these parameters were not correlated with pre-exercise apelin levels. In men, the area under the curve of plasma apelin level was significantly higher in obese than lean individuals (P < 0.05), but this difference was not observed in women.
CONCLUSIONS: A single bout of exhaustive exercise induced apelin secretion, which not only correlated with muscle mass, and insulin resistance and secretion,

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but also associated with upper and lower limbs' physical capacity. Our data suggest that apelin may be a therapeutic target to overcome metabolic dysfunction in obese patients.

2453   Board #289   June 1 9:30 AM - 11:00 AM

High Intensity Interval Training is Feasible Outside of a Laboratory Setting in Sedentary, Obese Women

Annie B. De La Rosa, Amy S. Clark, Jamie L. DeRevere, Todd A. Astorino. *California State University, San Marcos, San Marcos, CA.*

(No relevant relationships reported)

High intensity interval training (HIIT) is a suitable alternative to endurance exercise (Burgomaster et al. 2008) as it elicits similar adaptations yet is more time efficient and enjoyable (Kong et al., 2016). Results from Sawyer et al. (2016) and Higgins et al. (2016) reported that HIIT is effective in persons with obesity. However, the majority of existing data supporting efficacy of HIIT were acquired in a laboratory in which trained personnel supervise all sessions. This setting may not translate to HIIT performed in a "real world" environment. **PURPOSE:** The purpose of this study was to determine the feasibility of HIIT outside of a laboratory setting in sedentary, obese women. **METHODS:** 17 sedentary, obese women (age=37.51 ± 10.53 yr.; BMI=39.11+4.34 kg/m²) participated in a 6-week exercise intervention with 3 training sessions per week, 2 in the laboratory (LAB) and 1 at home (HOME). Sessions were held at the same time of day within subjects and were performed a minimum of 24 hr apart. Heart rate (HR) was recorded via telemetry during LAB sessions, which were performed on a cycle ergometer. However, subjects were allowed to select the exercise modality for the HOME sessions, including running, cycling, or elliptical. The instructions for the HOME exercise mimicked the structure of the LAB sessions. Subjects were given downloadable HR monitors (Polar Inc., Lake Success, NY) to record HR during each HOME session. Subjects were asked to complete a HOME session 1 day/week at Rating of Perceived Exertion equal those attained during LAB on the Borg CR-10 scale. There were no consequences if the sessions were not completed. **RESULTS:** The average compliance rate for HOME in all 17 subjects was 73.53 ± 30.65%. Peak HR was higher during HOME for Week 1 (174.09 ± 18.63 vs 163.50 ± 14.98 b/min; p=0.01), Week 2 (175.56 ± 16.76 vs 157.50 ± 18.54 b/min; p=0.007), Week 3 (167.92 ± 20.45 vs 158.83 ± 13.89 b/min; p=0.014), and Week 4 (167.22 ± 21.38 vs 155.11 ± 15.77 b/min; p=0.026) versus LAB. There were no differences in peak HR between HOME and LAB peak HR for Week 5 (158.67 ± 26.08 vs 157.00 ± 16.30 b/min; p =0.99) or Week 6 (154.00 ± 28.82 vs 129.67 ± 31.66 b/min; p=0.31). **CONCLUSION:** In obese women, compliance to home-based HIIT is relatively high, and selected intensities are higher than those attained during lab sessions.

2454   Board #290   June 1 9:30 AM - 11:00 AM

Comparison of Measured and Predicted Resting Energy Expenditure Equations in Obese Pre-bariatric Surgery Patients

Chelsea L. Wenrich[1], Scott T. Jamieson[2], G. Craig Wood[2], Adam M. Cook[2], Christopher D. Still[2], Luke Haile[1], Curt B. Dixon, FACSM[3], Joseph L. Andreacci, FACSM[1]. [1]*Bloomsburg University, Bloomsburg, PA.* [2]*Geisinger, Danville, PA.* [3]*Lock Haven University, Lock Haven, PA.* (Sponsor: Joseph Andreacci, FACSM)

(No relevant relationships reported)

PURPOSE: To compare measured resting energy expenditure (MREE) to predicted resting energy expenditure (PREE) determined by three pre-programmed multi-frequency bioelectrical impedance analysis prediction equations in obese pre-bariatric surgery patients.
METHODS: Ninety women and twenty-six men (age: 42.6 ± 11.0 years, BMI: 48.1 ± 9.1 kg/m²) were included in this sample. After 3 hours of seated rest, MREE was measured prior to bioelectrical impedance analysis (SECA-mBCA 514) body composition assessment. MREE was obtained over a 10-minute period using a hand-held indirect calorimetry device (Korr REE-VUE). Three preprogrammed equations in the bioelectrical impedance analyzer (i.e. Mueller 2004, Liu 1995, and FAO/WHO/UHU) were used to calculate PREE.
RESULTS: The mean MREE determined by indirect calorimetry was 2164.1 ± 460.2 kcal. The PREE values (mean ± SD) for the Mueller, FAO/WHO/UHU, and Liu equations were 2182.5 ± 427.8 kcal, 2129.2 ± 521.2 kcal, and 2352.2 ± 473.4 kcal, respectively. Following statistical comparison, no significant differences were observed between MREE and PREE determined by the Mueller (14.6 ± 313.6 kcal, p = 0.896) and FAO/WHO/UHU (-38.8 ± 371.8 kcal, p = 0.102) equations. However, a significant difference was observed between MREE and PREE by Liu (184.2 ± 333.3 kcal, p = 0.003).

CONCLUSIONS: Our findings indicate that the Mueller and FAO/WHO/UHU programmed bioelectrical impedance analysis equations produce similar resting energy expenditure values as indirect calorimetry. These findings are important to weight management clinics without access to indirect calorimetry that currently use or are considering the use of this bioelectrical impedance analysis technology for their patients. Resting energy expenditure can be predicted in obese patients prior to individualized diet and exercise programming.

2455   Board #291   June 1 9:30 AM - 11:00 AM

Obesity in the Trauma Patient Delays Hospital Discharge and Increases Treatment Cost

Bushra Irshad[1], Lariel J. Mateo[1], Michelle M. Amaral[1], Lewis E. Jacobson[2], Jonathan M. Saxe[2], Courtney D. Jensen[1]. [1]*University of the Pacific, Stockton, CA.* [2]*St. Vincent Hospital, Indianapolis, IN.*

(No relevant relationships reported)

In the United States, more than one third of all adults are obese, classified by a BMI ≥ 30 kg/m². Direct medical costs for these individuals account for approximately 6% of national health expenditure. Several mechanisms have been proposed, but most consistently, obesity has been shown to complicate treatment and inflate resource utilization. Another possible explanation is obesity's role in prolonging recovery. Currently, information regarding the relationship between obesity and the duration of care is limited.
PURPOSE: To examine the effect of obesity on hospital discharge and consequent treatment cost.
METHODS: Our study involved 1,201 patients admitted to a Midwestern hospital who had complete demographic, anthropometric, and treatment data. Independent variables were age, sex, anthropometric indices, and five measurements of injury severity. Dependent variables were hospital length of stay (number of days) and total patient billing (dollars). Independent-samples t tests assessed differences between obese and non-obese patients, a negative binomial regression evaluated hospital length of stay, and a multiple linear regression tested logged cost data.
RESULTS: Across the sample, average age was 55.1 ± 20.3 and 67.5% of patients were male. Average BMI was 28.4 ± 6.6 and 14.4% of patients were obese. Mean injury severity score was 16.3 ± 10.6 and average length of stay was 7.7 ± 9.0 days. Independent-samples t tests found obese patients to have 19.4% longer hospital stays (1.5 days; p=0.061) and 31.4% greater hospital bills (p=0.015) than non-obese patients. With confounding variables held constant, the negative binomial regression found obesity to predict a 17.1% longer hospital stay (1.3 days; p=0.007). While the multiple linear regression showed a non-significant increase for the effect of BMI on logged patient charges (p=0.111), classification of obesity on logged patient charges supported a trend for increase in patient cost (p=0.078).
CONCLUSIONS: Obesity in the hospitalized patient associated with a significantly longer duration of care and a trend for increased total expenditure. Exercise may function as a preventive strategy to avert the temporal and financial ramifications of obesity.

2456   Board #292   June 1 9:30 AM - 11:00 AM

Reducing Attrition and Improving Program Adherence in a Physician-Referred Weight Loss Program for Adults.

Jennifer J. Zwetsloot[1], Rebecca A. Battista, FACSM[1], Kristopher Hartley[2], Chris Demczar[2], Alanna Young[2], Erica Larson[1]. [1]*Appalachian State University, Boone, NC.* [2]*Appalachian Regional Healthcare Systems, Paul H. Broyhill Wellness Center, Boone, NC.* (Sponsor: Rebecca A. Battista, FACSM)

(No relevant relationships reported)

It has been shown that physician-referred hospital-based team-approach programs can be effective interventions for weight loss for adults. Programs that include strategies in behavior change may assist in successfully completing a weight loss program. **PURPOSE:** The purpose of this project was to evaluate the effectiveness of behavioral contracting to improve program adherence and reduce attrition in a physician-referred weight loss program for adults. **METHODS:** Participants included obese (BMI≥30) adults (Age 53.4±1.3yrs) enrolled in a physician-referred program. Participants were enrolled without signing an accountability contract (CONTROL, N=48) or enrolled after signing an accountability contract (CONTRACT, N=48). Starting and final weights were recorded before and after a 16-24 week intervention period that included supervised exercise sessions (EX), and scheduled consultations with a registered dietitian (RD, N=4) and a behavioral health specialist (BHS, N=4). The CONTRACT group signed an accountability statement that listed program goals, standards/expectations, and an acknowledgment of commitment statement. Attendance for EX, RD, and BHS sessions was recorded. Program completion was determined if a final weight was recorded for a participant at the end of the program. Independent sample t-tests (p<0.05) were used to determine differences in participant characteristics. **RESULTS:** There were no significant differences in participant characteristics for

CONTRACT as compared to CONTROL (Age 53.0±13.6 vs. 53.8±12.0; Sex 81.3% vs. 81.3% female; Starting Weight (lbs) 238.1±44.7 vs. 228.1±38.9; % Weight Loss -6.7±3.3% vs. -4.8±4.5%). Program completion was higher for CONTRACT as compared to CONTROL (87.5% vs. 58.3%). The proportion of participants who attended 75-100% of required consultation visits was higher for CONTRACT as compared to CONTROL (RD 85% vs. 29%; BHS 77% vs. 25%). However, EX attendance was slightly lower for CONTRACT as compared to CONTROL (44% vs. 52%). **CONCLUSION:** Behavioral contracting may be an effective tool for increasing specialized consultation adherence and reducing attrition in a physician-referred weight loss program. Additional research is required to determine how to increase exercise session adherence.

F-05   Thematic Poster - **Fitness Assessment**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100C

2476   Chair: Kimberly Reich. *High Point University, Burlington, NC.*

(No relevant relationships reported)

2477   Board #1   June 1 1:00 PM - 3:00 PM

Cardiometabolic Risk Factors, Muscular Fitness, and Cardiorespiratory Fitness in Apparently Healthy Young Adult Females

Ryan Tyler, Timothy A. Rengers, Samantha C. Orr, Mary A. Elsesser, Evan Eschker, Tamara Hew-Butler, FACSM, Charles R.C. Marks, Myung D. Choi, Kristin R. Landis-Piwowar, Elise C. Brown. *Oakland University, Rochester, MI.*

(No relevant relationships reported)

Although most of the data linking physical fitness to cardiometabolic (CMB) health explores assessments related to body composition and cardiorespiratory fitness, emerging evidence suggests muscular fitness also plays a key role in the pathogenesis and prevention of CMB diseases. However, the majority of this research has focused on men and have used a handgrip test to assess muscular strength which tests small muscle groups. **PURPOSE:** Therefore, the purpose of this study was to examine the associations between individual CMB risk factors and physical fitness in apparently healthy non-obese young adult females using barbell exercises involving large and small muscle groups to measure muscular strength. **METHODS:** A total of 19 non-obese [body mass index (BMI) < 30 kg/m2] females aged 22.9± 4.8 years participated in this cross-sectional study. After obtaining informed consent, each participant was assessed for: resting heart rate and blood pressure; fasting blood biomarkers [triglycerides, glucose, total cholesterol, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C)]; muscular strength [1 repetition max (1 RM) back squat, press, and deadlift], muscular endurance, muscular power, and VO$_2$max. A composite muscular strength index was calculated by dividing individual 1 RM scores by bodyweight and then transformed into z-scores. The average of these three z-scores was computed to form a muscular strength index. Spearman's rho (ρ) was used to examine bivariate correlation coefficients between physical fitness and CMB risk variables. Statistical significance was set a priori at P ≤ 0.05. **RESULTS:** Significant correlations were observed between muscular strength and HDL-C (ρ = 0.542, P = 0.02), muscular power and LDL-C (ρ = -0.523, P = 0.02), and VO$_2$max and resting heart rate (ρ = -0.664, P = 0.001). No significant associations were found between muscular endurance and CMB risk variables. **CONCLUSION:** Muscular strength was positively associated with HDL-C, while muscular power and VO$_2$max were negatively associated with LDL-C and resting heart rate, respectively. These findings support the inclusion of muscular strength and muscular power training in addition to cardiovascular fitness training in healthy women in the prevention of CMB disease.

2478   Board #2   June 1 1:00 PM - 3:00 PM

Exercise Thresholds on Trial: Are They Really Equivalent?

Kevin Caen. *Ghent University, Ghent, Belgium.*

(No relevant relationships reported)

Purpose: The interchangeable use of whole-body exercise thresholds and breakpoints (BPs) in local oxygenation responses, as measured via near-infrared spectroscopy (NIRS), has recently been questioned in scientific literature. Therefore, the present study aimed to longitudinally investigate the interrelationship of four commonly used exercise thresholds: critical power (CP), the respiratory compensation point (RCP) and BPs in muscle (m[HHb]$_{BP}$) and brain (c[O$_2$Hb]$_{BP}$) oxygenation.
Methods: Nine male participants (21.8±1.2 years) completed six weeks of cycling interval training. Prior to and following the intervention period, subjects performed a ramp incremental (RI) exercise protocol to determine RCP, m[HHb]$_{BP}$ and c[O$_2$Hb]$_{BP}$ and four constant work rate (WR) tests to calculate CP.
Results: WRs associated with CP, RCP, m[HHB]$_{BP}$ and c[O$_2$Hb]$_{BP}$ increased with 7.7 ± 4.2%, 13.6±9.0%, 9.8±5.7% and 11.3±11.1%, respectively. CP was lower (pre: 260±32W, post: 280±41W) (*P* < 0.05) than the WRs associated with RCP (pre: 281±28W, post: 318±36W) and c[O$_2$Hb]$_{BP}$ (pre: 283±36W, post: 313±32W) which occurred concomitantly (*P* = 0.683). M[HHb]$_{BP}$ occurred at the highest WR and differed from all others (pre: 313±23W, post: 344±32W) (*P* < 0.05). Training-induced WR differences (ΔWR) did not contrast between thresholds and initial parameter differences were not affected by the intervention (*P* = 0.253). Thresholds were partly correlated before (R = 0.67-0.85, *P* < 0.05) and after (R = 0.83-0.96, *P* < 0.05) training, but ΔWR were not interrelated (*P* > 0.05).

Conclusion: Results of the present study strongly question true equivalence and interchangeability of whole-body thresholds and BPs in the local oxygenation response during RI exercise, thereby suggesting that BPs in muscle and brain oxygenation should not be used as a replacement for classical threshold concepts.

2479   Board #3   June 1 1:00 PM - 3:00 PM

Altered Kinematics Over a 2-minute Continuous Push-up Assessment

Jennifer Hewit. *United States Military Academy, West Point, NY.*

(No relevant relationships reported)

Push-ups are a common and fundamental muscular endurance exercise performed by individuals of all ages and abilities. Ensuring that the body maintains proper positioning throughout such an activity is crucial for both optimizing performance as well as minimizing the risk of injury. **PURPOSE:** To investigate the changes in body positioning (i.e. hand positioning and torso angle) throughout a standardized 2-minute continuous push-up test. **METHODS:** Video of the entire 2-minute push-up bout was collected for a total of 26 males (23.3 ± 6.9 years old). Of interest to the researchers was 1) Hand Height (HH) – distance the hand was in relation to the shoulder, 2) Hand Width (HW) – distance between the 3rd metacarpophalangeal joint of each hand, and 3) Torso Angle (TOR) - angle of the torso to the horizontal axis. Three consecutive repetitions at the start and end of the bout were averaged and used for comparative analysis. Paired t-tests were used to compare the means of the beginning and ending repetitions. An alpha level of 0.05 was used throughout. **RESULTS:** Both HH and TOR significantly decreased by the end of the bout (HH: 10.8 ± 5.4cm vs. 6.8 ± 5.6cm, p = 0.00; TOR: 24.7 ± 6.5° vs. 17.8 ± 8.8°, p = 0.00), while HW significantly increased (0.54 ± 0.06cm vs. 0.56 ± 0.05cm, p = 0.01). **CONCLUSION:** As participants became tired, they assumed a body position that likely allowed for a greater percentage of their body weight to be supported by their lower body (i.e. hands wider and closer to the shoulder with greater hip flexion). While this adjustment allowed them to continue the exercise, compensational patterns like this should be identified and addressed in training in order to strengthen the primary muscles targeted by the exercise (e.g. pectorals, triceps brachii and abdominals).

2480   Board #4   June 1 1:00 PM - 3:00 PM

Free Weight Bench Press Muscular Fitness Normative Data for Adults Aged 20-29 Years

Young Sub Kwon[1], Robert A. Robergs[2], Hosung So[3], Christine M. Mermier[4]. [1]*Humboldt State University, Arcata, CA.* [2]*Queensland University of Technology, Brisbane, Australia.* [3]*California State University, San Bernardino, CA.* [4]*University of New Mexico, Albuquerque, NM.* (Sponsor: Ann Gibson, FACSM)

(No relevant relationships reported)

The only available norms for the bench press muscular fitness tests for the general population are the norms developed by the Cooper Institute. These norms were developed using the Universal Gym DVR bench press equipment, which makes these values not directly applicable to free weight bench press. **PURPOSE**: The free weight bench press test is one of the most convenient tests used to evaluate muscular fitness and the effectiveness of resistance training programs for a variety of sports. However, its use and interpretation as an evaluative measurement for health-related physical fitness tests are limited because there are few published reference values derived for the general population. Therefore, the aims of the present study were to generate normative values for free weight bench press 1 repetition maximal (RM) and 4 sets of 65% of 1RM training volume (total repetitions × resistance) for 20- to 29-year-olds for men and women. **METHODS**: We recruited healthy 606 subjects for this study. 351 males (mean±SD, age=23 ± 2 yr, height= 177±7cm, body mass=83±16kg) and 255 females (age=23±3 yr, height=167±6cm, body mass=67±11.3kg) aged 20 to 29 years from different universities comprised the subject pool. Data collected from the bench press test included absolute (1RM) and relative (the ratio of 1RM to body weight) strength, and the total repetitions and absolute and relative total volumes of the 1st set and 4 sets of 65% of 1 RM bench press test with 30 second rest periods between sets. Percentile norms and descriptive statistics were generated. **RESULTS**: Table 1 reports the %tile rank values for the bench press exercise for men and women. **CONCLUSIONS**: Our results provide, for the first time, reference standards for the general population aged 20 to 29 years sex-and age-specific free weight bench press 1RM and training volumes of the 4 sets of 65% of bench press test with 30 second rest periods between sets.

Table 1. %tile rank for bench press muscular fitness for men and women				
	1RM (kg)		Total Training Volume (kg)	
%tile rank	Men	Women	Men	Women
75	119	54	2480	1115
50	98	49	1795	925
25	81	41	1500	684

2481   Board #5   June 1 1:00 PM - 3:00 PM

Lower Limb Peak Power As A Predictor Of Radial Trabecular Bone Strength

Priscilla Franson, Kimberly D. Espartero, Andrew Denys, Maria G. Alvarez, Arianna M. Mazzarini, Rebekkah J. Reichert, Vanessa R. Yingling, FACSM. *California State University, East Bay, Hayward, CA.* (Sponsor: Vanessa R Yingling, FACSM)
(No relevant relationships reported)

A field measure of muscle function that can be used in recreational and educational settings to detect bone strength can be an important component in bone health programs and decrease the incidence of fracture as people age. Recent studies reporting significant correlations between muscle power and bone strength (Janz, 2015, Yingling, 2017) have focused on cortical bone sites, however trabecular bone is a common site of fracture. As well, bone's response to mechanical loading is site specific and thus a loading stimulus to the lower limbs should not have an effect on the bones of the upper limbs. **PURPOSE:** To determine if relative grip strength or lower limb peak power is more predictive of radial trabecular bone strength. **METHODS:** Eighty-six Division II athletes, 56 females and 30 males (age (yrs) 20.2 ± 1.7, height (m) 1.7 ± 0.1, body fat % 17.0 ± 7.4) performed a grip strength (RGS) test using a hand dynamometer and a maximum vertical jump test using a Vertec. Peak Power (PP) was calculated from vertical jump height and combined relative grip strength was calculated. Trabecular Bone Mineral Content (vBMC.tb), Trabecular Bone Mineral Density (vBMD. tb), Total Area (T.Ar.tb), and Bone Strength in compression (BSIc) were measured using peripheral Quantitative Computed Tomography (pQCT) at the 4% radial site. Linear regressions were run to relate muscle function and trabecular bone strength. **RESULTS**: PP and RGS were significantly related to each of the four bone strength variables. Yet, PP explained more of the variability in bone strength than RGS. PP had larger R^2 values for all measurements: vBMC.tb (RGS [R^2=0.1233] PP [R^2=0.5085]), vBMD.tb (RGS [R^2=0.1051] PP [R^2=0.3012]), T.Ar.tb (RGS [R^2=0.1227] PP [R^2=0.4162]), BSIc (RGS [R^2=0.1713] PP [R^2=0.5240]). **CONCLUSION:** PP using vertical jump and RGS using a hand dynamometer can be used to assess trabecular bone mass, geometry and architecture. Interestingly PP, a lower limb measurement explained more variance in bone strength of the distal radius. PP is a measure of power which may be a more predictive measure of trabecular bone strength than a muscle strength measure, even one specifically for the upper limb. Lower limb muscle power calculated by vertical jump assessment could provide a means to monitor trabecular bone strength parameters in the upper limb.

2482   Board #6   June 1 1:00 PM - 3:00 PM

Hemodynamic and Metabolic Responses to Self-Paced and Ramp Graded Exercise Protocols

Nicholas Beltz[1], Fabiano T. Amorim[2], Ann L. Gibson, FACSM[2], Jeffrey M. Janot[1], Len Kravitz[2], Christine M. Mermier[2], Nathan Cole[2], Terence A. Moriarty[2], Tony P. Nunez[3], Sam Trigg[2], Lance C. Dalleck[4]. *[1]University of Wisconsin-Eau Claire, Eau Claire, WI. [2]University of New Mexico, Albuquerque, NM. [3]Metropolitan State University of Denver, Denver, CO. [4]Western State Colorado University, Gunnison, CO.*
(No relevant relationships reported)

PURPOSE: Compare metabolic and hemodynamic responses between self-paced (SP) and ramp (RAMP) graded exercise testing (GXT) protocols. Given that SP is controlled for time while RAMP is not, similarities in physiological responses between protocols may support SP as a viable testing option from a time-management standpoint.
METHODS: Sixteen recreationally trained men (23.7±3.0 yrs) completed two separate treadmill GXT protocols. SP consisted of five 2-min stages (10 min total) of increasing speed clamped by the Borg RPE$_{6-20}$ scale. RAMP increased speed by 0.16 km/hr every 15 s until volitional exhaustion. All testing was performed at 3% incline. Oxygen consumption (VO_2) was measured via indirect calorimetry; hemodynamic function was measured via thoracic impedance, and blood lactate (BLa$^-$) was measured via portable lactate analyzer. Differences between SP and RAMP protocols were analyzed as group means by using paired samples t-tests (R Core Team (2017))**.**
RESULTS: Maximal values for SP and RAMP were similar ($p > 0.05$) for VO_2 (47.1±3.4 vs. 47.4±3.4 mL•kg^{-1}•min^{-1}), heart rate (198±5 vs. 200±6 beats•min^{-1}), ventilation (158.8±20.7 vs. 159.3±19.0 L•min^{-1}), cardiac output (26.9±5.5 vs. 27.9±4.2 L•min^{-1}), stroke volume (145.9±29.2 vs. 149.8±25.3 mL•beat^{-1}), arteriovenous oxygen difference (18.5±3.1 vs. 19.7±3.1 mL•dL^{-1}), and peak BLa$^-$ (11.7±2.3 vs. 11.5±2.4 mM•L^{-1}), respectively.
CONCLUSIONS:SP elicits similar maximal metabolic and hemodynamic responses in comparison to RAMP for our sample. These results support SP as a feasible GXT protocol. Electing to utilize SP may benefit clinicians and researchers from a time-management perspective.

2483   Board #7   June 1 1:00 PM - 3:00 PM

Revisiting The ACSM Metabolic Equation For Walking: Development Of A Cadence (steps/min) Metabolic Equation

Christopher C. Moore[1], Scott W. Ducharme[1], Elroy J. Aguair[1], John Staudenmayer[1], Stuart R. Chipkin[1], John M. Schuna Jr.[2], Tiago V. Barreira[3], Catrine Tudor-Locke, FACSM[1]. *[1]University of Massachusetts Amherst, Amherst, MA. [2]Oregon State University, Corvalis, OR. [3]Syracuse University, Syracuse, NY.* (Sponsor: Catrine Tudor-Locke, FACSM)
(No relevant relationships reported)

The ACSM has long published a metabolic equation using walking speed and grade to predict oxygen consumption. The small homogeneous sample (n=3, trained men) used to derive the speed component of this equation calls into question its generalizability. Further, the equation's free-living application is limited by the difficulty of measuring speed. Conversely, walking cadence (steps/min) is a practical and measurable metric that has been shown to be a reasonable proxy for walking intensity. **PURPOSE:** To develop a metabolic equation using cadence to predict oxygen consumption (VO_2; mL/kg/min) during level walking (and compare its predictive accuracy to that of the ACSM metabolic equation) in a large sample of men and women aged 21-40 years. **METHODS:** Sixty-nine adults (52% women, mean±SD age=30.0±5.6 years, BMI=24.6±3.3 kg/m^2) completed 5-min treadmill bouts separated by 2-min rest at four speeds: 53.6, 67.1, 80.5, and 93.9 m/min (2.0, 2.5, 3.0, 3.5 mph). The cadence-VO_2 relationship was quantified with a quadratic model of best fit, producing the cadence metabolic equation. For an unbiased evaluation of this equation, leave one out cross-validation (LOOCV) was then performed and the root mean square error (RMSE) was calculated. The ACSM metabolic equation for walking was then applied to these data for comparison, and its predictive accuracy was evaluated by determining its RMSE. The bias of both metabolic equations was also calculated. **RESULTS:** The cadence metabolic equation was [VO_2 (mL/kg/min) = $0.0021*C^2 - 0.24*C + 15.4$, where C = cadence]. The RMSE [±95% CI] from the LOOCV of the cadence metabolic equation was 2.5 [±1.0] mL/kg/min and its bias [±95% CI] was 0.6 [±0.3] mL/kg/min. The RMSE from applying the ACSM walking metabolic equation to this data was 3.1 [±1.2] mL/kg/min, with a bias of -2.5 [±0.2] mL/kg/min. **CONCLUSION:** In the same way that speed is used in the ACSM metabolic equation, cadence may also be used in a walking metabolic equation with similar error and reduced bias. The greater sample size and sex distribution used herein to develop this cadence-based metabolic equation suggests greater potential to produce accurate and generalizable estimations. Future research should test this equation during overground walking and incorporate grade as an additional variable.

2484   Board #8   June 1 1:00 PM - 3:00 PM

Validity of My Jump App to Measure Vertical Jump Height of the Elderly

Iransé Oliveira-Silva[1], Rejane M. Cruvinel-Cabral[2], André R. Medeiros[2], Daniel A. Boullosa[2]. *[1]UniEVANGÉLICA, Anápolis, Brazil. [2]UCB, Brasília, Brazil.* (Sponsor: Carl Foster, FACSM)
(No relevant relationships reported)

Vertical jump has been widely used as a method to evaluate the neuromuscular performance of the lower limbs in several populations. Vertical jump is highly recommended for this purpose because its simplicity and rapid application in different settings. More specifically, vertical jump is a predictor of functional capacity, fall risk, and loss of anaerobic capacity in the elderly. Recently, the iPhone App "My Jump" has emerged as an interesting alternative to measure vertical jump height. This App has showed a similar precision as the contact mat, which is considered a reference method for jumping height evaluation. However, My Jump App has been validated only with a sample of young individuals therefore its validity for evaluation of the elderly is unknown. PURPOSE: To verify the validity of the iPhone App "My Jump" for evaluation of countermovement jump (CMJ) height of the elderly. METHODS: Forty-one elderly (29 women), 71±7 years old, 66.5±12.4 kg of body mass, volunteered to participate in this study. After evaluation of body mass, all participants performed 3 CMJs between 8:00 and 10:00 h. Every participant performed the jumps on a contact mat connected to a computer with a specific software (Chronojump, v. 1.6.2, Boscosystem, Spain). At the same time, the jump was recorded with a mobile (iPhone 7, Apple, USA) at a sampling rate of 240 Hz, using the My Jump App. The best jump was used for further analyses. The intraclass correlation coefficient (ICC), and the coefficient of variation (CV%) were used to verify the relative and absolute reliability. Pearson's correlation coefficient was used to verify the strength of the relationship between both evaluations. RESULTS: CMJ height was 10.78±5.23 cm when recorded with contact mat, and 10.87±5.32 when recorded with My jump App. The ICC was 0.997, and the CV% was 1.77. There was a nearly perfect correlation between methods (r=0.999; p=0.000). CONCLUSION: Our results suggest that My Jump App is a valid method to evaluate vertical jump performance in the elderly when using a contact mat as the reference method.

Abstracts were prepared by the authors and printed as submitted.

F-06   Thematic Poster - **Nutritional Status of Athletes II**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100C

2485   **Chair:** Enette Larson Meyer. *University of Wyoming.*
(No relevant relationships reported)

2486   Board #1   June 1 1:00 PM - 3:00 PM

The Effects Of Intensive Weight Loss On Metabolome In Female Fitness Competitors

Heikki Sarin[1], Anni Joensuu[1], Matti Jauhiainen[1], Katja Borodulin[1], Satu Männistö[1], Joseph Lee[2], VIlle Isola[3], Juha Ahtiainen[3], Keijo Häkkinen[3], Kati Kristiansson[1], Juha Hulmi[3], Markus Perola[1]. [1]*National Institute for Health and Welfare, Helsinki, Finland.* [2]*University of Columbia, New York City, NY.* [3]*University of Jyväskylä, Jyväskylä, Finland.*
(No relevant relationships reported)

Intensive weight reduction has become popular in many performance and aesthetic sports. However, health effects of prolonged semi-starvation are scarcely studied in a longitudinal, systems biology setting.
PURPOSE: The aim of our study was to examine how intensive weight loss with large amount of exercise affects system biological pathways and health related biomarkers in female fitness/physique athletes aiming for low body fat while maintaining their lean mass.
METHODS: The study population consisted of healthy fitness/physique athletes divided in Diet (n=25) and Control (n=17) group. The study included three time point measurements: before the weight loss period (PRE), after the 19.8±3.6 weeks of weight loss period (MID) and after the 17.5±2.6 weeks of recovery period (POST). Control-group was instructed to maintain their usual fitness lifestyle, exercise levels and energy intake constant during the study. NMR-platform was used for the determination of metabolome. Data analysis was performed using R and significance threshold was set to 2.1×10^{-3}.
RESULTS: Intensive weight loss in the Diet-group was composed of mainly large (~51 %) decreases in total body fat mass (p <0.001) waist circumference (~8 %) and the android region (~70 %) reflecting visceral fat mass (p < 0.001). This was accomplished by decreased energy intake (~18 %) and increased total amount (METh) of exercise (~15 %). Weight loss affected significantly on several inflammation related biomarkers such as α_1–acid glycoprotein (p=2.47×10^{-9}) and various HDL-metabolites (p=8.22×10^{-12}). The reduction of visceral fat mass was significantly associated with the observed changes in lipid and inflammation biomarker concentration after adjusting for confounding factors. All detected changes in metabolome were reversed back to baseline levels during the recovery period. No changes were observed in the controls.
CONCLUSIONS: Intensive weight reduction has positive, but temporary effects on serum metabolome in fitness/physique athletes. Decrease in visceral fat mass seem to explain majority of these effects of weight reduction on lipid profile and inflammation related biomarkers.
Supported by Academy of Finland (grant No. 275922 to JH and No. 269517 to MP), Finnish Fitness Sports Association and Department of Biology of Physical Activity.

2487   Board #2   June 1 1:00 PM - 3:00 PM

Evaluation of Dietary Intake &lt Training Volume During Army Initial Entry Training

Jeremy McAdam, Kaitlin McGinnis, JoEllen Sefton. *Auburn University, Auburn, AL.*
(No relevant relationships reported)

PURPOSE: : Evaluate training volume and dietary intake, and estimate energy balance in Army Initial Entry Training (IET) soldiers.
METHODS: Dietary intake was assessed by collecting diet logs for 3 meals on each of 3, non-consecutive days during the first week of IET. Training volume was measured across 12 weeks using Actigraph wGT3X accelerometers. A total of 96 (Age = 18.7 yrs. Sd. ± 1.9, Wt. = 71.6 sd. ± 12.4 kg) male trainees were monitored and completed diet logs; monitoring occurred at all time, with 12 soldiers assessed each week. Energy expenditure estimates were calculated using metabolic equivalents and actigraph reported intensities and duration.
RESULTS: On average IET soldiers daily accumulated 183 (sd. ± 16) min low, 89 (sd. ± 16) min moderate, 17 (sd. ± 6) min vigorous, and 4 (sd. ± 1) min of very vigorous intensity physical activity across 12 weeks. Estimated overall energy expenditure was 3,154 (± 187) calories per week with a negative net energy balance of -482 (± 187) calories. Regression analysis revealed body weight was a significant predictor (adj. R^2 = 0.5512, p < 0.001) for negative energy balance. For every 1-kilogram increase in body mass, energy balance became more negative by 52.4 calories.

CONCLUSIONS: IET is a physically demanding environment with large volumes of training and high energy expenditures. IET soldiers are likely exposed to chronic net negative energy balance, those weighing more are at an elevated risk. Nutritional strategies including supplementation may be needed to meet the calorie demands of training.

2488   Board #3   June 1 1:00 PM - 3:00 PM

Leptin and Ghrelin Predict Resting Metabolic Rate and Energy Expenditure in Female Collegiate Runners

Mindy Patterson, Dina Acosta, Jenna Lin, Rita DelloStritto, Alexis Ortiz, FACSM. *Texas Woman's University, Houston, TX.* (Sponsor: Alexis Ortiz, FACSM)
(No relevant relationships reported)

Leptin and ghrelin are counterregulatory hormones that maintain energy balance through food intake and energy expenditure through hypothalamic signaling. Leptin circulates in the blood proportional to fat mass (FM) and decreases food intake and promotes energy expenditure through hypothalamic signaling. Ghrelin is released from the stomach to stimulate food intake also via hypothalamic actions.
PURPOSE: To examine the relationship of leptin and ghrelin with resting metabolic rate (RMR) and total energy expenditure (TEE) in female collegiate runners and inactive females.
METHODS: Outcomes were compared between female collegiate runners (n=12; age 22.2±3.3 years) logging a minimum of 30 miles per week and inactive females (n=14; age 25.3±1.9 years) using a cross-sectional study design. RMR and TEE were measured by air displacement plethysmography (BOD POD®). Fasting leptin and fasting ghrelin were quantified using enzyme-linked immunosorbent assay. Fat mass (FM) and lean mass (LM) were determined by dual-energy X-ray absorptiometry. Stepwise regression predicted the association of fasting concentrations of leptin and ghrelin on RMR and TEE in each group.
RESULTS: BMI (runners: 19.8±1.4 kg/m²; inactive: 22.6±2.8 kg/m²; p = .004), FM (runners: 10.76 kg; inactive: 18.32 kg, p ≤ .001) and TEE (runners: 2,420 kcal/d; inactive: 1,469 kcal/d; p ≤ .001) differed between groups, but not LM and RMR. In runners only, higher leptin predicted higher RMR (*Beta* = .338; p = .004), but to a lesser extent than LM (*Beta* = .685; p ≤ .001). Together leptin and LM strongly, positively contributed to the variance of RMR (adj. R^2 = .99). Leptin (*Beta* = .337; p = .004) and LM (*Beta* = .686; p ≤ .001) predicted TEE in the same manner as RMR in runners only. Ghrelin negatively predicted RMR and TEE (*Beta* = -.72; p = .019) similarly. In inactive females, neither leptin nor ghrelin predicted RMR or TEE.
CONCLUSION: LM was the strongest predictor of RMR and TEE in collegiate female runners. Higher leptin and lower ghrelin also predicted higher RMR and TEE indicating both biomarkers impact hypothalamic signaling to influence energy expenditure to maintain energy homeostasis in endurance trained females.

2489   Board #4   June 1 1:00 PM - 3:00 PM

Energy Balance, Body Composition, and Bone Health in Female Lacrosse Players

Hannah Zabriskie, Brad Currier, Patrick Harty, Richard Stecker, Andrew Jagim, Chad Kerksick, FACSM. *Lindenwood University, St. Charles, MO.*
(No relevant relationships reported)

In female athletes, prolonged energy deficits increase the risk of a syndrome known as the female athlete triad; characterized by dysmenorrhea, disordered eating, and reduced bone mineral density (BMD). This syndrome is more common in endurance or aesthetic sports, and has yet to be explored in some team sports. **PURPOSE:** The purpose of this study was to evaluate the relationship between energy status, body composition, and bone health in Division II female lacrosse players. **METHODS:** Twenty-two female lacrosse players (20.4 ± 1.8 years, 69.1 ± 8.7 kg, 168 ± 6.3 cm, 28.1 ± 2.99% fat, 1.03 ± 0.06 g/cm² BMD) wore a physical activity monitor and recorded diet over a four-day period approximately four months prior to starting NCAA season play. The physical activity monitor measured total daily energy expenditure, activity energy expenditure, and physical activity level (PAL). Each player completed a DEXA scan and a resting metabolic rate (RMR) test. Correlations and linear regression with backward selection were utilized for analysis. **RESULTS:** Players presented with an average RMR of 1542.20 kcal/day (SD = 145.97), a PAL of 2.24 (SD =0.42), and an energy deficit of 1,186.85 kcal (SD = 813.09). Those with greater fat free mass (FFM) (r = 0.602, p=0.003) and greater fat mass (FM) (r = 0.656, p = 0.0009) had a higher RMR. Total body mass was found to have stronger influence on RMR than FFM or FM (p = 0.007). Players with greater energy deficit had more absolute (r = -0.447, p = 0.037) and relative (r = -0.445, p = 0.038) FM. Bone mineral content tended to worsen with increased energy deficit (p=0.0693) though energy balance had no relationship with BMD (p= 0.8742). **CONCLUSIONS:** Our results imply that total body size is the strongest predictor of RMR. Furthermore, players with greater absolute and relative FM tended to display greater energy deficits, possibly reflecting attempts to lose weight by cutting calories and increasing activity, thereby inducing an energy deficit. This behavior may be a symptom of disordered

eating, a component of the female athlete triad. Overall, female lacrosse players had a significant energy deficit of enough magnitude to suggest that performance may be impaired. Though bone health was not negatively affected in this study, prolonged energy deficit in a similar population could lead to reduced bone mineral density.

2490   Board #5   June 1 1:00 PM - 3:00 PM

Higher Activity Energy Expenditure And Lower Resting Energy Expenditure Among Healthy Female Athletes

Kazuko Ishikawa-Takata[1], Motoko Taguchi[2], Suguru Torii[2]. [1]*National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan.* [2]*Waseda University, Saitama, Japan.*
(No relevant relationships reported)

Among non-athletes, total energy expenditure (TEE) and physical activity energy expenditure (PAEE) increases over the low and middle range of physical activity, but resting energy expenditure (REE) does not (Pontzer, 2016). However, compensatory metabolic adaptation is found among highly trained athletes (Silva, 2017).**PURPOSE**: To clarify the relationship between TEE and its components over a wide range of physical activity levels (PAL) among healthy female athletes.**METHODS**:Eighty-five healthy female college athletes (short, middle and long distance runners, jumpers, throwers, walkers, swimmers, rhythmic sportive gymnasts, judo players, and lacrosse players) were evaluated during the training season. TEE and REE were assessed by the doubly labelled water method and respirometry, respectively. Total energy intake (TEI) was assessed using 7-day dietary record. PAEE was determined as TEE-0.1(TEE)-REE, and PAL was determines as TEE/REE. Among them, 41 athletes were measured for training induced energy expenditure (TIEE) using heart-rate monitoring. Adjusted TEE, REE, TIEE, and TEI were calculated using the residuals of regression analysis to eliminate the effects of fat free mass, fat mass, age and height. Estimated REE (eREE) was calculated using an equation used in Taguchi's study (2011). **RESULTS**: Adjusted TEE, PAEE and TIEE were significantly positively correlated with PAL (r=0.636, 0.848, and 0.425, p<0.001, p<0.001, and p=0.001). Adjusted REE and the difference between REE and eREE were significantly negatively correlated with PAL (r=-0.531 and -0.468, p<0.001 for both). However, adjusted TEI did not correlate significantly with PAL (r=0.198, p=0.069). **CONCLUSIONS**: Both higher energy expenditure related to physical activity and/or training and lower REE lead to higher PAL among female athletes. Lowered REE may be caused by insufficient energy intake in relation to high energy expenditure.

2491   Board #6   June 1 1:00 PM - 3:00 PM

Examination of Male Athlete Triad Symptoms in Endurance Trained Athletes

Erin M. Moore[1], Toni M. Torres-McGehee[1], Clemens Drenowatz[2], Dave F. Stoddan[1], Justin M. Goins[1], Thaddeus C. Broderick[1], Brittany T. Williams[1]. [1]*University of South Carolina, Columbia, SC.* [2]*Pädagogische Hochschule Oberösterreich, Linz, Austria.*
(No relevant relationships reported)

Male Athlete Triad (MT), composed of 1) low energy availability (LEA), 2) low bone mineral density (BMD) and 3) decreased reproductive hormones is novel and not established. The impact of LEA in males needs further examination. **PURPOSE:** Examine 2 components of MT: 1) energy availability (EA) and 2) BMD in endurance-trained male athletes. Secondarily examine: energy intake (EI), exercise energy expenditure (EEE), and macronutrients (carbohydrates [CHO], protein [PRO], and fats). **METHODS:** A cross-sectional design of 14 endurance-trained male athletes (age: 25.9 ± 4.2 years; weight: 71.1 ± 5.6kg; height: 179.3 ± 4.6cm; VO_{2max} of 63 ± 6.7ml·kg^{-1}·min) was used. Inclusion criterion included participants training for competition, have $\leq$12% body fat and a VO_2max $\geq$41ml·kg^{-1}·min. Data was collected across 2 training weeks (high volume [HV] and low volume [LV]) and included: dietary logs, exercise logs, and BMD via Dual-Energy X-Ray Absorptiometry. Sense-Wear Armbands calculated EEE and EA was calculated as EA= ([EI-EEE]/FFM). Macronutrients were assessed using ACSM recommendations. LEA was defined as $\leq$ 20kcal^{-1}kg^{-1}FFM. **RESULTS:** Overall, EI = 2929.4 $\pm$ 244.4 kcals; EEE = 1263.4 $\pm$ 107.3 kcals; and EA =25.6 $\pm$ 3.2 kcal^{-1}kg^{-1}FFM. A 2 (week) X 7 (days) ANOVA revealed a main effect between the weeks for EA F(1,13)=62.81 (p<0.01, ηp^2=0.83), EI F(1,13) 143.6 (p<0.01, ηp^2=0.92) and EEE F(1,10) 138.5 (p<0.001, ηp^2=0.93). A significant interaction was found between days and EA (p<0.01; ηp^2= 0.35), and EEE (p<0.01; ηp^2= 0.50), as well as the 2 weeks and EEE (p=0.002, ηp^2=0.41). The average Z-score showed no decrease in BMD (2.3 $\pm$ 3.5). Overall, during both HV and LV weeks, participants did not meet the ACSM recommendations for macronutrients. Intakes of CHO were under-consumed (HV: 71.4%; LV: 85.7%), PRO and fats were over-consumed (PRO-HV: 35.7%; LV: 42.9% and fats-HV&LV: 42.9%). **CONCLUSION:** Overall, males presented with an average EA = 25 kcal^{-1}kg^{-1}FFM and normal BMD. There is evidence (EEE and EI) similar to female research specifically, decreased intake of CHO and overconsumption of PRO and fats. Currently, there is

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limited knowledge on the physiological outcomes of males participating in high EEE activities with decreased EI intake and the corresponding physiological outcomes. Cut points for LEA need to be established in the future.

2492   Board #7   June 1 1:00 PM - 3:00 PM

Is Disordered Eating Related To Muscle-enhancing Supplement Use And Exercise Context in Adolescents?

Kethe M. E. Engen[1], Christine Sundgot-Borgen[1], Monica K. Torstveit[2], Jan H. Rosenvinge[3], Oddgeir Friborg[3], Gunn Pettersen[3], Solfrid Bratland-Sanda[4], Elin Kolle[1], Jorunn Sundgot-Borgen, FACSM[1]. [1]*Norwegian School of Sport Sciences, Oslo, Norway.* [2]*University of Agder, Kristiansand, Norway.* [3]*University of Tromsø, Tromsø, Norway.* [4]*Telemark University College, Bø, Norway.* (Sponsor: Jorunn Sundgot-Borgen, FACSM)
(No relevant relationships reported)

Participation in organized sport at a lower competitive level may protect against disordered eating (DE), whereas exercising in a gym context may increase DE risk. Use of supplements advertised as muscle enhancing is common in both contexts due to the expectancy of performance or appearance enhancement. However, how supplement use (SU) relates to DE dependent on these two exercise contexts in adolescents is not known. **Purpose:** To study how participation in sport or/and a gym context and SU relates to DE in adolescents. **Method:** Participants were 599 boys and 1038 girls enrolled in a RCT to promote a positive body image and prevent DE in high schools. The "Eating Disorder Examination Questionnaire" (EDEQ) short form measured DE. Participants provided information about exercise context (1 = gym + sport, 2 = gym only, 3 = neither sport or gym, 4 = sport only) and SU (1 = protein and creatine (PSU+CSU), 2 = protein only (PSU), and 3 = no SU). ANCOVA was used to examine main and interaction effects of SU and sport context. Effects were considered significant when F test was $p = <.05$. The analyses were stratified for gender. **Results:** Among boys, PSU+CSU was associated with higher EDEQ-score ($b = 1.31$, $p < .01$). In addition, reporting either sport, gym, or gym + sport context was associated with lower EDEQ-score ($b = -1.16$, $p = .01$) in boys. In girls, higher EDEQ-score was associated with reporting gym or gym + sport context ($b = .77$, $p < .01$ and $b = .68$, $p = < .01$), while higher score was associated with sport context ($b = -.33$, $p = .02$). Effects were found for the covariates body mass index (boys, $b = 1.05$, $p < .01$, girls, $b = .18$ $p = .01$) and studying sport program (boys, b -1.21 $p < .01$). No effects were found for other covariates (income, physical activity level and immigration status). **Conclusion:** Boys who reported using protein and creatine supplements and girls who exercised in gyms had higher DE. Interestingly, lower DE in boys was related to both sport and/or gym exercise participation compared to boys not reporting participation in either of the two contexts. Attention and preventive actions should be aimed towards girls engaging in gym exercise, and towards boys who consume protein and creatine supplements, and who do not participate in any of the two exercise contexts. Future studies should however examine how other exercise contexts relates to SU and DE.

2493   Board #8   June 1 1:00 PM - 3:00 PM

Examination of Female Athlete Triad Components in Collegiate Equestrian Athletes

Toni M. Torres-McGehee[1], Kyra Dodson[1], Dawn M. Emerson[2], Kelly Pritchett[3], Erin M. Moore[1], Monica Kimmel[1]. [1]*University of South Carolina, Columbia, SC.* [2]*University of Kansas, Lawrence, KS.* [3]*Central Washington University, Ellensburg, WA.*
(No relevant relationships reported)

Due to the aesthetic demands, Equestrian athletes are at high risks for eating disorders (ED) and in turn may be more susceptible to Female Athlete Triad (Triad) characteristics: low energy availability (LEA) with or without an eating disorder (ED), menstrual cycle dysfunction, and low bone mineral density (BMD). **PURPOSE:** To examine Female Athlete Triad component risks in NCAA Division I female equestrian athletes. A secondary purpose examined: resting metabolic rate (RMR) energy intake (EI), exercise energy expenditure (EEE), energy availability (EA) and macronutrient profile of carbohydrates (CHO), proteins (PRO), and fats. **METHODS:** Female NCAA Division I Equestrian athletes (n = 28, age 19.4 ± 1.3 yrs, height 166.2 ± 5.1 cm, weight 61.7 ± 7.1 kg) participated in the study. Participants completed a demographic survey, menstrual cycle questionnaire, Eating Disorder Inventory-3, ED symptoms checklist, a 7 day online dietary and exercise log. Participants were measured for height, weight, DXA scan (BMD), and RMR through indirect calorimetry (MedGem). Exercise energy expenditure was calculated using Ainsworth equation and EA was calculated by EA = ((EI-EEE)/free fat mass). Macronutrients (CHO, PRO, and fats) were assessed using ACSM recommendations. **RESULTS:** Overall, Triad component risk showed 78.6% (n = 22) equestrian athletes had 1 component and 7.1% (n = 2) had 2 components. Overall risk for LEA was 82.1% (n = 23); 64.3% (n = 18) of those with LEA also presented with ED risk, while 17.8% (n = 5) reported LEA without ED risk. Energy assessment included: RMR = 1441.0 ± 227.9 kcal/day; EI = 1401.6 ± 421.8 kcal/day; EEE = 403.2 ± 161.9 kcal/day, and EA = 21.9 ± 9.9 kcals/kg^{-1}FFM/

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day. Regarding macronutrient profile, 96.2% (n = 26) athletes reported under the recommendations for CHO intake, 74.1% (n = 20) were under the recommended PRO intake, and 81.2% (n = 22) were within the recommendations for fat intake while 18.8% were over the fat recommendations. **CONCLUSION:** Majority of Equestrian athletes were at risk for at least 1 Triad component and LEA with ED risk was prevalent; thus raising concern for the at large population of Equestrian athletes. Recognition and intervention of Triad components can prevent long lasting health issues and protect the longevity of equestrian athlete's careers and level of performance.

F-07   Thematic Poster - **Physical Activity and Healthy Aging**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100E

2494   **Chair:** Loretta DiPietro, FACSM. *The George Washington University School of Public Health and Health Services, Washington, DC.*

(No relevant relationships reported)

2495   Board #1   June 1 1:00 PM - 3:00 PM
Gender-Specific Effects in Cognition and Mobility Following Exercise in Older Adults at Risk for Dementia

Narlon C. Boa Sorte Silva, Dawn P. Gill, Ashleigh De Cruz, Robert J. Petrella, FACSM. *Western University, London, ON, Canada.* (Sponsor: Robert J Petrella, FACSM)

(No relevant relationships reported)

Purpose: To investigate gender-specific adaptations following a 24-week multiple-modality exercise intervention with additional mind-motor training on cognition and mobility.
Methods: Older adults (n = 127, age = 67.5 [7.3] yr, 71% women) were randomized to a 45-min multiple-modality exercise intervention with additional 15 minutes of either mind-motor training (M4 group) or an active control intervention (15 minutes of balance, range of motion and breathing exercises, [M2 group]). Assessment occurred at baseline, 24 weeks (intervention endpoint), and 52 weeks (after a 28-week no-contact follow-up). The study outcomes were: cognition (global cognitive functioning [GCF], concentration, reasoning, planning, and memory), and mobility (usual and dual-task gait velocity, step length and variability). Mixed between-within subjects ANOVA was used to examine: i) main effects of time (baseline vs 24 weeks), intervention group (M4 vs M2) and gender (men vs women); ii) interactions of time x intervention group, and time x gender.
Results: At 24 weeks, trends for greater improvements in GCF and memory favouring M4 (both *p<.08*) were observed, with no interaction effects for gender. For usual gait, M2 showed greater velocity (*p=.001*) and step length (*p=.003*), compared to M4. For dual-task gait, M2 showed greater improvements in velocity (*p=.04*), and trends for significant improvements in variability (*p=.05*). Gender-specific effects were observed for dual-task step length favouring women (*p=.02*).
Results at 52 weeks: M4 showed greater improvements in GCF (*p=.02*) and memory (*p=.03*), compared to M2. As well, trends for gender-specific effects were observed in memory favouring women (*p=.06*). For usual gait, M2 retained improvements in velocity (*p=.05*), compared to M4. For dual-task gait, gender-specific effects were observed in dual-task step length favouring women (*p=.03*).
Conclusion: Additional mind-motor training compared to an active control intervention showed trends for greater benefits to cognition; however, it did not affect gait performance. Overall, gender-specific effects were seen for memory and dual-task step length across groups, suggesting that women benefited more from exercise compared to men, and were able to retain these improvements after a no-contact follow-up. Funding: CIHR MOP 130474

2496   Board #2   June 1 1:00 PM - 3:00 PM
Effects of Tai Chi on Beta Endorphin and Inflammatory Markers In Older Adults with Chronic Pain

Tongjian You, FACSM, Elisa F. Ogawa, Yurun Cai, Ling Shi, Suzanne G. Leveille. *University of Massachusetts Boston, Boston, MA.*

(No relevant relationships reported)

Musculoskeletal pain is associated with dysfunction of the opioid analgesic system and elevated inflammation in older adults. **PURPOSE:** To examine the effects of Tai Chi on blood levels of beta endorphin and inflammatory markers in older adults with chronic pain. **METHODS:** Forty community-dwelling older adults (≥65 years) with multisite pain were randomly assigned to light physical exercise or Tai Chi, each offered twice weekly for 12 weeks. Plasma levels of beta endorphin, C-reactive protein (CRP), interleukin 6 (IL-6), and tumor necrosis factor alpha (TNF-α) were assessed at baseline and within 2 weeks after completing the intervention. Paired t-tests were used to assess changes of log-transformed beta endorphin and inflammatory markers within each group, and pairwise t-tests were used to assess differences between groups. **RESULTS:** Twenty-one participants in the light physical exercise group and nineteen participants in the Tai Chi group provided blood samples. Following the 12-week intervention, neither light physical exercise nor Tai Chi changed levels of beta endorphin and inflammatory markers. However, in older adults who completed 70% or more classes, Tai Chi significantly lowered levels of beta endorphin (p<0.05) from baseline to post-intervention, whereas light physical exercise did not change levels of beta endorphin. **CONCLUSION:** Tai Chi tended to reduce levels of beta endorphin but did not affect levels of inflammatory markers in older adults with chronic pain. Future studies need to focus on the role of the opioid analgesic system and immune system in regulating pain with aging and the long-term effects of Tai Chi on pain-related biomarkers. (Supported by National Institutes of Health R21 AG043883)

2497   Board #3   June 1 1:00 PM - 3:00 PM
A Comparison Of Two Community Based Exercise Interventions For Reducing Falls Risk In Older Adults

Jessica Pope[1], Steven Morrison[2], Amanda Estep[1], Shane Caswell[1], Jatin Ambegaonkar[1], Kathryn Helwig[1], Nelson Cortes[1]. [1]*George Mason University, Manassas, VA.* [2]*Old Dominion University, Norfolk, VA.*

(No relevant relationships reported)

Falls are a major health problem for older adults with a reported 1/3 people over the age of 65 likely to suffer a fall in a given year. Exercise interventions have improved muscle strength and reaction time in older adults. Many interventions have occurred in a controlled setting. Further research is needed to evaluate the impact of fall prevention programs conducted in community settings to improve falls risk factors.
PURPOSE: To compare the effects of two interventions (INT); The Lebed Method (TLM) and Staying Active and Independent for Life (SAIL) on right and left leg strength (RLS & LLS), foot and hand reaction time (FRT & HRT), and timed up and go (TUG) in older adults in community venues.
METHODS: 74 and 103 older adults participated in TLM and SAIL (73±8 years, 1.6±.1 m, 82.1±21.7 kg; 71±7 years, 1.6±.1 m, 80±19 kg, respectively). TLM, a dance therapy program, was implemented for 8 weeks, 1h, 2x/week. SAIL included aerobics, balance, strength, and stretching exercises and lasted 10 weeks, 1h, 3x/week. RLS & LLS (kg), FRT & HRT (ms), and TUG (s) were assessed pre & post INT (time). A 2-way factorial MANOVA was conducted to assess differences between time and INT.
RESULTS: A significant interaction was observed for LLS (p<0.05). LLS improved from pre to post for TLM (pre=14.3±7, post=20.2±8.1) and SAIL (pre=20.9±6.2, post=18.2±6.5). Only main effects were attained for remaining variables (p<0.05). All participants were faster (TUG, pre=9.1±4, post=8.2±3.1), improved FRT (pre=336±91, post=327±101) & HRT (pre=282±87, post=277±86). Faster HRT and FRT were seen for SAIL (319±96, 269±87) compared to TLM (356±90, 298±83). RLS & LLS increased from pre (16.4±7, 16.8±6.9) to post (20.7±7.5, 20.6±6.9). Leg strength was greater in SAIL (RLS=19.3±7, LLS=19.4±6.4) than TLM (RLS=16.6±8.2, LLS=16.9±8).
CONCLUSION: While both interventions were effective at improving leg strength and reaction time, SAIL had the greatest improvements. SAIL includes exercise and music like TLM but was developed for general population, yielding an attractive program while addressing specific modifiable risk factors. Future studies should investigate long-term retention of benefits following intervention, tracking changes in balance, activity level, and number of falls. Supported by grant from Potomac Health Foundation.

2498   Board #4   June 1 1:00 PM - 3:00 PM
Square-stepping Exercise For Older Adults With Chronic Disease To Improve Cognition and Mobility

Erin M. Shellington, Dawn P. Gill, Sonja M. Reichert, Matthew Heath, Robert J. Petrella, FACSM. *University of Western Ontario, London, ON, Canada.*

(No relevant relationships reported)

Square-stepping exercise (SSE) is a visuospatial working memory task with a cued stepping response that improves mobility and cognition in older adults.
Purpose: To determine if a SSE intervention improves cognitive and mobility in older adults with chronic disease (i.e., knee osteoarthritis [KOA]; type 2 diabetes mellitus [T2DM] with self-reported cognitive complaints [sCC]; and dementia), compared to control groups.
Methods: We conducted three pilot randomized controlled trials, with 12- and 24-week intervention periods, compared to wait-list control groups. Assessments focused on: mobility (i.e., 30-second chair stand, and walking speed) for adults with KOA;

cognition [i.e., Cambridge Brain Sciences, antisaccade reaction time (RT)] for adults with T2DM with sCC; and mood and behaviours questionnaire (i.e., Neuropsychiatric Inventory Questionnaire; NPIQ) for adults with dementia.
Results: KOA participants showed trends toward improved 30-second chair stand at 12-weeks (F=1.8, p=0.12, η_p^2=0.16) and 24-weeks (F=3.4, p=0.09, η_p^2=0.18), and walking speed at 24-weeks (F=2.4, p=0.14, η_p^2=0.14), compared to controls after adjusting for baseline. T2DM with sCC improved on planning change scores from 12 to 24-weeks (F=5.8, p=0.03, η_p^2=0.28) compared to controls, and a non-significant improvement in antisaccade RT of 38 ms (SD 16). Adults with dementia improved on NPIQ scores (i.e. symptoms) at 12-weeks (total: F=7.3, p=0.01, η_p^2=0.25; frequency: F=9.4, p=0.01, η_p^2=0.30; and severity: F=7.0, p=0.02, η_p^2=0.24), compared to controls. Conclusions: In our pilot trials, SSE showed promise for improving mobility and cognition in adults with chronic disease and demonstrates the potential for its use in adults with diverse mobility and cognitive impairments.
Funding: Supported by the Department of Family Medicine, University of Western Ontario, Mitacs Accelerate, Ontario Graduate Scholarship, and Schlegel - University of Waterloo Research Institute for Aging.

2499   Board #5   June 1 1:00 PM - 3:00 PM

Physical Activity, Physical Fitness Related To Quality Of Life For Older Adults In Beijing China

CAILIANG ZHOU, Hong REN. *BEIJING SPORT UNIVERSITY, BEIJING, China.*
(No relevant relationships reported)

Physical activity, physical fitness related to quality of life for older adults in Beijing China
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College of Sport Sciences, Beijing Sport University
Purpose: To explore the relationships between physical activity, physical fitness and quality of life for the elderly population. **Methods:** We included in our study 105 older adults (≥60 years old) from three community in Beijing, China. Data of physical activity was collected by physical activity survey for the elderly (PASE). Items of physical fitness included grip strength, flexibility and balance, assessing according to the measurement manual of National Physical Fitness Surveillance in China. T score (ranging from 0-100) was calculated for each physical fitness item and added up to a total score. Quality of life was measured by the Medical Outcome Study 36-item short form health survey (SF-36). Subscales of SF-36 were summarized into two subdomains of physical component summary regarding physical health, and mental component summary for mental health. Multivariable linear regression was used to explore the relationship between physical activity, physical fitness and quality of life. **Results:** Among the study population physical activity and total score of all 3 items of physical fitness were the most important impact factors for physical component summary (standardized regression coefficients were 0.39 and 0.33, respectively). As regarded to mental component summary, total score of all 3 items of physical fitness, but not physical activity, was the major influencing factor (standardized regression coefficient was 0.24). No interactions were found between physical activity and physical fitness in relation to two subdomains of quality of life (P>0.05). **Conclusion:** Both physical activity and physical fitness had independent effects on quality of life for older adults in Beijing,China. Physical activity was the most important factor that associated with physical health, but not with mental health. The summary condition of grip strength, flexibility and balance was positively correlated with both physical and mental health.
Keywords: Physical activities, Physical fitness, Quality of life

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2500   Board #6   June 1 1:00 PM - 3:00 PM

Physical Fitness Performance and Normative Score of Elderly Male Rural Dwellers

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(No relevant relationships reported)

PURPOSE: In Taiwan, there is no national consensus on the normative score for assessing physical fitness performance in elderly people living in rural communities. The study thus endeavored to set up the normative score and to understand the current status of physical fitness of elderly male rural dwellers in Taiwan.
METHODS: The study first surveyed the 1,033 men aged 65 and over in Tianliao township of Kaohsiung County. After an entire township sampling, 414 subjects were selected to receive examination, resulting in a response rate of 60.8%. Twelve of the 414 subjects were excluded due to use of assistive devices or severe joint disease, leaving a total of 402 subjects enrolled for formal analysis.Each subject had completed questionnaires and received physical fitness assessment. All of the subjects were divided into five 5-year age subgroups. The normative physical fitness scores were listed by nine-rank percentile distribution(in the order of 5%, 10%, 25%, 30%, 50%, 70%, 75%, 90%, 95% respectively).

RESULTS: The average age of the 402 subjects read 74.5±6.0 years old. The 50 percentile of each physical fitness assessment were listed such as body mass index 24.1 kg/m2, percent body fat 20.6%, grasp test of dominant hand 33.3kg,5-time sit and stand 11.2 sec, 30-s chair stand test 14 time, open-eye stand on right foot 19.6 sec, chair sit-and-reach test -1.2 cm, and 8-feet walking test 8.0 sec. All physical fitness performance was observed to decrease with aging.
CONCLUSIONS: Elderly males in different age groups demonstrate different levels of physical fitness as indicated by the disparities in the normative physical fitness scores, and it seems sensible to adopt different normative physical fitness scores for elderly males living in rural and urban areas.

2501   Board #7   June 1 1:00 PM - 3:00 PM

Efficacy of High-Intensity Resistance and Sprint Interval Training in Older Adults

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(No relevant relationships reported)

High-intensity interval training has been shown to improve health/fitness factors in adults. Evidence is limited in older adults with chronic disease and increased risk for exercise-related complications and for resistance training modes. **PURPOSE:** Assess the efficacy (aerobic and functional fitness) and safety of high-intensity resistance and sprint-cycle interval training in at-risk older adults. **METHODS:** Forty-eight participants (30 women; 69±6 years; 28.0±5.5 kg/m²; 60% with ≥2 chronic diseases) trained 3 days/week for 6 weeks. Participants were randomized to conditions: 1) high-intensity sprint interval cycle training (SIT; N=17); 2) high-intensity resistance training (HIRT; N=20); or 3) moderate-intensity continuous aerobic exercise (MICE; active control; N=11). Baseline and post-training measures included: maximal aerobic capacity (VO₂max), body composition, functional movement screen (FMS), floor-transfer-time (FTT), timed-up-and-go (TUG), balance, and flexibility. Subjective measures were: satisfaction with physical function, mobility, and physical activity enjoyment (PACES). Data analysis: repeated measure ANOVA and paired-t tests (P<0.05). **RESULTS:** VO₂max improved similarly in all groups (SIT 2.2±0.3; HIRT=3.5±0.7. MICE 2.1±0.5 ml/kg/min, P<0.01 for all). Both high-intensity groups improved in FTT (HIRT=17%, P=<0.01; SIT =12%, P<0.05) and FMS (HIRT=17%, SIT =10%, P<0.01). Only HIRT improved in TUG (10.6%) and balance (9%). Perceived satisfaction with physical function improved in all groups (HIRT=389%; SIT=266%; MICE = 167%; all P<0.01) with similarly high overall enjoyment (5.8-6.3 out of 7; P<0.05). No injuries or adverse events occurred with training. **CONCLUSION:** HIRT and SIT required less time (~28 minutes) than MICE guidelines, elicited equivalent gains in aerobic fitness, and appear to be safe for older adults with chronic disease. Additional functional fitness benefits (mobility and FMS) accompanied high-intensity training (SIT/HIRT). HIRT elicited improvements in mobility, balance, and 4 of 7 FMS measures compared to SIT (2 of 7 FMS measures). These HIRT specific gains are associated with enhanced independence and ability to perform activities of daily living. Future studies should confirm these findings and assess longer training durations.

2502   Board #8   June 1 1:00 PM - 3:00 PM

Heart Rate Increase and Recovery as Predictors of Mobility Decline in Well-Functioning Older Adults

Eleanor M. Simonsick[1], Gerald J. Jerome, FACSM[2], Jennifer A. Schrack[3], Stephanie A. Studenski[1], Luigi Ferrucci[1]. *[1]National Institute on Aging, Baltimore, MD. [2]Towson University, Towson, MD. [3]Johns Hopkins Bloomberg School of Public Health, Baltimore, MD.* (Sponsor: Gerald J. Jerome, FACSM)
(No relevant relationships reported)

PURPOSE: Endurance walk test performance is a powerful predictor of future mobility limitation and decline in older adults; whether other test parameters such as heart rate increase and post-test recovery provide useful metrics of resiliency has received limited attention. METHODS: Using data on 784 well-functioning (able to walk 400m quickly without stopping, not taking beta blockers) men (47%) and women aged 60 to 94 years participating in the Baltimore Longitudinal Study of Aging, we examined heart rate increase (HR-I) from a resting state immediately after completing a fast-pace 400m walk and HR recovery (HR-R; HR decline 2-minutes post-test completion) in relation to 400m time, usual gait speed and reported ability to walk ¼ to 1 mile at baseline and at follow-up an average of 2.1 years later. RESULTS: At baseline, independent of age, sex, race, height and reported exercise, HR-I (b=-1.02; p&lt.001) and HR-R (b=-1.12; p&lt.001) in separate models were negatively associated with 400m time; that is higher HR was associated with better performance; whereas, for a given 400m time, higher HR-I and HR-R were associated with worse baseline reported walking ability (b=-.007; p=.011 and -.011; p=.002). Longitudinally, higher HR-I and HR-R predicted slower follow-up 400m time and poorer reported walking ability independent of baseline values (b=.19; p=.039 and b=.24; p=.037; b=-.010; p=.007 and -.011; p=.011). No associations were observed between HR-I or HR-R and baseline or

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Abstracts were prepared by the authors and printed as submitted.

follow-up usual gait speed. CONCLUSION: In well-functioning older adults, better heart rate response equates with better endurance walk performance, but for a given performance, higher heart rate response predicts worse concurrent reported walking ability and poorer future endurance walk performance and reported ability. Including heart rate response to endurance walk testing which is typically collected for safety monitoring may improve predictive models of future functional status.

F-08   Thematic Poster - **Thermoregulatory Sweating**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100F

2503   **Chair:** James M. Carter, FACSM. *Gatorade Sports Science Institute, Barrington, IL.*

(No relevant relationships reported)

2504   Board #1   June 1 1:00 PM - 3:00 PM

Relation between Regional and Whole Body Sweat Sodium Concentration and the Effect of Exercise Intensity

Lindsay B. Baker, FACSM, Corey T. Ungaro, Bridget C. Sopeña, Ryan P. Nuccio, Adam J. Reimel, Kelly A. Barnes. *Gatorade Sports Science Institute, Barrington, IL.*

PURPOSE: To determine if exercise intensity has a significant effect on the relation between regional (REG) sweat [Na^+] and whole body (WB) sweat [Na^+].
METHODS: Eleven recreational endurance athletes (7 men, 4 women; 71.5±8.4 kg; 28-40 yr) completed two randomized trials cycling for 90 min at 65% of HR_{max} (LOW, 109±20 Watts) or 85% of HR_{max} (HIGH, 169±27 Watts) in a plastic isolation chamber to determine WB sweat [Na^+] using the washdown technique. REG sweat was collected from the dorsal and ventral forearms, dorsal and ventral wrists, triceps, upper chest, scapulas, lower back, ventral thighs, calves, and forehead using absorbent patches. REG and WB sweat [Na^+] were measured via ion chromatography. An 11-site aggregate of REG sweat [Na^+] was calculated from the surface area weighted mean of all sites. Room temperature (30.1±0.3°C vs. 30.1±0.2°C) and relative humidity (43.0±1.1% vs. 43.6±1.5%) were consistent between trials. Subjects consumed a consistent diet for 48-h and drank 500 mL of water 2 h before trials. Paired t-tests were used to compare measures at LOW and HIGH intensity. Linear regression and Pearson correlation were used to compare REG and WB.
RESULTS: WB sweat rate (0.516±0.077 g/cm²/min vs. 0.764±0.133 g/cm²/min; p<0.001) and WB sweat [Na^+] (32.6±14.3 mmol/L vs. 52.7±14.6 mmol/L; p<0.01) increased from LOW to HIGH. REG sweat [Na^+] increased (p<0.05) from LOW to HIGH at all sites except the thigh (p=0.13) and calf (p=0.18). The ratio between REG and WB sweat [Na^+] was greater at LOW vs. HIGH for the thigh (1.03±0.20 vs. 0.83±0.17; p=0.02) and lower back (1.29±0.25 vs. 1.08±0.19, p=0.04), but there were no differences between intensities at any other site, including the 11-site aggregate (1.28±0.20 vs. 1.22±0.16; p=0.45). There was a significant correlation between REG and WB sweat [Na^+] at each of the 11 sites for both LOW (r=0.70-0.92; p<0.05) and HIGH (r=0.68-0.93; p<0.05).
CONCLUSIONS: These findings suggest that for most sites REG and WB sweat [Na^+] increase proportionally with an increase in exercise intensity. Thus, in general the relation between REG and WB sweat [Na^+] is consistent across exercise intensities. While more research is needed, it seems that regression equations can be used to predict WB sweat [Na^+] from most REG sites irrespective of intensity when exercising between 65 and 85% HR_{max}.

2505   Board #2   June 1 1:00 PM - 3:00 PM

Sport Specific Normative Data for Sweating Rate and Sweat Sodium Loss in Athletes: An Update

Kelly A. Barnes[1], James M. Carter, FACSM[1], Melissa L. Anderson[2], John R. Stofan[1], Matthew D. Pahnke[1], Rebecca K. Randell[3], Lindsay B. Baker, FACSM[1]. *¹Gatorade Sports Science Institute; PepsiCo, Inc, Barrington, IL. ²Gatorade Sports Science Institute; PepsiCo, Inc, Bradenton, FL. ³Gatorade Sports Science Institute; PepsiCo, Inc, Beaumont Park, United Kingdom.*

Previously, we published sweating rate (SR) and sweat sodium concentration ([Na^+]) normative data in 506 athletes. **PURPOSE**: The purpose of this study was to expand the data set and analyses to establish sport-specific normative data for SR and rate of sweat Na^+ loss. **METHODS:** Data from 1303 athletes (1103 male, 200 female) were compiled from field and lab testing. SR was calculated from the difference in pre- to post-exercise body mass, correcting for food/fluid intake and urine/stool loss. A standardized absorbent sweat patch technique was used to determine local sweat [Na^+] and normalized to whole body sweat [Na^+] using published regression equations. Rate of sweat Na^+ loss was determined from the product of whole body sweat [Na^+] and SR. The sport-specific analysis included sports with n>100; endurance (n=255), soccer (n=268), basketball (n=196), American football (n=271), and baseball (n=161). **RESULTS:** Data are mean ± SD. SR differed significantly between sports (ANOVA, Tukey's post hoc; p<0.05); American football displayed the highest SR (1.5 ± 0.7 L/h), followed by endurance (1.3 ± 0.6 L/h), basketball (1.0 ± 0.4 L/h), soccer (0.9 ± 0.4 L/h) and baseball (0.8 ± 0.3 L/h). The rate of sweat Na^+ loss was higher in American football (55.9 ± 36.8 mmol/h) and endurance (51.7 ± 27.8 mmol/h) compared with soccer (34.6 ± 19.2 mmol/h), basketball (34.5 ± 21.2 mmol/h), and baseball (27.2 ± 14.7 mmol/h). The rate of sweat Na^+ loss was higher in soccer than baseball. After accounting for the impact of covariates (age, sex, body mass, temperature, humidity, season, and intensity), there were still significant differences (ANCOVA, Tukey's post hoc; p<0.05) in the adjusted means for SR and rate of sweat Na^+ loss; endurance (1.2 L/h, 43.1 mmol/h), football (1.0 L/h, 38.2 mmol/h) and soccer (1.0 L/h, 35.4 mmol/h) were higher than baseball (0.8 L/h, 25.5 mmol/h), and endurance was higher than basketball (0.9 L/h, 32.0 mmol/h). **CONCLUSION:** This study suggests the potential for significant variation in the rate of sweat fluid and Na^+ losses between sports, with highest values generally occurring in endurance and American football. There are already products targeted to meet the needs of endurance athletes to replace their higher sweat fluid and electrolyte losses; perhaps there is also a need for products and education specific to other sports.

2506   Board #3   June 1 1:00 PM - 3:00 PM

Body Sweat Mapping of Untrained Males during Exercise-Induced Hyperthermia

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(No relevant relationships reported)

Aerobic training increases gross and regional sweating rates (RSR) allowing improved evaporative heat loss. Variation in RSR are widely recognized, but limited RSR data and implications for thermoregulation are available in untrained individuals. **PURPOSE:** Our aim was to investigate RSR and distribution at 35 sites in young, untrained males (UT) versus endurance-trained male athletes (TR) during exercise-induced hyperthermia in a moderate environment. **METHODS:** Six young, healthy, untrained males (22 ± 3 yrs, VO_{2max} 42.7 ± 7.2 ml.kg⁻¹.min⁻¹) and nine aerobically trained male athletes (23 ± 3 yrs, VO_{2max} 70.2 ± 13 ml.kg⁻¹.min⁻¹) ran for 60 minutes in 25.6 ± 4.5°C, 48.5 ± 0.5% relative humidity, and a 1 m.s⁻¹ air velocity. RSR were measured at two exercise intensities (I1, 60% VO_{2max}; I2, 75% VO_{2max}) using a modified absorbent technique. **RESULTS:** Core temperature was similar between groups at all stages (P>0.05). GSL was significantly higher in TR versus UT at I1 and I2 (I1: TR 365 ± 84, UT 157 ± 66 g.m⁻².h⁻¹, P<0.001; I2 TR 657 ± 119, UT 311 ± 93 g.m⁻².h⁻¹, p<0.001), reflecting a significantly higher absolute work rate in TR versus UT (p<0.01). Absolute RSR were significantly higher in TR versus UT at 28 of 35 regions at I1 and 31 out of 35 regions at I2. Highest RSR were observed on the central mid back in both groups (I1 TR 797 ± 250, UT 277 ± 120 g.m⁻².h⁻¹; I2 TR 1139 ± 364, UT 365 ± 148 g.m⁻².h⁻¹), with lowest values on the palms in TR (I1 98 ± 58, I2 126 ± 53, g.m⁻².h⁻¹) and anterior upper arms in UT (I1 33 ± 24, I2 71 ±30 g.m⁻².h⁻¹). Both groups showed a medial to lateral decrease in RSR on the posterior torso, and proximal to distal increase on the arms. Normalized ratio values were significantly different between groups at 4 and 6 sites out of 35 at I1 and I2, respectively, none of which were significant following Bonferroni correction. No correlation was observed between RSR and local skin temperature in either group. **CONCLUSIONS:** These data provide the most detailed exercise-induced RSR for untrained males, showing large RSR variation. Despite significant differences in GSL and absolute RSR, normalized data suggest no significant differences in distribution of sweat between groups. Male athletes demonstrated superior thermoregulation, with similar Tcore and Tsk values despite a higher absolute workload.
Funded by the Adidas Innovation Team.

2507   Board #4   June 1 1:00 PM - 3:00 PM

Trapped Sweat in Various Sports Uniforms During Sport-Specific, Laboratory-Based Exercise

Bridget C. Sopena, Kelly A. Barnes, Ryan P. Nuccio, Adam J. Reimel, John R. Stofan, Lindsay B. Baker, FACSM. *Gatorade Sports Science Institute, BARRINGTON, IL.*

Previous research has measured the amount of sweat absorbed in basketball uniforms during exercise, but data are limited in other sports. **Purpose**: To determine the amount of trapped sweat (TS) in various sports uniforms during sport-specific, laboratory-based exercise. **Methods**: Eleven male (30 ± 5 years, 75.7 ± 5.2 kg) and 6 female (29 ± 4 years, 59.9 ± 9.9 kg) moderately-trained athletes completed 3 trials consisting of 120 min intermittent sport-specific exercise in standard uniforms for various sports, including football (n=9 men), basketball (n= 4 men, 5 women), soccer (n=4 men, 5 women), baseball/softball (n=4 men, 4 women), and/or endurance (n=5 men, 4 women) in a temperature-controlled laboratory (basketball: 25°C, 55% rh; all other sports: 30°C, 55% rh). Protocols were designed to simulate the demands of each sport (endurance: $82 \pm 5\%$ HRmax, RPE 13 ± 2; football: $75 \pm 10\%$ HR_{max}, RPE 13 ± 1; soccer: $77 \pm 10\%$ HRmax, RPE 12 ± 1; basketball: $66 \pm 12\%$ HR_{max}, RPE 10 ± 2; and baseball/softball: $59 \pm 3\%$ HR_{max}, RPE 9 ± 2). Sweat loss (SL) was determined from change in nude body mass corrected for fluid intake, urine loss, respiratory water loss, and metabolic mass loss. Nude and clothed body mass were measured pre- and post-exercise to determine TS. Analysis of variance followed by Tukey's post hoc test was used to compare sports. Data are mean $\pm$ SD. **Results**: There were significant differences in SL between sports (p<0.0001): football (2.61 ± 0.36 kg), endurance (2.18 ± 0.53 kg) and soccer (1.99 ± 0.81 kg) > basketball (1.24 ± 0.37 kg) and baseball/softball (1.19 ± 0.38 kg). There were also significant differences in TS (p<0.0001): football (0.58 ± 0.14 kg) > endurance (0.28 ± 0.16 kg) and soccer (0.24 ± 0.18 kg) > basketball (0.11 ± 0.08 kg) and baseball/softball (0.15 ± 0.12 kg). TS as a percentage of SL was significantly (p<0.0001) higher in football ($22.5 \pm 3.8\%$) than endurance ($12.2 \pm 4.7\%$), soccer ($10.9 \pm 3.4\%$), basketball ($9.2 \pm 4.4\%$), and baseball/softball ($10.8 \pm 6.2\%$). **Conclusion**: Sports with higher SL were associated with higher volumes of TS in uniforms. The football uniform (including full pads) led to the most TS and greatest underestimations in SL. Such high volumes of TS are also likely to have ramifications for evaporative heat loss capacity and therefore warrant future research investigating the effects of TS on thermoregulation.

2508   Board #5   June 1 1:00 PM - 3:00 PM

Prolonged Work in the Heat Impairs Heat Loss on the Next day in Older Men

Sean R. Notley, Robert D. Meade, Andrew W. D'Souza, Brian J. Friesen, Glen P. Kenny. *University of Ottawa, Ottawa, ON, Canada.*

(No relevant relationships reported)

Performing prolonged, arduous occupational work in the heat is associated with considerable heat strain, which may be exacerbated on the next work day. Recently, we showed that whole-body heat loss was not modified by prolonged work in the heat on the preceding day in young habitually active men. However, it is unclear whether prolonged heat strain may reduce heat loss on the next day in older workers, who display impaired thermoregulatory function and who recover more slowly from exercise-induced stress compared to young adults. **PURPOSE**: To determine whether prolonged work in the heat impairs whole-body heat loss and exacerbates heat storage on the next day in older men. **METHODS**: Changes in whole-body heat exchange and heat storage were assessed in six older (60 years (SD 5)) men during heat stress tests performed on the same day prior to (Day 1), and on the day following (Day 2), a prolonged work simulation. Each heat stress test involved three, 30-min bouts of cycling performed at increasing, fixed rates of metabolic heat production of 150 (Ex1), 200 (Ex2) and 250 W/m² (Ex3), each separated by 15-min recovery, in hot-dry conditions (40°C, 20% relative humidity (RH)). The work simulation (7.5 h) involved three moderate intensity intermittent work bouts (2 h) each separated by 30-min rest breaks in hot-dry conditions (38°C, 34% RH). Total heat loss (evaporative ± dry heat exchange) and metabolic heat production were measured using direct and indirect calorimetry, respectively. Body heat storage was quantified as the temporal summation of heat production and loss. **RESULTS**: Total heat loss (mean±95% CI) during Ex1 did not differ between Day 1 (149±8 W/m²) and Day 2 (143±6 W/m²; *P*=0.29), but decreased on Day 2 during Ex2 (181±7 W/m²) and Ex3 (219±10 W/m²) relative to Day 1 (191±7 and 230±14 W/m², respectively; both *P*<0.01). As a result, body heat storage across all exercise bouts was 19% greater on Day 2 (364±74 kJ) than on Day 1 (295±50 kJ; *P*=0.02). **CONCLUSIONS**: Prolonged work in the heat impairs whole-body heat loss and exacerbates body heat storage during moderate-to-high intensity work on the next day in older men. These outcomes indicate that older workers may be more vulnerable to heat-related illness when performing consecutive, arduous work shifts.

2509   Board #6   June 1 1:00 PM - 3:00 PM

Heart Failure Modulates Thermoregulatory Control Independently Of Differences In Physical Characteristics And Metabolic Heat Production

Surendran Sabapathy[1], Bryce N. Balmain[1], Ollie Jay, FACSM[2], Kenji Shiino[1], Glenn M. Stewart, FACSM[3], Rohan Jayasinghe[4], Jonathan Chan[4], Norman R. Morris[1]. *[1]Griffith University, Gold Coast, Australia. [2]University of Sydney, Sydney, Australia. [3]Mayo Clinic, Rochester, MN. [4]Gold Coast University Hospital, Gold Coast, Australia.*

(No relevant relationships reported)

PURPOSE: Heart failure (HF) patients appear to exhibit altered thermoregulatory responses during exercise in the heat. However, the extent to which these responses are altered due to physiological impairments independently of biophysical factors associated with differences in metabolic heat production (H_{prod}), evaporative heat balance requirements (E_{req}) and/or body size, is presently unclear. Therefore, we examined thermoregulatory responses in 10 HF and 10 age-matched controls (CON) similar in body size during exercise at a fixed rate of H_{prod}, and thus E_{req}, in a 30°C environment. **METHODS**: Rectal temperature (Trec), local sweat rate (LSR), and cutaneous vascular conductance (CVC) were measured during 60-min of cycle ergometry. Whole-body sweat rate (WBSR) was estimated from pre-post nude body weight corrected for fluid intake. Hprod and Ereq, as well as dry heat loss (Hdry) and evaporative heat loss from the skin (Esk) — assuming all secreted sweat evaporated, were calculated using partitional calorimetry. **RESULTS**: Despite exercising at the same rate of H_{prod} (HF: 338±43; CON: 323±31W, p=0.25), T_{rec} was greater (p<0.01) in HF (0.81±0.16°C) than CON (0.49±0.27°C). In keeping with a similar E_{req} (HF: 285±40; CON: 274±28W, p=0.35), no differences in WBSR (HF: 0.45±0.11; CON: 0.41±0.07L/h, p=0.38) or LSR (HF: 0.96±0.17; CON: 0.79±0.15mg/cm²/min, p=0.50) were observed between groups. Similarly, H_{dry} was comparable between groups (HF: 22.9±3.2; CON: 20.4±5.0W, p=0.14). Consequently, the cumulative body heat storage was similar between groups (HF: 154±106; CON: 196±174kJ, p=0.44). Furthermore, CVC was lower in HF than CON (HF: 0.83±0.42; CON: 2.10±0.79au/mmHg, p<0.01). **CONCLUSIONS**: Collectively, these findings demonstrate that HF patients exhibit an impaired skin blood flow response, but no differences in sweating. Given that HF had similar body heat storage to CON at the same Hprod, their greater rise in core temperature can be attributed to a less uniform distribution of heat between the body core and periphery.

2510   Board #7   June 1 1:00 PM - 3:00 PM

No Evidence Of Thermoregulatory Impairment In Donor Skin During Exercise-induced Hyperthermia

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(No relevant relationships reported)

According to the US Army's Standards of Medical Fitness (AR 40-501), "Prior burn injury (to include donor sites) involving a total body surface area of 40 percent or more does not meet the standard". While the Standard implies that elevations in skin blood flow and sweating during donor skin during an exercise-induced hyperthermic challenge, this has not been experimentally verified. **PURPOSE:** This study tested the hypothesis that human donor skin retains the capability to increase skin blood flow and sweat production in response to exercise-induced hyperthermia. **METHODS:** Thirteen burn survivors (11 males; aged 36±12 years) with well-healed burn injuries spanning 36.4±17.5% of body surface area (BSA), as well as donor sites covering 18.0±9.8% BSA, cycled for 60 min at a workload eliciting ~50% of maximal aerobic capacity. Environmental conditions were set at 39.5±0.2°C and 21.8±3.8% relative humidity. Immediately prior to and upon completion of exercise, skin blood flow was assessed via laser-Doppler imaging from donor sites and adjacent non-injured skin (n=12). Local sweat rate was also assessed at the same skin sites at 45 min of exercise using absorbent material (n=10). Gastrointestinal temperature was measured using an ingestible temperature sensor. **RESULTS:** At 60 min of exercise, the elevation in gastrointestinal temperature averaged 0.8±0.3°C (P<0.01). At the end of this exercise bout, the magnitude of the increase in skin blood flow was similar between donor and non-injured sites (donor: 103±45 flux units; non-injured: 123±58 flux units; P=0.21). Similarly, local sweat rate did not differ between sites (donor: 0.54±0.29 mg/cm²/min; non-injured: 0.62±0.26 mg/cm²/min; P=0.27). **CONCLUSION:** These data suggest that well-healed donor skin retains the capability to elevate skin blood flow and sweating during exercise in the heat. Therefore, the US Army should exclude donor skin when determining whether the size of a burn injury meets the Standards of Medical Fitness.

Abstracts were prepared by the authors and printed as submitted.

F-09   Free Communication/Slide - **Athlete Care: Amateur, Olympic and Professional**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-200E

2511   **Chair:** Leonardo P. Oliveira. *University of Chicago, Chicago, IL.*

(No relevant relationships reported)

2512   June 1 1:00 PM - 1:15 PM

Lower-Extremity Vibration Threshold, But Not Proprioception Or Mobility, Distinguishes Non-Progressive From Progressive Multiple Sclerosis Sub-Types

Julia D. Miehm[1], Julianna L. Averill[1], Jongil Lim[1], John Buonaccorsi[1], Carolina Ionete[2], Jane A. Kent, FACSM[1], Richard van Emmerik[1]. [1]*University of Massachusetts Amherst, Amherst, MA.* [2]*University of Massachusetts Medical School, Worcester, MA.*

(No relevant relationships reported)

Multiple Sclerosis (MS) is a demyelinating disease of the central nervous system (CNS). There are two major sub-types of MS: non-progressive (NP) and progressive (P). NP is characterized by intermittent exacerbations of symptoms, followed by a return to near baseline. P is characterized by a steady worsening of symptoms. Many people who are diagnosed as NP will transition to P. Both NP and P result in sensorimotor impairments that can lead to poor mobility and decreased quality of life. **PURPOSE:** A sensitive, non-ambulatory measure of sensorimotor function that can predict the transition from NP to P could be useful in the clinical management of MS. **METHODS:** Sensorimotor function of 19 control (CON; 14 women, 55.6±13.9 yrs), 31 NP (28 women, 52.6±9.9), and 29 P (20 women, 59.4±9.1) participants was assessed. Vibration threshold was measured with a Biothesiometer at three locations on the plantar surface of the non-dominant (CON) or most-affected (NP, P) foot. Proprioception was measured at the ankle with a manipulandum, using a position-matching task. Mobility measures included the 25-foot-walk (25FWT) and the Timed-Up-and-Go (TUG). Data were analyzed across and between groups using a one-factor ANOVA and post-hoc pairwise t-tests, respectively, with significance established as $p < 0.05$. **RESULTS:** There was a main effect of group for all outcome variables. Vibration threshold distinguished NP from P in that these differed across those groups. Neither mobility measure nor proprioception at the ankle distinguished the 2 MS sub-types.

	CON (n=19)	NP (n=31)	P (n=29)	ANOVA p value
Big Toe (v)[b,c]	12.74±10.97	15.63±13.79	26.11±15.52	0.004
5th Metatarsal (v)[b,c]	9.47±7.97	13.97±13.34	27.19±16.92	0.001
Heel (v)[b,c]	12.16±11.85	15.45±12.70	28.07±16.39	0.001
Proprioception (α°)[a,b]	1.85±1.20	4.53±4.48	5.11±3.76	0.001
25FWT (s)[a,b]	5.12±0.50	8.44±4.88	10.07±4.56	0.001
TUG (s)[a,b]	6.89±1.17	11.90±7.10	13.95±5.84	0.001

Table 1. Data are mean±SD. Significant differences: [a]CON vs. NP; [b]CON vs. P; [c]NP vs. P

CONCLUSION: Vibration threshold may be a promising outcome variable for discriminating among individuals with NP and P MS sub-types. This could be useful in a clinical setting for cross-sectional comparisons of NP and P, as well as to detect transitions from NP to P in longitudinal studies.

2513   June 1 1:15 PM - 1:30 PM

The Preventive Effect Of A Bounding Exercise Programme On Hamstring Injuries In Amateur Male Soccer

Sander van de Hoef[1], Michel Brink[2], Bionka Huisstede[1], Maarten van Smeden[3], Niels de Vries[4], Edwin Goedhart[4], Vincent Gouttebarge[5], Frank Backx[1]. [1]*University Medical Center Utrecht, Utrecht, Netherlands.* [2]*University of Groningen, Groningen, Netherlands.* [3]*Leiden University Medical Center, Leiden, Netherlands.* [4]*Royal Netherlands Football Association, Zeist, Netherlands.* [5]*Dutch Consumer Safety Institute, Amsterdam, Netherlands.*

(No relevant relationships reported)

Hamstring injuries (HI) are the most common muscle injuries in both professional and amateur soccer. With the introduction of the effective Nordic hamstring exercise (NHE), a decrease of hamstring injuries was expected. Nevertheless, an annual increase of HI is seen in the last decade. This might be due to poor compliance. Arguments for non-compliance are among others, that the NHE is not soccer-specific enough. Therefore, we developed the Bounding Exercise Programme (BEP) as an alternative. It is a sport-specific exercise programme which includes concentric, eccentric and plyometric exercises. **PURPOSE**: To determine the preventive effect of the Bounding Exercise Programme on hamstring injury occurrence in adult amateur male soccer players. **METHODS**: Soccer teams (N=32) competing on first class amateur level, were cluster-randomized to the intervention or control group. Both groups were instructed to perform their regular training programme, and the intervention group was also instructed to perform the BEP during the whole competition. At baseline, player characteristics were gathered from all participants. During the competition 2016-2017 all players weekly registered exposure (minutes) and HI occurrence. Compliance (meters of BEP) was reported by all players in the intervention group. **RESULTS**: 588 male soccer players (24,7 +/-4,5 yrs old) participated in this study. A total of 65 HI were reported within one competition. The overall HI incidence was 1,39 per 1000 soccer hours for the control group and 1,12 per 1000 soccer hours for the intervention group.
Analysis of intention to treat showed no statistical significant difference between both groups in occurrence of HI (OR =0.89, 95% CI 0.459-1.747) and no significant difference in time to first HI (HR =0.90 ,CI = 0.478-1.695). There was also no effect found of adherence to BEP for the occurrence of HI and time to first HI. **CONCLUSIONS**:Our study showed no benefit of BEP over regular soccer on preventing HI in adult amateur soccer players. Compliance for BEP was moderate (on average 71%)

2514   June 1 1:30 PM - 1:45 PM

Vigorous Physical Activity And Bone Mineral Density In Anorexia Nervosa Female

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(No relevant relationships reported)

Restrictive Anorexia Nervosa (ANR) is a clinical mental disorder defined as abnormal eating behavior and is often associated with physical hyperactivity. There is no consistent cut-off use to define what is considered excessive physical activity in term of duration, frequency and intensity in contrast with healthy physical activity (1). On the other hand, ANR is marked by bone loss and with low Body Mineral Density (BMD)(2). Few data are available in daily patterns of Physical Activity and in the relationship between time spent in moderate to vigorous PA and Bone Mineral Density (BMD) **PURPOSE:** To determine the association between time spent in moderate to vigorous physical activity (MVPA) and BMD in females with anorexia nervosa. **METHODS:** 17 females with anorexia nervosa (22+2 yrs) were included in the study. Body composition was assess by DXA measurements (Hologic QDR-4500W, Waltham, MA). 24h Physical activity levels and sleep time were monitored by using actigraphy (ActiSleep and ActiGraph GT3X, Pensacola, US). **RESULTS:** Females with diurnal higher VPA levels demonstrated an increased in integral Femoral Neck Bone Mineral Density (FNBMD) (0.678 g/cm2 vs. 0.623 g/cm2) compared to those with lower diurnal VPA levels (p<0.05). Time spent in light physical activity (LPA) is associated with a significantly lower total hip BMD (g/cm2)(0.788 ± 0.11 vs 0.873 ± 0.15 ; p< 0.001). CONCLUSION: This investigation shows that ANR females accumulating more total Vigorous Physical Activity presented increased BMDs when compared to their less active peers. These data highlight the importance of VPA in females with AN to counteract their low bone mass and to improve their bone health. High time spent in LPA may be considered to be deleterious for BMD.(1) Achamrah N, Coëffier M, Déchelotte P. Physical activity in patients with anorexia nervosa. Nutr Rev.

2016 May;74(5):301-11.(2) Howgate DJ, Graham SM, Leonidou A, Korres N, Tsiridis E, Tsapakis E. Bone metabolism in anorexia nervosa: molecular pathways and current treatment modalities. Osteoporos Int. 2013 Feb;24(2):407-21.

2515   June 1 1:45 PM - 2:00 PM

Recovery of Lower Extremity Strength and Function following ACL Reconstruction in Skeletally Immature Patients

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(No relevant relationships reported)

BACKGROUND: Following anterior cruciate ligament reconstruction (ACLR) surgery, lower extremity recovery of the uninjured limb >90% is commonly recommended for clearance to return-to-play (RTP). However, evidence regarding the timing of achieving such a recovery is lacking, especially in skeletally immature populations. **PURPOSE:** To examine the proportion of pediatric ACLR patients (<15 years) who achieve >90% of lower extremity recovery at 6-9 months following ACLR surgery. **METHODS:** Bilateral strength (quadriceps, hamstrings, hip abductor, and hip extensor), Y-balance (anterior, posteromedial, and posterolateral reach), and hop (single, triple, cross-over, and 6 meter timed) tests were assessed. Descriptive statistics (%) were employed. Additionally, sub-groups were analyzed according to sex and technique/autograft type: males with transphyseal quadruple hamstrings (Male-HS), females with transphyseal quadruple hamstrings (Female-HS), and males with extra/intra-compartmental physeal-sparing iliotibial band (Male-ITB) using chi-square (x^2) test with p<0.05. **RESULTS:** A total of 93 pediatric ACLR patients (Male-HS: N=21, age=13.6±1.0, Female-HS: N=33, age=13.4±0.7, Male-ITB: N=39, age=12.5±1.3) were enrolled. Time from ACLR to RTP testing was 6.9±3.4 months. The proportion of pediatric ACLR patients, overall, achieving >90% of strength was: 76.3% in quadriceps, 39.1% in hamstrings, 79.6% in hip abductors, and 82.8% in hip extensors. Y-balance test resulted 82.6% in anterior reach, 83.9% in posteromedial reach, and 89.1% in posterolateral reach. Hop test indicated 62.5% in single hop, 72.9% in triple hops, 56.5% in cross-over hops, and 71.4% in 6 meter timed hops. X^2 analysis identified a difference in hamstrings strength, which showed a lower proportion of >90% recovery in Male-HS (23.8%) and Female-HS (15.6%) compared to Male-ITB (66.7%, p<0.01). **CONCLUSIONS:** Approximately 7 months following ACLR, more than 3/4 of the patients achieved >90% of quadriceps, hip abductor, and hip extensor strength, but not hamstrings strength. While over 4/5 of the patients performed >90% in Y-balance, less than 3/4 achieve >90% on hop tests. Graft type markedly influences hamstrings strength. Less than 1/5 (18.9%) of Male-HS and Female-HS reached >90% compared to 2/3 (66.7%) in Male-ITB patients.

2516   June 1 2:00 PM - 2:15 PM

Long-term Functional Impact of Viscosupplementation Versus True Placebo in Symptomatic Hip Osteoarthritis; A Randomized Control Trial

Jane Konidis[1], Philippe Corbeil[1], Antoine Cantin-Warren[2], Sylvie Turmel[3], Emile Cardinal-Soucy[1], Remi Lacroix[3], Etienne Belzile[3]. *[1]University Laval, Quebec City, QC, Canada. [2]Center for Interdisciplinary Research in Rehabilitation and Social Intergration (CIRRIS), Quebec City, QC, Canada. [3]University Hospital Center of Quebec (CHUQ), Quebec City, QC, Canada.*
(No relevant relationships reported)

INTRODUCTION: Degenerative hip osteoarthritis (OA) is a common progressive disorder causing disability. The injection of exogenous hyaluronic acid (HA), or viscosupplementation (VS), can potentially help restore the properties of synovial fluid. There is little literature available evaluating the long-term effects and the functional impact of VS in hip OA. **PURPOSE:** To determine if a single intra-articular injection of a high-molecular weight (HMW) VS would improve function and decrease pain in persons suffering from hip OA. **METHODS:** A double-blinded randomized control trial was conducted at a University Hospital Center in Canada. Patients were randomly allocated to either the treatment group, an ultrasound guided single intra-articular injection of a HMW HA, or the placebo group, a single extra-articular injection of local anesthetic. Participants underwent evaluations at 2 weeks prior to the injection (T0), and at 1 month (T1), 3 months (T2) and 6 months (T3) post injection. Patients completed two questionnaires; the Hip Disability and Osteoarthritis Outcome Score (HOOS) and the 36-Item Short Form Survey (SF-36). Gait biomechanics were evaluated in a lab. **RESULTS:** Between May 2014 and September 2017, 38 participants were evaluated in this study over the course of 6 months. In the treatment group, N = 19 and in the placebo group, N = 18. The mean age at the time of injection was 55. On the HOOS symptom subscale, the placebo group worsened from T0 to T3 by 6.29% compared to the treatment group. The VS group improved their pain subtotal from T0 to T2 by 4.73%. The control group worsened by 1.22% during that same time and continued to deteriorate by 6.09% at T3. There were also improvements in the activities of daily living subscale from T0 to T3, with the treatment group improving

by 5.29% while the placebo group worsened by 5.15%. The most important change occurred in the sports and recreational subscale of the HOOS. Between T0 and T3, the placebo group worsened by 7.611 points (- 17.82%). The treatment group improved by 6.67%. **CONCLUSION:** Our preliminary results suggest that a HMW VS hip injection for degenerative OA, when compared to true placebo, may lead to long-term improvements in pain relief, increase in function and in activity participation. **NIH Clinical Trials Registry:** NCT02086474

2517   June 1 2:15 PM - 2:30 PM

The Prevalence Of Obstructive Sleep Apnea Within A Professional Rugby League Team: An Exploratory Study

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(No relevant relationships reported)

Obstructive sleep apnea (OSA) is a disorder characterized by recurrent episodes of partial or complete obstruction of the upper airway. This results in non-restorative sleep leading to daytime sleepiness and decreased quality of life. It is estimated that 1-5% of the worldwide population suffer from OSA, however the prevalence within athletes is largely unknown. **PURPOSE:** To characterize the prevalence of OSA within a team of professional rugby league athletes. **METHODS:** 22 professional rugby league athletes underwent one night of home-based polysomnography, with apnea-hypopnea index (AHI) used to indicate the presence and severity of OSA. Linear models were used to determine if playing position (back, forward), ethnicity (European-Australian, Polynesian) or body composition influenced the prevalence or severity of OSA. **RESULTS:** 10 cases of OSA were found. When considering ethnicity, a likely moderate difference was observed between Polynesians and European-Australians for AHI during rapid eye movement sleep (ES = 0.94; ±0.77, p<0.05). Differences between forwards and backs were unclear (ES = 0.44; ±0.77, p>0.05). Increased BMI (ES = 0.83; ±0.77, p<0.05) and skinfold thickness (ES = 0.87; ±0.49, p<0.05) were associated with increased AHI. **CONCLUSION:** Within professional rugby league athletes, Polynesians may be more susceptibility to OSA than European-Australians. Furthermore, our data suggests that athletes with greater BMI and skinfold thickness may be predisposed to the existence of OSA.

2518   June 1 2:30 PM - 2:45 PM

Cardiovascular Risks For Participation In Marathon Among The Adolescent Athletes In Sri Lanka - A Pilot Study

Sanka Thebuwanaarachchi. *Teaching Hospital Karapitiya, Galle, Sri Lanka.*
(No relevant relationships reported)

Undetected cardiovascular abnormalities are one of the major causes of sudden death in young athletes. Currently we lack data on this field in Sri Lanka.
PURPOSE :To determine the prevalence, the associated factors of cardiovascular disease among the adolescent players and the cardiovascular risks for participating in marathon. **METHODS:** Research was conducted in three sports medicine clinics selected from the hospitals of three main provinces in the country including Western, Southern and Central provinces where sports medical officers' conducted pre participation medical screening of players and documented in Pre participation Examination (PPE) forms. Study population consisted of adolescent players aged between 10 to 19y who attended previously mentioned clinics for medical clearance prior to the marathon run . Physically challenged players were excluded. Sample was selected from January 2015 to August 2015. The sample size was 900. Convenient cluster sampling method was incorporated. Pretesting was done which lead to the amendments in the Data extraction sheet. Secondary data were collected from the PPE forms from the clinics. A cross-sectional analytical study was conducted to determine the prevalence and the associated factors of cardiovascular disease: **RESULTS** : Prevalence of cardiovascular diseases among adolescent players in Sri Lanka according to our study was 2%. Most common cardiac abnormality was Mitral Valve Prolapse. Mitral Stenosis, Ventricular Septal Defect and Aortic Stenosis were the other cardiac abnormalities detected. Important incidental finding of our study was a higher prevalence (6%) of bronchial asthma among adolescent players which was more than the cardiovascular disease. **CONCLUSION** : Properly conducted Pre Participation screening reveals underlying cardiovascular disease and it may be used as a tool to identify cardiovascular risks for participation in marathon among adolescent players and hence reduce sudden cardiac death incidents.

Abstracts were prepared by the authors and printed as submitted.

2519 June 1 2:45 PM - 3:00 PM

Immune and Hormones Levels Responses Before and After Specific Maximal Protocol of Brazilian Olympic Athletes

Hugo Tadashi Kano, Layene Peixoto Barros, Franz H. Burini, Roberto C. Burini. *UNESP Medical School, Botucatu, Brazil.* (Sponsor: Roberto C Burini, FACSM)

(No relevant relationships reported)

Athletes are overexposed to stress factors such as training routine, sleep and dietary pattern, wich may influence immune function and hormones patterns modulating health and performance. Immune supression after sport metabolic overload is an issue for elite athletes and should be considered during training log. **Purpose:** The purpose of this study was to evaluate Leukocytes, Testosterone and Cortisol responses to specific maximal protocol of elite brazilian atheltes, and their relations dynamically. **Methods:** We evaluated 55 elite athletes (16 judo, 10 boxing and 29 rowing olympic national athletes; 38 males and 17 females; 24.2±6yrs) for leukocytes (Leuk) and hormones levels such as Testosterone (T) and Cortisol (C) taken blood samples before and after specific maximum effort protocol. **Results:** Leukocytes values before and after test were 7.42±1,3 and 10.02±1,7x10³/mm3 (pre *vs* post 2,6 x10³/mm³); Cortisol levels were 15.3±2,7 and 16.2±1,9mg/dL (pre *vs* post 0.9mg/dL) and Testosterone 371.5±57,2 and 362.1±73,1mg/dL. Analysing genders separately, post *vs* pre difference of Leukocytes, Testosterone and Cortisol levels for males and females were 2.4x10³/mm³, -18.8mg/dL, 0.5mg/dL; 3.1x10³/mm³; 2.2mg/dL and 1.7mg/dL respectively. **Conclusions:** Leukocytes elevation after maximum effort were observed on males and females athletes despite sport modality, and these elevations were not associated with Testosterone or Cortisol variations during this protocol. Leukocytes response may be a primary indicator of imune response integrity compared with Testosterone declines or Cortisol elevations in response to sport induced stress protocol.Health issues, specially upper respiratory tract infections, has been associated with imune supression after metabolic overload and should be focused besides sports adaptation to training log and competition.

F-10 Free Communication/Slide - **Cardiometabolic Health**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-200F

2520 **Chair:** Stella L. Volpe, FACSM. *Drexel University, Philadelphia, PA.*

(No relevant relationships reported)

2521 June 1 1:00 PM - 1:15 PM

Oral Consumption of Bisphenol A Increases Glucose Responses in Adults

Sean Stanelle, Alyssa Bird, Leana Mosesian, Garrett Grant, Julie Pollard, Eduardo Uribe, Dana Williams, Suzanne Phelan, Todd Hagobian, FACSM. *California Polytechnic State University San Luis Obispo, San Luis Obispo, CA.* (Sponsor: Todd Hagobian, FACSM)

(No relevant relationships reported)

Previous observational studies have shown a correlation between urinary bisphenol A (BPA) and type 2 diabetes, however the direct effects of BPA on risk markers in the pathogenesis of diabetes are unknown. **PURPOSE:** To determine the effects of oral ingestion of BPA on glucose, insulin, and estrogen responses. **METHODS:** After an overnight fast, ten healthy college students (7W, 3M; 40% Hispanic, 21.0 ± 0.8 yrs; 24.2 ± 3.9 kg/m²) were block randomized, in a double-blinded fashion, to oral consumption of Placebo (PL), BPA at 4 µg/kg BW (BPA-Low), and BPA at 50 µg/kg BW (BPA-High). Blood glucose, insulin, and estrogen concentrations and calculated area under the curve (AUC) were assessed at baseline, minutes 15, 30, 45, 60, and then every 30 minutes for the next 2 hours in response to a 75g oral glucose tolerance test using a repeated measures ANOVA. **RESULTS:** Compared to PL, BPA AUC was significantly higher (p < 0.05) in BPA-Low and BPA-High (295 ± 139, 2239 ± 1255, 14030 ± 4350 ng/mL*min). Compared to PL, glucose AUC tended to be higher (p = 0.08) in BPA-Low and was significantly (p = 0.04) higher in BPA-High (1150 ± 23, 1232 ± 24, 1245 ± 30 mmol/L*min). Insulin AUC (6360 ± 382, 6527 ± 400, 5683 ± 462 ug/mL*min) and estrogen AUC (12154 ± 2752, 12161 ± 2326, 11145 ± 2263 pg/mL*min) were not significantly different between conditions (p > 0.05). **CONCLUSION:** Oral BPA consumption of 50 µg/kg BW significantly increased glucose AUC, but not insulin or estrogen. These data provide the first direct evidence in humans that consumption of BPA alters a risk marker in the pathogenesis of type 2 diabetes.

2522 June 1 1:15 PM - 1:30 PM

The Influence of Metabolic Syndrome on Carotid Intima Media Thickness in Children

Robert E. Downing, Rebecca Place, Paul Visich. *University of New England, Biddeford, ME.*

(No relevant relationships reported)

Increased carotid intima-media thickness (CIMT) is accepted as an early indicator for the development of atherosclerotic coronary artery disease (CAD). The presence of metabolic syndrome (MetS) in adults is shown to have a negative influence on CIMT and thus CAD. As obesity rates increase in children, which elevates the risk of MetS, it is unclear how this might alter a child's CIMT.
PURPOSE: To determine if children with MetS are at a greater risk of an increased CIMT.
METHODS:Two hundred and twenty-one children had their CIMT assessed. In addition, all subjects completed a fasting blood lipid and glucose profile, waist circumference (WC) and resting blood pressure to evaluate MetS risk factors. A licensed sonographer completed scans on the right and left common carotid artery using the Terason t3200 ultrasound unit with a linear transducer probe. CIMT was measured using the software The Carotid Analyzer for Research Version 6. To evaluate the effect of MetS on CIMT, the students were categorized into three groups: 0 MetS Risk Factors (n=73), elevated WC (≥90th%, n=31) only and MetS (n=11). A random sample of 11 subjects were chosen from the first two groups.
RESULTS: A total of 33 students with an age of 10.5±0.51, height 150.0±8.0cm, and weight 55.7±16.1kg participated in the study. An increase in the right, left and combined CIMT's were observed in children with MetS (0.554±0.023 (p<0.005), 0.552±0.019 (p<0.005), and 0.552±0.016 (p<0.0001), respectively) and elevated WC only (0.552±0.017, (p<0.005), 0.551±0.023 (p<0.003), and 0.551±0.018 (p<0.005), respectively) Vs children with 0 risk factors (0.532±0.004, 0.531±0.009, and 0.531±0.005, respectively). When comparing the elevated WC only group to the MetS group, there was no differences in CIMT.
CONCLUSIONS: It appears MetS negatively impacts CIMT, however an elevated WC by itself negatively impacts CIMT. Early identification of children with an elevated WC may be beneficial in identifying children at risk for premature cardiovascular disease. Assessment of CIMT in children with an elevated WC may help motivate families to make positive lifestyle modifications.

2523 June 1 1:30 PM - 1:45 PM

Combining Short-Term Interval Training With Caloric-Restriction Improves ß-Cell Function In Obese Adults

Monique E. Francois, Nicole M. Gilbertson, Natalie Z.M Eichner, Emily M. Heiston, James H. Mehaffey, Taryn E. Hassinger, Peter T. Hallowell, Steven K. Malin, FACSM. *University of Virginia, Charlottesville, VA.* (Sponsor: Steve Malin, FACSM)

(No relevant relationships reported)

Background: Obese adults have an increased risk of type 2 diabetes (T2D). Although insulin resistance is a key etiological factor, the progressive loss of ß-cell function causes T2D. Lifestyle therapies, such as caloric-restriction and interval exercise training (INT) have separately been shown to improve insulin secretion; however, the impact of these therapies combined on ß-cell function prior to meaningful weight loss is unknown.
Purpose: To examine the impact of a low-calorie diet (LCD), with and without INT, on ß-cell function in obese adults.
Methods: Twenty-two, middle-aged obese (Age: 46±12 y; BMI 38±6 kg/m²) adults were randomized to either 2-wks of a LCD (~1200 kcal/day) or an energy matched LCD+INT intervention (supervised: 60-min/d alternating 3-min at 90 and 50% HRpeak). VO₂peak and body fat were assessed before and after interventions. After an overnight fast, a 120-min 75g oral glucose tolerance test (OGTT) with blood samples every 30-min was performed, and glucose, insulin, and C-peptide were used to define glucose-stimulated insulin secretion ([GSIS: Δinsulin/Δglucose]), hepatic clearance (HC: AUC_{insulin}/AUC_{c-peptide}), and ß-cell function (Disposition Index [DI: IGI x Matsuda Index]) for early- (0-30-min) and total-phase (0-120-min) responses. GLP-1_{active} was also measured during 0, 30 and 60-min of the OGTT to assess incretin effects.
Results: Neither intervention altered body fat % (Time: *P*=0.74), and only LCD+INT increased VO₂peak (Interaction: *P*=0.03). LCD+INT reduced glucose total area under the curve (tAUC) when compared with LCD (Interaction: *P*<0.05). While both interventions increased insulin sensitivity by ~13% (Time: *P*=0.04), only LCD+INT elevated early-phase GSIS (Interaction: *P*=0.05) with no change in HC (Time: *P*=0.11). LCD+INT tended to increase early-, but not total-phase, ß-cell function to a greater extent when compared with LCD (Interaction: *P*=0.06). GLP-1_{active} tAUC increased similarly after LCD+INT and LCD (Time: *P*<0.05) by ~28%.

Conclusions: Independent of insulin sensitivity and GLP-1, INT combined with LCD improved early-phase pancreatic function in obese adults when compared to an energy matched diet. Additional work is required to elucidate the mechanism(s) by which INT improves insulin secretion during weight loss to optimize diabetes prevention.

2524   June 1 1:45 PM - 2:00 PM

Exercise-induced Energy Deficit Lowers Glycemia At Breakfast The Next Day, But Not Over 24-hours.

Michael Schleh, Lisa Guth, Haojia Jing, Jeffrey F. Horowitz, FACSM. *University of Michigan, Ann Arbor, MI.*

(No relevant relationships reported)

Several studies have reported improved glycemic control the day after a session of exercise, but it is unclear if this is a direct effect of exercise or an indirect effect of the exercise-induced energy deficit. **Purpose:** Determine the effect of energy deficit after acute exercise on free-living glycemic control the next day. **Methods:** 12 healthy subjects (male=4, female=8, age=28±6 yrs, BMI=24.6±3.2 kg•m^{-2}, VO_{2max}=36±10 ml•kg^{-1}•min^{-1}) completed two experimental trials, which were identical other than the energy content of the meals consumed after exercise. Before each trial, continuous glucose monitoring (CGM) probes were inserted in the abdominal region. On day 2, subjects were provided a standardized breakfast and lunch, then they exercised in the afternoon at 65% VO_{2max} until 350 kcals were expended (~50 min). After exercise on one occasion, subjects consumed meals (~55% CHO, ~30% Fat, ~15% PRO) supplemented with calories to replenish the energy expended during exercise, thereby achieving energy balance (EB). On the other occasion, the meals after exercise were not supplemented with extra calories, inducing a 350 kcal energy deficit (ED). Throughout the next day, subjects ate identical meals in both the EB and ED trials, and free-living glycemic control was compared between trials starting at 0800h. **Results:** 3-hour post-prandial area under curve (AUC) was significantly lower after breakfast in ED compared with EB (27.5±3.5 vs. 29.3±4.0 mM•h^{-1}, P=0.03), but not different after lunch (28.8±4.2 vs. 27.9±3.3 mM•hour^{-1}, P=0.38), dinner (28.7±3.3 vs. 27.3±3.3 mM•hour^{-1}, P=0.50), or evening snack (27.8±3.3 vs. 26.8±2.1 mM•hour^{-1}, P=0.45). Similarly, average postprandial glucose (3-hour) was lower after breakfast in ED vs. EB (5.6±0.7 vs. 6.0±0.8 mM, P=0.02), and not different between trials after the other meals. Despite differences in the glycemic response to breakfast, average 24-hour glycemic response did not differ between ED and EB (24-hour AUC: 27.2±2.5 vs. 26.5±2.1 mM•h^{-1}, respectively; P=0.2). **Conclusion:** Compared with eating meals that replenish the energy expended during exercise, an exercise-induced energy deficit lowered the glycemic response to breakfast the next day - but this energy deficit did not impact total 24-hour glycemia the day after exercise. **Supported by NIH GRANT#** R01 DK077966

2525   June 1 2:00 PM - 2:15 PM

Components of Metabolic Flexibility Improved 48 hours After High Intensity Interval Exercise.

Timothy D. Allerton[1], Brian Irving[2], Guillaume Spielmann[2], Stefany Primeaux[3], Arnold Nelson, FACSM[2], Dennis Landin[4], Neil Johannsen[2]. *[1]Pennington Biomedical Research Center, Baton Rouge, LA. [2]Louisiana State University, Baton Rouge, LA. [3]LSU Health Sciences Center, New Orleans, LA. [4]Louisisana State University, Baton Rouge, LA.* (Sponsor: Arnold Nelson, FACSM)

(No relevant relationships reported)

The inability to switching between fuel sources (fat and carbohydrates), termed metabolic inflexibility, plays a prominent role in the development of type 2 diabetes and obesity. Evidence suggests that chronic exercise interventions and weight reduction improve metabolic flexibility (MF). However, little is known about the impact of a single bout of high-intensity interval exercise (HIIE) on MF. **Purpose:** To assess the impact that HIIE has on MF and blood flow in response to a mixed meal tolerance test (MMTT) performed without exercise (BL) or following 1H or 48H post-HIIE. **Methods:** Participants (n=16, aged 21.2 ± 1.2 y, BMI 22.6 ± 2.7 kg/m^2) completed 3 mixed meal tolerance tests (MMTT; 412.2 ± 71.5 kcal) (BL, 1H and 48H) lasting 180 minutes. Indirect calorimetry measurements were taken prior to the mixed meal (0 min), 60 min, and 120 min post mixed meal. MF was determined by subtracting RER 60 min - RER 0 min and analyzing the rate of carbohydrate and fat oxidation/suppression (FatOx). HIIE was 10 x 60s intervals at 90% (154.6 ± 35.6 W) of power output achieved at VO_{2peak}, followed by 60s of recovery. Additionally, we measured blood flow in the vastus lateralis (VL) every 30-min utilizing near-infrared spectroscopy (NIRS). **Results**: Fasting FATox was elevated 48H post-exercise compared to BL (1.31 ± 0.39 mg/kg/min vs.0.96 ± 0.32 mg/kg/min, p=0.04). The ability to suppress FATox at the 60-min time-point of the MMTT was significantly higher 48H post-exercise compared to BL (~20% vs. ~12%, p=0.01). Increased VL blood flow was detected 120-minutes into the MMTT during BL. When compared to BL, 1H post-exercise VL blood flow changes were significantly higher at 60 (1.8 fold, p=0.03) and 120-min (2.0 fold, p=0.04) time points. **Conclusions:** Our results suggest, a single bout of HIIE improves MF up to 48H post-exercise, which is characterized

by higher fasting and meal-induced suppression of FATox. Postprandial VL blood flow was also stimulated to a greater degree 1H post-exercise when compared to the BL postprandial measurement. The impact of acute HIIE demonstrates MF can be improved acutely, prior to chronic adaptations.

2526   June 1 2:15 PM - 2:30 PM

Relationship between Cardiorespiratory Fitness and Relative Gut Microbiota Composition in Healthy Adults

Ryan P. Durk[1], Esperanza Castillo[1], Leticia Márquez-Magaña[1], Gregory J. Grosicki[2], Nicole Bolter[1], C. Matthew Lee[1], James R. Bagley[1]. *[1]San Francisco State University, San Francisco, CA. [2]Tufts University, Boston, MA.*

(No relevant relationships reported)

PURPOSE: Bacteria residing in the human gastrointestinal tract has a symbiotic relationship with its host. Animal models have demonstrated a relationship between exercise and gut microbiota composition. The purpose of this study was to explore the relationship between cardiorespiratory fitness and relative gut microbiota composition, measured by the ratio of Firmicutes to Bacteroidetes (F/B ratio) in healthy adults. **METHODS**: Twenty-one males and 19 females (Age=26.1 ± 2.8 y; BMI=24.0 ± 4.2 kg/m^2), who did not take antibiotics in the last 6 months, volunteered for this study. Participants completed a 3-month exercise recall, tracked their nutritional intake for 7 days (via MyFitnessPal®), and collected their stool sample with an OMNIGENE Gut® home stool collection kit. Body composition and maximal cardiorespiratory fitness (VO_{2max}), were measured via air displacement plethysmography using the Bod Pod® and a symptom-limited graded treadmill test, respectively. Relative microbiota composition was determined by analyzing DNA extracted from stool samples using a Quantitative Polymerase Chain Reaction (qPCR) approach that specifically measured the amount of a target gene (16s RNA) found in Firmicutes and Bacteroidetes. Relationships between F/B ratio and potentially related dietary, anthropometric, and fitness variables were assessed using correlation analyses with appropriate Bonferroni adjustment ($p<0.004$). **RESULTS**: Average F/B ratio in all participants was 0.94 and average VO_{2max} was 45.8 ± 8.8 ml/kg/min. F/B ratio was significantly correlated to VO_{2max} ($r=0.45$, $p<0.004$), but no other fitness, nutritional intake, or anthropometric variables ($p>0.004$). **CONCLUSIONS**: VO_{2max} was responsible for ~20% of the variance of an individual's relative gut bacteria as determined by F/B ratio. These data support animal findings by demonstrating a relationship between relative human gut microbiota composition and cardiorespiratory fitness in healthy adults. Future investigations should confirm this relationship in heterogenous populations and investigate the utility of exercise training as medium to promote beneficial changes in gut microbiota.

2527   June 1 2:30 PM - 2:45 PM

Effects of Maternal Exercise on Hepatic Steatosis in Young Adult Rats

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(No relevant relationships reported)

Introduction: Maternal high fat diets (HFD) result in excess fat accumulation in the liver of offspring, known as hepatic steatosis. Maternal exercise during this crucial period of fetal development can be protective against hepatic steatosis in older offspring. However, it is unknown whether these protective effects can be seen in younger offspring. Here we sought to determine whether maternal exercise would attenuate maternal HFD-induced steatosis in young adult rats. **Methods:** Female Wistar rats (7-8 weeks of age) were randomized into one of four groups: HFD (42% fat, 10% sucrose) or normal chow diet (ND) with either exercise (RUN) or sedentary (SED) for each group. All dams returned to ND/SED conditions following parturition. Post-weaning, all offspring were maintained in ND/SED conditions for 18 weeks. **Results:** Male offspring had increased body mass compared with females (p<0.05). Maternal HFD-induced increases in male offspring body mass was attenuated in the HFD/RUN offspring (p<0.05). Maternal HFD feeding significantly increased hepatic steatosis in male (but not female offspring), which was not attenuated by maternal RUN. However, maternal RUN increased (p<0.05) hepatic markers of mitochondrial biogenesis and mitophagy (TFAM, PPARγ, NRF2) in all offspring and the mitophagy marker BNIP3 in HFD-RUN offspring. Interestingly, hepatic markers of de novo lipogenesis (FAS, ACC), mitophagy (ATG12:5, BNIP3, P62, LC3 II/I), and mitochondria biogenesis/content (TFAM, OX PHOS-Complex II) were significantly increased in female vs. male offspring. **Conclusion:** Although maternal exercise did not attenuate maternal HFD-induced hepatic steatosis as has been previously reported in older adult offspring, it did significantly increase hepatic markers of mitochondrial biogenesis and autophagy/mitophagy. Furthermore, female offspring had elevated hepatic markers of mitochondrial health which may possibly explain why female

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Abstracts were prepared by the authors and printed as submitted.

rats are protected against maternal HFD-induced hepatic steatosis. Future studies are warranted to shed light on the timeline of hepatic steatosis development under the influence of maternal exercise.

2528 June 1 2:45 PM - 3:00 PM
Physical Activity during Pregnancy Alters Gene Expression in Neonatal Tissue

Leryn J. Reynolds[1], Niraj R. Chavan[2], Brittany B. Rice[2], Hannah F. Maddox[2], Joshua D. Preston[2], Logan B. DeHoff[2], Kevin J. Pearson[2]. *[1]Old Dominion University, Norfolk, VA. [2]University of Kentucky, Lexington, KY.* (Sponsor: David Swain, FACSM)
(No relevant relationships reported)

Offspring born to mothers who exercise during pregnancy have been shown to have reduced birth weight and body weight during adolescence; however, mechanisms to explain this phenomenon are lacking. **PURPOSE:** This study examined whether male infants born to mothers with low levels of naturally occurring physical activity during pregnancy (<6,000 steps/day; <6K) had altered expression of genes related to glucose metabolism and adipogenesis compared to infants born to mothers with greater than 6,000 steps/day (>6K). **METHODS:** Physical activity levels were assessed via Fitbit Flex during the second and third trimester of pregnancy. The dartos layer of the foreskin was collected following circumcision in full term, singleton, male neonates (n = 6 per group). Tissue was homogenized, RNA isolated, and a NanoString code set run to quantify a panel of genes related to glucose metabolism and adipogenesis, as well as housekeeping genes. **RESULTS:** Peroxisome proliferator-activated receptor alpha (<6K: 86.4±9.2 vs. >6K: 59.4±5.0) and cAMP responsive element binding protein 1 (<6K: 285.7±36.8 vs. >6K: 197.4±12.1), genes encoding proteins that are involved in partially regulating adipogenesis, and DNA methyltransferase 1 (DNMT1) (<6K: 132.2±6.4 vs. >6K: 112.5±3.7), a gene coding an enzyme involved in the regulation of DNA methylation patterns, were significantly decreased in the infants born to mothers with higher levels of physical activity during pregnancy (p<0.05). Adiponectin receptor 1 (<6K: 490.1±38.1 vs. >6K: 743.3±99.7), a receptor that is downregulated in obese, insulin resistant populations, and glucose transporter 1 (<6K: 88.0±15.7 vs. >6K: 153.3±13.0), a glucose transporter responsible for basal levels of glucose uptake in most cells, were significantly increased in the tissue of neonates born to mothers with higher levels of physical activity (p<0.05). **CONCLUSION:** These preliminary data suggest that low levels of physical activity during pregnancy are associated with increased gene expression of markers of adipogenesis and decreased markers involved in insulin sensitivity and glucose uptake. Further, these adaptations or other gene expression changes may be epigenetically regulated as DNMT1 levels were significantly lower in the lower physical activity group.

F-11   Free Communication/Slide - **Exercise and Neuroscience**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100D

2529 **Chair:** J. Carson Smith, FACSM. *University of Maryland, College Park, MD.*
(No relevant relationships reported)

2530 June 1 1:00 PM - 1:15 PM
Exercise Training Alters Expression of Acid Sensing Ion Channels (ASICs) in Sensory Pathways

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(No relevant relationships reported)

Exercise is an effective therapy for numerous pathological conditions that are associated with elevated metabolites and inflammatory factors. These chemicals can activate receptors on peripheral sensory neurons, such as Acid Sensing Ion Channels (ASICs) and Transient Receptor Potential Vanilloid 1 (TRPV1). High-intensity exercise can induce release of protons, metabolites, and inflammatory factors, which are known to activate ASICs and TRPV1 and elicit reflex-mediated changes in hemodynamics and respiration, as well as pain perception and fatigue.
Purpose: Does exercise training alter the expression of ASICs and TRPV1 in skeletal muscle afferents and carotid body (CB)?
Methods: Female C57BL/6 mice were divided into sedentary (SED), low intensity training (LIT) and high intensity interval training (HIIT) groups. HIIT was trained on treadmill every other day for 4 weeks (4 bouts of 6 min intervals at 80-90% of

maximum velocity (V_{max}) with 4 min of active rest), whereas LIT trained at 40-50% of V_{max} for the same distance. SED mice were placed on the treadmill for similar periods of time. After 4 weeks, all groups underwent an incremental treadmill test for maximal exercise performance. Lumbar dorsal root ganglia (DRG) and CB were collected 48 hrs after maximal exercise, and mRNA levels of ASICs and TRPV1 determined by RT-qPCR.
Results: HIIT had higher exercise performance (V_{max}, time to exhaustion and workload) compared to LIT and SED (p ≤ 0.05), while there was no significant difference between LIT and SED groups. Body composition, as measured by NMR, did not change significantly between groups after 4 weeks of training. HIIT showed reductions (p ≤ 0.05) of ASIC1b, ASIC2, ASIC3, TRPV1 mRNA levels in DRG, as well as reductions (p ≤ 0.05) in ASIC1b, ASIC2 in CB compared to SED. Paradoxically, LIT showed an upregulation (p ≤ 0.05) of ASIC3 and ASIC1a in DRG and CB.
Conclusion: HIIT improves exercise performance and lowers ASICs and TRPV1 mRNA in sensory pathways. We suggest that ASICs and TRPV1 downregulation could contribute to enhanced exercise performance by diminishing sensations of pain and fatigue. Diminishment of these sensory pathways might contribute to the benefits of exercise in disease conditions by reducing deleterious sympathoexcitation and associated inflammation.
Supported by Department of Veteran Affairs.

2531 June 1 1:15 PM - 1:30 PM
Functional Brain Plasticity Following Physical Training in Amnestic Mild Cognitive Impairment: A Neuroimaging Study

Tamir Eisenstein, Galit Yogev-Seligmann, Nir Giladi, Elissa Ash, Talma Hendler, Yulia Lerner. *Tel Aviv Sourasky Medical Center, Tel Aviv, Israel.*
(No relevant relationships reported)

Amnestic mild cognitive impairment (aMCI) is the typical prodromal stage of Alzheimer's disease (AD). To date, pharmacological treatments in aMCI are of modest efficacy. Evidence suggest that physical exercise may promote structural and functional brain changes in healthy adults and clinical settings. However, the extent to which comparable effects can be observed in aMCI remains unclear. **PURPOSE:** Identify brain mechanisms underlying neurocognitive effects of aerobic training in aMCI. **METHODS:** 23 subjects with aMCI (age 70.9±5.6) were assigned to aerobic (AT, n=11) or balance and coordination (BAC, n=12) groups. Intervention lasted 16 weeks, 3 sessions/week. AT intensity gradually increased to 70-80% of heart rate reserve (HRR), while BAC was kept below 30%. HRR and peak oxygen consumption (Vo2peak) were determined using cardiopulmonary exercise test. Subjects underwent fMRI sessions, evaluating neural pattern during tasks, known to be sensitive in aMCI (i.e. face-name associative memory and processing of complex auditory information). Neuropsychological assessments were performed to evaluate changes in cognitive domains including verbal and spatial memory, and executive functions. **RESULTS:** Increased activity in bilateral hippocampi was found in the AT group post intervention (p<0.007), while increased activity in left fusiform gyrus was shown in the BAC group (p<0.008), during memory encoding. During information processing, both groups demonstrated increased responses in high-order cognitive and language areas (e.g. temporo-parietal junction and inferior frontal gyrus), representing greater resemblance to normal aging patterns, compared to pre-training [q(FDR)<0.05]. Changes in Vo2peak were correlated with changes in executive functions in the AT group, including semantic verbal fluency (r=0.819, p<0.002) and phonemic verbal fluency (r=0.611, p<0.03). Improvements in immediate recall (normalized Z-score change 0.74±0.89, p<0.015) and delayed recall (0.71±0.71, p<0.005) of verbal information (1st & 8th repetitions of the Rey auditory verbal learning test) were demonstrated in the BAC group. **CONCLUSION:** Both aerobic and non-aerobic (low-intensity balance and coordination) training modalities may promote neuroplastic changes in older individuals with aMCI and high risk of AD.

2532 June 1 1:30 PM - 1:45 PM
The Impact of Imperceptible Vibratory Noise on the Spinal Motor Reflex

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(No relevant relationships reported)

Imperceptible noise stimulation has been shown to increase agility, stability and decrease muscle tremor. Previous research has shown that this effect is mediated via decreases in motor unit discharge variability and decreased motor unit synchronization. However, whether these motor unit effects arise from a spinal or cortical mechanisms is unknown and may change how these technologies are implemented to enhance human performance.
PURPOSE: Determine the effect of imperceptible vibratory noise on the spinal motor reflex (Hoffman Reflex).

METHODS: 12 males participated in the collection of a Hoffman reflex (H-reflex) recruitment curve and underwent either a randomized STIM (noise applied) trial or SHAM (control). The H-reflex recruitment curve was obtained from the median nerve of the subject's dominant arm. The intensity that elicited the onset of the M-wave was used to standardize the H-reflex stimulation intensity. The STIM trial was performed by introducing a random imperceptible vibratory noise 3 seconds before the collection of the H-reflex. The test was repeated for a total of 10 stimulations with six seconds of rest between stimulations. The resulting H-reflex amplitudes were then normalized to the maximal M-wave (Mmax) found during the H-reflex recruitment curve. Data were assessed with a generalized estimating equation, clustering for multiple observations. **RESULTS**: The H-reflex was 19.1% (SE±2.42) of Mmax in the STIM trials and 17.4% (SE±2.66) in the SHAM trials, showing a significant increase of 1.73% with STIM ($p = 0.0016$). **CONCLUSIONS**: Subjects showed an increase in spinal excitability while undergoing STIM. The results demonstrate that the spinal reflex plays a role in the motor adaptation response to imperceptible vibration. This increase in spinal excitability suggests that the performance benefits of imperceptible noise stimulation may have a rapid onset, on the order of 10-20 milliseconds, in contrast to cortical mechanisms which are greater than 100 milliseconds. Determining which motor centers mediate the behavioral response to noise stimulation, and to what degree, will help define the optimal parameters for the application of noise stimulation.

2533   June 1 1:45 PM - 2:00 PM

Aerobic Exercise and Cerebral White Matter Integrity in MCI Patients: A 1-Year Randomized Controlled Trial

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(No relevant relationships reported)

Cerebral white matter (WM) represents the structural substrate of neuronal communications and is damaged in dementia patients. Aerobic exercise training (AET) may improve cerebral WM integrity in healthy older adults, but its effect in populations at risk for dementia remains unclear. **PURPOSE:** To determine the effect of AET on cerebral WM integrity in patients with amnesic mild cognitive impairment (MCI) **METHODS:** We conducted a 1-year, single-blinded, parallel randomized controlled trial of AET and stretching intervention programs in patients with MCI. At baseline and post intervention, diffusion tensor images (DTI) were acquired to estimate fractional anisotropy and mean diffusivity (MD) that are analyzed by tract-based spatial statistics (TBSS) and compared among the major WM fiber tracts. High-resolution T1-weighted images were also acquired to measure the volumes of cerebral WM and WM hypointensities. Maximal oxygen consumption (VO$_2$max) was measured at pre and post intervention. **RESULTS:** Thirty-six MCI patients completed AET (n=16) or stretching (n=20) program with the baseline and post-intervention MRI scans. After intervention, participants in AET program improved VO$_2$max while those in stretching group showed slight declines (time × treatment: $P=0.008$). The volumes of WM and WM hypointensities did not show treatment effects over time (time × treatment: $P>0.05$). However, TBSS analysis demonstrated that improvements of VO$_2$max with AET are correlated with the reductions of MD among the major WM fiber tracts (Figure). **CONCLUSIONS:** In patients with amnesic MCI, AET did not improve cerebral WM volume and integrity between the intervention and control groups. However, individual improvements of VO$_2$max were associated with the reductions of MD. These findings suggest that benefits of AET on cerebral WM integrity depend on the magnitude of cardiorespiratory fitness gains. *This study was supported by the NIH (R01AG033106 and K99HL133449).*
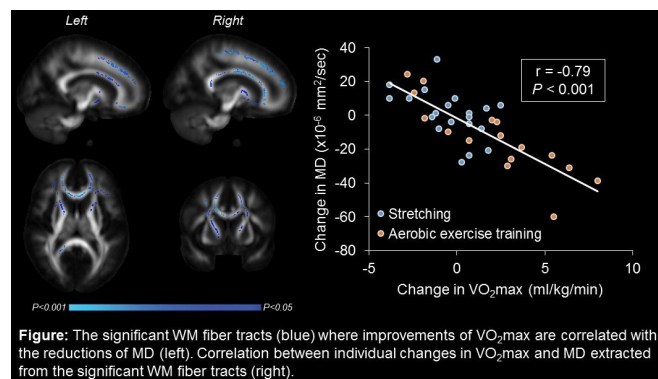
Figure: The significant WM fiber tracts (blue) where improvements of VO$_2$max are correlated with the reductions of MD (left). Correlation between individual changes in VO$_2$max and MD extracted from the significant WM fiber tracts (right).

2534   June 1 2:00 PM - 2:15 PM

Aerobic Exercise Regulates Synaptic Transmission by Attenuating Oxidative Stress in the Paraventricular Nucleus of Spontaneously Hypertensive Rats

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(No relevant relationships reported)

PURPOSE: Synaptic transmission in the hypothalamic paraventricular nucleus (PVN) plays a key role in the control of sympathetic outflow. Whether exercise training associated with reduced sympathetic activity and oxidative stress in hypertension is implicated in changes in sympathetic drive in the PVN remain unclear.
METHODS: In the present study, spontaneously hypertensive rats (SHRs) were subjected to exercise training for 8 weeks, five times per week, and Westar Kyoto (WKY) rats as cohort control. Miniature excitatory and inhibitory postsynaptic currents (mEPSCs and mIPSCs) were recorded from PVN in *ex vivo* hypothalamic slice preparations obtained after the last training, and biomarkers of oxidative stress and physical indexes were observed.
RESULTS: The mean frequency and amplitude, as well as the rise time and the decay time constant of mIPSCs, were significantly decreased in 20-wk-old SHRs compared with WKY 20-wk-old controls. In contrast to mIPSCs, only the mean mEPSCs frequency was higher, and there were no other changes in mEPSCs in comparison to the control group. SHRs exhibited higher ROS, 8-OHdG, and MDA, and lower SOD1, SOD2, CAT, Ogg1, and SOD activity, CAT activity in the PVN. These SHRs also had a significant increase in heart rate, blood pressure and sympathetic nerve activity, and higher levels of norepinephrine (NE). Exercise training ameliorated all these changes, resulting in an increase in the mean frequency, amplitude and the kinetics of mIPSCs, accompanied by a decrease in the mean frequency of mEPSCs in the PVN.
CONCLUSIONS: This study demonstrates that moderate intensity, high frequency exercise training induces antioxidant-related adaptations in the PVNs of SHRs, which in studies resulted in a selective enhancement of inhibitory synaptic transmission partly to recue autonomic nerves and reduce blood pressure in hypertension.

2535   June 1 2:15 PM - 2:30 PM

Effect of Acute Exercise on Salience Network Functional Connectivity and Affect in Healthy Older Adults

Alfonso J. Alfini[1], Lauren R. Weiss[2], Junyeon Won[2], Corey Michelson[2], Daniel Callow[2], Caroline Simon[2], Adam P. Spira[1], J. Carson Smith, FACSM[2]. [1]Johns Hopkins University, Baltimore, MD. [2]University of Maryland, College Park, MD. (Sponsor: Dr. J. Carson Smith, FACSM)
(No relevant relationships reported)

Mood and anxiety disorders are the most prevalent mental disorders among older adults and are associated with poor health outcomes. Exercise may be a useful means of treating or preventing these disorders, but the mechanism by which it does so is unclear. The salience network (SN), which connects the prefrontal cortex with several limbic brain regions, plays a primary role in emotion regulation. While several cross-sectional studies have demonstrated a link between increased SN resting-state functional connectivity (SN-RSFC) and mood and anxiety symptoms, none have examined the effect of acute aerobic exercise on SN-RSFC and affective measures in a sample of healthy older adults.
PURPOSE: To determine the effect of acute aerobic exercise on self-reported affect and SN-RSFC among healthy older adults. We hypothesized that exercise would enhance positive affect and decrease negative affect and SN-RSFC.
METHODS: Using a crossover repeated measures design, 21 participants (mean ±SD = 65.6 ±8.0; range 55-85) completed two study visits with 30-min of moderate-intensity bicycle exercise or seated rest, immediately followed by a resting-state fMRI scan. They completed the Positive and Negative Affect Schedule before and after each condition. We performed a seed-based analysis (AFNI v.17.3.01; seeds = L and R insula; 34, 22, -2) to determine changes in SN-RSFC.
RESULTS: Compared to rest, 30-min of moderate-intensity exercise increased positive affect ($p = 0.015$) and led to notable, but non-significant, decreases in negative affect ($p = 0.059$). Exercise also significantly decreased SN-RSFC in three limbic brain regions: L hippocampus, L amygdala, and L middle temporal gyrus ($p < 0.01$).
CONCLUSIONS: Acute aerobic exercise enhanced positive affect and decreased SN-RSFC in healthy older adults. Results suggest that exercise-induced changes in functional connectivity within the brain's salience network may drive the effects of exercise on mood and anxiety in this population. Further studies are needed to test different doses of acute and chronic exercise on these outcomes.

2536   June 1 2:30 PM - 2:45 PM

Probing the Therapeutic Potential of Brain Stimulation for Functional and Corticospinal Deficits Following Traumatic Musculoskeletal Injury

Shawn Flanagan. *University of Pittsburgh, Pittsburgh, PA.*
(Sponsor: WIlliam Kraemer, FACSM)
(No relevant relationships reported)

Background: Traumatic anterior cruciate ligament (ACL) rupture can lead to bilateral deficits in balance, skilled movement, and force production. Such deficits persist for years independent of knee musculature or joint translation. Recently, others have demonstrated reduced cortical sensorimotor excitability and hemodynamic activity in conjunction with increased cortical inhibition and normalized spinal inhibition. The consequences of traumatic musculoskeletal injury (MSI) appear to extend to the brain, with maladaptive neuroplasticity contributing to disability. Non-invasive brain stimulation (NIBS) represents a promising strategy to modulate corticospinal activity after traumatic MSI, but therapeutic efficacy is untested. **Objective:** To examine the influence of NIBS on behavioral and neurophysiological activity after ACL rupture. **Methods:** Twenty women participated in a randomized, sham-controlled, double-blind, cross-over study. Nine experienced traumatic ACL rupture and reconstruction within five years of the study (ACL: N=9, age 20.6±2.3yr, height 166.1±8.0cm, weight 68.1±9.1kg). Eleven matched participants with no history of lower body injury served as controls (CON: N=11, 20.3±1.4yr, 165.0±5.3cm, 65.7±8.4cm). Participants completed a familiarization visit followed by two treatment visits with active or sham intermittent theta-burst stimulation (iTBS) applied to the injured (or non-dominant) motor cortex (M1) leg representation. Voluntary activation, force production, and corticospinal dynamics were examined. **Results:** The protocol was well tolerated. Active stimulation increased voluntary activation (4.2±1.4%, $p = 0.01$), relative force (44.22±14.21N, $p = 0.01$), and MEP amplitude (10.9±3.1%, $p = 0.00$) in the injured leg. Stimulation normalized superimposed twitch force (0.28±3.02N, $p = 0.93$) and contralateral silent period duration (-10.91±5.13ms, $p = 0.05$). **Conclusions:** One bout of NIBS was sufficient to normalize behavioral and corticospinal dysfunction 3.2±1.1yr after MSI, with distinct effects on the interhemispheric motor system network. Future work on the effects of repeated treatments, injury characteristics, and timing is needed. Nevertheless, traumatic MSI may be added to the list of conditions with neurological aspects responsive to NIBS.

2537   June 1 2:45 PM - 3:00 PM

Are Exercise Effects on Valence-Modulation of the Acoustic Startle Eyeblink Response Trait Dependent?

Kathryn Elizabeth Wilson[1], Jianchun Yin[2], Rodney King Dishman, FACSM[3]. *[1]University of Nebraska Medical Center, Omaha, NE. [2]Shanghai Normal University, Shanghai, China. [3]University of Georgia, Athens, GA.* (Sponsor: Rodney K. Dishman, FACSM)
(No relevant relationships reported)

Studies using objective probes for emotional state conclude no effect of exercise on affective processing. However, these studies fail to control for trait differences in sensitivity to affective cues and have been primarily restricted to prescribed (rather than self-selected) exercise intensities. It is possible that effects of exercise on affective processing of appetitive and aversive stimuli are moderated by motivational dispositions (approach/avoidance) reflective of individual differences in functioning of neural systems responsible for behavioral inhibition and behavioral activation (BIS/BAS traits). It is also possible that effects are influenced by perceived control of the exercise intensity.
PURPOSE: This laboratory experiment tested the hypotheses that 1) changes in sensitivity to emotional stimuli would manifest for those stimuli to which one is naturally predisposed to attend (i.e., aversive stimuli for BIS-dominant, and appetitive stimuli for BAS-dominant individuals), and 2) effects would be enhanced following exercise at a self-adjusted intensity.
METHODS: We examined valence-modulation of the acoustic startle eyeblink response during affective picture viewing before and after moderate intensity exercise with and without the opportunity to adjust intensity, or quiet rest among 58 undergraduates scoring high or low for BIS/BAS traits.
RESULTS: A 4 way mixed-model ANOVA indicated a main effect for valence [$F(2, 108) = 16.21$, $p < .01$, $\eta^2 = .23$, $\varepsilon = .97$], consistent with expected effects of picture content. There were no effects of personality group ($p \geq .18$, $\eta^2 \leq .08$). Helmert contrasts revealed a 3-way quadratic interaction between valence, condition and time [$F(1, 54) = 6.2$, $p = .02$, $\eta^2 = .10$]. Follow-up RM-ANOVAs revealed a quadratic valence X time interaction during the prescribed exercise condition [$F(1, 57)=7.38$, $p=.01$, $\eta^2 = .12$]; the reduction in ASER magnitude in response to neutral stimuli was greater than that in response to unpleasant or pleasant stimuli. These effects were not observed in the adjustable exercise or control conditions.
CONCLUSIONS: Results confirm that cycling exercise does not alter emotional response to affective pictures, regardless of motivational disposition, and extend the evidence to conditions in which participants can alter the exercise intensity.

F-12   Free Communication/Slide - **Gait and Biomechanics**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100F

2538   **Chair:** Julia Freedman Silvernail. *University of Nevada, Las Vegas, Las Vegas, NV.*
(No relevant relationships reported)

2539   June 1 1:00 PM - 1:15 PM

Effect Of Forefoot Type On Self-reported Pain In Minimalist and Traditionally Shod Runners

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(No relevant relationships reported)

Distance running is a popular recreational activity despite high rates of overuse injury. The efficacy of wearing minimalist shoes to prevent injury has been debated. We previously reported that minimalist runners are more likely to experience site-specific lower extremity pain; however, no clear relationship has been established between shoe type, forefoot (FF) shape (Egyptian, Morton's, or square), and pain. Therefore, the **purpose** of this study is to examine self-reported pain in the lower limbs in minimalist and traditionally shod runners with various forefoot types. **Methods:** Following consent, 48 experienced runners (age: 27.5 ±9.3 yrs, hgt: 172.2 ±10.2 cm, mass: 70.6 ±15.6 kg, gender: 18M/30F) who reported running at least 10 miles a week for the past three months, completed a visual analog scale (VAS) about pain they experience in five common sites of injury: knee, ankle, calf, shin, and foot. A score of ≥ 3 on the VAS was considered pain. Shoes were categorized as either minimalist (n=40 feet, midsole drop <4mm) or traditional (n=56 feet, midsole drop>4mm). Superior view photographs were taken of the FF and were categorized as Egyptian (EF) (n=73 feet, typical foot with Hallux the most distal toe), Morton's (MF) (n=10 feet, 2nd toe longer than Hallux), or square (SQ) (n=13 feet, Hallux and 2nd toe equal length). Separate three-factor chi-square analyses determined if shoe type (minimalist, traditional) and forefoot type (EF, MF, SQ) were related to pain (yes, no). (α=0.05). **Results:** More minimalist runners with EF reported pain (61.8%; p=0.004) when compared to MF (50%) or SQ (20%). More minimalist runners with EF reported calf pain (77.8%; p=0.028) than those with MF (0%) or SQ (20%). FF type did not relate to pain at any other site. **Conclusion:** Runners with EF are more likely to report pain in at least one location, and specifically in the calf, than runners with other FF shapes when wearing minimalist vs traditional shoes. Minimalist shoes encourage the runner to strike the ground with the forefoot; however, this requires more eccentric loading of the calf musculature and Achilles tendon. Our minimalist runners with EF reported more calf pain than those with other FF types. Other FF types may be better able to absorb the foot contact and muscle forces better than a more typical foot when wearing minimalist shoes.

2540   June 1 1:15 PM - 1:30 PM

Sagittal Plane Gait Mechanics are Associated with Femoral Cartilage Thickness After ACL Reconstruction

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(No relevant relationships reported)

Individuals with ACL reconstruction (ACLR) are at greater risk for knee osteoarthritis (OA) due to aberrant walking biomechanics. Cartilage morphology is typically imaged using magnetic resonance imaging, but ultrasonography may provide a cost-effective alternative method. **PURPOSE**: To evaluate the association between sagittal plane knee mechanics and femoral cartilage thickness in individuals with ACLR. **METHODS**: 33 individuals with primary unilateral ACLR (age=22.2±2.9 years; body mass index=24.2±4.5 kg/m²; time since ACLR=55.8±31.6 months; 73% Female; IKDC=85.7±9.5; 16 patellar tendon; 8 hamstring tendon; 9 allograft) participated in this study. Femoral cartilage thickness was assessed at the medial (MC) and lateral (LC) femoral condyle, and intercondylar (IC) notch using ultrasonography in 140° of knee flexion. Participants completed 5 walking trials at a self-selected speed while striking consecutive force plates, and data were extracted from the first 50% of stance phase. Kinematic variables included the peak knee flexion angle (KFA), knee flexion angle at heel contact (KFHC), and knee flexion excursion (KFE). Kinetic variables included the peak external knee flexion moment (KFM) and angular impulse (KFI). Partial correlation adjusted for gait speed and time since ACLR was used to analyze the relationship between ultrasound and gait variables (α=0.05). **RESULTS**: After adjusting for gait speed and time since ACLR, greater KFI was associated with thicker MC cartilage (r=0.46, p=0.006). Trends were observed between greater KFI and

thicker LC cartilage (r=0.26, p=0.08) and thicker IC cartilage (r=0.28, p=0.07). Larger KFE was associated with thicker MC cartilage (r=0.34, p=0.04), thicker LC cartilage (r=0.39, p=0.02), and thicker IC cartilage (r=0.38, p=0.02). Larger KFA was associated with thicker MC cartilage (r=0.29, p=0.05) and thicker IC cartilage (r=0.36, p=0.03). No relationships were found between cartilage thickness measures and KFHC or KFM. **CONCLUSIONS**: These data suggest that sagittal plane knee mechanics during gait are associated with thicker femoral cartilage in individuals with ACLR. Knee flexion is used to attenuate ground reaction force during gait. As such improving sagittal plane knee mechanics during gait may alleviate knee OA risk in individuals with ACLR.

2541   June 1 1:30 PM - 1:45 PM

Intrinsic and Extrinsic Muscle Function in Rearfoot Strikers During Barefoot and Shod Treadmill Running

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(No relevant relationships reported)

Barefoot/minimalist running is theorized to cause an increase in the activity of intrinsic and extrinsic foot muscles. Although studies have shown an increase in the activity of extrinsic foot muscles during barefoot running very little data exists documenting the effects of barefoot running on intrinsic foot muscles. **PURPOSE**: To compare the activity of select extrinsic and intrinsic muscles during barefoot and shod running in rearfoot strikers.
METHODS: A convenience sample of 21 recreational runners were assigned to run both shod and barefoot in a random order. Electrodes were placed on the subjects' dominant lower extremity over the peroneus longus (PL), tibialis anterior (TA), and abductor hallucis (AH) muscles. Subjects participated in a treadmill running protocol consisting of running at 8.0 and 9.7 kph while lower extremity kinematics and electromyographic (EMG) activity of the muscles were recorded using an 8 camera motion analysis system in both footwear conditions. The EMG data were filtered with a fourth order, band pass filter with 10 and 350 Hz cutoffs. Using a 250 ms window, the root mean square (RMS) of the filtered data was obtained. The RMS was normalized to the peak EMG activity of the 8.0 kmh barefoot trials. Using the marker displacement data, the stance phases of the amplitude normalized 9.7 kmh trials were extracted. The average RMS value of the PL, TA, and AH during the stance phase of these trials were obtained and grouped according to running speed and muscle. A two factor, fixed effects ANOVA model was used to determine the effect of footwear condition and muscle on the mean RMS values.
RESULTS: The mean (± 1 S.E.) amplitude normalize RMS value during the barefoot condition for the TA, PL, and AH was 50 (± 4.7), 109 (± 17.9), and 123 (± 18.4) percent, respectively. During the shod condition the mean (± 1 S.E.) amplitude normalize RMS value for the TA, PL, and AH was 52 (± 6.1), 103 (± 17.3), and 130 (± 16.8). A significant effect was noted only for muscle (p < .001). Both the PL and the AH exhibited significantly greater activity than the TA in both the shod and barefoot conditions. A significant effect of footwear condition was not present (p = .923).
CONCLUSIONS: In rearfoot strikers, footwear does not appear to affect the EMG activity of the TA, PL, or AH.

2542   June 1 1:45 PM - 2:00 PM

Barefoot Gait Adaptations Remain With Use of the Barefoot Orthotic

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(No relevant relationships reported)

Orthotics are used to treat a number of foot and ankle pathologies, but require the use of supportive footwear. Alternatively, the barefoot condition enhances sensation from the plantar foot leading to gait adaptations that may influence injury prognosis and incidence. Recently, a barefoot orthotic (Hozhoni Balance Rail®) was designed to adhere to the plantar surface rather than being secured inside footwear; thus, potentially allowing for the benefits of the barefoot gait, while also providing the stability of an orthotic. **PURPOSE:** To determine if the commonly observed barefoot gait adaptations were found when walking and running with the barefoot orthotic. **METHODS**: 12 healthy habitually shod runners (7 men and 5 women, age: 25 ± 3.8 yr; height: 1.58 ± 0.15 m; mass: 68.1 ± 8.9 kg) participated in this study. Gait kinematics and kinetics were analyzed as participants performed 10 over-ground trials of running and walking in running shoes (SHOD), barefoot (BF), and while wearing the barefoot orthotics (BF ORTHO). Kinematic data was obtained via 3D motion analysis and ground reaction force (GRF) data were captured as subjects ran across a runway with an embedded force plate. Kinematic and kinetic differences between the SHOD, BF and BF ORTHO conditions for both walking and running were analyzed using repeated measures ANOVA tests. **RESULTS**: There were no significant differences between the BF and BF ORTHO conditions in terms of gait kinematics or kinetics in either walking or running, indicating that the barefoot orthotic does not interfere with the natural barefoot gait. Consistent with previous research,

subjects exhibited decreased stride lengths in the BF and BF ORTHO conditions when walking (BF: 1.38±0.20 m, BF ORTHO: 1.43±0.19 m, SHOD: 1.54±0.17 m, p<0.05 compared to SHOD) and running (BF: 1.98±0.27 m, BF ORTHO: 2.06±0.30 m, SHOD: 2.16±0.31 m, p<0.05 compared to SHOD). Additionally, the BF and BF ORTHO conditions were associated with reduced peak vertical GRFs in walking (BF: 1.16±0.10 m, BF ORTHO: 1.19±0.12 m, SHOD: 1.29±0.11 m, p<0.05 compared to SHOD) and running (BF: 2.29±0.26 m, BF ORTHO: 2.27±0.21 m, SHOD: 2.48±0.22 m, p<0.05 compared to SHOD). **CONCLUSION**: The barefoot orthotic does not interfere with the natural barefoot gait, indicating the potential for clinical use while barefoot or without supportive footwear.

2543   June 1 2:00 PM - 2:15 PM

The Influence of Maximal Running Shoes on Biomechanics Prior to and Following a 5K Run

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(No relevant relationships reported)

Lower extremity injuries are a common occurrence among runners. Recent footwear trends have included minimal and maximal running shoe types. Maximal running shoes are unique because they provide the runner with a highly cushioned midsole in both the rearfoot and forefoot. Little is known about how maximal shoes influence running biomechanics. **PURPOSE**: To examine the influence of maximal running shoes on biomechanics prior to and following a 5K run as compared to neutral running shoes. **METHODS**: : Fifteen female runners participated in two testing sessions (neutral shoe session and maximal shoe session) with 7-10 days between sessions. Three-dimensional kinematics and kinetics were collected while subjects ran along a 10 meter runway. After five running trials, they completed a 5K treadmill run, and then completed five additional running trials. Variables of interest included impact peak of the vertical ground reaction force, loading rate, and peak eversion. Differences were determined by using a series of two-way repeated measures ANOVA models (shoe x time). **RESULTS**: There was a significant main effect for shoe type for impact peak and loading rate. Comparing the neutral shoe to the maximal shoe prior to and following running a 5K, subjects exhibited an increased loading rate [(pre-neutral: 60.83 BWs/sec; pre-maximal: 81.15 BWs/sec) p=0.000, (post-neutral: 61.22 BWs/sec; post-maximal: 79.10 BWs/sec) p=0.008], and increased impact peak [(pre-neutral: 1.58 BWs; pre-maximal: 1.76 BWs) p=0.004, (post-neutral: 1.55 BWs; post-maximal: 1.79 BWs) p=0.003] in the maximal shoe condition. There were no shoe-time interactions and no significant findings for peak eversion. **CONCLUSIONS**: Runners exhibited increased impact forces and loading rate when running in a maximal versus neutral shoe. Since increases in these variables have been associated with an increased risk of running related injuries, runners who are new to running in a maximal shoe may be at an increased risk of injury. Therefore, runners should be cautious when switching from a neutral shoe to a maximal shoe; however, further work is necessary to better understand the longer-term impact.

2544   June 1 2:15 PM - 2:30 PM

Kinematics And Muscle Activity While Running In Minimalist, Neutral, And Ultra-cushioning Shoes

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(No relevant relationships reported)

While several studies have compared muscle activity in minimalist and traditional running shoes, to date it is unknown how muscle activity changes when running in ultra-cushioning shoes. **PURPOSE:** To evaluate differences in kinematics and muscle activity while running in minimalist (Min), traditional (Trad), and ultra-cushioning (Ultra) shoes. **METHODS:** Participants included 13 runners (sex: 5 M; 8 F; age: 22 ± 5.4 years). Whole body kinematics were recorded using a 12-camera motion capture system while participants ran in each shoe. Ankle, knee, and hip range of motion (ROM) during stance phase were calculated in all three planes. Muscle activity was recorded from seven lower extremity muscles. Differences in kinematics and average root mean square (RMS) amplitude during stance were evaluated using one-way repeated measures ANOVAs. **RESULTS:** Mean values for variables with significant differences are shown in Table 1. Post hoc comparisons revealed hip internal rotation ROM was higher in the Ultra shoes than in either the Trad (p=.033) or Min (p=.047) shoes. Ankle dorsiflexion ROM was lower in the Ultra shoes than in either the Trad (p=.007) or Min (p=.038) shoes. Mean gluteus medius RMS was higher in the Ultra shoes than in either the Trad (p=.013) or Min (p= .017). Mean RMS for the tibialis anterior was also higher in the Ultra shoes than in either the Trad (p=.033) or Min (p=.029). Finally, mean RMS for the peroneus longus was higher in the Ultra shoes than the Trad shoes (p=.046). **CONCLUSION:** The minor differences in kinematics suggest individuals maintained their preferred movement path in all three shoes. However, the increased muscle activity may indicate the neuromuscular system was working harder to maintain the preferred path in the Ultra shoes.

Table 1. Mean (± standard deviation) for variables which were significantly different between shoe conditions. *F* and *p* values refer to omnibus tests. For post hoc values see text.

	Min	Trad	Ultra	$F_{2,24}$, p
Hip int. rotation ROM (°)	7.0 ± 5.6	6.4 ± 4.4	8.4 ± 5.9	4.82, .017
Ankle dorsiflexion ROM (°)	20.8 ± 3.6	20.7 ± 4.2	18.3 ± 3.7	6.69, .005
Mean GM RMS (mV)	3.6 ± 1.2	2.6 ± 0.7	6.5 ± 2.4	5.15, .014
Mean TA RMS (mV)	6.4 ± 3.1	5.0 ± 4.6	7.1 ± 4.5	4.50, .036

2545   June 1 2:30 PM - 2:45 PM

Sex and Speed Influence Frontal Plane Kinematics During Running

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(No relevant relationships reported)

Frontal plane mechanics, such as hip adduction angle and base of gait (BOG), have been implicated as causes for running-related injuries such as iliotibial band syndrome and patellofemoral pain. While modification of frontal plane variables may be a way to alter injury risk, the effect of speed and sex on frontal plane mechanics has not been investigated. Describing these effects may facilitate more appropriate prescription of gait retraining to reduce injury risk. **PURPOSE**: To determine the influence of sex and speed on frontal plane kinematics during running. **METHODS**: Whole body kinematics and ground reaction forces were collected for 99 NCAA Division I collegiate athletes (52 males) during treadmill running at 2.68, 3.35, and 4.47 m/s. Athletes were healthy at time of testing and had no history of lower extremity surgery. BOG at midstance (cm), hip adduction at initial contact (ADD_{IC}, deg), peak hip adduction (ADD_{PK}, deg), and peak contralateral pelvic drop (PEL_{PK}, deg) for the right limb were compared between sex and speed using 2-way repeated measures ANOVAs. **RESULTS**: A significant sex by speed interaction (p < 0.01) for BOG was observed. BOG decreased significantly (p < 0.01) with speed for both sexes. Females exhibited larger BOG than males at 3.35 and 4.47m/s (females: 0.6 ± 1.5 cm and -0.1 ± 1.5 cm, males: 0.2 ± 2.4 cm and -0.9 ± 2.5 cm for 3.35 and 4.47 m/s, respectively). No significant interactions (p ≥ .40) were observed for ADD_{IC}, ADD_{PK}, or PEL_{PK}. There was a significant speed main effect for ADD_{IC}, ADD_{PK}, and PEL_{PK}. ADD_{IC} and ADD_{PK} increased significantly with speed (p < 0.01). PEL_{PK} at 2.68m/s was significantly less than 3.35 and 4.47m/s (p < 0.01, mean difference = 0.5 deg). Females demonstrated greater ADD_{IC} and ADD_{PK} than males (p < 0.01, mean difference = 2.0 deg for both ADD_{IC} and ADD_{PK}). **CONCLUSIONS**: Females demonstrate a wider BOG than men at faster running speeds. Females also demonstrate greater hip adduction than men at the same running speed. As a result, both sex and speed must be considered when assessing frontal plane kinematic variables, particularly with regard to identifying excessive motion which may be related to injury.

2546   June 1 2:45 PM - 3:00 PM

Lower Extremity Strength & Kinematic Variability in Healthy Runners During a Prolonged Run: Preliminary Analysis

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(No relevant relationships reported)

BACKGROUND: To date limited studies incorporating prolonged runs in healthy runners have produced conflicting results. Furthermore, kinematic variability of the ankle, knee and hip have not been assessed, nor has hip strength been measured simultaneously. Rather previous studies have focused on foot contact angle variability and stride time variability.
PURPOSE: To compare changes in lower limb strength & kinematic variability after a prolonged run in healthy runners.
METHODS: 7 healthy subjects (25±2.5 years, 1.77±0.12 m, 65.2±19.9 kg) volunteered for this study. Subjects ran on a motorized treadmill for an average of 44.3±1.9 minutes at a self-selected training pace. 3D kinematic data were collected after 5 minutes of running and again at the end of the run at 200Hz using reflective markers placed on the lower body with 6 infrared cameras. Variables of interest included ankle, knee and hip sagittal, frontal and transverse plane angles. Standard deviation (SD) and coefficient of variation (CV), were calculated for each dependent variable (DV) at the beginning and end of run. Approximate entropy (ApEn) was also calculated for each DV at both time intervals. Hip strength was assessed in the sagittal, frontal and transverse planes of motion before and after the run using a handheld dynamometer. Each subject performed 3 maximum voluntary isometric contractions (MVICs) for each motion. The highest number for each motion was recorded.

Additionally, heart rate (HR) and rate of perceived exertion (RPE) was recorded at the beginning and end of run. A paired samples T-test was conducted to compare all DVs. Alpha level was set at 0.05.
RESULTS: Average running speed: 2.63±.26 m/s. Only hip front plane SD was significantly different from the beginning to the end of the run (t=-2.93, p=.03). Specifically, SD increased from 7.42±1.63 to 8.21±1.44. All other DVs, including all strength measures, remained unchanged from the beginning to end of run (p>0.05).
CONCLUSIONS: Based on our preliminary results, a prolonged run had minimal impact on kinematic variability and hip strength. Despite subjects reaching a fatigued state (RPE 17; 85% HR max), each subject was able to maintain their preferred running pattern. Perhaps it is not the running time that affects kinematic variability, but the combination of both time and intensity of the run.

F-13   Free Communication/Slide - **Physical Activity, Sedentary Behavior and Health: New Epidemiologic Findings**

Friday, June 1, 2018, 1:00 PM - 3:00 PM
Room: CC-101CD

2547   **Chair:** Charles E. Matthews, FACSM. *National Cancer Institute, Rockville, MD.*

(No relevant relationships reported)

2548   June 1 1:00 PM - 1:15 PM

Mortality Attributable to Sedentary Behavior and Physical Inactivity in the United States

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(No relevant relationships reported)

In addition to the health hazards associated with lack of moderate-to-vigorous physical activity (MVPA), sedentary behavior (i.e. sitting) has recently been identified as potential risk factor for premature mortality. **PURPOSE:** To estimate the population attributable fraction [PAF%] for all-cause mortality in the United States associated with combined categories of sedentary behavior and MVPA. **METHODS:** Data on the prevalence [P] of combined sedentary behavior and MVPA categories were obtained from self-report questionnaires in the 2013-14 U.S. National Health and Nutrition Examination Survey [N= 5,926 non-pregnant adults 18+ y of age]. Sedentary behavior was operationalized as daily sitting time in the following categories (h/day): <4, 4-5.9, 6-8, and >8. Total MET-h per week of MVPA was computed and categorized into 4 groups: ≤2.5, 2.51-16, 16.01-34.5, and ≥34.51. Hazard ratios (HRs) for all-cause mortality associated with the combined sedentary behavior and MVPA categories were obtained from a published pooled analysis of 1,005,791 adults [Ekelund et al. The Lancet 2016;388:1302-10]. The PAF% [((P[HR-1])/(P[HR-1]+1))X100] for all 16 combinations of sedentary behavior and MVPA were computed and summed across groups to determine the overall PAF% associated with sedentary behavior and physical inactivity. **RESULTS:** Population prevalence in the combined categories sitting and MVPA ranged from 2.3% to 19%, with the highest prevalence observed in the low MVPA/high sitting groups. The overall PAF% associated with sitting and physical inactivity was 25.8%. **CONCLUSION:** Approximately 26% of premature deaths in the United States can be attributable to excessive sitting and physical inactivity.

2549   June 1 1:15 PM - 1:30 PM

Physical Activity Throughout Adulthood And Medicare Expenditures In Us Adults

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(No relevant relationships reported)

PURPOSE: To examine the relationship between moderate-to vigorous physical activity (MVPA) participation throughout adulthood and Medicare health care expenditures later in life.
METHODS: NIH-AARP Diet and Health Study respondents' data were linked to Medicare claims data (N=21,750 US adults) to estimate health care utilization and costs prospectively after age 65 yrs. The analytical cohort, retrospectively reported their MVPA participation (never/rarely, <1, 1-3, 4-7, and >7 hrs/week) for ages 15-18, 19-29, 35-39 and 43-64 years, from a single time-point prior to Medicare eligibility. 10 distinct MVPA trajectories were identified, and a two-part multivariable model was used to estimate the association between trajectories and average annual Medicare expenditures.

RESULTS: The mean number of accumulated years of health care expenditures was 6.2 years, and the average annual total health care cost was $7,813/person/year. After adjustment, average annual expenditures were lower for adults who were consistently active (i.e., 7 hrs/week MVPA throughout adulthood), aggressive improvers (i.e., very little activity during adolescent but consistent 7 hrs/week during adulthood), and with a lull in 20-30s (i.e., very active during adolescent, moderately active in 20-30s, very active in mid-life) when compared to those who did no MVPA in any life-period (i.e., consistently inactive) (See Table). Detailed sensitivity analyses did not reveal evidence of confounding or effect modification.

CONCLUSION: Adults that are consistently active or show substantial MVPA improvement throughout adulthood have lower health care expenditures after age 65. Strategies that promote physical activity throughout adulthood may help reduce Medicare expenditures.

Table: Medicare expenditures based on MVPA trajectory throughout adulthood

Trajectory (N)	Average marginal decrease (per person/year) (95% CI)	
	Age-adjusted	Multivariable
Consistently inactive (743)	Referent	Referent
Moderate improver (1,988)	-$1,116 (-$1,185, -$1,047)	-$818 (-$2061, $425)
Consistent 1hr (3,273)	-$152 (-$221, -$83)	-$48 (-$1249, $1,154)
Aggressive improver (1,168)	-$2,310 (-$2,382, -$2,237)	-$1,896 (-$3,178, -$616)
Early improver & late decliner (1,128)	-$1,044 (-$1,122, -$965)	-$819 (-$2,106, $467)
Moderate decliner (2,028)	$255 ($176, $335)	-$101 (-$1,357, $1,155)
Fast decliner (1,676)	-$319 (-$393, -$247)	-$250 (-$1,518, $1,018)
Consistently active (5,220)	-$1,421 (-$1,488, -$1,354)	-$1,165 (-$2,299, -$31)
Steady decliner (1,802)	-$37 (- $144, +$39)	-$115 (-$1,389, $1,160)
Lull in 20-30s (2,724)	-$1,607 (-$1,675, -$1,540)	-$1,423 (-$2,602, -$244)

2550   June 1 1:30 PM - 1:45 PM

Sitting Time And Quality Of Life In Office Workers Undergoing A Sedentary Behavior Intervention

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(Sponsor: Matthew P. Buman, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of this study was to investigate the association of changes in occupational sitting time and self-rated quality of life (QOL) in adult sedentary office workers undergoing a sedentary behavior intervention. **METHODS**: Data were derived from the ongoing study 'Stand & Move at Work', a group randomized trial aimed at reducing employee sedentary time through individual, environmental, and policy level changes. Physical functioning and mental health QOL scores were assessed with the SF-12 questionnaire. Sitting time (min/day) throughout the work day was assessed by the activPal accelerometer/inclinometer with seven days of continuous wear. Work logs were used to isolate sitting minutes at work. These measures were assessed at baseline and at the three month time-point during the intervention. Change over time was computed for all variables by subtracting the individual 3-month value from the baseline value. The correlations between change in sitting time and changes in physical functioning and mental health were estimated by Pearson's correlation coefficient. **RESULTS**: A total of 344 men and women were available for these analyses, of whom 24% were male and the average age was 45 +/- 11 yr. The mean baseline sitting time was 70 +/- 16% of the workday. Change in sitting time was inversely correlated with the physical functioning score (r=-0.13, p <0.05), whereas sitting time was not associated with the mental health score (r=-.042, p = 0.44). **CONCLUSIONS**: Decreases in sitting time were associated with improvement in self-reported physical functioning quality of life but not in mental health quality of life. Longer term results over 12 months of intervention and comparisons between the two different intervention arms may shed more light on the robustness and interpretation of the possible link between sitting time and quality of life domains.

2551   June 1 1:45 PM - 2:00 PM

10-year Changes In Accelerometer-determined Physical Activity And Sedentary Time During Midlife: CARDIA

Kelley Pettee Gabriel, FACSM[1], Steve Sidney[2], David R. Jacobs, Jr.[3], Mercedes Carnethon[4], Cora E. Lewis[5], Pamela Schreiner[3], Raja Malkani[1], James M. Shikany[5], Kara M. Whitaker[6], Jared P. Reis[7], Barbara Sternfeld, FACSM[2]. *[1]University of Texas Health Science Center at Houston School of Public Health, Austin, TX. [2]Kaiser Permanente Northern California, Oakland, CA. [3]University of Minnesota, Minneapolis, MN. [4]Northwestern University, Chicago, IL. [5]University of Alabama at Birmingham, Birmingham, AL. [6]University of Iowa, Iowa City, IA. [7]National Heart, Lung, and Blood Institute, Bethesda, MD.*
(No relevant relationships reported)

PURPOSE: Describe the 10-year race/sex specific changes in accelerometer-determined physical activity (PA) and sedentary time in a midlife cohort.
METHODS: Data are from 881 Coronary Artery Risk Development in Young Adults (CARDIA) participants aged 18 to 30 years at baseline (1985-86) who wore the accelerometer and had valid wear ($\geq$4 of 7 days, $\geq$10 hours per day) at the Year 20 (2005-06; ages 38-50) and Year 30 (2015-16; ages 48-60) exams. At Year 20, accelerometer measures were first collected using the ActiGraph 7164; at Year 30 the ActiGraph wGT3X-BT model was used. A calibration factor (counts divided by 1.088, based on a subset who simultaneously wore both devices at Year 30) was applied to Year 30 data to account for differences in models. All 10-year change estimates are expressed as median (25th, 75th percentiles). Wilcoxon Rank Sum tests were used to examine 10-year changes overall and within the four race/sex groups.
RESULTS: Over 10 years, participants experienced significant reductions in average accelerometer counts [-46.7 (-122.7, 31.1 ct·min·d^{-1}; $p<0.001$]. This reduction was shown within each race/sex group, with the greatest decline observed in black men (all $p<0.001$). Sedentary time significantly increased overall (32.9 min·d^{-1}), with the largest increases shown in black women (56.9 min·d^{-1}) followed by black men (50.2 min·d^{-1}), white women (28.9 min·d^{-1}) and men (19.0 min·d^{-1}); all $p<0.001$. Light intensity PA decreased (-29.2 min·d^{-1}), with black men having the greatest reductions (-38.3 min·d^{-1}), followed by white (-35.3 min·d^{-1}) and black (-26.6 min·d^{-1}) women, then white men (-25.6 min·d^{-1}); all $p<0.001$. Moderate to vigorous intensity PA (MVPA) also declined (-5.5 min·d^{-1}) with the largest reductions shown in black men (-7.3 min·d^{-1}), then white men (-6.9 min·d^{-1}), and white (-4.9 min·d^{-1}) and black (-4.3 min·d^{-1}) women; all $p<0.001$. Of note, black women had the lowest accumulated MVPA at Year 20. Finally, median time spent in MVPA bouts lasting $\geq$8 of 10 consecutive minutes slightly increased in white men and women (2.3 and 0.60 min·d^{-1}, respectively; both p<0.01), which was not shown in black participants.
CONCLUSIONS: We found a decline in overall PA during the midlife transition. This reduction was largely attributable to increases in sedentary time and reductions in light intensity PA.

2552   June 1 2:00 PM - 2:15 PM

Effects of Replacing Prolonged Sedentary Bouts with Short Sedentary Bouts or Physical Activity On Mortality

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(No relevant relationships reported)

Evidence suggests that prolonged, uninterrupted sedentary bouts (e.g. sitting for hours at a time) may be the most harmful manner in which to accumulate sedentary behavior. Little is known concerning the type of activity that should be substituted for prolonged, uninterrupted sedentary bouts to impart health benefit. For example, does substituting longer sedentary bouts with shorter sedentary bouts reduce mortality risk, or is physical activity needed? **PURPOSE**: Using isotemporal substitution techniques, the purpose of this study was to examine whether replacing prolonged sedentary bouts with (1) shorter sedentary bouts, (2) light-intensity physical activity (LIPA), or (3) moderate-vigorous intensity physical activity (MVPA) is associated with reductions in all-cause mortality risk. **METHODS**: Participants (n=7,999) from the REasons for Geographic and Racial Differences in Stroke (REGARDS) Study, a national cohort study of black and white U.S. adults $\geq$45 years, were studied. Sedentary time was measured using a hip-mounted accelerometer worn for 7 consecutive days. In isotemporal substitution models, short sedentary bout time (bouts <30 min), LIPA, MVPA, and accelerometer wear time (each expressed in 30 minute units per day) were included in a single Cox regression model that included adjustment for covariates. Resultant hazard ratios (HR) estimated associations for replacing 30 min of prolonged sedentary bout time (bouts $\geq$

30 min) with an equal amount of time in a given type of activity (short sedentary bouts, LIPA, or MVPA) on all-cause mortality risk. **RESULTS**: Over a median follow-up of 5.5 years, there were 647 deaths. There was a beneficial association for replacing prolonged, uninterrupted sedentary bout time with both LIPA (per 30-minute HR: 0.85; 95% CI: 0.80-0.90) and MVPA (per 30-minute HR: 0.69; 95% CI: 0.52-0.90) on all-cause mortality risk, but no association for replacement with shorter sedentary bouts (per 30-minute HR: 0.99; 95% CI: 0.96-1.03). **CONCLUSIONS**: In this national cohort study of middle-aged and older adults, replacing prolonged, uninterrupted sedentary bouts with shorter sedentary bouts was not associated with a reduction in all-cause mortality risk. Instead the all-cause mortality risk incurred by prolonged, uninterrupted sedentary bouts was only reduced by LIPA or MVPA.

2553 June 1 2:15 PM - 2:30 PM

Mortality Risk Reductions for Replacing Sedentary Time with Physical Activities

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(No relevant relationships reported)

BACKGROUND: Insufficient physical activity is a well-established risk factor for chronic disease and early mortality. More recent evidence suggests that excess sitting time may be an additional risk factor, independent of physical inactivity. This may be due, at least in part, to the displacement of physical activities with sedentary behaviors. PURPOSE: To examine the mortality risk reductions associated with replacing thirty minutes of daily sitting time for an equivalent duration of physical activity. METHODS: Participants included 40,866 men and 60,891 women in the Cancer Prevention Study-II Nutrition Cohort. An isotemporal substitution approach to Cox proportional hazards regression models were used to estimate adjusted hazard ratios (HR) and 95% confidence intervals (HR, 95% CI) for all-cause mortality associated with the substitution of thirty minutes of daily sitting time with an equal duration of light or moderate-to-vigorous intensity physical activity (LPA, MVPA). RESULTS: During 14 years (1999-2013) of follow-up, 16,163 men and 15,638 women died. Overall, reallocation of 30 min·day^{-1} of sitting to LPA (HR=0.94, 0.92-0.97) or MVPA (HR=0.91, 0.88-0.93) was associated with significant reductions in mortality risk. Among the least active participants, the replacement of 30 min·day^{-1} of sitting time with 30 min·day^{-1} LPA was associated with a 14% mortality risk reduction (HR=0.86, 0.83-0.89) and replacement with MVPA was associated with a 50% mortality risk reduction (HR=0.50, 0.44-0.58). Similar associations were seen among the moderately active group (HR=0.91, 0.89-0.96 for LPA replacement, HR=0.65, 0.56-0.79 for MVPA replacement). However, among the most active participants, substitution of sitting time with LPA or MVPA was not associated with a significant reduction in mortality risk (HR=1.00, 0.97-1.02, HR=0.97, 0.95-1.01, respectively). CONCLUSIONS: Among the least active and moderately active, the replacement of modest amounts of sitting time with either LPA or MVPA was associated with longevity, although the associations were strongest when sitting time was replaced with MVPA.

2554 June 1 2:30 PM - 2:45 PM

Changes in Energy Reserves Contribute to Cognitive Decline with Aging

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(No relevant relationships reported)

PURPOSE: Identification of physiological changes that predict functional decline and reflect the onset of cognitive change may identify mechanisms common to mobility and cognition; potentially leading to earlier diagnoses and intervention efforts. Although greater peak VO$_2$ and walking efficiency have been linked to better preservation of physical functioning with aging, it is unclear how changes in energy reserve affect cognitive performance. The objective of this study was to assess the association between longitudinal changes in energy reserve and cognitive performance in a cohort of well-functioning adults. METHODS: Peak VO$_2$ (ml/kg/min), the energetic cost of a 5-min 1.5 mph treadmill walk (ml/kg/min), and cognitive performance were assessed in over 1000 participants (mean baseline age 67.5, range 24- 96, 49% male) of the Baltimore Longitudinal Study of Aging. The primary outcomes were changes in the domains of attention, memory, and executive function over an average of 4-years (range 1-7 yrs), measured through a neuropsychological battery at each visit. The primary predictor was energy reserves (mean walking VO$_2$/peak VO$_2$). The association between change in energy reserves and change in cognitive performance was modeled using linear regression models with generalized estimating equations for repeated measures, adjusted for age, sex, body mass index (kg/m^2), race, education, number of chronic conditions, and an interaction between energy reserves and age.

RESULTS: In fully adjusted population average models, a significant interaction between energy reserves and age was observed for memory (β = -0.42, p<0.001), executive function (β = 1.63, p<0.001), and attention (β = -0.19, p=0.04), indicating that declining energy reserves contributed to poorer cognitive performance in all domains over time. Z-scores indicate these effects were greatest for memory, followed by executive function and attention.
CONCLUSIONS: Among well-functioning, community-dwelling adults, declining energy reserves are linked to poorer cognitive performance over time. This evidence indicates that combining measures of energy capacity and energy cost to assess physiologic reserve may serve as an early indicator of cognitive decline and convey evidence of those at risk of poorer cognitive outcomes over time.

2555 June 1 2:45 PM - 3:00 PM

Strong Evidence from the 2018 Physical Activity Guidelines Advisory Committee

Alison Vaux-Bjerke[1], Eric Hyde[2], Katrina L. Piercy[1], Richard D. Olson[1], Richard P. Troiano[3], Janet E. Fulton, FACSM[2]. [1]*Office of Disease Prevention & Health Promotion, U.S. Dept. of Health & Human Services, Rockville, MD.* [2]*Centers for Disease Control and Prevention, U.S. Dept. of Health & Human Services, Atlanta, GA.* [3]*National Cancer Institute, National Institutes of Health, U.S. Dept. of Health & Human Services, Bethesda, MD.* (Sponsor: Janet Fulton, FACSM)

(No relevant relationships reported)

The U.S. Department of Health and Human Services (HHS) charged an external federal advisory committee to review the scientific literature and provide independent recommendations to the government to inform the development of the second edition of the *Physical Activity Guidelines for Americans*.
Purpose To present a selection of conclusions with evidence graded as 'strong' from the 2018 Physical Activity Guidelines Advisory Committee (Committee) systematic literature review.
Methods The Committee asked 38 questions on relationships between physical activity and health outcomes in systematic literature reviews. A grading rubric was used to evaluate the strength of evidence - Strong, Moderate, Limited, or Grade Not Assignable (insufficient evidence). A grade of 'strong' indicated that evidence from the literature directly applied to the systematic review question; was free from serious doubts about generalizability; limited the risk of bias; showed consistency in the direction and approximate size of the effect across studies; and provided considerable confidence in the accuracy of the findings. The Committee presented its conclusions during five public meetings.
Results The Committee concluded there was strong evidence that physical activity has a beneficial effect on many health outcomes, including improvements in weight and bone health in children under age six, physical function in older adults, and incidence of seven types of cancer. Examples are provided in Table 1.
Conclusion The Committee's systematic reviews will be compiled into a Scientific Report and submitted to the HHS Secretary. The Department will use the Committee's evidence-based recommendations, as well as public and federal agency comments, to develop the second edition of the *Physical Activity Guidelines for Americans*. The Committee's work firmly grounds the second edition of the *Physical Activity Guidelines for Americans* in the current science on physical activity and health.

Table 1. Selected conclusion statements for 'strong' evidence.

Subcommittee / Work Group	Topic	Conclusion Statement
Brain Health	Dementia	Strong evidence demonstrates that greater amounts of physical activity are associated with a reduced risk of developing dementia.
	Anxiety	For the general population, strong evidence demonstrates reduced state anxiety following acute bouts of exercise and reduced trait anxiety following weeks/months of regular exercise.
	Depression	Strong evidence demonstrates that greater amounts of physical activity reduce the risk for depression.
Cardiometabolic Health and Weight Management	Weight Gain	Strong evidence demonstrates a relationship between greater amounts of physical activity and attenuated weight gain in adults, with some evidence to support that this relationship is most pronounced when physical activity exposure is above 150 minutes per week.
Sedentary Behavior	All-cause mortality	Strong evidence demonstrates a significant relationship between greater time spent in sedentary behavior and higher all-cause mortality rates.
Youth	Fitness in youth ages 6-17	Strong evidence demonstrates that increased moderate-to-vigorous physical activity increases cardiorespiratory fitness and increased resistance exercise increases muscular fitness in children and adolescents.
Pregnancy Work Group	Prevention of gestational weight gain	Strong evidence demonstrates a significant, but modest, inverse relationship between physical activity and gestational weight gain.
	Incidence of gestational diabetes mellitus	Strong evidence demonstrates a significant inverse relationship between leisure-time physical activity and risk of gestational diabetes mellitus.

F-31   Thematic Poster - **Cardiac Physiology**

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100C

2610   Chair: Tracy Baynard, FACSM. *University of Illinois at Chicago, Chicago, IL.*

(No relevant relationships reported)

2611   Board #1   June 1 3:15 PM - 5:15 PM

Effects of Increased Preload on Cardiac Function in Younger vs Older Women

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(No relevant relationships reported)

PURPOSE: Limitations in cardiac preload and/or compliance could underlie diminished stroke volume and ventricular remodeling adaptations to endurance exercise in older women. The present study tested the hypothesis that attenuated cardiac function in older women persists during acute increases in preload, both at rest and during exercise. **METHODS**: Nine younger (Y, 21-28 y) and ten older (O, 61-73 y) healthy, non-endurance trained women were studied 1) at rest in the supine and seated positions, and 2) during graded upright cycle ergometer exercise (20, 40, 60 and 80% of VO$_2$peak), both before and after acute plasma volume (PV) expansion (via IV infusion of 5% albumin; 10ml/kg). Cardiac responses to postural change, exercise, and PV expansion were measured using echocardiography (rest and low intensity exercise) and open circuit C$_2$H$_2$ (exercise). **RESULTS**: Under resting normovolemic conditions, stroke volume (SV) was augmented in the supine (vs. upright) posture in both Y (61±9 vs. 52±8 ml/beat, P<0.05) and O (55±10 vs. 49±7 ml/beat, P<0.05) women. Hypervolemia augmented supine SV further in Y (68±4 ml/beat, P<0.05 vs. normovolemia), but not in O (55±10 ml/beat, P>0.05 vs. normovolemia) women. These resting postural and hypervolemic effects were mediated by changes in end diastolic volume, and not secondary to age group differences in the extent of PV expansion (averaged +16% and +13% in Y and O, respectively) or estimated filling pressures (E/E'). E/A ratio during peak resting preload conditions (i.e., supine hypervolemia), moreover, was positively associated with VO$_2$peak in Y, but not in O women. During upright exercise, hypervolemia increased SV an average of 15 ml/beat across all 4 work intensities in Y women (p<0.05 vs. normovolemia). This was in contrast to O women, who exhibited very small increases in SV during hypervolemic exercise (i.e., <5 ml/beat). **CONCLUSIONS**: Healthy older women appear to have a reduced ability (relative to younger women) to utilize acute increases in preload to raise left ventricular stroke volume, including during large muscle exercise. These findings likely reflect the combined effects of exceptional lusitropic function in younger women, and a less compliant ventricle in the aged female heart.

2612   Board #2   June 1 3:15 PM - 5:15 PM

Critical Speed in Heart Failure Rats: The Central Determinant of Performance

Jesse C. Craig, Joseph H. Merino, Daniel M. Hirai, Trenton D. Colburn, Ayaka Tabuchi, Jacob T. Caldwell, Carl J. Ade, Timothy I. Musch, FACSM, David C. Poole, FACSM. *Kansas State University, Manhattan, KS.* (Sponsor: David C. Poole, FACSM)

(No relevant relationships reported)

A hallmark symptom of heart failure (HF) is exercise intolerance. The power-duration relationship for high intensity exercise is a powerful phenomenon that integrates multiple physiological systems to define the framework of tolerance within and across species in health and disease. The parameters of this relationship, critical speed (CS) and D′ represent the aerobic and 'anaerobic' capacities of the animal and in combination accurately predict exhaustion. Elucidating the determining mechanisms of CS and D′ in HF will allow for development of more efficacious therapies. **PURPOSE:** To establish the power-duration relationship in a validated model of HF and elucidate the mechanism(s) that determine CS and D′. Specifically, we tested the hypotheses that: 1) CS (but not D′) would be reduced in HF; and 2) measurements of heart function would correlate with CS. **METHODS:** Nine adult female Sprague-Dawley rats were randomized to control (CON; n = 4) or HF (n = 5) groups. HF was induced via surgical myocardial infarction and the rats were given ≥ 21 days to recover. Multiple constant speed treadmill runs to exhaustion were used to determine CS and D′ in both groups. Doppler echocardiography was used to evaluate heart function (i.e., fractional shortening (FS) which approximates ejection fraction) following CS and D′ determination. **RESULTS:** HF reduced FS by 50% (HF: 24 ± 2%, CON: 48 ± 3%; p < 0.001); indicative of moderate severity HF. CS was reduced by ~15% in HF rats compared to CON (38 ± 1 vs 45 ± 1 m/min; p < 0.001). D′ was not different (HF: 79 ± 13 m, CON: 61 ± 13 m; p = 0.34). CS was positively correlated with FS (r 0.9, p = 0.002); D′ was not (r -0.33, p = 0.42). **CONCLUSION:** CS and D′ can be resolved in an animal model of moderate HF where CS is reduced but D′ is not. Crucially, this HF model is free from the prescription therapeutics that confound interpretation of the mechanistic relationship between HF and CS or D′ in humans. That FS was correlated with CS has important mechanistic and clinical implications.

Structural and Functional Determinants of Critical Speed in Heart Failure

Abstracts were prepared by the authors and printed as submitted.
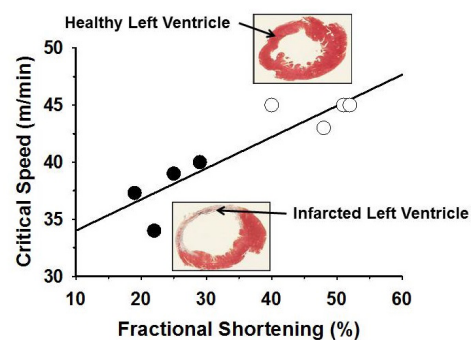
2613   Board #3   June 1 3:15 PM - 5:15 PM

Non-invasive Assessment Of Right And Left Ventricular Cardiac Output After Changes In Gravity And Posture

Uwe Hoffmann[1], Jessica Koschate[1], Uwe Drescher[1], Lutz Thieschäfer[1], Daniel Dumitrescu[2], Andreas Werner[3]. *[1]German Sport University, Koeln, Germany. [2]University of Cologne, Koeln, Germany. [3]German Air Force - Centre of Aerospace Medicine, Koenigsbrueck, Germany.*

(No relevant relationships reported)

Gravity changes along the z-axis (posG$_z$) influence right and left ventricular cardiac output (CO$_{RV}$, CO$_{LV}$). This is of importance in many sports after changes in posture or in phases of accelerations. **PURPOSE:** This study aimed to compare estimates of cardiac output by gas exchange and continuous blood pressure (cBP) measurements to assess transient differences in CO$_{RV}$ and CO$_{LV}$. **METHODS:** Nine healthy male subjects (age: 31 ± 3 y, BMI: 24 ± 2 kg·m^{-2}) participated in experiments on a long-arm human centrifuge (laHC; base line: 1.7 g), in parabolic flights (PF) and on a tilt seat (TS; initial position 65°). Three consecutive posGz changes for ~22 s intervals (I_1, I_2, I_3) were performed (laHC: 2.1 g - 1.2 g - 2.1 g; PF 1.8 g - 0 g - 1.8 g; TS: 90° - -6° - 90°). Breath-by-breath V'O$_2$, heart rate and cBP were measured. Left ventricular stroke volume was determined from cBP allowing to estimate CO$_{LV}$. Arterio-venous O$_2$ concentration difference was calculated as average for 30 s before the first posGz change (I_1). This allows calculating CO$_{RV}$ for the following periods (I1, I2, I3) according to Fick's principle. **RESULTS:** Differences between CO$_{RV}$, CO$_{LV}$ are shown in Fig. 1. The highest difference (9.26 L·min^{-1}) was found in TS after the change from the 90° to -6° position. **CONCLUSION:** The combination of V'O$_2$ and cBP measurements allows to assess differences in CO$_{RV}$ and CO$_{LV}$. The differences in I_2, after a reduction in posGz indicate a blood volume shift into the pulmonary veins which has an impact on CO$_{LV}$, which increases during the following posGz increase (I_3). Further influences from breathing must be studied.
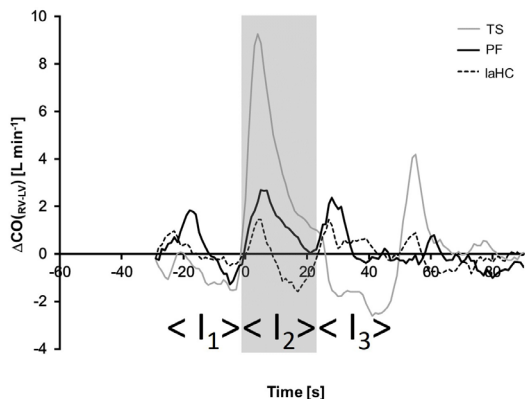
Fig. 1: Difference of CORV and COLV

Acknowledgement: This study was funded by German Ministry of Education and Research (50WB1426)

2614   Board #4   June 1 3:15 PM - 5:15 PM

Right Ventricular Remodeling In Olympic Athletes During 8 Years Of High-intensity Training

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(No relevant relationships reported)

Previous studies suggested that long-term exposure to repeated bouts of high-intensity exercise may have detrimental effects on the right ventricle (RV), potentially causing an 'exercise-induced' cardiomyopathy. **PURPOSE:** We aimed to evaluate the effects of 8 years of intensive exercise training on cardiac adaptations in Olympic athletes. **METHODS:** We selected Italian athletes who qualified consecutively for the 2008, 2012 and 2016 Summer Olympic Games. Athletes underwent a complete cardiovascular evaluation before every Olympic event including a clinical and echocardiographic examination. Athletes were categorized as either endurance or non-endurance athletes. **RESULTS:** 50 Olympic athletes (64% male; 24 ± 4 y) from different sporting disciplines (n=20 endurance and n=30 non-endurance athletes) met the criteria for inclusion. Mild increases in RV outflow tract diameter (long axis 6 ± 12%; short axis 5 ± 13%), RV basal (7 ± 12%) and mid diameter (18 ± 21%), RV end-diastolic area (7 ± 15%), right atrium area (6 ± 15%), and RV/Left Ventricle (LV) diameter ratio (5 ± 11%) were observed during follow-up. Furthermore, significant increases in aortic root size (8 ± 7%), left atrium area (9 ± 21%) and left ventricle

diameter were found (1 ± 4%). Systolic functional parameters of both ventricles did not change over time, whereas a mild decrease in indices of LV diastolic function (E/A ratio: -12 ± 21%; E': -5 ± 17%) was observed. Most changes occurred between the first and second evaluation, and parameters plateaued between the second and third evaluation. Endurance athletes demonstrated greater increases in RV end-diastolic area compared to non-endurance athletes. **CONCLUSION:** Olympic athletes showed mild but continued cardiac remodeling, including RV and LV cavity, RV and LV atrium, and the aortic root while maintaining intensive exercise training over 8 years follow-up. However, cardiac RV and LV remodeling appears to plateau and no signs of reduced RV or LV cardiac function occurred over time. Therefore, our data does not support the hypothesis that exercise alone may cause detrimental effects on cardiac morphology and function in Olympic athletes. V.L.A is financially supported by a grant from the Radboud Institute for Health Sciences.

2615   Board #5   June 1 3:15 PM - 5:15 PM

Heart Rate Responses in the Diving Reflex among Aerobically Trained and Untrained Men

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(No relevant relationships reported)

The mechanisms of the diving reflex involve the simultaneous activation of the sympathetic and parasympathetic nervous systems (PNS). The enhanced PNS capabilities as achieved through aerobic training has been investigated in the diving reflex, specifically vagally-mediated bradycardia, and the research remains controversial. **PURPOSE:** The current study was conducted to evaluate heart rate responses associated with the diving reflex in aerobically trained and untrained men. **METHODS:** Using 2 x 3 mixed factorial ANOVA, lowest heart rate achieved, percent heart rate reduction, and time course of heart rate reduction were compared between aerobically untrained ($n = 7$) and trained ($n = 9$) men while breath holding in air, water at 15 °C, and water at 0 °C. **RESULTS:** Results showed that trained men did not differ in percent heart rate reduction or lowest heart rate achieved, although there was a tendency for lowest heart rate achieved in the trained group ($p = .06$). A significant interaction was found for time course ($p = .01$), where trained men took significantly longer to reach a plateau in heart rate in the air compared to untrained men. No differences in training status were found for time course in the two water conditions. However, a linear increase in time course for untrained men in the water conditions indicated a potentially delayed response by the PNS with the diving reflex. **CONCLUSION:** No additional clarification on the impact of training status on the diving reflex has been made except that an effect may lie in the timing of the response of the PNS.

2616   Board #6   June 1 3:15 PM - 5:15 PM

Exercise Training May Attenuate the Cardiac Changes Associated with the Menopause

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(No relevant relationships reported)

The menopause is generally associated with lower cardiovascular function. Exercise training is known to improve cardiovascular function, but whether it attenuates the effects of the menopause are unclear. PURPOSE: To investigate the effects of exercise training on left ventricular (LV) function and mechanics in post-menopausal women. METHODS: Eleven pre-menopausal and 14 post-menopausal healthy untrained middle-aged women (age 45-58 years) were included in this retrospective study. Peak aerobic capacity was assessed on an upright cycle ergometer. Resting LV function and basal and apical mechanics were assessed using echocardiography. Post-menopausal women were reassessed after 12 weeks of exercise training (3 sessions/week consisting of 4×4 min intervals at 90-95% maximum heart rate; attendance ≥70%). Data on LV mechanics are reported for 11 pre- and 12 post-menopausal women. The Bayes factor [BF_{10}=p(H$_1$)/p(H$_0$)] from the Bayesian independent samples t-test was used to assess the evidence for differences in cardiovascular function between untrained pre-menopausal women and post-menopausal women before and after exercise training (H$_1$). A BF_{10} of 1 indicates equal evidence for both the null (H$_0$) and alternative hypotheses, while smaller values indicate increasing strength of evidence for the null hypothesis and larger values favour H$_1$. RESULTS: We found weak evidence for similar peak aerobic capacity, cardiac output, heart rate, systemic vascular resistance, LV volumes and most measures of LV function and mechanics between untrained pre- and post-menopausal women (BF_{10} range 0.37-0.77). The key exception to this was a lower peak septal wall velocity during early diastole (E') in untrained post-menopausal women, compared with pre-menopausal women (mean±SD: 0.09 ± 0.02 vs. 0.11 ± 0.02 m/s; BF_{10}=3.56). After exercise training, peak aerobic capacity was higher in post-menopausal women (34 ± 5 vs. 29 ± 5 mL/min/kg; BF_{10}=2.58), while strength of evidence for menopause-related differences in E' decreased (BF_{10}=1.80).

CONCLUSION: Short-term high-intensity aerobic interval training improves peak aerobic capacity in middle-aged post-menopausal women, and reduces the extent of menopause-related differences in LV function. Amanda Nio is the beneficiary of a doctoral grant from the AXA Research Fund.

2617   Board #7   June 1 3:15 PM - 5:15 PM

Differential Effects of Three Distinct Training Approaches in a Rat Model of Severe Pulmonary Hypertension

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(No relevant relationships reported)

PURPOSE: Optimizing exercise as therapy for pulmonary arterial hypertension (PAH) requires an understanding of which approaches maximize benefit and minimize detriment, particularly in more advanced disease. Therefore, in rats with severe, angioproliferative PAH we examined cardiopulmonary effects of three distinct training approaches: 1) high-intensity interval training (HIIT), 2) low-intensity continuous exercise training (CET), or 3) voluntary wheel running (VWR).
METHODS: SD rats (~200g, male) with Sugen+Hypoxia- induced PAH (SuHx) underwent 6 wks of training as either HIIT (2 min at ~85% VO_2reserve [VO_2R] + 3 min at 30%VO_2R, for 4-5 cycles, n=12) or CET (45-60 min at 50%VO_2R, n=11) performed 5 days/wk on a treadmill, or were housed with computer-monitored wheels (n=14). Additional SuHx rats were untrained (SED, n=15). Healthy, unexercised animals were controls (CON, n= 14). Echocardiography was performed at pre- and post-training; all other measures were post-training.
RESULTS: Mortality in SuHx was highest for SED (5 deaths at days 65, 66 (2), 77, and 81) and HIIT (4 deaths at days 56, 60, 68, and 71), and lowest for CET (2 deaths at days 60 and 73) and VWR (2 deaths at days 59, 68). While all animals exhibited similar baseline RV function, SuHx rats that died prematurely (n=13) had worse (p<0.05) cardiac output (CO, 148±12mL) and stroke volume (SV, 466±39uL/min) at pre-training compared to surviving SuHx (n=39, 216±19uL, 593±30mL/min). SuHx-induced elevation in RV systolic pressure (RVSP) and RV hypertrophy were not ameliorated by training with any approach (p>0.05 vs.SuHx-SED). However, final RV function in surviving SuHx was higher for all 3 training approaches (p<0.05 vs. SuHx-SED) as indicated by CO (mL/min) = 258±51, 222±44, 191±17, and 126±16; and by SV (uL/min) = 564±60, 529±51, 554±48, and 364±32, for HIIT, CET, VWR, and SED SuHx, respectively.
CONCLUSION: In a rat model of severe, angioproliferative PAH, 3 different training approaches achieved gain in RV function despite no amelioration of RV hypertrophy and elevated RVSP. However, in contrast to previous findings in a model of mild PAH, HIIT resulted in increased mortality for animals with poorer RV function prior to training onset and suggests that it may not be appropriate in the presence of more advanced disease. FUNDING: NIH-NHLBI R-15 (MB Brown)

F-32   Thematic Poster - Military Physiology: Energy Expenditure

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100F

2618   Chair: David DeGroot, FACSM. *Tripler Army Medical Center, Tripler AMC, HI.*

(No relevant relationships reported)

2619   Board #1   June 1 3:15 PM - 5:15 PM

Prediction Equation For Estimating Total Daily Energy Requirements Of Special Operations Personnel

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(No relevant relationships reported)

Abstract
Special Operations Forces (SOF) engage in a variety of military tasks with many producing high energy expenditures, resulting in undesired energy deficits and loss of body mass. Therefore, the ability to accurately estimate daily energy requirements would be useful to generate adequate feeding regimens to support maintenance of energy balance during military operations. **Purpose:** Generate a predictive equation estimating energy requirements of SOF. **Methods:** Retrospective analysis of data collected from SOF personnel engaged in 12 different SOF training scenarios. Energy expenditure and total body water were determined using the doubly-labeled water (DLW) technique. Physical activity level was determined as daily energy expenditure divided by resting metabolic rate. Physical activity level was broken into quartiles (0 = mission prep, 1 = common warrior tasks, 2 = battle drills, 3 = specialized intense activity) to generate a physical activity factor (PAF). Regression analysis was used to construct two predictive equations (Model A; body mass and PAF, Model B; fat-free mass and PAF) estimating daily energy expenditures. **Results:** Average measured energy expenditure during SOF training was 4468 (range: 3700 to 6300) Kcal·d^{-1}. Regression analysis revealed that physical activity level ($r = 0.91$; $P < 0.05$) and body mass ($r = 0.28$; $P < 0.05$; Model A), or fat-free mass (FFM; $r = 0.32$; $P < 0.05$; Model B) were the factors that most highly predicted energy expenditures. Predictive equations coupling PAF with body mass (Model A) and FFM (Model B), were correlated ($r = 0.74$ and $r = 0.76$, respectively) and did not differ (mean ± SEM: Model A; 4463 ± 65 Kcal·d^{-1}, Model B; 4462 ± 61 Kcal·d^{-1}) from DLW measured energy expenditures. **Conclusion:** By quantifying and grouping SOF training exercises into activity factors, SOF energy requirements can be predicted with reasonable accuracy and these equations can be used by dietetic/logistical personnel to plan appropriate feeding regimens to meet SOF nutritional requirements across their various mission profile.
Disclaimer: The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

2620   Board #2   June 1 3:15 PM - 5:15 PM

Comparison of Pandolf Equation and Measured Metabolic Cost of Load Carriage in UK Military Personnel

Christopher A J Vine[1], Sarah L. Coakley[1], Stephen D. Myers[1], Ella F. Walker[1], Carla A. Rue[1], Ben J. Lee[1], Tessa R. Flood[1], Julianne Doherty[1], Beverley Hale[1], Mark Rayson[2], Joeseph J. Knapik, FACSM[3], Deborah Gebhardt, FACSM[4], Bradley C. Nindl, FACSM[5], Piete E H Brown[6], Sarah Jackson[7], Julie P. Greeves[7], Sam D. Blacker[1]. [1]University of Chichester, Chichester, United Kingdom. [2]Mark Rayson Consulting Limited, Bristol, United Kingdom. [3]Fitness, Injury, and Performance Analysis, Abingdon, MD. [4]Human Resources Research Organization, Alexandria, VA. [5]University of Pittsburgh, Pittsburgh, PA. [6]Institute of Naval Medicine, Royal Navy, Gosport, United Kingdom. [7]Army Personnel Research Capability, Army HQ, Andover, United Kingdom.

(No relevant relationships reported)

PURPOSE: The metabolic cost of load carriage (LC) is frequently predicted using the Pandolf et al. (1977) equation. Recent laboratory investigations have identified that the Pandolf equation under-predicts the metabolic cost of LC in untrained personnel during treadmill walking (Drain et al., 2017). However, the relationship between the actual and Pandolf predicted metabolic cost of outdoor LC in UK Armed Forces personnel has not been established.
METHODS: Twenty-two UK Armed Forces personnel (Royal Marine Commandos and Parachute Regiment, mean ± SD: age 23 ± 3 years; stature 180.9 ± 4.9 cm; body mass 83.1 ± 6.6 kg; predicted VO_{2max} 54.0 ± 3.1 ml·kg^{-1}·min^{-1}) completed 15, 20 minute stages of outdoor LC, with external load masses ranging from 25 to 70 kg. The stages were completed at a patrol, forced, and insertion marching speed (2.5, 4.8, and 5.5 km·h^{-1}, respectively). During the final 2-4 minutes of each LC stage, oxygen uptake (VO_2) was measured using the Douglas bag technique. Predicted VO_2 for each speed-load mass combination was calculated using the Pandolf equation and compared to the measured VO_2 using paired t-tests and 95 % Limits of Agreement (LoA).
RESULTS: The Pandolf equation systematically under-predicted the metabolic cost of LC for all speeds and load masses combined [mean difference 3.2 ± 2.9 ml·kg^{-1}·min^{-1} (p<0.001), 95% LoA -2.5-8.9 ml·kg^{-1}·min^{-1}] resulting in a VO_2 predictive error of 17.5 %. Mean difference and 95% LoA at the different speeds were: (a) 2.5 km·h^{-1} [4.8 ± 1.9 ml·kg^{-1}·min^{-1}, (p<0.001), 95% LoA 1.0-8.6 ml·kg^{-1}·min^{-1}], (b) 4.8 km·h^{-1} [1.5 ± 2.7 ml·kg^{-1}·min^{-1} (p<0.001), 95% LoA -3.9-6.9 ml·kg^{-1}·min^{-1}], and (c) 5.5 km·h^{-1} [4.2 ± 3.3 ml·kg^{-1}·min^{-1} (p<0.001), 95% LoA -2.1-10.7 ml·kg^{-1}·min^{-1}], with prediction errors of 30 %, 6 % and 14 %, respectively.
CONCLUSIONS: The current study demonstrates a systematic under-prediction of VO_2 for British Army personnel during outdoor LC when applying the Pandolf equation, supporting the findings of previous laboratory studies. Furthermore, the error appears to be of greater magnitude when LC speeds are lower, i.e. at a representative patrolling pace. This in part could be attributed to the load mass distribution of the modern solider, which differs from the back mounted load carried data used to develop and refine the Pandolf equation.

Abstracts were prepared by the authors and printed as submitted.

2621   Board #3   June 1 3:15 PM - 5:15 PM

Pandolf Equation Efficacy In Predicting Gender-Specific Energy Expenditure Differences While Carrying Light To Heavy Loads

Victoria A. Gregory, Charles S. Fulco, Peter N. Frykman, Rebecca E. Fellin, Nathaniel I. Smith, Joseph F. Seay. *U.S. Army Institute of Environmental Medicine, Natick, MA.*

(No relevant relationships reported)

With the recent decision permitting women to enter Combat Arms roles in the military, knowledge of gender-based differences in energy expenditure (EE) during load carriage has become more operationally relevant. However, one of the most common equations for predicting the energy cost of load carriage has not been systematically compared between male and female Soldiers.
PURPOSE: To examine the efficacy of the Pandolf equation [1] to predict EE of male and female Soldiers while carrying light to heavy loads.
METHODS: Seven women were individually matched with 7 men by height and body weight (differences < 2.54 cm and 4.54 kg for each pair). All participants walked at 1.34 m·s⁻¹ for 10-min bouts on a level treadmill while unloaded (BW) and then carrying vest-borne loads of 15, 35 and 55 kg. VO_2 data were collected during the last 3 min of each bout. 2-way RM ANOVA compared VO_2 at each load between the men and women. Measured results were then compared to equation predictions.
RESULTS: Measured EE increased significantly with load and was significantly greater for men (443 ± 92 W) than women (388 ± 97 W). The equation predicted EE more accurately for women at lighter loads and more accurately for men at heavier loads (Figure 1).
CONCLUSION: Using height and weight matched men and women, the Pandolf equation was more accurate for predicting EE at the heavier loads for men and at the lighter loads for women. These results support modification of the Pandolf equation to account for differences in gender and carried load.
DISCLAIMER: The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.
[1] Pandolf *et al.,* 1977. *J Appl Physiol.* Oct; 43(4): 577-81.

Figure 1. Predicted and Measured Energy Expenditure
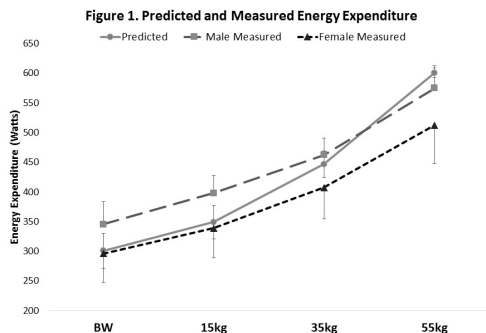
2622   Board #4   June 1 3:15 PM - 5:15 PM

Comparison of Training Intensity, Energy Balance, and Sleep Duration in British Army Officer Cadets between Base and Field Exercise

Sarah C. Needham-Beck[1], Andrew G. Siddall[1], Jane E.S. Thompson[1], Steven D. Powell[1], Victoria C. Edwards[1], Sam D. Blacker[1], Sarah Jackson[2], Julie P. Greeves[2], Steve D. Myers[1]. [1]*University of Chichester, Chichester, United Kingdom.* [2]*Army Personnel Research Capability, Army HQ, United Kingdom.*

(No relevant relationships reported)

PURPOSE: Initial military training typically prepares personnel for service through a combination of structured activities such as physical training, foot drill, and classroom and practical lessons conducted on base and during field exercises. This study compared the training intensity, energy balance, and sleep duration between 5 days of training on base and 5 days on a field exercise in Officer Cadets (OCs). METHODS: Twenty-nine (12 Female, 17 Male, mean ± SD: age 24 ± 2 y, 1.76 ± 0.10 m, body mass 79.4 ± 11.0 kg) OCs volunteered. Energy expenditure was assessed using a wrist-mounted research grade accelerometer, worn during weeks 9 (base) and 22 (field exercise) of the 42-week British Army Regular Commissioning Course. Energy intake was quantified from researcher-led dietary weighing and food diaries for a sub-set of OCs (n=16), which was compared to daily energy expenditure to calculate energy balance. On base and field exercise data were compared using paired and independent

sample t-tests, with statistical significance set at p<0.05. RESULTS: Time spent in the sedentary, light, and moderate exercise intensity zones was similar while training on base and on field-exercise (p>0.05). However, more time was spent in the vigorous exercise intensity zone on base compared to the field exercise (mean difference ± SD: 28 ± 22 min, p<0.001). Daily sleep time was higher on base compared to the field exercise (333 ± 91 vs. 126 ± 79 min, p<0.001) and the OCs were in negative energy balance both on base (-3.17 ± 2.00 MJ), and during the field exercise (-7.18 ± 5.35 MJ), with a greater energy deficit experienced on exercise (p<0.05). CONCLUSIONS: Time spent in physical activity zones were similar during training on base and on field exercise, although less time was spent in the vigorous intensity zone during the latter. However, OCs had less sleep and a greater energy deficit during field exercise, which has potential implications for their ability to sustain the level of activity required; therefore, impacting physical performance and potentially increasing fatigue-related injury risk.

2623   Board #5   June 1 3:15 PM - 5:15 PM

Timing of Energy and Macronutrient Intake of British Army Officer Cadets during Military Training

Victoria C. Edwards[1], Steve D. Myers[1], Andrew G. Siddall[1], Jane E.S Thompson[1], Steven D. Powell[1], Sarah Jackson[2], Julie P. Greeves[2], Sophie L. Wardle[2], Sam D. Blacker[1]. [1]*University of Chichester, Chichester, United Kingdom.* [2]*Army HQ, Andover, United Kingdom.*

(No relevant relationships reported)

Purpose: In athletic populations, the amount and timing of macronutrient intake can influence the restoration of muscle glycogen, attenuation of muscle damage and affect training recovery and adaptations. Despite similarities in the physically demanding, long-term nature of training for both athletes and military personnel, the composition and timing of dietary intake by military personnel is often more limited than athletes, particularly in initial military training establishments. This study quantified the total energy intake and timing of energy and macronutrient intake for Officer Cadets (OC) during training. **Methods:** Twenty (10 male and 10 female) OC's (mean ± SD: age 22 ± 1 years, 1.73 ± 0.08 m, body mass 77.0 ± 9.3 kg) undertaking the British Army Officer Commissioning Course at the Royal Military Academy Sandhurst completed food diaries for 10 days, alongside researcher-led dietary weighing of main meals. Daily energy intake and carbohydrate (CHO), protein (PRO) and fat proportions were analysed using nutritional analysis software (Nutritics). Paired and independent samples t-tests were used to compare dietary intake between meals and sex, respectively. **Results:** Total average energy (M; 16 ± 5, F; 13 ± 3 MJ·day⁻¹) and PRO (M; 144 ± 42, F; 114 ± 25 g·day⁻¹) intake over 10 days was greater for men than women (p<0.05). However33w2, no difference (p>0.05) was found between sexes for CHO (M; 453 ± 148, F: 377 ± 80 g·day⁻¹) and fat (M; 149 ± 46, F; 122 ± 34 g·day⁻¹) intake. Energy, PRO and fat intake, but not CHO intake, was in line with UK Military Dietary Reference Values for both sexes. Average PRO and CHO intake was greater (p<0.05) at mealtimes (M) than snacks (S) irrespective of sex (PRO 112 ± 48 (M) vs 28 ± 28 (S); CHO 306 ± 137 (M) vs 167 ± 134(S) g). However, unlike PRO (breakfast (B) 32 ± 14; mid-morning (S1) 10 ± 10; lunch (L) 38 ± 15; mid-afternoon (S2) 11 ± 11; dinner (D) 42 ± 18; evening (S3) 8 ± 7 g), CHO intake was more evenly spread throughout the day (B 91 ± 43; S1 52 ± 43; L 101 ± 42; S2 66 ± 53; D 114 ± 52; S3 43 ± 38 g). **Conclusion:** The present study indicates that OC energy, PRO and fat intake is in line with current UK military guidelines, however CHO intake was suboptimal. Future research should consider whether a more even distribution of macronutrient intakes throughout the day can aid training adaptions and recovery.

2624   Board #6   June 1 3:15 PM - 5:15 PM

Comparison of Research- and Consumer-grade Energy Expenditure Estimation Methods during 10 Days of Military Training

Andrew G. Siddall[1], Jane E. S. Thompson[1], Steven D. Powell[1], Victoria C. Edwards[1], Sarah S. Kefyalew[2], Priya A. Singh[2], Elise R. Orford[2], Michelle C. Venables[2], Sarah Jackson[3], Julie P. Greeves[3], Sam D. Blacker[1], Steve D. Myers[1]. [1]*University of Chichester, Chichester, United Kingdom.* [2]*Medical Research Council, Cambridge, United Kingdom.* [3]*Army HQ, Andover, United Kingdom.*

(No relevant relationships reported)

PURPOSE: Wearable physical activity monitoring devices have improved the ability to estimate free-living total energy expenditure (TEE) but their application during arduous military training alongside more well-established techniques has not been widely documented. This study aimed to assess the validity of two wrist-worn activity monitors to estimate TEE by evaluating performance against doubly labelled water (DLW) during British Army Officer Cadet (OC) training.
METHODS: Twenty (10 male and 10 female) OCs (mean ± SD: age 22 ± 1 years, height 1.73 ± 0.08 m, body mass 77.0 ± 9.3 kg) wore one research-grade accelerometer (GENEActiv, Cambridge, UK; "RES") on the dominant wrist and one commercially

available (FITBIT SURGE, USA; "COM") monitor on the non-dominant wrist for 10 days of training. Immediately prior to this 10-day period, participants consumed a bolus of DLW and provided daily urine samples, which were analysed by mass spectrometry to determine TEE. Bivariate correlations and limits of agreement were calculated to compare the 10-day mean TEE from DLW with both activity monitors to evaluate device performance.

RESULTS: TEE (mean ± SD) from DLW, RES and COM were 17.2 ± 2.7 MJ day^{-1} (4112 ± 652 kcal day^{-1}), 17.3 ± 2.8 MJ day^{-1} (4129 ± 677 kcal day^{-1}) and 15.1 ± 3.7 MJ day^{-1} (3607 ± 888 kcal day^{-1}), respectively. TEE from DLW was linearly correlated with both RES (r=0.786, p<0.001) and COM (r=0.888, p<0.001). Despite a stronger association with DLW however, COM tended to underestimate TEE (mean bias [95% CI]) by -2.1 [-5.6-1.4] MJ day^{-1} (-505 [-1348-339] kcal day^{-1}; p<0.05). In contrast, mean TEE from RES was similar to DLW (-0.05 [-3.6-3.5] MJ day^{-1}; -11 [-867-845] kcal day^{-1}; p>0.05).

CONCLUSION: Wearable physical activity monitors provides a cheaper and more practical method for estimating free-living TEE than DLW, and could be useful for military populations. However, this study suggests a consumer monitor may underperform, by underestimating TEE, during physically demanding training in comparison to a research-grade device.

2625   Board #7   June 1 3:15 PM - 5:15 PM

Comparison Of Daily Energy Expenditure And Weekly Physical Activity Exposure Estimated Using Consumer And Research-grade Physical Activity Monitors During Officer Cadet Initial Military Training

Steven D. Powell[1], Andrew G. Siddall[1], Jane E. S Thompson[1], Victoria C. Edwards[1], Sarah Jackson[2], Julie P. Greeves[2], Sophie Wardle[2], Sam D. Blacker[1], Steve D. Myers[1]. *[1]University of Chichester, Chichester, United Kingdom. [2]Army HQ, Andover, United Kingdom.*

(No relevant relationships reported)

PURPOSE: Wearable physical activity monitors provide the capability to estimate the physical demands of military training and to potentially inform training practices. This study aimed to compare both the daily energy expenditure (EE) and weekly physical activity (PA) measured from two wrist-worn activity monitoring devices in Officer Cadets (OC) during initial military training.

METHODS: Forty (26 male, 14 female) OC's (mean ± SD: age 24 ± 2, height 1.76 ± 0.08 m, body mass 79.21 ± 9.97 kg) wore a consumer ("CN"; Fitbit Surge, San Francisco, USA) and a research-grade ("RG"; GENEActiv Original, Activinsights, Cambridge, UK) activity monitor during the second 14-week term of British Army OC training. A filtering process was implemented to exclude training days that did not fulfil wear-time criteria. Bivariate Pearsons correlations and limits of agreement (LoA) were used to compare EE measurement and duration of sedentary, light, moderate and vigorous PA between devices.

RESULTS: Mean daily estimated EE from the CN and RG were 13.9 ± 2.5 and 15.7 ± 1.8 MJ day^{-1}, respectively. Estimated daily EE ranged from 8.6 ± 2.8 (day 35) to 22.4 ± 6.7 MJ day^{-1} (day 49) in CN and from 10.7 ± 4.5 (day 55) to 21.3 ± 8.1 MJ day^{-1} (day 49) in RG. There was a strong correlation between EE in CN and RG over 14 weeks (r = 0.761, p<0.001). However, the LoA indicated that CN underestimated EE (mean bias [95% CI] by -1.4 [-16 - 3.2] MJ day^{-1}, p<0.001) compared to the RG. Mean daily estimates from CN were 1069 ± 86 sedentary minutes, 221 ± 44 light minutes, 40 ± 14 moderate minutes and 56 ± 16 vigorous minutes. RG estimated 543 ± 53 sedentary minutes, 90 ± 16 light minutes, 249 ± 52 moderate minutes and 33 ± 14 vigorous minutes. All intensities were significantly different between CN and RG (p<0.05). The CN overestimated on sedentary minutes (526 mins day^{-1} [319 - 734] mins day^{-1}), light minutes (131 [39 - 224] mins day^{-1}) and vigorous minutes (24 [-15 - 62] mins day^{-1}), but underestimated moderate minutes -208 [-295 - -122] mins day^{-1}).

CONCLUSION: Consumer grade physical activity monitors provide an easily accessible tool for monitoring military training but more research is required to improve their accuracy before they can be used to inform training practices.

2626   Board #8   June 1 3:15 PM - 5:15 PM

The Use of Modern Technology to Evaluate Shipboard Metabolic Rate Aboard a U.S. Navy Ship While Deployed in the Persian Gulf

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(No relevant relationships reported)

Physiological data are often used to develop work/rest cycles and thermal exposure guidance. A large component of the U.S. Navy's shipboard heat exposure guidance, known as Physiological Heat Exposure Limit (PHEL) curves, relies on metabolic rate. Shipboard work spaces present an extremely challenging work environment

with respect to the impact of high heat and humidity on the integrity of obtaining digital data. Data collections conducted on an aircraft carrier have an increased potential for signal disruption due to the potential for electromagnetic interference and previous attempts have been unsuccessful. With the availability and technological advancement of more robust commercial, wireless physiological data devices, it is now possible to evaluate if existing exposure guidance accurately reflects the work rate performed within the shipboard environment. **PURPOSE:** To obtain actual shipboard metabolic rates of various personnel aboard an aircraft carrier deployed in the Persian Gulf. **METHODS:** Twenty-nine personnel (age: 23 ± 3 yrs, height: 169 ± 10 cm, weight: 79.4 ± 14.3 kg) had their VO_2, HR, and T_{core} measured while performing actual shipboard duties for approximately three hours on two separate days (T1 and T2). Personnel were from the following work spaces: Flight Deck, Hangar Bay, Scullery, Galley, Waste Management, Catapult, and Reactor Room. **RESULTS:** From a possible total collection time of 12,771 min, there were 9,248 min (72%) of usable data for VO_2, 12,120 min (95%) for HR, and 10,711 min (84%) for T_{core}. Mean results were consistent across all personnel for both trials (mean trial duration = 194 ± 33 min). VO_2 was 0.67 ± 0.14 L/min and 0.67 ± 0.11 L/min, p=.22; HR was 102 ± 11 bpm and 96 ± 11 bpm, p=.06; and T_{core} was 37.6 ± 0.2°C and 37.4 ± 0.2°C, p=.04 for T1 and T2, respectively. **CONCLUSION:** Findings from this pilot study indicate that physiological data, including actual work setting VO_2, HR, and T_{core} data, can be obtained using current technology in extreme work place (i.e., field) environments. This sophisticated technology can have a significant impact on developing new work/rest guidance, in addition to heat exposure guidance, in military and civilian work place environments. Results from this pilot evaluation will lead to an effort to revise the U.S. Navy's shipboard PHEL curve guidance.

F-33 Thematic Poster - **Movement Biomechanics in People with Obesity**

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100E

2627   Chair: Clare E. Milner, FACSM. *Drexel University, Philadelphia, PA.*

(No relevant relationships reported)

2628   Board #1   June 1 3:15 PM - 5:15 PM

Differences in Jump Landing Mechanics, Strength, and Vertical Jump Height Between Obese and Non-Obese Children

Bradley Bowser, Claire Sylvestre, Christopher Kaddatz. *South Dakota State University, Brookings, SD.* (Sponsor: Matt Vukovich, FACSM)

(No relevant relationships reported)

It has been reported that overweight and obese children display increased joint loading, higher impact loading and decreased joint ROM during walking and running. There is limited research examining the movement mechanics of other high impact activities in children. **PURPOSE:** To compare jumping mechanics, strength, and max vertical jump between healthy weight children and children classified as overweight or obese. **METHODS:** 42 children (22 males, ages 11.1±1.6 yrs; 20 females, ages 10.9±1.3 yrs) were divided into 2 groups based on the CDCP's BMI percentile for children. 24 children were classified as healthy weight (HW) (n=13 males, 11 females; BMI percentile 44.8±25.8) and 18 children were classified as overweight/obese (OW/OB) (n=9 males, 9 females; BMI percentile 95.6±3.9). Participants completed 2 testing session approximately 1 week apart. During the first session age, height, mass, and leg strength were collected. Max torque created during isokinetic knee extensions at 90 degrees/s was used to determine leg strength. For the second visit participants completed a max vertical jump test and 5-10 drop jump trials. For jump trials, participants jumped off a 20 cm platform onto 2 force plates and immediately jumped up to a target set at 60% of their max jump height. Ground reaction forces (1000Hz) and joint kinematics (200Hz) were captured for each trial. One way ANOVAs (α=0.05) were used to determine group differences for each of the variables of interest listed in Table 1. **RESULTS:** Results can be found in Table 1. **CONCLUSION:** There appear to be no group differences in leg strength, max vertical jump height, or max landing force. However, similar to other studies, HW children displayed greater ROM during landings than children classified as OW/OB. Increased joint ROM while landing from a jump has typically been thought to decrease vertical loading, however our data suggests significantly greater ROM does not always result in increased vertical loading.

Variable	HW Mean(SD)	OW/OB Mean(SD)	ANOVA
Leg Strength (Nm/BW)	223.8(41.0)	221.3(57.7)	0.87(0.05)
Max vertical jump (cm)	33.6(7.34)	30.8(7.44)	0.22(0.38)
Max landing force (BW)	2.02(0.38)	1.96(0.47)	0.64(0.14)
Average load rate (BW/s)	34.1(12.6)	26.5(10.0)	0.041(0.67)*
Instantaneous Load rate (BW/s)	110.4(24.1)	82.9(20.3)	0.0003(1.23)*
Dorsiflexion excursion (degrees)	48.6(5.07)	42.6(7.92)	0.008(0.90)*
Knee flexion excursion (degrees)	43.4(9.32)	35.3(8.20)	0.007(0.92)*
Hip flexion excursion (degrees)	21.3(9.83)	14.8(6.10)	0.026(0.79)*

Table 1. Summary of means, p-values and effect sizes for variables of interest

*indicates $p \leq 0.05$

2629   Board #2   June 1 3:15 PM - 5:15 PM

Gait Characteristics In Persons With COPD Who Have Obesity

Micah J. Munoz, Ann Marie N. Wilson, Christian P. Manhard, Stephen Bailey, FACSM, Gytis Balilionis, Srikant Vallabhajosula. *Elon University, Elon, NC.* (Sponsor: Dr. Stephen Bailey, FACSM)
(No relevant relationships reported)

Persons with Chronic Obstructive Pulmonary Disease (COPD) experience a greater fall risk than healthy individuals of the same age. Obesity has been associated to an even greater fall risk in persons with COPD. Gait abnormalities such as an increasing step width has also been associated with severity of COPD. Recent research has shown that a high intensity intervention decreases step width in persons with COPD. However, no research has been done to investigate possible difference in gait pattern between persons with COPD who have obesity and those who have a healthy body mass index (BMI). **PURPOSE**: To investigate differences in gait pattern between people with COPD who have obesity and those who have a healthy BMI. **METHODS:** 9 persons with COPD who have a BMI in the Obese category (OBMI) and 5 persons with COPD who have a BMI in the healthy category (HBMI) participated. Participants completed 5 trials of walking forward at a comfortable pace on pressure-sensor walkway. Velocity, cadence, step width, stride length, and stance % were measured as average of 5 trials and compared between groups using a 2-tailed independent samples t-tests or a Mann-Whitney U test depending on normality. Hedges' effect size was also calculated. **RESULTS**: OBMI group walked with wider steps showing a trend towards statistical significance (OBMI: 15.7±4.9cm; HBMI: 9.9±2.5cm; p=0.053). No other variables were significantly different between the groups. Effect sizes ranged from trivial (0.05 for cadence) to large (1.08 for step width). **CONCLUSION:** A wider step gait in OBMI may be related to increased fear of falling. Research with greater sample size must be done to further investigate the how obesity affects gait patterns in persons with COPD.

2630   Board #3   June 1 3:15 PM - 5:15 PM

Kinetic Features and Recent History of Lower Extremity Injury in Overweight and Obese Runners

Heather K. Vincent, FACSM, Cong Chen, Michelle L. Bruner, Daniel C. Herman, FACSM, Joseph G. Wasser, Kevin R. Vincent, FACSM. *University of Florida, Gainesville, FL.*
(No relevant relationships reported)

Kinetics of running mechanics have been implicated in the development of bony and soft tissue injuries. Progressively heavier runners may be at increased risk for lower extremity injuries due to kinetic factors, but this has yet to be examined. The relationships between running kinetics and recent lower extremity injury among runners of different body sizes are not clear. **PURPOSE:** To determine the key kinetic characteristics of running gait among runners across the spectrum of body mass index (BMI in kg/m^2) values with and without recent history of lower extremity injuries. **METHODS:** Recreational competitive runners (N=278; 46.6% women; 34.8 ± 14.9 yr) were stratified into three BMI groups in kg/m^2: healthy weight BMI<24.9, overweight BMI 25-30, obese BMI≥30. A 3D motion tracking system and instrumented treadmill captured ground reaction forces (GRF) and loading rates at preferred running speed. BMI group comparisons were made using univariate analyses of variance covaried for running speed. Recent history of lower extremity bony and soft tissue injuries related to running was self-reported. Key variables included peak GRF and vertical instantaneous loading rate (VILR). Linear regressions were used to determine the relationship between BMI and VILR after accounting for running speed; models included age, sex, running speed, GRF and VILR. **RESULTS:** Injury prevalence (stress fractures, tendonitis, plantar fasciitis, patellofemoral pain) was not different among the three BMI strata (28%-38%). Peak GRFs were highest in the overweight group compared to the healthy weight and obese runners, respectively (1919 ± 282 N vs 1566 ± 318 and 1794 ± 419 N; p<0.0001). VILR was also highest in

the overweight group compared to the healthy weight and obese runners, respectively (47.9 ± 11.9 kN/s vs 40.7 ± 14.1 kN/s and 39.9 ± 13.3 kN/s; p<0.001). Regression results indicated that after accounting for running speed (R2=.123), BMI accounted for an additional 6% of the variance to the model for VILR (B coefficient 0.251). **CONCLUSIONS:** The effect of BMI on loading rates during running at a preferred speed is relatively small. Our findings indicate that progressively heavier runners were not at a higher risk for lower extremity injury, and this may be due to internal motion adjustments that are made to control VILR and peak GRF at preferred speeds.

2631   Board #4   June 1 3:15 PM - 5:15 PM

Relative Muscle Strength Is Associated With Obesity-induced Biomechanical Adaptations Of The Trunk During Sit-to-stand

Lance M. Bollinger, Amanda L. Ransom, Rebekah F. Seay. *University of Kentucky, Lexington, KY.*
(No relevant relationships reported)

Obesity decreases relative skeletal muscle strength and alters biomechanics during daily activities such as rising from a chair. To date, the role of this decreased muscle strength in obesity-induced biomechanical alterations is unknown. **Purpose:** To determine the relationship between lower extremity skeletal muscle strength and biomechanics during sit-to-stand. **Methods:** Nine obese (BMI 32.5 ± 2.5 kg/m^2) young adults (age: 28.4 ± 5.7 y) completed sit-to-stand task three times from a chair (seat height: 52 cm). Ten high speed cameras were used to track retroreflective coordinate data through 3D motion analysis at a rate of 200Hz. Specific outcomes of interest included: peak trunk flexion velocity (deg/s), peak trunk flexion angle (deg), and task duration (s). Maximal voluntary isometric contractions (MVICs) of the knee extensors and flexors were measured via a previously validated handheld dynamometer (Hoggan MicroFET2) and normalized to body mass. Linear regression was used to determine relationships between body mass and relative muscle strength with independent variables. **Results:** Body mass index was positively associated with peak trunk flexion velocity (y = 4.458x - 57.208, r^2 = 0.506, p = 0.032), but not peak trunk flexion angle (p = 0.127) or task duration (p = 0.924). Conversely, relative knee extensor and knee flexor strength were inversely related to peak trunk flexion velocity and angle (r^2 = 0.541 - 0.780, p < 0.05). The ratio of relative knee extensor to knee flexor strength was inversely related to task duration (y = -0.773x + 4.784 r^2 = 0.553, p = 0.022). **Conclusions:** Excess body mass induces greater trunk flexion velocity, likely to generate sufficient momentum to stand. High levels of knee extensor and flexor strength may decrease peak trunk flexion angle and velocity reduce sit-to-stand time in obesity.

2632   Board #5   June 1 3:15 PM - 5:15 PM

Fatigability of the Dorsiflexor Muscles in People with Type 2 Diabetes and Controls

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(No relevant relationships reported)

People with type 2 diabetes (T2D) and diabetic polyneuropathy are more fatigable for the dorsiflexor muscles during isometric fatiguing contractions; however, it is unknown if the greater fatigability is observed in people with T2D and no signs of neuropathy. **PURPOSE**: To determine the neural and muscular mechanisms of dorsiflexor muscle fatigability for an intermittent isometric contraction task in people with T2D and healthy controls. **METHODS**: 8 people with T2D (65±6 yrs; 29±5 kg·m^{-2}; 8,378±2,712 daily steps; 2 women) with no signs of diabetic polyneuropathy were matched based on age, BMI, and physical activity with 5 healthy controls (64±6 yrs; 26±2 kg·m^{-2}; 9,400±828 daily steps; 2 women). Fatigability was assessed with an intermittent isometric protocol using 6-s contractions at 50% of maximal voluntary contraction (MVC), followed by a 4-s rest until task failure. MVCs were performed every 60s. Task failure was defined as MVC ≤ 50% baseline MVC. Electrically-evoked twitch contractions were elicited during and after each MVC to estimate voluntary activation and contractile properties of the dorsiflexor muscles. **RESULTS**: Time to task failure of the fatiguing task was 42% briefer in people with T2D compared with controls (6.62±4.17 vs. 11.40±6.58 min, respectively; P=0.065). Voluntary activation was similar between T2D and control group at baseline (96.8±3.7 vs. 98.2±1.4%, P=0.43) and declined similarly during the fatiguing task (task end; 94.9±6.4 vs. 92.6±4.0%, P=0.39). The electrically-evoked twitch amplitude was similar for people with T2D and controls before the fatiguing task (5.3±3.8 vs. 5.4±2.3 Nm, P=0.96) and declined similarly during the fatiguing task (51.1±28.0 vs. 55.0±43.3% reduction, P=0.13). **CONCLUSIONS**: Both muscular and neural mechanisms contributed to fatigability of the dorsiflexor muscles for an intermittent isometric fatiguing task in people with T2D and age- and BMI matched-controls, although mechanisms in the muscle played a greater role than the reduction in neural drive. These findings that suggest people with T2D whom have no signs of diabetic polyneuropathy are more

fatigable than controls independent of physical activity levels, although, statistical power analysis indicates 11 people in each group are needed to clarify the findings of this preliminary data set.

2633   Board #6   June 1 3:15 PM - 5:15 PM

Quadriceps Impairment Is Associated With Knee Mechanics During Gait In Obese Young Adults

Michael N. Vakula[1], Koren L. Fisher[2], Pablo B. Costa[2], Derek N. Pamukoff[2]. *[1]Utah State University, Logan, UT. [2]California State University, Fullerton, Fullerton, CA.* (Sponsor: Daniela Rubin, PhD, FACSM)
(No relevant relationships reported)

Obesity is a preventable risk factor for osteoarthritis (OA), a leading cause of pain and physical disability. Prior studies have linked altered gait biomechanics and quadriceps strength deficits to OA development in clinical populations, but data are lacking in young obese individuals without OA.
PURPOSE: To compare quadriceps strength and gait biomechanics between obese (OB) and normal weight (NW) young adults. A secondary purpose was to examine the relationship between quadriceps function and gait biomechanics.
METHODS: 47 participants were recruited and classified by body mass index (BMI), 24 NW (BMI = 21.9±1.7; 54% female) and 23 OB (BMI = 33.7±2.4; 48% female). Fat and fat-free mass (FFM) were obtained via air displacement plethysmography. Quadriceps strength was assessed using a maximal voluntary isometric knee extension at 60° of knee flexion. Gait biomechanics were collected at a standardized (ST) (1 m/s) and self-selected (SS) gait speed. A 2 group by 2 condition ANOVA was used to evaluate peak knee flexion angle (PKF), knee flexion excursion (PKE), peak internal knee extension moment (KEM), peak vertical ground reaction force (vGRF), vertical loading rate (vLR), isometric peak torque (PT), and rate of torque development (RTD). Pearson correlations were calculated between quadriceps strength and gait biomechanics at ST and SS speed.
RESULTS: OB had lower PT (3.52 [95%CI: 3.11, 3.93] vs. 4.11 [95% CI: 3.67, 4.55] Nm/FFM, p=.03), and late RTD (7.6 [95%CI: 6.1, 9.1] vs. 10.0 [95%CI: 8.8, 11.2] Nm/FFM/sec, p=.02) compared to NW. NW had a faster SS gait speed compared to the OB (1.30 [95%CI: 1.29, 1.31] vs. 1.19 [95%CI: 1.11, 1.21] m.s^{-1}, p=.02). *Post hoc* analyses reveal that at SS gait speed, NW had greater vGRF (p =.002), vLR (p=.009), and KEM (p=.01). No differences between groups were found at ST gait speeds. Partial correlation adjusted for SS walking speed revealed a moderate relationship between early RTD and KEM (r=0.42, p<.01).
CONCLUSIONS: OB have deficits in quadriceps strength relative to FFM, and walk slower compared to NW. RTD was moderately associated with KEM, and KEM was lesser in OB compared to NW. Smaller KEM suggests that OB walk with a quadriceps avoidance gait, which may contribute to knee OA development. Exercise interventions targeting RTD may be useful for improving walking mechanics in OB.

F-34   Thematic Poster - Muscle Physiology in Muscular Dystrophy and Cancer

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100H

2634   Chair: Dawn Lowe, FACSM. *University of Minnesota, Minneapolis, MN.*
(No relevant relationships reported)

2635   Board #1   June 1 3:15 PM - 5:15 PM

Structural Mechanism For Small-molecule Activation Of The Serca Calcium Pump In Muscular Dystrophy

Samuel F. Carlson, J. Michael Autry, Ji Li, Hideki Aihara, Razvan L. Cornea, David D. Thomas. *University of Minnesota - Twin Cities, Minneapolis, MN.* (Sponsor: Dawn Lowe, FACSM)
(No relevant relationships reported)

Purpose: We have characterized a small-molecule activator of SERCA, the sarcoplasmic reticulum calcium transporting ATPase in muscle. A hallmark of muscular dystrophy (MD) is decreased sarcolemma stability and increased calcium influx, leading to myocyte damage and death. Increasing SERCA activity by gene therapy reverses MD in cell culture and animal models. We continue the characterization of recently-discovered small-molecule activators (SMA) of SERCA by the Thomas lab, since their binding site on SERCA was unknown. **Methods:** Small-molecule activation of SERCA was characterized by three techniques: enzyme assays, fluorescence spectroscopy, and x-ray crystallography, with particular focus on the potent SMA1163. **Results:** ATPase assays indicate that SMA1163 stimulates SERCA activity by 36 ± 11%, with an EC$_{50}$ of 3 ± 1 µM (n=6). SMA1163 activated

both ATPase activity and calcium transport by SERCA. Tryptophan (TRP) residues of SERCA exhibit a potent, dose-dependent fluorescence quenching by SMA1163, with an EC$_{50}$ = 2 ± 1 µM, indicating a transmembrane binding site of SMA1163. Fluorescence of a site-directed fluorescein probe (FITC) identifies kinetic transitions resulting from SMA activation, including enhancement of calcium binding and phosphate release. Conformation-specific proteolytic cleavage and intramolecular glutaraldehyde cross-linking were used to determine the effect on SERCA headpiece structure, indicating that SMA1163 retains normal ligand-binding effects. An atomic structure of SERCA+SMA1163, determined by x-ray crystallography, indicates a transmembrane domain binding site for SMA1163 on SERCA, consistent with TRP fluorescence. Furthermore, the binding site of SMA1163 is located on the energy transduction segment of SERCA, consistent with the kinetic mechanisms of activation detected by FITC fluorescence. **Conclusions**: We propose that SMA1163 may be a useful activator of SERCA calcium transport to help alleviate MD, as an alternative approach to SERCA gene therapy.

2636   Board #2   June 1 3:15 PM - 5:15 PM

Isometric Training Increases Strength and Improves Pathophysiology of Dystrophic Skeletal Muscle

Angus Lindsay, James M. Ervasti, Dawn A. Lowe, FACSM. *University of Minnesota, Minneapolis, MN.* (Sponsor: Dawn A. Lowe, FACSM)
(No relevant relationships reported)

Mice lacking dystrophin (*mdx*) exhibit skeletal muscle weakness and susceptibility to contraction-induced injury. Because dystrophin mediates radial force transmission and skeletal muscle membrane integrity, the debate continues regarding the practicality and ethical implications of prescribing exercise training for patients with Duchenne muscular dystrophy (DMD). **PURPOSE:** To determine if isometric contractions improve skeletal muscle strength and morphology of *mdx* mice. **METHODS:** Anterior crural muscles of male wildtype and *mdx* mice were subjected to either no training or training sessions composed of 5 isometric tetanic contractions and a torque-frequency protocol *in vivo*. In Study 1, mice (n = 8) completed 3 training sessions over 7 days followed by an i*n vivo* eccentric contraction injury protocol. In Study 2, mice (*mdx* only, n = 8) completed 6 training sessions over 28 days. Centrally-nucleated fibers, myosin/actin content, fiber cross-sectional area and embryonic MHC (eMHC) positive fibers from *tibialis anterior* (TA) muscles were quantified. **RESULTS:** In Study 1, peak isometric torque increased in both wildtype (2.6 to 2.9 N·mm, p = 0.03) and *mdx* (3.0 to 3.6 N·mm, p < 0.01) mice after 7 days; however this did not affect *in vivo* susceptibility to eccentric contraction-induced injury of *mdx* mice (p = 0.69). In Study 2, peak isometric torque of *mdx* mice increased after 28 days (2.6 to 3.4 N·mm, p = 0.04). Training resulted in lower TA mass of the trained compared to the contralateral leg (67 ± 4 vs 81 ± 3 mg, p = 0.02) without altering the content of myosin-actin (p = 0.82). Trained TAs also had reduced fibrosis (5.1 ± 0.5 vs 2.9 ± 0.4%, p = 0.02), fewer eMHC positive fibers (3.6 ± 0.8 vs 0.9 ± 0.2%, p = 0.03) and more uniformly-sized fibers compared to untrained TAs. **CONCLUSION:** These results show that exercise training in the form of isometric tetanic contractions can improve dystrophic muscle strength and morphology indicating a potential alternative therapy for enhancing muscle strength and ambulation in patients with DMD.

2637   Board #3   June 1 3:15 PM - 5:15 PM

Recovery of Membrane Excitability in Dystrophic Skeletal Muscle Following Eccentric Contractions

Cory W. Baumann[1], Gordon L. Warren, FACSM[2], Dawn A. Lowe, FACSM[1]. *[1]University of Minnesota, Minneapolis, MN. [2]Georgia State University, Atlanta, GA.*
(No relevant relationships reported)

PURPOSE: Dystrophin, a subsarcolemmal protein, plays a role in maintaining membrane integrity of muscle fibers. A key feature of skeletal muscle that lacks dystrophin, as in the *mdx* mouse model for Duchenne muscular dystrophy (DMD), is a heightened sensitivity to contraction-induced strength loss. We have previously reported that this exaggerated loss of strength is attributed to impaired membrane excitability, which is evident during and immediately following eccentric (ECC) contractions. However, a detailed electromyographic (EMG) analysis of the time course of recovery from this type of injury is currently lacking. The purpose of this study was to assess recovery of strength and membrane excitability of injured, dystrophic muscle. **METHODS:** Male *mdx* mice were chronically implanted with stimulating electrodes on the left common peroneal nerve and EMG electrodes on the left tibialis anterior muscle. The left anterior crural muscles of anesthetized mice performed 50 maximal ECC contractions. Peak isometric torque and M-wave root mean square (RMS) were measured up to 14 days post-injury. **RESULTS:** Torque and M-wave RMS were reduced 66% (p < 0.001) from the first to last ECC contraction, with 99% (p < 0.001) of the variance in torque being explained by the variance in M-wave RMS. Immediately after the ECC protocol, isometric torque and M-wave RMS were reduced 61% (2.87 to 1.10 mN m) and 52% (1.37 to 0.65 mV), respectively,

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compared to pre-injury (p < 0.001). By day 2, the low M-wave RMS recovered to pre-injury (1.37 vs. 1.18 mV, p = 0.34) and coincided with a large improvement in isometric torque (1.10 to 1.85 mN·m, p < 0.001), which fully recovered by day 9 (2.87 vs. 2.90 mN·m, p = 0.82). **CONCLUSIONS:** These data substantiate that a main contributor to ECC contraction-induced strength loss in dystrophic muscle is impaired membrane excitability. Moreover, acute recovery of strength in the days after the ECC protocol occurred in conjunction with the restoration of membrane excitability. Our results provide a mechanistic explanation for why dystrophic muscle is more prone to ECC contractions and gives insight into how the muscle recovers post-injury. Importantly, these findings may aid in the development of therapeutic treatments for patients with DMD, particularly in regards to establishing safe and effective exercise programs.

2638   Board #4   June 1 3:15 PM - 5:15 PM

The Effect of Exercise Interventions on Muscle Fiber Type in mdx Mice

Matthew C. Kostek, FACSM, Kailey Omstead. *Duquesne University, Pittsburgh, PA.*
(No relevant relationships reported)

Duchenne Muscular Dystrophy (DMD) is the most common lethal genetic disease in boys. There is no cure and few treatments. A gene mutation (dystrophin) causes the disease and the pathology is exacerbated by chronic inflammation. Our previous studies have shown exercise interventions affect the pathology of dystrophic muscle. In the current study we sought to examine the effect of two different exercise protocols and contraction types on muscle fiber type. **Purpose:** The goal of our study is to determine the effect of exercise and contraction type on muscle fiber type changes in dystrophic mouse muscle. **Methods:** 36 male mdx mice and 7 control (healthy) mice, approximately 5 weeks of age were randomized to four groups: voluntary wheel running exercise, concentric-only, or eccentric-only exercise for 4 or 8 weeks. At study conclusion, skeletal muscle tissue was extracted and preserved for analysis. Fiber typing was conducted with standard immunohistochemistry techniques. All dependent variables were analyzed with a one-way ANOVA to examine differences between treatment groups. A p-value of < 0.05 was considered significant. **Results:** All mice completed the study. Fiber type of gastrocnemius muscle demonstrated an increase in the percentage of type I fibers (5.2 + 3.6%, p = 0.04). No differences were noted between concentric and eccentric-only exercise muscle contractions. A standard histologic analysis of the gastrocnemius revealed a decrease in fiber necrosis due to exercise interventions (p = 0.03). Exercise was able to modify muscle fiber type in mdx mice. **Conclusion:** Exercise may have a role in improving the oxidative capacity and muscle fiber characteristics in muscular dystrophy and is dependent on the type of exercise.

2639   Board #5   June 1 3:15 PM - 5:15 PM

The Effect of Creatine and Creatinine on Myocellular Injury in Doxorubicin-Treated Skeletal Muscle Myoblasts

Eric Bredahl[1], Wisam Najdawi[1], Sarah Hook[1], Joan Eckerson, FACSM[1], Jake Siedlik[1], Kristen Drescher[2]. *[1]Creighton University, Omaha, NE. [2]Creighton University School of Medicine, Omaha, NE.* (Sponsor: Dr. Joan M. Eckerson, FACSM)
(No relevant relationships reported)

Doxorubicin (DOX) is a powerful chemotherapy agent that is associated with a number of deleterious side effects including skeletal muscle dysfunction and atrophy. Although the exact mechanisms behind the observed myotoxicity are not fully understood, DOX treatment has been shown to result in the generation of reactive oxygen species and changes in short-term energy metabolism. Conversely, creatine (Cr) supplementation has been shown to have a therapeutic role in several disease states characterized by muscle atrophy, which is a hallmark of DOX treatment. **PURPOSE:** To examine the ability of Cr and CrN to attenuate the decline in Cr metabolism and minimize DOX-induced apoptosis and necrosis in skeletal muscle myoblasts. **METHODS:** Rat skeletal muscle myoblasts were cultured until they reached 85-90% confluency using rat skeletal muscle growth media (GM). Cells were subcultured and treated with one of the following for 12 hours: normal GM (control); Cr (10mM Cr+GM); CrN (10mM CrN+GM); DOX (25µM DOX+GM); DOX+Cr+GM; and DOX+CrN+GM. After incubation, protein analysis was performed using western blotting and rates of apoptosis and necrosis were assessed using an Annexin V apoptosis detection kit and high contrast staining. A one-way ANOVA with Tukey's *post-hoc* testing was used to detect significance. **RESULTS:** There was a significant change relative to GAPDH in creatine kinase (CK) expression between the control and DOX-treated cells (15±18.2% vs. 90±8.7%, p=0.03). In addition,13.2±7.5% of DOX-treated cells were undergoing apoptosis, which was significantly higher than the 3.26±5.5% in the control cells (p=0.04). No significant differences in rates of apoptosis were found between control samples and cells treated with DOX+Cr or DOX+CrN. **Conclusion:** These findings suggest that CK expression is significantly altered in skeletal muscle myoblasts treated

with DOX relative to control cells and that DOX treatment results in higher rates of necrosis and apoptosis. Treatment with Cr or CrN minimized the DOX-induced change in CK expression, as well as the rate of apoptosis and necrosis. These findings suggest that Cr and CrN may attenuate the degree of skeletal muscle dysfunction and atrophy during chemotherapy with DOX.

2640   Board #6   June 1 3:15 PM - 5:15 PM

Effect of Resistance Training on Contractile Force Production during Doxorubicin-Treatment

Mikayla Kaufenberg[1], Allison Tigner[1], Sarah Hook[1], MacKenzie Twaddell[1], Meghan Wagner[1], Eric Bredahl[1], Jake Siedlik[1], Joan Eckerson, FACSM[1], Kristen Drescher[2]. *[1]Creighton University, Omaha, NE. [2]Creighton University School of Medicine, Omaha, NE.* (Sponsor: Dr. Joan Eckerson, FACSM)
(No relevant relationships reported)

Doxorubicin (DOX) is a powerful chemotherapy agent associated with several harmful side effects including cardiovascular and skeletal muscle dysfunction. The observed muscle dysfunction can have a significant impact on the capacity of the DOX-treated patient to perform activities of daily living. Although it has been shown that aerobic and anaerobic exercise before treatment can minimize the degree of DOX-induced muscle dysfunction, few studies have examined the effect of resistance training (RT) on muscle dysfunction during chemotherapy treatment with DOX. **PURPOSE:** To examine the ability of RT on skeletal muscle dysfunction during DOX treatment using a rat model. **METHODS:** Male Sprague-Dawley rats (N=39) were randomly assigned to one of four groups: Sedentary + Saline (SS, n=8), Sedentary + DOX (SDOX, n=10), RT + Saline (RTS, n=12), and RT + DOX (RTDOX, n=9). Animals in the RT groups were housed in specialized cages where the food and water height was progressively elevated so that they achieved an erect bipedal stance to access their food and water for a total of 15 wk. Animals in the sedentary groups remained in standard animal housing for the duration of the study. Starting week 10, animals received weekly intraperitoneal injections of DOX (3 mg/kg) for 4 wk. One week after their last injection, animals underwent *ex vivo* muscle analysis of the soleus (SOL) and extensor digitorum longus (EDL) muscles. A one-way ANOVA with Tukey's post-hoc testing was used to detect significance. **RESULTS:** Maximal twitch forces for the EDL were significantly lower in the SDOX (6.01 ± 1.85 g/s vs. 11.39 ± 3.48 g/s, p=≤0.05) group compared to SS. Rats in the RTDOX had a significantly higher maximal twitch force compared to SDOX (9.37 ± 3.01 vs. 6.01 + 1.85 g/s, p=≤0.05) and a significantly lower twitch force compared to RTS (9.37± 3.01 vs. 15.42 ± 4.83, p=≤0.05) for the EDL. No significant differences were found among the groups for maximal twitch forces in the SOL. **CONCLUSION:** These findings suggest that DOX-induced muscle dysfunction is more pronounced in the EDL than the SOL. However, it appears that RT during treatment is effective in mitigating some of the effects of DOX-induced muscle dysfunction in the EDL.

2641   Board #7   June 1 3:15 PM - 5:15 PM

Cancer Environments Effect on Skeletal Muscle mTORC1 Regulation by Physical Activity and Feeding in Mice

Brittany Counts, Brandon VanderVeen, Justin Hardee, Dennis Fix, Ryan Montalvo, James Carson, FACSM. *University of South Carolina, Columbia, SC.* (Sponsor: Dr. James Carson, FACSM)
(No relevant relationships reported)

Physical activity and feeding behaviors exert continuous regulation on daily skeletal muscle anabolic signaling. Mice exhibit diurnal variation in physical activity levels and food intake, which are significantly elevated during the dark cycle and negligible during the light cycle. The mechanistic target of rapamycin complex 1 (mTORC1) signaling axis serves to integrate feeding and activity behaviors to regulate muscle anabolism. The Apc[Min/+] (MIN) mouse is an established preclinical model of cancer cachexia. While cachexia suppresses basal mTORC1 signaling, there are significant gaps in our understanding of how the cancer environment effects diurnal mTORC1 fluctuations to feeding and activity. **Purpose**: We examined the cancer environment's effect on diurnal mTORC1 flux in skeletal muscle. **Methods**: Body weight, food consumption, physical activity, and plasma glucose were monitored for 4 consecutive days at the end of the light (SEDINTARY [SED]) and dark (ACTIVE [ACT]) cycles in male C57BL/6 (B6; N=16) and MIN (N=14) mice. Mice had free access to food and water, and were sacrificed at the end of either the SED or ACT state. Gastrocnemius muscle was used for analysis. Statistical significance was set at p≤0.05. **Results**: B6 exhibited significant differences in physical activity, food consumption and plasma glucose between SED and ACT states; the cancer environment disrupted this response. MIN activity was reduced 50% (p=0.002) during the ACT state compared to B6. MIN did not have a diurnal variation in circulating glucose (p=0.186), and food intake was increased 2.3 (p<0.001) fold during the SED state. B6 muscle 4EBP1 phosphorylation, a marker of mTORC1 signaling, was induced by the ACT state compared to SED state (p=0.003). Muscle 4EBP1 phosphorylation flux (ACT / SED ratio) was suppressed (p=0.002) in the MIN compared to B6. **CONCLUSION**: Daily muscle anabolic flux

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is disrupted in MIN mice. Moreover, this suppressed anabolism, which may be driven by decreased feeding and reduced physical activity behaviors. Future studies should examine if targeting these behaviors can improve skeletal muscle anabolic flux in the presence of the cancer environment. Supported by NCI R01-CA121249

2642   Board #8   June 1 3:15 PM - 5:15 PM

Effect Of Aerobic Physical Training On The Expression Of Muscular Myomirs In Experimental Models Of Cancer.

João LP Gomes, Gabriel C. Tobias, Tiago Fernandes, Andre C. Silveira, Patricia C. Brum, Roger Chammas, Edilamar M. Oliveira. *University of Sao Paulo, Sao Paulo, Brazil.*

(No relevant relationships reported)

PURPOSE: There are several comorbidities associated with cancer as muscle cachexia. MicroRNAs (miR) in skeletal muscle (myomiRs) has been highly investigated for being related to several physiological and pathological factors. Aerobic physical exercise plays an important role in the regulation of the expression of several microRNAs.**METHODS**: We analyzed the expression of myomiRs using two mice models MMTV-PyMT (breast cancer, non-cachectic) and CT26 (colon cancer, cachectic). Animals were running trained and divided into 4 groups: SH-sedentary Health; ST-Sedentary Trained; CS-Cancer Sedentary; CT-Cancer Trained. Body and skeletal muscles were weights. Skeletal muscle function was analyzed by grip strength. We analyzed microRNAs expression by RT-PCR and proteins levels by Western blot. The tumor volume was determined by macroscopic caliper measures.**RESULTS**: Exercise training prevented the tumor progression. MMTV non-cachectic animals showed no loss of muscle mass and function. MiR-206 expression increased CS and miR-486 was decreased and it was not prevented in CT group. We also evaluated the same parameters in the CT26 model. The body mass, gastrocnemius and anterior tibial weight were decreased in CS and it was not prevented in CT group. Cancer increased the expression of miR-206 in skeletal muscle and aerobic training does not prevent these effects. The expression of miR-486 was decreased in CS group and PTEN levels was increased (p<0.05), decreasing PI3K-AKT-mTOR pathway and decreased muscle mass and function. However aerobic trained does not prevented theses effects. **CONCLUSIONS**: MiR-486 expression was decreased in skeletal muscle and circulation due to cancer and can be regulating cachexia by decreasing protein synthesis pathway. While miR-206, that is a skeletal muscle specific, was increased and the target genes tested were not modified. Thus, these two microRNAs can be markers of the skeletal muscle damage in cancer cachexia, regulating the of protein synthesis pathways.

F-35   Thematic Poster - **Protein Metabolism**

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100C

2643   Chair: Nancy R. Rodriguez, FACSM. *University of Connecticut, Storrs, CT.*

(No relevant relationships reported)

2644   Board #1   June 1 3:15 PM - 5:15 PM

Evaluation Of Lean Body Mass As A Predictor Of Dietary Protein Intake

Joseph R. Stanzione, Joseph I. Boullata, Michael Bruneau, Jr., Stella L. Volpe, FACSM. *Drexel University, Philadelphia, PA.* (Sponsor: Stella L. Volpe, FACSM)

(No relevant relationships reported)

Protein is of increasing concern with respect to intake recommendations. Presently, most predictive calculations for protein recommendations are based on either actual body weight (ABW) or a calculated ideal body weight (IBW). It has been proposed that, when calculating protein needs, dosing may be better predicted using lean body mass (LBM) rather than ABW or IBW. **PURPOSE:** To explore whether a relationship exists between average protein intake and LBM in Masters athletes**. METHODS:** This was a cross-sectional study, where 132 Masters athletes (70 women; 62 men) (39±10 years of age) were measured for LBM with dual-energy X-ray absorptiometry (DXA). Athletes also completed a food frequency questionnaire (FFQ) to determine average daily protein intake. Bivariate and multivariate regression models were used to correlate and predict LBM with protein intake, after controlling for percent body fat (PBF), sex, age, and body mass index (BMI) as potential confounders. Alpha levels were set *a priori* at p<0.05. **RESULTS:** Significant correlations were reported between LBM and protein intake (r=0.297, p<0.001), PBF and protein intake (r=-0.343, p<001), and sex and protein intake (r=-0.272, p<0.01), and were included in our multivariate regression. LBM predicted protein intake bivariately (R^2=0.088,p<0.001), but was lost in the multivariate model when PBF and sex were controlled (p>0.05). PBF alone predicted protein intake in this model (sr=0.112, sr =-0.215, p<0.01). **CONCLUSION:** Our results support a significant relationship between protein intake and LBM in Masters athletes using a bivariate model; however, it is unclear whether a definitive relationship exists due to lack of significant results in the multivariate model. An additional finding revealed that PBF demonstrated a significant negative relationship with protein intake. Longitudinal research should be conducted to better elucidate these relationships.
This study was not funded

2645   Board #2   June 1 3:15 PM - 5:15 PM

Blood Flow Restriction Combined With Low-load Resistance-type Exercise Increases Myofibrillar Protein Synthesis Rates

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(No relevant relationships reported)

Blood flow restriction (BFR) with or without resistance type exercise training has been suggested to increase muscle mass and strength. However, there is limited data on the acute effects of blood flow restriction in combination with or without low-load resistance-type exercise on muscle protein synthesis rates.
PURPOSE: To determine the impact of blood flow restriction with and without concomitant low-load resistance-type exercise on *in vivo* myofibrillar protein synthesis rates in healthy young males.
METHODS: Twenty young healthy men (age: 24±1 y, BMI: 22.9±0.6 kg/m²) were randomly subjected to two 5-min cycles of single leg blood flow restriction combined with (LLRE-BFR; n=10) or without (REST-BFR; n=10) low-load resistance-type exercise (20%-1RM). Myofibrillar protein synthesis rates were assessed by combining a primed continuous L-[ring-$^{13}C_6$]phenylalanine infusion with the collection of blood samples and muscle biopsies from both the blood flow restricted and control leg in each participant.
RESULTS: In resting conditions, blood flow restriction (REST-BFR) did not increase myofibrillar protein synthesis rates when compared to the control leg (0.0445±0.0037 vs 0.0432±0.0038 %/h, respectively; P=0.683). In contrast, when combined with low-load resistance-type exercise, blood flow restriction (LLRE-BFR) increased post-exercise myofibrillar protein synthesis by 10±5% when compared to the control leg (0.0475±0.0047 vs 0.0433±0.0042 %/h, respectively; P=0.042).
CONCLUSIONS: Blood flow restriction does not increase myofibrillar protein synthesis rates in healthy young men. When combined with low-load resistance-type exercise, blood flow restriction increases post-exercise myofibrillar protein synthesis rates.
Supported by the Dutch Technology Foundation STW

2646   Board #3   June 1 3:15 PM - 5:15 PM

Myofibrillar Protein Synthesis to Traditional and Cluster Sets in Trained Young Men and Women

Amadeo F. Salvador[1], Sarah K. Skinner[1], Joseph W. Beals[1], Justin Parel[1], Alexander Ulanov[1], Lucas Li[1], Scott A. Paluska, FACSM[1], Jonathan M. Oliver[2], Nicholas A. Burd[1]. *[1]University of Illinois at Urbana-Champaign, Urbana, IL. [2]Texas Christian University, Fort Worth, TX.* (Sponsor: Scott A. Paluska, FACSM)

(No relevant relationships reported)

During traditional (TRD) resistance exercise, there is a decrease in the velocity and power output achieved over the course of a set consisting of multiple repetitions. Reconfiguration of an exercise set into a cluster set (CLU), which includes a brief intra-set rest period, has been shown to counteract this performance decline. However, the effect of intra-set rest manipulations during resistance exercise on changes in postexercise myofibrillar protein synthesis rates (MPS) is not clear. **PURPOSE:** We determined if any differences exist in the stimulation of postexercise MPS to acute bouts of CLU and TRD paradigms of barbell back squats. **METHODS:** In crossover trials, 5 resistance trained men and women (23±2 y; LBM: 60±5 kg; 1RM back squat: 143±13 kg) performed CLU or TRD configurations of barbell back squats and ingested 20 g whey protein before and immediately after exercise. Blood and muscle biopsy samples were collected at rest and after exercise during primed continuous L-[ring-$^{13}C_6$]phenylalanine infusions. The TRD condition consisted of 4 sets × 10 repetitions with 120 seconds inter-set rest. CLU condition consisted of 4 sets × (2 × 5) repetitions with 90 seconds inter-set rest and 30 seconds intra-set rest at ~70% of 1RM. Mean and peak velocity were measured for all repetitions. **RESULTS:** Volume load (repetitions × load) was matched between the TRD (8400±39 kg) and CLU conditions (8400±39 kg; P=XX)). CLU condition tended to allow for greater mean velocities versus TRD condition over the 4 sets (0.52±0.02 m/s and 0.47±0.02 m/s, respectively). The cumulative (0-5 h) MPS were increased (P<0.05) above basal in both TRD (237%) and CLU conditions (215%) with no difference between conditions (P=0.72).

Abstracts were prepared by the authors and printed as submitted.

However, the temporal pattern of change in MPS tended to be greater in the TRD conditions versus CLU condition (P=0.10). **CONCLUSION:** These data showed that both TRD and CLU configurations of barbell back squat augment postexercise MPS throughout 0-5 h of recovery in trained young men and women. These data indicate that the intra-set rest manipulations present in CLU do not induce differences in muscle anabolism from TRD-style of resistance exercise in trained young men and women.

2647   Board #4   June 1 3:15 PM - 5:15 PM

Dose Effect of Whey Protein on Gut Hormone Responses in Pre-Diabetics and Type 2 Diabetics

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(No relevant relationships reported)

BACKGROUND: GLP-1 and GIP have been shown to increase following a 50 g dose of whey protein prior to a high glycemic load in type 2 diabetics. However, this increase is reduced in diabetics compared to healthy individuals. Pancreatic polypeptide (PP) and peptide tyrosine tyrosine (PYY) also increase, while ghrelin decreases after the consumption of whey protein; however, it is not known if a similar hormone response occurs with a lower dose of whey protein consumption prior to a glycemic load or if there is a dose effect. Our hypothesis was that 20 g and 30 g of whey protein would elicit an increase in GLP-1, GIP, PP, and PYY and decrease ghrelin in a dose dependent manner.
PURPOSE: The purpose of this study was to examine the effect of two different doses of whey protein ingested 30 min prior to a 50 g OGTT on gut hormone and incretin response.
METHODS: Nine diabetic and pre-diabetic participants (n=9, mean ± SD; age: 64.3 ± 8.1 yrs; BMI: 29.4 ± 6.0 kg/m²; HbA1c: 6.4 ± 0.6%) completed three trials. The randomly assigned trials consisted of: ingestion of 250ml of water (CON); 250 ml of water + 20 g whey (20g); 250ml of water + 30 g whey (30g), prior to completing a 50 g OGTT. Blood was collected at -30, 0, 15, 30, 60, 90, 120, and 150 min for the measurement of GIP, GLP-1, ghrelin, PP, and PYY. The whey protein mixture was administered immediately following the -30 min and the 50 g OGTT began immediately after the 0 min blood draw. Metabolites were measured using multiplex fluorescent detection. One-way repeated measure ANOVA was used for statistical analysis for each dependent variable ($P < 0.05$).
RESULTS: 20g and 30g of whey protein significantly increased integrated area under the curve (AUC) of GIP 32% and 38% compared to CON. 30g significantly decreased ghrelin AUC -13.9% and -20% compared to 20g and CON. 30g significantly increased PP AUC 28% compared to CON only. There were no differences in ghrelin and PP AUC between 20g and CON. There were no significant differences for GLP-1 and PYY between all trials.
CONCLUSION: 30 g of whey protein prior to a glucose challenge increased the secretion of GIP and PP and decreased ghrelin in type 2 and pre-diabetics. There seems to be a dose affect relationship between whey, ghrelin, and PP. 30 g of whey preload may induce insulinotropic and satiety effects stemming from GIP, PP, and ghrelin responses in type 2 and pre-diabetics.

2648   Board #5   June 1 3:15 PM - 5:15 PM

Aerobic Exercise Training Improves Myofibrillar Protein Synthesis, Capillarization, and Quadriceps Strength in Older Adults

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(No relevant relationships reported)

Skeletal muscle atrophy and subsequent strength loss occur in aging via a myriad of biological mechanisms. This involuntary loss of muscle and strength, termed sarcopenia, can progress to a clinically relevant decline in physical function. Resistance exercise training (RET) effectively attenuates sarcopenia, but RET may not be feasible for many older adults. Aerobic exercise training (AET) is well-established to improve cardiopulmonary health; however, its effects on protein turnover, skeletal muscle mass and strength are less clear. **PURPOSE:** The aim of this study was to determine if AET improves basal myofibrillar protein synthesis (MPS) and capillarization, thereby promoting skeletal muscle hypertrophy and increased strength. We hypothesized that basal MPS would increase in response to AET and that this would be accompanied by enhanced capillarization, skeletal muscle mass, and strength. **METHODS:** Subjects included healthy older adults who were randomized to non-exercise (NON; n=11, 71.4 ± 1.3 y) or exercise (EX; n=12, 73.7 ± 1.2 y). EX group completed 24 weeks of walking 3x/week for 1 hr at 70% heart rate reserve, while the NON group did not participate in structured exercise. For both groups, a stable isotope tracer was infused after an overnight fast before and after 24 weeks.

Muscle biopsies were taken from the *vastus lateralis* to assess MPS and capillarization. Subjects performed maximal strength testing via isokinetic dynamometry, and lean mass was determined with dual-energy X-ray absorptiometry (DXA). **RESULTS:** Basal MPS increased in the EX group (+50.7%, p=0.0094) along with capillary density (+66.4%, p=0.0333), peak oxygen consumption (+15.8%, p=0.0104), and isokinetic quadriceps strength (+15.1%, p=0.0149). Lean mass did not change in either group (p>0.05). **CONCLUSION:** These results indicate the effectiveness of AET to increase muscle protein turnover and capillarization in healthy older adults, possibly ridding muscle of damaged proteins and improving overall muscle quality. We conclude that AET improves muscular strength which may mitigate the functional decline associated with sarcopenia.

2649   Board #6   June 1 3:15 PM - 5:15 PM

Blunted Muscle Protein Synthetic Response To Feeding And Resistance Exercise In Obese Young Adults

Joseph W. Beals, Sarah K. Skinner, Stephan van Vliet, Isabel G. Martinez, Elizabeth G. Poozhikunnel, Alexander V. Ulanov, Li Lucas, Scott A. Paluska, Nicholas A. Burd. *University of Illinois, Urbana, IL.* (Sponsor: Scott A Paluska, FACSM)

(No relevant relationships reported)

Abstract

Obesity induces anabolic resistance of myofibrillar protein synthesis rates (MPS) to the ingestion of a protein-dense food in young adults. However, the effectiveness of acute resistance exercise before food ingestion to enhance the amino acid sensitivity of MPS with obesity has not been examined. **PURPOSE:** To compare the impact of resistance exercise on MPS responses to protein-dense food ingestion in normal-weight (NW) and obese (OB) young adults. **METHODS:** 7 NW (21±1y, BMI 21.9±0.5 kg/m²) and 7 OB (22±1y, BMI 35.7±2.3 kg/m²) men and women underwent primed continuous L-[*ring*-¹³C$_6$]phenylalanine infusions coupled with blood and muscle biopsy collections to measure MPS at basal and fed-state of the exercise (EX) and non-exercise (CON) legs. Participants performed unilateral resistance exercise (4 sets × 10-12 repetitions) followed by the ingestion of 6 oz of lean pork loin (36 g protein; 4 g fat; 180 kcal). **RESULTS:** Total work performed during exercise was similar among groups (NW: 1610±164 kg; OB: 1888±154 kg, P=0.24). Plasma essential amino acid concentrations increased similarly after pork ingestion in both groups (time effect: P<0.05) with peak values at 2 h of the postprandial period. Basal MPS was similar between NW and OB groups (P>0.05). MPS was stimulated in the EX and CON legs after pork ingestion in both the NW (absolute change from basal: CON 0.027±0.008 %/h; EX 0.058±0.011 %/h) and OB groups (CON 0.027±0.006 %/h; EX 0.033±0.011 %/h; P<0.05). MPS was stimulated to a greater extent in the EX vs. CON legs in NW (P=0.02) but not OB group (P=0.26). **CONCLUSION:** Our results suggest that increased adiposity may attenuate the effectiveness of resistance exercise to augment the postprandial MPS response.

2650   Board #7   June 1 3:15 PM - 5:15 PM

The Effect of Pre Sleep Casein Protein Consumption on Next Morning Resting Metabolic Rate in Resistance Trained Women

Brittany R. Allman, Margaret C. Morrissey, Michael J. Ormsbee, FACSM. *Florida State University, Tallahassee, FL.*

(No relevant relationships reported)

The Effect of Pre-Sleep Casein Protein Consumption on Next-Morning Resting Metabolic Rate in Resistance-Trained Women
Brittany R. Allman, Margaret C. Morrissey, Michael J. Ormsbee FACSM
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Nighttime eating has been discouraged by the media due to its purported negative implications on metabolism. However, recent studies have shown that nighttime casein protein (PRO) either increases or has no effect on next morning resting metabolic rate (RMR). However, the effects of eating PRO at night on RMR in resistance-trained women is unclear. **PURPOSE**: To examine the effect of consuming nighttime PRO on next-morning RMR in resistance-trained women. **METHODS**: Thirteen healthy, resistance-trained (squat 100% body weight, bench press 70% body weight), normal weight and fatness (BMI, 19.9±2.3 kg/m²; body fat 28.7±4.9%), eumenorrheic females (age, 22±3 years) volunteered for this study. Participants reported to the lab on four different occasions: pre-testing and maximal testing familiarization (1a), maximal testing (1b), and two experimental trials (2 and 3). Thirty minutes before bed participants consumed micellar casein protein (PRO; 30g protein, 120kcals) or a non-caloric, sensory-matched placebo (PLA; 0g protein, 0kcals) in random order. RMR and respiratory exchange ratio (RER) were measured using open-circuit indirect calorimetry at baseline (BL) and immediately upon waking (AM) the following morning. **RESULTS**: There was no significant change in next-morning RMR when

consuming PLA (BL: 1554±193; NM: 1537±204 kcal/d; Δ= -17kcal/day; p=0.41), or PRO before bed (BL: 1551±156; NM: 1525±171 kcal/d; Δ=-26 kcal/day; p=0.36). There was no significant change in next-morning RER when consuming PLA (BL: 0.74±0.05 CO_2/O_2; NM: 0.76±0.04 CO_2/O_2, Δ=0.02 CO_2/O_2; p=0.13) or PRO before bed (BL: 0.77±0.05; NM: 0.77±0.02; Δ=0.0; p=0.29). **CONCLUSIONS**: In resistance-trained women, 30g of casein PRO pre-sleep does not significantly change next morning RMR or RER. Therefore, it is metabolically feasible for women to consume protein at night without negative metabolic implications. This study was supported by Dymatize® Nutrition and FrieslandCampina®.

2651   Board #8   June 1 3:15 PM - 5:15 PM

Higher Protein Intakes Enhance Whole Body Protein Metabolism and Exercise Performance in Endurance-Trained Males

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(No relevant relationships reported)

Dietary amino acids are important for both the repair and rebuilding of body proteins and the replenishment of exercise-induced oxidative losses. Current athlete recommendations are based primarily on the protein intake required to maintain nitrogen (i.e. protein) balance rather than one that optimizes whole body protein metabolism and maintains exercise performance. **PURPOSE**: To determine how a range of protein intakes, including a new tracer-derived safe intake, altered protein metabolism and exercise performance during a period of controlled training. **METHODS:** Using a double blind randomized crossover design, 10 male endurance-trained runners (~32y; ~65 ml O2/kg/min; ~62 km/wk) completed 3 trials, each consisting of 4 days of controlled training (20, 5, 10, 20km days 1-4, respectively). Controlled diets provided 6-9 g/kg/d of carbohydrate and 0.80 g protein/kg/d from whole foods that was supplemented with 0.12 (LOW), 0.40 (MOD), and 1.03 (HIGH) g of crystalline amino acids/kg/d modelled after egg protein. Oral [^{15}N] glycine was ingested on the 1st and 4th day to determine whole body protein synthesis (S), breakdown (B), and net balance (NB). Maximum voluntary isometric contraction (MVC), 5-km Time Trial (5kmTT) and peak force (Jump) were tested 2 days before and immediately after the controlled diet and training. **RESULTS:** S and B were not altered by training or protein intake. NB was negative in LOW and positive in HIGH with a dose-response between conditions (HIGH > MOD > LOW, p<0.05). Inferential statistics revealed that for MVC, HIGH likely (probability 87%) had a moderate benefit over LOW (ES=0.57) and likely (probability 77%) a small benefit over MOD (ES=0.42). For the 5kmTT, HIGH likely (probability 79%) had a moderate benefit over LOW (ES=0.57) and a possible (probability 69%) small benefit over MOD (ES=0.26). No differences were found for Jump performance. **CONCLUSION:** Endurance trained males consuming adequate carbohydrate maintained exercise performance and enhanced whole body protein metabolism when consuming >1.2g/kg/d of dietary protein. Our data suggest that training quality and post-exercise recovery would be optimized in endurance-trained runners who consume dietary protein towards at the higher end of current ACSM recommendations (i.e. 1.2-2g/kg).

F-36   Free Communication/Slide - Physical Activity Promotion and Intervention Strategies

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100D

2652   Chair: Catrine Tudor-Locke, FACSM. *University of Massachusetts Amherst, Amherst, MA.*
(No relevant relationships reported)

2653   June 1 3:15 PM - 3:30 PM

Physical Activity Maintenance Among African American Women: Factors Associated with Lapses and Recovery

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(No relevant relationships reported)

PURPOSE: Studies have demonstrated that lapse-recovery cycles, or the brief periods of little to no physical activity (PA) that may persist for days or weeks (lapses) followed by a return to normal PA levels (recovery), are integral to long-term PA maintenance in African American (AA) women. Given the low PA levels and high

rates of chronic disease among AA women, understanding factors associated with lapse-recovery cycles in AA women who successfully maintain PA may improve interventions for promoting and sustaining PA in high-risk populations. **METHODS**: AA women (≥ 18 years) who self-reported PA maintenance (≥ 6 months) were recruited via email, word-of-mouth, and social media to complete an online survey. Questions included whether respondents experienced a lapse in the previous year, and if so, the number and causes of lapses, the longest lapse experienced, and factors that helped to resume PA. Trained reviewers coded open-ended responses separately, using a priori codes; discrepancies were discussed to reach consensus. **RESULTS**: Of the 206 respondents, 139 (67.5%; age 38.4 ± 11.6 years) experienced a lapse in PA in the past year. Most women (58.3%, n=81) experienced 1-2 lapses, with most lasting <1 month (43.9%). The top five predictors of lapses included work demands (33.1%), an injury or surgery (24.5%), travel/vacations (22.3%), lack of time (19.4%; e.g. scheduling conflicts) and family factors (16.5%; e.g. caretaking, relationship issues). The factors associated with resuming PA included becoming motivated again (18.0%; e.g. goal-setting, self-talk), social support (15.1%; e.g. encouragement from friends/family, joining PA groups), weight (14.4%; e.g. gaining weight as motivation), feeling better (14.4%; e.g. physically and mentally, body craving PA), and recovering from an injury or surgery (14.4%). **CONCLUSIONS**: Understanding correlates of PA lapse-recovery cycles in AA women who maintain PA can aid in developing strategic interventions to foster long-term PA behaviors among this important population. Our findings suggest that motivation, social support, weight and positive affect might be ideal intervention targets. Future studies should explore the impact of targeted strategies to address lapse-recovery cycles.

2654   June 1 3:30 PM - 3:45 PM

African American Women and Outdoor Physical Activity: Understanding Patterns and Group Engagement

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(No relevant relationships reported)

PURPOSE: New strategies are needed to improve leisure-time physical activity (PA) levels among African American (AA) women. Outdoor PA provides immediate benefits such as stress reduction and social cohesion and shows promise for PA promotion. However, little is known about the prevalence of outdoor PA among AA women as well as if engaging in PA with others is associated with outdoor PA participation. The purpose of this study was to: 1) describe outdoor PA among AA women and 2) examine differences in outdoor PA participation between those who engage in PA in a group compared to those who engage in PA alone. **METHODS:** Using an assets-based approach, we conducted an online survey of 206 AA women who had maintained PA for at least 6 months. Those who completed both of the following questions were included in this preliminary analysis (N=195): 1) In the last 6 months, what type(s) of outdoor physical activities did you engage in most often? and 2) In the past 6 months, have you engaged in PA with others? Chi-square tests were used to examine differences in outdoor physical activities by group engagement. Significance was set at alpha < .05 and SAS 9.3 was used to perform these analyses. **RESULTS:** Of the 195 respondents completing both questions (age in years: 40.3±11.8), 107 (54.9%) reported participating in at least 1 outdoor PA. Hiking (35.5%) was the most frequently reported outdoor PA followed by walking (19.6%) and running (14.0%). The majority of respondents (50.8%) participated in PA with others as a part of an organized group (30.8%), with family (6.2%) or with friends (13.9%). However, there was no significant difference in frequency of outdoor PA by category of group PA engagement (chisq: 8.93, p=0.0630). **CONCLUSIONS:** Our findings suggest that a significant proportion of AA women participate in outdoor PA. However, more research is needed to explore the potential of outdoor PA to motivate AA women.

2655   June 1 3:45 PM - 4:00 PM

Incentivizing Physical Activity in American Indian Adolescents At Risk For Metabolic Disorders

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(No relevant relationships reported)

PURPOSE: American Indians (AI) have high prevalence of diabetes in youth and may benefit from programs designed to promote increased exercise behavior as a strategy to improve metabolic health. In this study, we tested whether financial incentives would elicit greater frequency and/or duration of exercise in AI youth at high risk to

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FRIDAY, JUNE 1, 2018

develop diabetes. **METHODS**: We enrolled overweight or obese, non-diabetic AI boys and girls, 11-20 years old with low physical activity. Participants were instructed to exercise 3 days/week for 48 weeks at a Choctaw Wellness Center, earning payments for 20-60 minute sessions of moderate-to-vigorous physical activity. The program was subdivided into three, 16-week-long phases to test different incentive strategies. **RESULTS**: Mean ± sem age of the 43 girls and 34 boys who completed baseline tests and started exercise was $14.0 ± 2.2$ y. Several risk factors for future diabetes were present, including high body fat ($43 ± 8\%$), low physical activity ($6,400 ± 2,899$ steps per day) and low aerobic fitness (VO_2max: $19.4 ± 5.7$ ml/kg/min). In Phase 1, the financial incentive to exercise more frequently was not effective; the incentivized subgroup had a similar number of exercise sessions ($28 ± 2$) as the control payment group ($26 ± 3$, $p > 0.05$). However, in Phase 2, the financial incentive to increase exercise duration was successful; exercise duration for the incentivized and control subgroups were $38 ± 2$ versus $29 ± 1$ minutes per session ($p= 0.002$, Effect size $=0.9$), respectively. In Phase 3, the effect of reducing the incentives was inconclusive due to high participant withdrawal. **CONCLUSIONS**: Our goal to get habitually sedentary, obese adolescents to increase their exercise behavior was at least partly successful, since the participants collectively completed 3,229 exercise sessions. The use of incentives was also helpful to promote the program and to extend the duration of exercise sessions in Phase 2. However, a remaining challenge is to help adolescents overcome barriers that prevent them from exercising more frequently and sustaining a daily exercise program. Funding: NIH/ NIMHD P20 MD000528, Choctaw Nation of Oklahoma

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2656 June 1 4:00 PM - 4:15 PM

Effect Of An Exercise Counselling Clinic On Exercise Behaviour In Men With Prostate Cancer.

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(No relevant relationships reported)

Prostate cancer (PC) treatments can result in long-term side effects that impact physical function and quality of life. Exercise has been shown to be a safe and effective strategy to reduce and manage treatment side effects; however, very few PC survivors are sufficiently active and providing supervised exercise programming is not feasible in many clinical settings. To address this need, the Prostate Cancer Supportive Care (PCSC) Program implemented an exercise counselling clinic led by a certified exercise physiologist that focused on facilitating exercise behaviour change. **Purpose:** To evaluate if an exercise counselling clinic can improve the aerobic and resistance exercise levels in men with PC, to align with the exercise oncology guidelines. **Methods:** Participants of the PCSC Program were invited to attend an exercise counselling clinic as part of their regular PC clinical care, namely 4 x 45-minute one-on-one sessions over 12-months (baseline, 3-, 6- and 12-months). At each session, the total amount of aerobic and resistance exercise, current PC treatments, physical symptoms and readiness for change were recorded using self-report questionnaires and a guided interview. A retrospective chart review was performed from data collected between July 2015 (clinic inception) and September 2017. **Results:** 128 men (age = $67.6±7.0$) attended the clinic at baseline. 93 of these men attended 2 or more visits and were analyzed further. 55% were currently receiving treatment or had received it in the past 6-months. Attendance was 73% at the 6-month follow-up and dropped to 36% at 12-months. Compared to baseline, there was an 18% increase in men meeting aerobic exercise guidelines (62%, $p<0.01$), 26% increase for resistance training guidelines (47%, $p<0.01$) and 22% increase for both aerobic and resistance training guidelines (39%, $p<0.01$). At baseline, the vast majority of men were in the preparation, action or maintenance stage of change (41%, 13% and 40% respectively). **Conclusion:** An exercise counselling clinic can significantly improve aerobic and resistance exercise levels in men with PC and improve adoption of the exercise oncology guidelines. Future work will focus on duration and intensity of support required to increase long-term behaviour change and target men with PC who are not meeting exercise oncology guidelines.

2657 June 1 4:15 PM - 4:30 PM

Exercise Prescription in Cancer Survivors: What Explains Poor Retention?

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(No relevant relationships reported)

There are approximately 13 million cancer survivors in the U.S.; fewer than 10% meet the exercise recommendations outlined by the American College of Sports Medicine. Poor adherence is likely explained by a variety of factors. If we can identify these

factors, we may be able to tailor the prescription, monitoring, and encouragement of exercise more effectively. **PURPOSE:** To determine variables that influence retention in an exercise trial on cancer survivors. **METHODS:** We enrolled 157 cancer survivors in an exercise program lasting 10 weeks and consisting of biweekly cardiovascular, strengthening, and flexibility components. At baseline and following the intervention, we assessed anthropometric and cardiovascular profiles, health and cancer history, and physical functioning. Chi-square and logistic regression analyses tested variables associated with program completion. **RESULTS:** We retained 37.7% of patients through follow-up. Women were more likely to complete the trial (43.2%) than men (19.4%; $p=0.010$). Differences between cancer type were minimal. Adherence was better among breast cancer patients ($p=0.016$) but this was attributable to sex; there was no difference among patients with multiple cancers ($p=0.583$) or patients who had a previous heart attack ($p=0.681$) or stroke ($p=0.528$), had diagnosed hypertension ($p=0.513$) or pulmonary disease ($p=0.199$), were obese ($p=0.893$), or smoked ($p=0.333$). Fatigue ($p=0.696$) and mode of treatment (surgery, chemotherapy, radiation; $p>0.225$) did not affect completion. There was a difference among patients with hyperlipidemia (50.0% retained) compared to patients without hyperlipidemia (32.4%; $p=0.040$). Patients with poor sit-and-reach scores were also more likely to drop out: 53.3% of patients who could reach their toes completed the program compared to 26.5% who could not reach their toes ($p=0.016$). **CONCLUSION:** Exercise adherence is low among cancer survivors; in our sample, fewer than 40% of patients were retained through follow-up. Several factors predicted retention, but sex had the strongest association. Further efforts must be made to identify risk factors for attrition in this population. The differences observed in retention by sex suggest other cohorts may need to be stratified by sex to verify our findings.

2658 June 1 4:30 PM - 4:45 PM

Effects Of Three-stage Training Program On Functional Fitness And Physical Activity For Community-dwelling Old-old Japanese

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(No relevant relationships reported)

PURPOSE: To examine the effectiveness of a three-stages physical training program on ADL-related functional fitness and daily physical activity for community-dwelling old-old Japanese women.
METHODS: After giving written informed consent, the subjects, unable to stand on one leg for more than 20 seconds with eyes open, were divided into a 3 times/week group (HFG; 13 females, $81.5±2.7$ yrs, BMI $22.8±1.6$) and a 1time/week group (LFG; 10 females, $81.7±3.2$ yrs, BMI $21.9±1.3$). The program was composed of three stages for 16 weeks. First, participants learned about management skill for their physical soreness and asked to stand on one-leg with eyes open for one minute, 3 times a day for each leg at class and at home. Second, they learned to strengthen their core and lower leg muscle using an elastic band. The last stage was to learn a three-minute arm and leg combined exercise program with music. ADL-related functional fitness(sitting & standing time, zigzag walking time), one-leg standing time with eyes open, and knee extension strength were obtained. Balance ability was measured by the area covering and total length of the center of gravity sway(COP). Each measurement item was assessed before and after the intervention period. Daily physical activity was measured by pedometer in the first and last 7days during the intervention period. Student's T-test and two-way repeated measures ANOVA were used to test the effectiveness.
RESULTS: The class participation were $82±4\%$ and $81±8\%$ respectively. Sitting & standing time (HFG: 18.4±5.6 to 16.3±5.1 sec., LFG: 17.4±3.9 to 17.7± 3.6sec. F=3.573, P=0.073), zigzag walking time(HFG: 19.2±2.9 to 17.2±4.2sec., LFG: 16.6±3.1 to 16.8±2.9sec, F=11.88,P=0.002), one-leg standing time with eyes open(HFG: 6.1±3.1 to 13.7±4.2 sec., LFG: 5.9±2.3 to 6.1±1.8sec, F=30.69,P=0.000), knee extension strength(P=0.040), and balance ability(area covering of COP; F=13,58, P=0.001, total length of COP; F=21.00, P=0.022) ,daily steps(HFG: 3864±747 to 4454±632steps, LFG: 3831±832 to 4001±860steps, F=5.28,P=0.032) also improved significantly in HFG.
CONCLUSIONS: Three-stage physical training program was effective for functional fitness and daily physical activity by old-old Japanese females.

2659   June 1 4:45 PM - 5:00 PM

Lifestyle Strategies to Support Sustained Physical Activity after Intentional Weight Loss: Results from MAINTAIN-pc Trial

Molly B. Conroy, FACSM[1], Bethany B. Gibbs[2], Margaret P. Lott[3], Rachel Hess[1], Cindy Bryce[2], Gary S. Fischer[2], Dana Tudorascu[2], Diane Comer[2], Laurey Simkin-Silverman[2], Kimberly Huber[2], Kathleen M. McTigue[2]. *University of Utah, Salt Lake City, UT. [2]University of Pittsburgh, Pittsburgh, PA. [3]University of Miami, Miami, FL.*
(No relevant relationships reported)

PURPOSE: Weight maintenance after intentional loss is challenging, and sustained physical activity (PA) levels can help. Less is known about lifestyle strategies that may promote sustained PA levels after intentional weight loss.
METHODS: We analyzed baseline and 24-month data from the Maintaining Activity and Nutrition through Technology-Assisted Innovation in Primary Care (MAINTAIN-pc) trial. MAINTAIN-pc recruited adults who had intentionally lost >= 5% body weight in past 2 years and were randomized to tracking tools with tailored coaching (CC) or tracking tools alone (TO). At assessments, participants reported lifestyle strategies used in the past six months, including self-monitoring, group support, behavioral skills, and professional support. PA levels were assessed with Omron pedometer HJ-720ITC with blinded feedback screen. Wilcoxon rank sum or t tests compared PA levels between strategy use vs. no use.
RESULTS: At baseline, the 194 participants were 53.4 (SD 12.2) years old, 74% female, and 88% White. Median baseline PA level was 5998 steps/day. At baseline, 69% used self-monitoring, 73% group support, 100% behavioral skills, and 68% professional support in past 6 months; at 24 months these rates were 75%, 60%, 98%, and 61%, respectively. Recording PA (53% baseline; 57% 24 months) and calories (52% baseline; 43% 24 months) were the most common self-monitoring strategies. There were no differences in strategies between CC and TO groups at either baseline or 24 months. Participants who used self-monitoring strategies at 24 months had higher PA levels at baseline (6473 vs. 4730 steps; p =0.045) and 24 months (6103 vs. 5251 steps; p=0.02) than those who did not. Within self-monitoring strategies, participants recording steps had greater PA levels than those who did not at 24 months (6103 vs. 5251; p=0.04, respectively). Participants with group support at 24 months also had higher baseline PA compared to those who did not (6779 vs. 5752; p=0.03). No differences were found in PA levels at baseline or 24 months based on behavioral skills or professional support.
CONCLUSIONS: Participants reported frequent use of a variety of lifestyle strategies at baseline and 24 months. Self-monitoring, especially recording daily steps, may be particularly important in sustaining PA levels after intentional weight loss.

2660   June 1 5:00 PM - 5:15 PM

Perceived Physical Fatigability Improves after a Weight Management Intervention in Obese Older Adults

Nancy W. Glynn, Theresa A. Gmelin, Adam J. Santanasto, John M. Jakicic, FACSM, Robert M. Boudreau, Steven M. Albert, Anne B. Newman, Elizabeth M. Venditti. *University of Pittsburgh, Pittsburgh, PA.* (Sponsor: John Jakicic, FACSM)
(No relevant relationships reported)

Obesity and lower physical activity (PA) are related to higher perceived global fatigue in older adults. Fatigue is also associated with disability and higher mortality. However, the effects of weight loss and PA interventions on improving physical fatigability are unknown. **PURPOSE:** We examined the impact of a community health care worker delivered healthy aging and behavioral weight management intervention on perceived physical fatigability among community-dwelling elders with obesity enrolled in the 13-month Mobility and Vitality Lifestyle Program (MOVE UP). **METHODS:** This analysis examined the effects of the first 5 months of intervention, which included the 10 Keys™ to Healthy Aging (month 1) and Diet, Weight, Activity Behavioral Induction (months 2-5) phases. We measured physical fatigability (perceived whole-body fatigue anchored to activities of fixed intensity and duration) using the validated 10-item Pittsburgh Fatigability Scale (PFS, range 0-50 with lower score= less fatigability); self-reported PA using the Community Healthy Activities Model Program for Seniors Survey (CHAMPS) questionnaire; and weight. **RESULTS:** At baseline, participants (N=115) were age 68.8±4.0 years, 83.5% female, 37.8% African American, with Body Mass Index of 34.4±4.5 kg/m^2. Baseline PFS score was 18.6±8.3 with 70.4% (N=81) having higher fatigability (PFS score = ≥15). After 5 months, participants lost 10.7 lbs (5.2% of body weight) and increased total physical activity by 0.8 hours/week. Concurrently, PFS scores significantly decreased by 2.5 points (13.4%) to 16.1±9.0 (p=0.001); the number of participants classified with higher fatigability after the 5 month intervention also declined to 53% (N=61). Preliminary 13-month data (N=93) indicate that mean PFS scores continue to decline to 15.6±8.2 (p=0.0003 for difference between baseline and 13-months). **CONCLUSION:** Moderate weight loss and modest gains in PA were accompanied by notable

improvement in perceived physical fatigability. Thus, lifestyle interventions may be effective at reducing fatigability, which is an important component in the age-related disablement pathway. Supported by CDC Cooperative Agreement #5U48DP0050001.

F-37   Free Communication/Slide - **Strength Testing/ Training**

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100F

2661   **Chair:** Kyle Sunderland. *High Point University, High Point, NC.*
(No relevant relationships reported)

2662   June 1 3:15 PM - 3:30 PM

Comparison of the Firefighter Candidate Physical Ability Test to Weight Lifting Exercises in Firefighters.

Charity Lane, Dustin Hardwick, Thomas Janus, O'Dane Brady, John Mayer, FACSM. *University of South Florida, Tampa, FL.* (Sponsor: John Mayer, FACSM)
(No relevant relationships reported)

Firefighting is an extremely demanding occupation requiring high levels of muscular strength and endurance to attend to a multitude of emergency situations. Matching resistance exercise programs to firefighter job demands has not been well-studied. PURPOSE: The purpose of this study was to compare the EMG activity of relevant muscles during the Candidate Physical Ability Test (CPAT) and weightlifting exercises in firefighters.
METHODS: A repeated measures study was conducted in 13 full-duty career firefighters (1 F, 12 M; aged 18-44 years) from 3 Florida fire departments. Participants reported to a university laboratory to complete 7 low load weightlifting exercises: Romanian deadlift, back squat, overhead press, bent-over row, banded Romanian deadlift, kneeling rotational throw, and glute hyperextension. On a separate day, participants reported to firefighter training grounds to complete the CPAT. The CPAT is a pre-employment functional capacity evaluation that reflects usual tasks performed during emergency responses, which consists of 8 events - stair climb, hose drag, equipment carry, ladder raise and extension, forcible entry, search, rescue, and ceiling breach and pull. During exercises and CPAT events, surface EMG activity was recorded from the oblique abdominal, deltoid, trapezius, latissimus dorsi, lumbar multifidus, gluteus maximus and medius, and hamstring muscles. For each muscle group, surface EMG activity (% maximum voluntary isometric contraction - MVC) was compared between the exercises and CPAT.
RESULTS: No difference (p > 0.05) in EMG activity was observed between weightlifting exercises and CPAT for the deltoid, trapezius, lumbar multifidus, gluteus maximus and medius, and hamstring muscles. EMG activity was significantly greater (p = 0.002) during the CPAT compared to the exercises for the abdominal obliques (39.9% +/- 27.8% vs. 12.0% +/- 6.4%, respectively). EMG activity was significantly greater (p = 0.049) during the exercises compared to CPAT for the latissimus dorsi (21.8% +/- 16.7% vs. 11.4% +/- 4.6%, respectively).
CONCLUSION: Standardized weightlifting exercises, along with additional exercises to activate and strengthen the abdominal obliques, should be considered when designing resistance exercise programs to match firefighter job demands.

2663   June 1 3:30 PM - 3:45 PM

High IntensityFunctional Training Improves Multiple Domains of Fitness in Females and Males

Katie M. Heinrich, Sarah J. Cosgrove, Jacob Frye. *Kansas State University, Manhattan, KS.* (Sponsor: Yuri Feito, FACSM)
(No relevant relationships reported)

It is unclear if high intensity functional training (HIFT), that temporally combines aerobic, gymnastics, and weightlifting exercises for general physical preparedness (GPP), improves multiple fitness domains. **PURPOSE**: To examine effects of 6-months of HIFT on nine fitness domains.
METHODS: Program evaluation participants (N = 48, 50% female, age = 31.8 ± 13.3 years, range = 18-66 years, 87.5% white) were new/existing members of a university HIFT gym at enrollment (HIFT experience = 9.8 ± 8.4 months, range = 0-27 months), and reported usually doing HIFT workouts 4.0 ± 1.1 days/week. At baseline and 6-months, field fitness tests measured coordination and balance (agility hop), agility (pro-agility), flexibility (sit-and-reach), power (standing long jump and seated medicine ball put), and muscular endurance/stamina (60-seconds of push-ups/ knee push-ups, sit-ups, air squats, and max repetitions of strict/banded pull-ups) on day 1; strength (1RM back squat, press, and deadlift) on day 2; and speed (400m run), and

cardiorespiratory endurance (1.5 mile run) on day 3. Participants completed the same standardized warm-up before each measurement day. Paired/independent samples t-tests were conducted using SPSS 24.
RESULTS: Females significantly improved flexibility (31.1 ± 9.2 cm to 34.1 ± 8.1 cm, t = 3.8, p = .001), power (long jump = 1.75 ± 0.33 m to 1.81 ± 0.31 m, t = 3.0, p = .006), muscular endurance (push-ups [n=13] = 25.2 ± 7.0 to 29.8 ± 7.8 reps, t = 2.4, p = .035), and strength (back squat = 58.2 ± 12.4 kg to 64.3 ± 13.9 kg, t = 4.6, p < .001; press = 32.3 ± 5.9 kg to 34.7 ± 7.4 kg, t = 3.7, p = .002; and deadlift = 80.0 ± 18.9 kg to 87.7 ± 22.0 kg, t = 3.2, p = .005). Males significantly improved flexibility (29.5 ± 8.6 cm to 31.6 ± 7.4 cm, t = 2.1, p = .043), muscular endurance (pull-ups [n=16] = 3.6 ± 0.9 to 4.2 ± 1.0 reps, t = 2.7, p = .018) and strength (back squat = 101.8 ± 27.0 kg to 110.6 ± 30.0 kg, t = 5.0, p < .001; deadlift = 130.4 ± 31.6 kg to 139.5 ± 31.2 kg, t = 4.2, p < .001). Females improved significantly more than males only for power (long jump, t = 3.1, p = .004).
CONCLUSIONS: The GPP-focused HIFT training significantly improved multiple fitness domains for females and males after 6 months of training, with no significant fitness decreases. Improvements were found even among experienced HIFT participants, which may help facilitate continued participation.

2664   June 1 3:45 PM - 4:00 PM

Effect of Heavy Resistance and Plyometric Training on Running Economy and 5km Performance in Well-trained Male Athletes

Li Fei, Ding Haiyong, Zhang Xiaohui, Han Guangqiang, Chen LinShan, Huang Chunyan. *SHANGHAI UNIVERSITY OF SPORT, SHANGHAI, China.*
(No relevant relationships reported)

Purpose The present study was to investigate the effect of 8-week heavy strength training plus plyometric training on well-trained male athletes' running economy and 5km performance.
Methods Twenty-three male long-distance runners (25.2 ± 3.8years; BMI:21.0 ± 1.1kg·m^{-2}; VO$_2$max: 66.4 ± 7.0 mlO2·kg^{-1}·min^{-1}) were allocated into experimental group (EG, N=12) or control group (CG=11).EG performed 8-weeks heavy resistance plus plyometric training, include 5sets of 5RM squats, RDL, Bulgaria squats plus 3sets of 10-15reps on low hurdle jumping and single leg jumping. CG performed endurance-strength, include 5sets of 20RM squats, RDL, Bulgaria squats plus 3sets of 20reps on trunk stability exercises. EG and CG did the similar endurance training program, which include 60-80km LSD per week, the intensity was a little bit below the anaerobic threshold. Before and after 8 weeks intervention, performed the following tests:(a) incremental test, (b) 12km·h^{-1},14km·h^{-1},16km·h^{-1}running economy test(c) 5-km running time trial, (e) counter movement jump test, (f) maximum dynamic strength test (1RM),(g) ground contact time at 16km/h.
Results: The EG showed significant improvement(p≤0.05)on 1RM strength($27.8\% \pm 5.4$), RFD($18.1\% \pm 3.3$),CMJ($13\% \pm 7.8$)12km·h^{-1}RE($3.3\% \pm 2.1$),14km·h^{-1}RE($4.6\% \pm 3.7$)16km·h^{-1}RE($6.2\% \pm 5.4$) ,5km($4.7\% \pm 3.2$). CG did not show any change in 1RM,RFD,CMJ and 5km trial, but a improvement on 12km·h^{-1}RE($2.3\% \pm 2.7$). Both EG and CG did not have any change in 16km·h^{-1} ground contact time.
Conclusions: The 8-week heavy strength training plus plyometric training have a good effect on running economy and 5km performance, and was more effective in improving neuromuscular performance and running economy compare with endurance-strength training.

2665   June 1 4:00 PM - 4:15 PM

Exercise Time and Intensity: The Ideal Ratio to Prevent Overtraining and Maximize Fitness

Heather J. Porter[1], Joshua J. Davis[2], Jinger S. Gottschall[1]. [1]*The Pennsylvania State University, University Park, PA.* [2]*Penn State Hershey Medical Center, Hershey, PA.* (Sponsor: W. Larry Kenney, FACSM)
(No relevant relationships reported)

The American College of Sports Medicine recommends that adults achieve at least 30-50 minutes of moderate-intensity cardiorespiratory exercise 5 days per week or 20-60 minutes of vigorous-intensity exercise 3 days per week. While these minimum guidelines are clearly described, there are currently no maximum guidelines, particularly with respect to high-intensity time and frequency, for the prevention of overtraining. **PURPOSE**: To evaluate the correlation between salivary hormones, time in varying heart rate zones, and psychosocial stress variables in order to prevent overtraining and improve fitness. Our hypothesis is that chronic exercise durations greater than 1 hour per week in the high intensity (greater than 90% maximum heart rate) zone will lead to decreased variation in the production of stress hormones, decreased ability to reach heart rate max and increased self-reporting of tension as well as fatigue. **METHODS**: Twelve healthy adults between 25-50 years who regularly exercised more than 8 hours per week recorded their heart rate during every training session and answered daily surveys regarding their mood for 3 weeks. Next, they

completed an experimental day composed of 2, 30-minute high-intensity interval sessions separated by 4-hours of non-active recovery. We collected saliva samples prior to each exercise session, immediately following, and 30-minutes post to assess changes in cortisol and testosterone concentrations. Heart rate was monitored throughout the experimental day to determine exercise and recovery values. **RESULTS**: There was a correlation between weekly time training at an intensity greater than 90% maximum heart rate and the variables associated with overtraining. Cortisol and testosterone saliva concentration fluctuated less in the participants who exercised in this extreme zone for more than 50 minutes per week. To add, these participants were not able to reach the same intensity during the second-high intensity session on the experimental day and reported greater tension as well as fatigue on the surveys in the weeks prior to testing. **CONCLUSIONS:** Our data demonstrate that 50 minutes of high-intensity training per week is a suggested maximum, cumulative time in order to prevent symptoms related to overtraining.

2666   June 1 4:15 PM - 4:30 PM

The Effect of Pre-Workout on Resistance Training Repetitions to Failure

Jacob Prete, Elaina Biechler, Adam Brogley, Matthew Greene, Emma Corkill, Hunter Dunlap. *Loras College, Dubuque, IA.* (Sponsor: Vincent Paolone, FACSM)
(No relevant relationships reported)

The usage of pre-workout supplementation has increased substantially in recent years, as research has shown pre-workout supplements can significantly enhance resistance performance in all populations.
PURPOSE: To compare and determine the effectiveness of a caffeine-free pre-workout and a caffeinated pre-workout on repetitions to failure in bench press and squat.
METHODS: Subjects completed a total of four trials. The first trial was done to find the subject's one-repetition maximum (1RM) for squat and bench press. A cross over design was used to determine the order of the final three trials in which the subject would drink eight ounces of a caffeinated pre-workout out (CA), a caffeine-free pre-workout (NC), or water (C). 20 minutes post consumption of fluid, the subjects did a standard warmup, then completed four sets of back squat for five repetitions at 70% of 1RM, and on the fifth set the subject would complete repetitions until fatigue. Bench press was done for four sets for five repetitions at 70% of 1RM, on the fifth set the subject would complete repetitions until fatigue. The number of repetitions completed on the last set of both squat and bench press were recorded.
RESULTS: An ANOVA was utilized to determine if significant differences occurred in repetitions to failure in the control trial, with caffeinated pre-workout, and with non-caffeinated pre workout. There was a statistically significant difference in squat ($F(1.304, 7.823)= 5.543$, p =.041) and bench press ($F(1.857, 11.141)= 5.484$, p=.024) repetitions to failure. Post hoc analysis revealed that squat repetitions to failure were significantly greater in CA and NC when compared to C (p=.028; p=.044). There was no significant difference between repetitions to failure when comparing CA and NC (p=.99). Post hoc analysis also revealed that bench press repetitions to failure were significantly greater in CA when compared to C and NC (p=.05; p=.234).
CONCLUSIONS: The use of CA significantly increased repetitions to failure for both squat and bench press when compared to a control trial. The use of NC resulted in a significant increase in repetitions to failure for squats, but no significant improvement in repetitions to failure in the bench press. The use of CA and NC have an ergogenic effect on resistance training performance.

2667   June 1 4:30 PM - 4:45 PM

Developing And Validating The Sit-to-stand As A Muscular Power Measure In Older Adults

Jennifer J. Sherwood, Cathy Inouye, Shannon L. Webb, Pavel V. Romanovski, Trenton Ashizawa, Tori Coleman, John W. Adams, Michel Mintsa Ossene. *California State University, East Bay, Hayward, CA.*
(No relevant relationships reported)

Purpose: Here, we tested the validity and reliability of velocity and power measurements performed with a Gymaware linear position transducer (LPT) during a sit-to-stand (STS).
Methods: Fifty-one asymptomatic men (n = 14) and women (n = 37) (ages 60-95 yrs.; 79.5 ± 9.9, mean $\pm$ SD) were recruited from California State University, East Bay (CSUEB) campus, and local independent-living senior populations. Sit-to-stand performance velocity and power was assessed with an LPT connected to a waist belt and base, and video recorded simultaneously and analyzed with Dartfish. Maximum hand-grip strength was assessed with a Jamar dynamometer. **Results:** The Pearson correlation coefficients of STS velocity and power were r = 0.9702 and r = 0.9651, providing evidence that the LTP and cinematography measurements were similar. The trial-to-trial reliability of the STS measured by the LPT gave an intraclass correlation

coefficient of 0.0.916-0.966 for velocity and 0.860-0.940 for power. The Pearson correlation between STS performance measured with the LPT and maximum hand-grip strength was r = 0.651.
Conclusion: Our findings show that the calculations derived from the LPT were very similar to those of cinematography and provide evidence for the validity of this method. The data from the LPT were shown to be reliable. Sit-to-stand performance power showed a good association with maximal hand-grip strength in older adults. These results suggest that power measures during the STS may be a safe and cost-effective method of assessing muscular fitness in older adults.

2668   June 1 4:45 PM - 5:00 PM

Bilateral Training Results in Superior Strength Improvements to Unilateral Despite Similar Changes in Fat-Free Mass

Courtenay Dunn-Lewis, Shawn D. Flanagan. *University of Pittsburgh, Pittsburgh, PA.*
(No relevant relationships reported)

PURPOSE: To determine if strength increases differ between bilateral and unilateral training; to determine whether differences, if any, were mediated by muscle hypertrophy. **METHODS**: College-aged men and women (n=67; age=19.7 ± 0.9 yr; height=168.7 ± 9.8 cm; body fat = 22.14 ± 10.23%) provided written informed consent to participate. Subjects were randomized to a unilateral or a bilateral training group for eight weeks. Strength testing (chest press and leg press) was performed at pre, mid, and post, with body composition (air displacement plethysmography) at pre and post. Statistics included a repeated measures ANOVA with LSD post-hocs and planned contrasts. **RESULTS**: As shown in Figure 1 (leg press), strength increased (significant linear trend for chest press and leg press: p=0.000) across all three time points. While there were no significant differences in strength at any time point, within-subjects contrasts displayed a significant linear trend interaction between time and training group for both leg press (0.049) and chest press (p=0.029) strength; the slopes of the two lines were therefore significantly different in favor of the bilateral trend. Although both groups increased FFM, the increase was comparable (mean kilogram change from pre to post: 1.6 ± 0.5, p=0.001 bilateral, 1.4 ± 0.4, p=0.001 unilateral). **CONCLUSION**: Bilateral training results in superior strength improvements over eight weeks as compared to unilateral despite similar changes in fat-free mass.

Table 1. Change in Leg Press Strength (lbs)

	Bilateral	Unilateral
Pre	0 ± 0	0 ± 0
Mid	19.3 ± 32.1	7.0 ± 11.3
Post	32.6 ± 42.0	15.2 ± 16.4

2669   June 1 5:00 PM - 5:15 PM

Early Pubertal Children Perceive High Intensity Interval Exercise as Less Strenuous than Young Adults

Ronen Bar-Yoseph, Pearl Law, Dan M. Cooper, Shlomit Radom-Aizik. *UCIrvine, Irvine, CA.*
(No relevant relationships reported)

High-intensity interval training (HIIT), which consists of repeated sessions of brief, intense bouts of exercise, has been shown to be an effective and time-efficient approach to improve aerobic training. Early pubertal children rely more heavily on aerobic metabolism and recover faster from exercise bouts. Borg's Rating of Perceived Exertion (RPE), a subjective measure of exercise intensity used to evaluate responses to specific training loads, has yet to be systematically explored in relation to HIIT among children of different maturation stages and sex groups. **PURPOSE:** To evaluate RPE during HIIT in children, adolescence, and young adults and to investigate the relationship between RPE, sex, and puberty. **METHODS:** One hundred healthy children and young adults (7-34 y/o, 47 males) participated in two exercise sessions on a cycle ergometer: 1) ramp-type progressive cycle ergometry to determine peak VO_2; 2) HIIT - ten times, 2-min bout at 80% peak work rate interspersed with 1-min rest. Borg's RPE (scale of 6-20) was recorded at the end of each 2-min exercise bout. **RESULTS:** Fifty two participants completed HIIT at 80% peak work rate. Completion rates were higher in early pubertal children (70%, 26/37) and young adults (68%, 13/19) compared to adolescents (30%, 13/44) with no sex difference. Among completers, mean RPE was significantly lower in the early pubertal children (14.9±1.7%, "hard") compared to adults (16.8±1.7%, "very hard") with no sex-effect. In all 3 groups RPE was increased with the progression of the test. Heart rate recovery was fastest in early pubertal children with no group difference in oxygen uptake. **CONCLUSION:** Early pubertal children perceive high-intensity exercise as less strenuous than young adults. Differences in RPE reported by the 3 groups may be partially explained through faster HR recovery and relying more on aerobic metabolism in early pubertal children compared to older children and young adults. Researchers and coaches should take into consideration the age of the participant

when using RPE in research or as a training tool. Underlying mechanisms involved in RPE-maturational related differences should be further explored (including cognitive responses).

F-38   Clinical Case Slide - **Hip and Pelvis III**

Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-200E

2670   **Chair:** Benjamin Hasan. *Northwestern Community Hospital Medical Group, Arlington Heights, IL.*
(No relevant relationships reported)

2671   **Discussant:** Bryan Wiley. *Kaiser Permanente, Ontario, CA.*
(No relevant relationships reported)

2672   **Discussant:** Pierre d'Hemecourt, FACSM. *Boston Children's Hospital, Boston, MA.*
(No relevant relationships reported)

2673   June 1 3:15 PM - 3:35 PM

Epidemiology and Clinical Presentation of Anterior Hip Pain among Elite Classical Dancers

Marijeanne Liederbach. *NYU Langone Orthopedic Hospital, New York, NY.* (Sponsor: Malachy P. McHugh, FACSM)
(No relevant relationships reported)

Hip injuries in dance can be commonplace and distressing in terms of human and financial impact. Approximately 11% of all time-loss injuries to dancers are because of hip pain and up to 50% of dancer visits to physicians are because of hip pain. PURPOSE: To assess the clinical presentation of dancers without dysplasia, labral tear or bony deformity in order to understand the movement factors associated with onset and cessation of anterior hip pain. METHODS: 250 student and elite classical dancers (24.1 ± 7.5 years; 72 men, 178 women) were assessed in our physical therapy clinic for strength, flexibility, balance, motor control and joint mobility. RESULTS: 82% of dancers had lower extremity strength asymmetry; 71% had talocrural or subtalar joint hypomobility on the ipsilateral side and 32% on the contralateral side relative to the side of hip pain. On the hip pain side, 100% had a positive Romberg test, 82% had a positive Airplane test and 70% a positive FADIR test. CONCLUSION: Because of the repetitive and movement biased fashion of dance training over many years, it is important for clinicians to understand the presentation of classical dancer hip pain as that of a multi-factorial, postural-behavioral movement impairment syndrome which entails skilled regional interdependent examination and defies a single common diagnostic label.

2674   June 1 3:35 PM - 3:55 PM

Hip Pain - Equestrian

Amanda M. Honsvall Hoefler. *University of Minnesota Methodist Family Medicine Residency, Saint Louis Park, MN.* (Sponsor: William O. Roberts, MD, FACSM)
(No relevant relationships reported)

HISTORY
A 61 year old horseback rider with severe OA and labral tear of the left hip underwent her 3rd fluoroscopically-guided triamcinolone injection for pain relief during competition season. She immediately experienced gradual worsening of left groin pain but was able to continue training.
Ten days post-injection, she returned with severe groin pain limiting weight bearing. She planned to leave the following day for a trip. She had no fever, chills, swelling, bruising or rash. She had mild pain with hip ROM testing. CRP was elevated without leukocytosis. MRI showed a small effusion with mild synovial inflammation. In the absence of systemic signs of infection, findings were consistent with reactive synovitis with low suspicion for infection. Upon discussion, the patient elected to proceed with her trip, monitor her symptoms closely, and present to a local ED if symptoms worsened.
She returned 2 weeks later unable to bear weight.
PHYSICAL EXAMINATION
Left hip exam demonstrated full passive internal and external rotation. Focal groin pain was reproduced by both active and passive ROM. No neurological deficits.
DIFFERENTIAL DIAGNOSIS
1. Septic arthritis
2. Avascular necrosis

Abstracts were prepared by the authors and printed as submitted.

FRIDAY, JUNE 1, 2018

3. Hemarthrosis
4. Reactive or crystalline synovitis
TESTS AND RESULTS
XR pelvis w/L lateral hip: Collapse of superior joint space with subchondral cystic change.
L Hip Aspiration: 4 mL bloody effusion (4.9 million RBCs, 2668 WBC, 69% PMNs). Synovasure positive.
Open I&D w/resection of the femoral head and placement of antibiotic spacer
- Synovitis with small amount of clear joint effusion. No gross purulence. Subchondral collapse and area of necrotic bone in the femoral head.
- 1/5 periarticular tissue cultures and 1/1 bone culture positive for Strep mitis/oralis.
- Bone path revealed acute osteomyelitis and osteonecrosis.
FINAL WORKING DIAGNOSIS
Septic arthritis and osteomyelitis of the left native hip
TREATMENT AND OUTCOMES
1. Six week course of IV ceftriaxone
2. Re-admitted 3 weeks post-op for fever, chills, headache and severe L hip pain following return to riding. Two extra-articular hematomas were identified on MRI and aspirated.
3. Re-admitted 6 weeks post-op for iliofemoral DVT. Underwent catheter-directed thrombolysis and stent placement for May Thurner's defect. Started on 6 months of Xarelto.
4. Left THA completed 6 weeks post-DVT.

2675   June 1 3:55 PM - 4:15 PM

Groin Injury- Swimming

Jennifer Soo Hoo, MD[1], Kristen Abbott, MD[2], Monica Rho, MD[1]. *[1]Shirley Ryan Abilitylab, Chicago, IL. [2]Northwestern University Health Service, Chicago, IL.* (Sponsor: Joseph Ihm, FACSM)

(No relevant relationships reported)

History:
A 20 year old Division 1 varsity swimmer who specializes in breast stroke presented for evaluation of worsening right groin pain over the past several months. Her pain was worse with breast stroke kick and increased intensity of training. The pain was located in right proximal adductor area. Her pain had continued despite working with a physical therapist and relative rest for at least 3 months. X-ray and MRI of pelvis including athletic pubalgia protocol was negative for any pathology. She denied any weakness or numbness/tingling.
Physical Examination:
Examination of her right leg revealed focal tenderness to palpation of proximal adductor tendon attachment on pubic symphysis without any swelling or deformity. She had pain with resisted adduction in all planes and resisted abdominal crunch. Active straight leg raise, pubic symphysis spring test were positive. Negative FADIR and log roll.
Differential Diagnosis:
1. Adductor strain
2. Adductor tendinopathy not seen on MRI
3. Athletic pubalgia
4. Osteitis pubis
5. Pelvic Floor dysfunction
6. Pubic rami stress fracture
Test and Results:
MRI pelvis:
- rectus abdominis insertion and right adductor tendon origin is normal in signal intensity and morphology.
- No evidence of osteitis pubis.
Ultrasound:
- thickening of right adductor tendon with evidence of enthesopathy and calcifications worse on the right.
- No evidence of osteitis pubis.
Final/Working Diagnosis:
Right adductor tendinopathy
Treatment and Outcomes:
1. Underwent PRP injection of right adductor tendon
2. Was non weight-bearing for 1 week post-injection
3. Progressed to full weight bearing and light exercise (swimming with just arms), 1-6 weeks post-injection
4. Began eccentric exercises, 7 weeks post injection
5. Ultrasound showed full tendon healing, cleared to return to full swimming and lifting, 12 weeks post injection

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2676   June 1 4:15 PM - 4:35 PM

Hip Injury - Soccer

James Alex, Heather Gillespie, FACSM. *Maine Medical Center, Portland, ME.* (Sponsor: Heather Gillespie, MD, FACSM)

(No relevant relationships reported)

ACSM 2018 National Conference
Clinical Case Abstract Submission
Title: Hip Injury - Soccer
Author: James Alex, Heather Gillespie, Maine Medical Center, Portland, ME. Email: jalex@mmc.org.
(Sponsor: Heather Gillespie, FACSM)
History: A 13 year old male soccer player without significant past medical history sustained an acute onset of anterior right hip pain while sprinting during a soccer game. He was immediately unable to walk and was carried off the field by teammates. He developed occasional transient episodes of pain radiating down his right leg without numbness or tingling noted. He was evaluated in the emergency department that evening, given oxycodone for analgesia, crutches to maintain non-weight-bearing status, and was referred to sports medicine for follow-up.
Physical Exam: Examination in the office 2 days after injury revealed no hip, leg, or abdominal abnormalities on inspection. He was able to bear about 50% of his weight on the right leg without crutches. Mild tenderness to palpation was noted anterior to the right lesser trochanter. Right hip active range of motion was limited to 10 degrees of flexion in the supine position with normal passive range of motion throughout and intolerance of resisted hip flexion. Normal resisted adduction strength was noted. Neurovascular testing of the right lower extremity was normal.
Differential Diagnosis:
1. Iliopsoas strain
2. Apophyseal avulsion fracture: AIIS, ASIS, or lesser trochanter.
3. Adductor strain
4. Femoral neck stress fracture
5. Slipped capital femoral epiphysis
Tests and Results: 2-view xray of the right hip reveals apophyseal avulsion fracture of the lesser trochanter of the right femur with 20mm of proximal displacement.
Final Diagnosis: Closed, proximally-displaced apophyseal avulsion fracture of the lesser trochanter of the right femur.
Treatment and Outcome:
1. Case reviewed with multiple surgeons (sports, trauma, pediatric orthopedics) regarding potential screw fixation.
2. Non-operative management pursued.
3. Stable proximal displacement visualized on repeat xray post-injury day 6.
4. Non-weight-bearing on crutches for 3 weeks.
5. OTC analgesia after post-injury day 3.
6. Gradual weight bearing by week 4.
7. Final return to sport pending at the time of submission.

2677   June 1 4:35 PM - 4:55 PM

Pelvic Pain In A Soccer Player- Soccer

John T. Nelson[1], Delmas Bolin[2]. *[1]Carilion Clinic VTC Family Medicine Residency, Roanoke, VA. [2]Edward Via College of Osteopathic Medicine, Virginia Campus, Roanoke, VA.* (Sponsor: Delmas Bolin, FACSM)

(No relevant relationships reported)

HISTORY: A 23 year old men's soccer player presented with left sided pubic bone pain for seventeen months. The injury occurred after collision with another player and falling onto his left side during a soccer game. He developed left sided pubic symphysis pain later that evening. He finished the season followed by complete inactivity for 2 months. At the start of the next season, the same left sided pain returned that was worse with initial steps, change of direction, and lateral movements. He was seen in a sports medicine clinic and had an MRI which showed edema in the rectus abdominis, left abductor, and pubic symphysis. He completed physical therapy with no improvement. He then developed intermittent sharp pain radiating to the left testicle with running, preventing return to play. Steroid and Platelet Rich Plasma injections did not alter symptoms. He was referred to General Surgery, Orthopedics, given NSAIDs, repeated PT, repeat MRI, and finally referred for a biomechanical evaluation and treatment.
PHYSICAL EXAMINATION: Pelvic compression test is + left. Palpation: left superior pubic rami pain; mild pain in left ischial tuberosity. ASIS to umbilicus measures 12 cm left, 13 cm right. ASIS is inferior on right. PSIS is superior on left. Left leg 1.5 cm shorter. Palpation of left lower abdominal quadrant lateral to the border of pubic symphysis reproduces left sided scrotal pain. Genitourinary/Hip exam: Unremarkable. Sensation intact bilateral L4-S1 distribution. Reflexes: 2+/4 bilateral knee and ankle. Pulses: 2+/4 bilateral post tibial
DIFFERENTIAL DIAGNOSIS: Stress Fracture of Pubic Ramus, Athletic pubalgia, Inguinal Hernia, Abdominal muscles strain/tear, Nerve Entrapment
TEST AND RESULTS: MRI (2nd): small area of edema in the left side of the pubic symphysis and inferior pubic ramus, consistent with stress reaction/athletic pubalgia.

FINAL WORKING DIAGNOSIS: Stress Fracture of the Pubic Ramus (resolving), left hemipelvis in-flare, causing pubic symphysitis and genital branch of Genitofemoral Nerve entrapment
TREATMENT AND OUTCOMES: Osteopathic manipulation- one course resolved pubic symphysis pain. US-guided hydrodissection of the left genitofemoral nerve-immediate alleviation of symptoms with return to play without pain or discomfort.

2678   June 1 4:55 PM - 5:15 PM
Hip Tumor Discovered in High School Basketball Player Referred to Physical Therapy with Knee Pain
Nicholas B. Washmuth. *Samford University, Homewood, AL.* (Sponsor: C Scott Bickel, FACSM)
(No relevant relationships reported)

HISTORY: A 15-year-old high school basketball player reported insidious onset of left knee pain. Knee pain was only present when running and pivoting. He denied ankle or hip dysfunction.
PHYSICAL EXAMINATION: Knee range of motion (ROM) and strength were unremarkable. Moderate weakness noted in bilateral hip extensors and abductors, as well as abdominals. Knee pain was reproduced during squatting movements. Significant lumbar spine, hip, and knee movement compensations were observed while squatting due to hip mobility restrictions. Lower extremity (LE) musculature demonstrated decreased extensibility. Hip internal rotation (IR) ROM limited to 10° left and 20° right, while hip external rotation (ER) limited to 30° bilaterally. Hip flexion limited to 70° left and 100° right. He described "pinching" in left groin during hip impingement special test. All other special tests for hip and knee were negative. Manual assessment of left hip joint accessory mobility revealed hypomobility in all directions.
DIFFERENTIAL DIAGNOSIS:
1. Knee pain compensatory in nature, related to decreased hip joint ROM and LE muscle extensibility
2. Femoral acetabular impingement, due to significant hip mobility deficits
3. Patellar tendinopathy
4. Patellofemoral pain syndrome
Treatment was initiated; however, no improvements in hip ROM were documented after 4 visits of physical therapy that included aggressive joint mobilization and ROM exercises, which led to the suspicion of femoral acetabular impingement. This warranted referral to orthopedic physician for imaging studies.
TESTS AND RESULTS:
Radiographs and MRI of left hip revealed hip tumor, leading to surgery on left hip
FINAL/WORKING DIAGNOSIS:
1. Knee pain compensatory in nature, related to decreased hip joint ROM and LE muscle extensibility2. Surgery, status post tumor excision, left hip
TREATMENT AND OUTCOMES:
Patient followed hip surgical dislocation post-operative rehabilitation protocol and returned to basketball without restrictions at 6 months post-operatively. This clinical case exemplifies the concept of regional interdependence and importance of inter-professional collaboration when patients are not progressing as expected with rehabilitation.

F-39   Clinical Case Slide - **Knee IV**
Friday, June 1, 2018, 3:15 PM - 5:15 PM
Room: CC-200F

2679   **Chair:** Mark E. Lavallee, FACSM. *Wellspan York Hospital, South Bend, IN.*
(No relevant relationships reported)

2680   **Discussant:** Ashley Zapf. *Andrews Institute, Woodbridge, VA.*
(No relevant relationships reported)

2681   **Discussant:** Jessie R. Fudge, FACSM. *Kaiser Permanente Washington, Everett, WA.*
(No relevant relationships reported)

2682   June 1 3:15 PM - 3:35 PM
A Rare Cause of Knee Pain in a Healthy Male Ultra-marathon Runner
Pierre L. Viviers, FACSM, Riaan Dreyer, Jeandré Viljoen, Wayne Derman. *Stellenbosch University, Stellenbosch, South Africa.*
(No relevant relationships reported)

HISTORY: A 58-year-old healthy male ultra-marathon runner presented with a 3-month history of atraumatic, gradually worsening right-sided anterior knee pain, aggravated by activity and associated with prominent morning stiffness and pain. Night pain was absent. Oral and parenteral NSAIDs provided no relief, nor did massaging. No history of smoking, alcohol or prior corticosteroid use was reported.
PHYSICAL EXAMINATION: The R-knee was slightly swollen with no obvious deformities. No clinical intra-articular effusion was noted. Palpation revealed tenderness over the quadriceps tendon insertion and superomedial knee. In addition, the patient showed significant weakness of the right gluteus medius and quadriceps muscles. Tests for mechanical disruption and intra-articular injury were negative. Further examination of the hip and ankle joints as well as the general systemic examination were unremarkable.
DIFFERENTIAL DIAGNOSIS:
Quadriceps tendinopathy
Patellar tendinopathy
Patello-femoral pain syndrome
Chondromalacia patellae
Patellofemoral osteoarthritis
Iliotibial band syndrome
Other sources of knee pain (such as arthritis and gout)
TEST AND RESULTS: Ultrasound: No soft tissue abnormalities. Suggestive area of a bony infarct in the distal femur. Plain radiographs (R-knee): Hypo-lucent area-distal femur (proximal to the condyles) MRI Knees: Bilateral areas of increased signal in the distal femoral shaft, suggestive of bilateral bony infarcts, were identified. Blood tests: within normal limits.
FINAL WORKING DIAGNOSIS: Spontaneous osteonecrosis of the knee (SPONK)/Ahlback`s Disease.
TREATMENT AND OUTCOMES: 1. Initial management: Conservative - physical therapy and eccentric strengthening exercises. 2. Final outcome: Returned to physical activity, but it is still debated whether this athlete should return to full participation in ultra-marathon running.

2683   June 1 3:35 PM - 3:55 PM
Unusual Knee Pain in a Volleyball Player
Adam Lewno, Daniel R. Lueders. *University of Michigan, Ann Arbor, MI.* (Sponsor: Robert Kiningham, FACSM)
(No relevant relationships reported)

HISTORY:
A 20 year old collegiate volleyball libera presents mid-season with 2 year history of self-resolving right inferolateral burning dysethesitic knee pain with a lasting dull ache that is primarily aggravated with hard contact to her lateral knee as when diving for balls. Over the last 3 weeks her pain has progressed despite multiple forms of knee padding, guards, braces, as well as dive form adjustments causing her to be more hesitant when diving for balls; ultimately negatively affecting her ability to be a defensive specialist on the court. She was previously evaluated for similar complaints in the 2016 season with planned sonographic guided infrapatellar branch of the saphenous nerve (IBSN) corticosteroid injection with hydrodissection but ultimately

did not proceed with treatment due improvement during the off season. She denies any catching, locking, instability, or swelling with no history of prior injury to her right lower extremity.

PHYSICAL EXAM:

SKIN: No rash or lesion

NEUROMUSCULAR: Tenderness at Gerdy's tubercle and distal lateral insertion of the patellar tendon. Normal strength, deep tendon reflexes, and sensation in lower extremities. No ligamentous laxity on special testing.

GAIT: No abnormality

DIFFERENTIAL DIAGNOSIS:

1. Tibial Contusion
2. Fibular Contusion
3. Avulsion fracture
4. Common fibular nerve neuropraxia or neuroma
5. IBSN neuropraxia or neuroma
6. Lateral Meniscus extrusion
7. LCL Strain
8. Distal Iliotibial Band (ITB) Syndrome
9. Distal ITB tendinosis
10. Symptomatic lateral plica

TESTs and RESULTS:

Right knee radiographs indicated bipartite patella with a small joint effusion but no fractures or degenerative changes

Diagnostic ultrasound of the right knee identified asymmetric thickening of the right ITB in its distal-most 5cm to its Gerdy's Tubercle insertion and correlating tenderness with sonopalpation. The adjacent joint line, bursae, nerves, and ligamentous anatomy were normal.

FINFAL DIAGNOSIS:

Distal Iliotibial Band Tendinosis

TREATMENT AND OUTCOMES:

1. Focused exercises on dynamic balance and quadriceps strengthening
2. Progressive ITB stretching
3. Graston instrument assisted soft tissue mobilization
4. Class IV laser treatment

Two weeks of in season treatment achieved complete resolution of her complaints with no disruption of her competitive play.

2684 June 1 3:55 PM - 4:15 PM

Knee Pain in a High School Soccer Player

Brian J. Schutzbach[1], Robert Gillis[2]. *[1]Wellspan Health, York, PA. [2]Wellspan Health, Gettysburg, PA.* (Sponsor: Mark Lavallee M.D., FACSM)

(No relevant relationships reported)

HISTORY: A 17 year old male soccer player presented with left knee pain after feeling an acute "snap" while running across field. He described pain as being sharp, stabbing, worse with movement and associated swelling immediately after the injury. He was unable to continue the game or bear weight. He was sent to Emergency Department for further evaluation.

PHYSICAL EXAMINATION: Examination in emergency department revealed athlete in no acute distress with a left knee appearing to have significant swelling, patella was superiorly displaced, and inability to flex or extend knee. Dorsal Pedis pulse was 2+. Skin was warm, dry, pink, with normal capillary refill. No neurological deficits. Vitals stable.

DIFFERENTIAL DIAGNOSIS: 1. Patella tendon rupture 2. Tibial tuberosity avulsion fracture3. Osgood Schlatter Disease 4. Patellar dislocation 5. Patella sleeve fracture

TEST AND RESULTS:Left Knee anterior-posterior, lateral, and oblique radiographs: Distracted and anteriorly displaced large avulsion fracture involving anterior proximal tibia and anterior tibial tuberosity. Maximum distraction of 18.7 mm. Growth plates not completely fused consistent with continued growth.

FINAL WORKING DIAGNOSIS: Type III tibial tuberosity avulsion fracture

TREATMENT AND OUTCOMES: 1. Initial immobilization, non-weight bearing, pain control.

2. Evaluation by Orthopedic Surgeon in office following day. 3. Open reduction and internal fixation with 2 screws perpendicular to fracture line performed on day 4 after injury. 4. Discharged home the same day with weight bearing as tolerated with knee immobilizer locked in extension with crutches. 5. 10 days post-operation: Transition to hinge brace and leg remained locked straight to prevent hyperextension. 6. 3 weeks: Physical therapy with unlocking brace for range of motion exercises 7. 7 weeks: Full range of motion. Cleared to play limited minutes in senior night game.8. 10 weeks: Return to all activities without restriction.

2685 June 1 4:15 PM - 4:35 PM

Knee Injury - Soccer

Matthew C. Hess, Garry W. K. Ho, FACSM. *VCU-Fairfax Family Practice Sports Medicine Fellowship, Fairfax, VA.* (Sponsor: Garry W. K. Ho, MD, FACSM, RMSK, FACSM)

(No relevant relationships reported)

History:

21 year-old male soccer player presented with a 2-day history of diffuse right knee pain which began suddenly after slipping over a soccer ball and landing awkwardly on his leg. Patient reportedly heard a 'loud pop,' was unable to ambulate off the soccer pitch, and has had difficulty walking since. He noticed immediate swelling, and complained of decreased range of motion. He denied numbness, tingling, weakness or prior injury to the knee.

Physical Examination:

Examination in the clinic was notable for antalgic gait, and a large right knee effusion. The patient's active and passive range of motion was restricted from +5 to 100 degrees on the right secondary to pain with normal tracking of the patella. He had tenderness over the medial joint line. The patient had 5/5 strength with flexion and extension. There was normal patellar glide without apprehension. He had a negative Lachman and anterior drawer, but this examination was limited by guarding, making accurate assessment difficult. Valgus stress testing revealed mild laxity. End point was firm with varus stress. Posterior drawer was negative, and he had no appreciable sag sign. The patient was unable to tolerate a McMurray test secondary to pain. He had a normal distal neurovascular exam.

Differential Diagnosis:

1. Tear of the anterior cruciate ligament
2. Medial meniscus tear
3. Strain of the medial collateral ligament
4. Osteochondral defect
5. Tibial plateau fracture

Tests and Results:

Plain film radiography not immediately available due to technical difficulties.

Targeted point-of-care musculoskeletal ultrasound of the knee:

--Large joint effusion with moderate sized hematoma posteriorly along lateral wall of intercondylar notch suspicious for anterior cruciate ligament injury

Final/Working Diagnosis:

Acute Anterior Cruciate Ligament Tear

Treatment and Outcomes:

1. Rest, ice, compression, elevation
2. Ibuprofen 600-800mg by mouth every 8 hours as needed for pain and inflammation
3. Right knee anterior-posterior, lateral and sunrise radiographs (once completed, showed soft tissue swelling and avulsion (Segond) fracture of the lateral tibial plateau
4. Weight bearing as tolerated
5. Referral to Orthopedic Sports Medicine for consideration of ACL reconstruction

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2686 June 1 4:35 PM - 4:55 PM

Knee Snapping After Arthroscopy Diagnosed With Ultrasound In A Runner And Weightlifter: A Case Report

Charonn D. Woods, Jonathan T. Finnoff, FACSM, Brennan J. Boettcher. *Mayo Clinic, Rochester, MN.* (Sponsor: Jonathan T. Finnoff, FACSM)

(No relevant relationships reported)

HISTORY: A 38 year old male presented for a diagnostic ultrasound to evaluate right knee snapping and pain with squats. He had a right knee arthroscopy 11 months prior for an osteochondral lesion of the patellofemoral joint with removal of loose bodies and chondroplasty of the defect. Post-operatively, he complained of 3/10 pain in the knee that became sharp with deep squats and a popping sensation within the terminal 10 degrees of extension.

PHYSICAL EXAMINATION:

Gait: Gait was nonantalgic. Heel and toe walking were normal. Squatting reproduced lateral right knee pain.

Knee exam: Active terminal knee extension reproduced superolateral knee snapping. Patellofemoral crepitus was noted. Ligamentous testing and meniscal provocation maneuvers were negative with no joint line tenderness.

DIFFERENTIAL DIAGNOSIS:

Intraarticular loose bodies

Lateral meniscus tear

Osteoarthritis with crepitus

Extra-articular snapping (biceps femoris, IT band, popliteus)

TESTS AND RESULTS:

Right knee plain radiographs demonstrated mild tricompartmental degenerative arthritis.

Diagnostic ultrasound of the superolateral right knee revealed hypertrophic synovial tissue snapping over a lateral femoral condyle osteophyte. There was no associated synovial hyperemia or joint effusion.

FINAL WORKING DIAGNOSIS:

Right superolateral knee snapping secondary to hypertrophic synovial tissue snapping over a lateral femoral condyle osteophyte.

TREATMENT AND OUTCOME:

An ultrasound-guided diagnostic injection of lidocaine was performed around the osteophyte which provided immediate relief. He was able to squat 135 lbs during the anesthetic phase, and had been unable to body weight squat without significant pain pre-injection. Given the positive response to the diagnostic injection, a repeat injection was performed with Depo-Medrol.

At the two month follow-up, patient reported 60-80% symptom reduction during problematic activity (lunging and squatting) and improvement in function.

Snapping in the knee can be a difficult diagnosis to obtain in an individual who has a known history of loose bodies in the knee. While several case reports exist describing snapping biceps femoris and popliteus tendons in the lateral knee, this is the first to our knowledge to describe a lateral femoral condyle osteophyte as the culprit of snapping.

2687   June 1 4:55 PM - 5:15 PM

Snapping Knee After Knee Arthroplasty In Recreational Athlete

Angela N. Cortez, Tracy Hoeg, Brian A. Davis, FACSM. *University of California at Davis, Sacramento, CA.* (Sponsor: Brian Adam Davis, FACSM)

(No relevant relationships reported)

HISTORY: A 63 year-old recreational athlete presented with right knee snapping 3 months after medial unicompartmental knee arthroplasty. Snapping sensation localized to posterior medial knee and aggravated with active knee flexion and extension. She experiences associated pain in the same area, and occasionally at rest. No instability. Surgical incision of anterior knee healing well without pain.

PHYSICAL EXAMINATION: Examination revealed knee extension to 10°, knee flexion to 120°, focal tenderness of distal semimembranosus tendon. Palpable snapping over medial hamstrings with knee extension and flexion between 20° to 90°. No varus or valgus instability. Mild knee effusion. Surgical scar to anterior knee healing well.

DIFFERENTIAL DIAGNOSIS:

1. Snapping Popliteal Recess
2. Hardware Loosening
3. Snapping Hamstring Tendon over Hardware
4. Snapping Pes Anserinus Syndrome
5. Snapping Fabella

TEST AND RESULTS:

- Right Knee AP and lateral radiographs showed slight posterior positioning of hardware, no periprosthetic lucency to suggest loosening or fracture.
- Right Knee MRI Maverick protocol without contrast showed the imaged portions of the biceps, semimembranosus, and semiteninosus are unremarkable. The distal aspect of the semimembranosus and semitendinosus is obscurred by susceptibility artifact as it passes posterior to the unicompartmental arthroplasty.
- Right Knee Dynamic Ultrasound Evaluation showed dynamic snapping of the semimembranosus tendon over the gastrocnemius tendon while patient actively flexed and extended her knee.

FINAL WORKING DIAGNOSIS: Snapping semimembranosus and gastrocnemius tendons due to medial unicompartmental arthroplasty hardware impingement in the right knee

TREATMENT AND OUTCOMES:

1. Completion of post-surgical rehabilitative physical therapy, including achieving full knee extension, for a total of 6 weeks.
2. Trial of ultrasound guided steroid injection to tendon site for persistent symptoms.
3. Consideration for semimembranosus tenotomy if symptoms persist despite steroid injection.
4. Consideration of unicompartmental knee revision vs total knee replacement as a last resort only.
5. Snapping and pain improved though not resolved with rehabilitative exercises 6 months post-op, pending steroid injection to semimembranosus and gastroc tendon.

F-40   Clinical Case Slide - **Medical Issues IV**

Friday, June 1, 2018, 3:15 PM - 4:55 PM
Room: CC-101CD

2688   **Chair:** Shawn F. Kane, FACSM. *US Army, Carthage, NC.*

(No relevant relationships reported)

2689   **Discussant:** Poonam P. Thaker, FACSM. *Presence Resurrection Sports Medicine Fellowship, Chicago, IL.*

(No relevant relationships reported)

2690   **Discussant:** George Guntur Pujalte, FACSM. *Mayo Clinic, Jacksonville, FL.*

(No relevant relationships reported)

2691   June 1 3:15 PM - 3:35 PM

Recurrent Chest Pain in an 18 Year Old Male with a History of Viral Perimyocarditis

Paul C. Goleb, Jr, Kyle Yost, Andrew Tucker. *University of Maryland Medical Center, Baltimore, MD.*

(No relevant relationships reported)

HISTORY: An 18 year old male athlete detailed a recent hospitalization for viral perimyocarditis during his pre-participation examination (PPE). His medical and surgical histories were otherwise not significant. He took no medications and had no known allergies. He denied alcohol use, smoking, or illicit drug use. His family history was non contributory. During his PPE he was symptom free and was cleared for all activity. Over the next weeks he reported multiple, brief, self-resolved episodes of substernal chest pain and shortness of breath. He denied syncope or palpitations. His symptoms did not worsen with exercise. One episode of chest pain prompted evaluation in a local ER, where he had a normal chest x ray, negative troponins, and normal vital signs. Following this episode, the patient was withheld from activity and referred to cardiology.

PHYSICAL EXAMINATION:

General: Well appearing male.

HEENT: No jugular venous distention.

Cardiovascular: Regular rate and rhythm, normal S1 and S2, no murmurs, rubs, or gallops. Brisk capillary refill. No tenderness to chest wall palpation. No pulsus paradoxus.

Respiratory: Clear to auscultation bilaterally.

Extremities: No clubbing, no cyanosis, no edema.

DIFFERENTIAL DIAGNOSIS:

1. Coronary artery disease
2. Arrhythmia
3. Pericardial effusion
4. Recurrent perimyocarditis
5. Pulmonary embolism

TEST AND RESULTS:

Initial Hospitalization:

EKG: Sinus rhythm with anterolateral ST elevation.

Troponin 11.48.

CRP 2.28.

Transthoracic echocardiogram: LVEF 56%.

Cardiac Catheterization: No coronary artery disease.

CT chest: No pulmonary emboli. No aortic dissection.

Cardiac MRI: Heterogeneous focal enhancement consistent with myocarditis. Normal LV size with low normal LV function (LVEF 51%).

Follow-Up:

TSH 0.6, ANA negative, P-ANCA negative, C-ANCA negative, CRP <0.1, ESR 1, CK 183, BNP 32, Troponin <0.04.

Holter Monitor: Normal sinus rhythm, no arrhythmias.

Exercise stress test: No ischemia.

FINAL/WORKING DIAGNOSIS:

Viral Perimyocarditis (Resolved).

TREATMENT AND OUTCOMES:

1. Withheld from activity following ER visit
2. Referred to Cardiology
3. Exercise Stress Test
4. Holter Monitor
5. Lab work-up
6. Repeat Cardiac MRI to be performed 3 months after initial study to re-assess inflammation
7. Return to play decision to be made following results of repeat cardiac MRI

2692   June 1 3:35 PM - 3:55 PM

Abdominal Trauma - Football

Jonathan Goike, Michael Baria. *Ohio State University, Columbus, OH.*

(No relevant relationships reported)

HISTORY: A 15 year old male football player was tackled during practice and sustained blunt force trauma to his abdomen from his opponent's helmet. He felt immediate right sided abdomen and shoulder pain. He was promptly assessed by the athletic trainer and removed from practice. The athletic trainer examined him and found both right upper quadrant tenderness and pain with rib cage / thorax compression. Though the athlete reportedly felt improved, the athletic trainer recommended further evaluation by a sports medicine physician.

PHYSICAL EXAM: Orthostatic vitals revealed a heart rate increase from 66 to 114 on sit to stand. He was alert, oriented and in no distress. He had significant right upper quadrant tenderness with rebound and positive Murphy's sign with moderate generalized abdominal tenderness. He had minimal right sided tenderness to palpation over the ribs without flail chest. No respiratory distress. Lung fields were clear to auscultation. Heart rate and rhythm were regular.

TESTS AND RESULTS:
Abdominal Radiograph – Non-obstructive bowel gas pattern, no pneumoperitoneum
Ultrasound FAST exam – Free peritoneal and retro-vesicular fluid
CT Abdominal/Pelvis – Grade 3 Liver laceration (7.9 cm) and Grade 1 Splenic laceration

DIFFERENTIAL DIAGNOSIS:
1. Liver laceration
2. Rib fracture
3. Pneumothorax/hemopneumothorax
4. Diaphragm spasm

FINAL/WORKING DIAGNOSIS:
Grade III Liver and grade I splenic laceration

TREATMENT AND OUTCOMES:
1. Immediate transfer to emergency department for trauma evaluation followed by observation in the ICU and surgical floors for 3 days.
2. Limited to walking for exercise and 10 pound lifting restriction for 6 weeks.
3. Returned to low impact, non-contact exercise and machine based strength training after 6 weeks.
4. Anticipate full return to sport following 6 months no contact and after repeat testing including CT, LFTs

2693   June 1 3:55 PM - 4:15 PM

Improved Pulmonary Function in a Patient with Lymphangioleiomyomatosis Following Exercise Training

Thomas W. Lowder. *University of Central Arkansas, Conway, AR.*

(No relevant relationships reported)

HISTORY: Lymphangioleiomyomatosis (LAM) is an interstitial lung disease the results in cystic destruction of the lung parenchyma, resulting in a decline (often rapid) in pulmonary function. There is no cure for this disease and lung transplantation is often required. Even with transplantation, the disease will still present, as the cells originate in the body (origin is at present unknown) and migrate to the lungs. This disease affects women almost exclusively.

PHYSICAL EXAMINATION: A 29 year-old female, diagnosed with Tuberous Sclerosis Complex (TSC) at after 5 and LAM at age 21, underwent 12mo of high-intensity exercise 2d/wk. Prior to training and every 3mo pulmonary function, oxygen uptake (VO$_2$), and bone mineral density were assessed.

DIFFERENTIAL DIAGNOSIS: LAM is similar to TSC in that TSC is a predisposing condition for LAM and several shared clinical features exist in both diseases (angiomyliipomas, TSC2 gene mutations). LAM shares similarities with both Birt-Hogg-Dube syndrome and Sjogren syndrome.

TEST AND RESULTS: After one year of training the patient improved forced expiratory volume in one second (FEV$_1$) by 9%, FEV$_1$/FVC (forced vital capacity) by 10%, peak flow by 47%, and a 20% increase in oxygen consumption.

FINAL WORKING DIAGNOSIS: Exercise can be used to improve pulmonary function and work capacity in a patient with TSC/LAM.

TREATMENT AND OUTCOMES: Treating LAM with high-intensity exercise resulted in marked improvement in this patient. Improvements were not seen until after 6mo, indicating that short-duration interventions may be insufficient in improving lung function.

2694   June 1 4:15 PM - 4:35 PM

Evaluating The Effectiveness Of The Girls On The Run Program With Respects To Self-esteem, Self-perceived Body Image, And Aerobic Capacity.

Amanda J. Cunningham. *Grand Valley State University / Central Michigan University, Allendale, MI.*

(No relevant relationships reported)

The aim of this study was to evaluate the effectiveness of the Girls on the Run program. Twenty seven girls who participated in the Girls on the Run for eleven weeks were evaluated pre and post the program on self-esteem, self-perception of body image and aerobic capacity. The girls were evaluated by a written survey and the PACER test. There was a significant positive increase in self-esteem (p=.014) and body o,age (p=.705). following the program the girls learned to be more accepting of themselves ad their body image. There was a non-significant increase in mean aerobic capacity starting at 39.8 ml/kg/min and ending at 41.87 ml/kg/min. This could be due to part to low intensity training versus highly structured high intensity training. The Girls on the Run program was shown in this study to have a positive outcome on girls' overall mental, emotional, and physical health through varying activities and positive leadership in the role models who coach. Future studies should evaluate the effects of high intensity training over a long period of times. As well as showing the effects of self esteem and positive body image in the young girls as they age.

2695   June 1 4:35 PM - 4:55 PM

Hematuria - Cross Country

Peter Obourn. *University of Connecticut Health Center, Hartford, CT.*

(No relevant relationships reported)

HISTORY: 21 year-old female cross country runner with 1 week of gross hematuria. History of microscopic hematuria on several occasions since age 3 with no history of gross hematuria. She was having hematuria on and off for a week. She had one painful void with 3 out of 10 burning pain at the urethra during hematuric void. Her urine color is consistent with fruit punch. Just prior to the episode of gross hematuria she had completed a 4 mile run consistent with her normal daily activity, not significantly more vigorous than her normal training routine. This had occurred about 3 days prior. She denied any increased urinary frequency or feelings of urinary retention. She denied fevers, chills, nausea, vomiting, muscle cramps, or flank pain. She denied unprotected sexual intercourse or vaginal discharge. She denied any recent illnesses, specifically sore throat.

PHYSICAL EXAMINATION: Vital signs were normal. Healthy, well appearing, in no apparent distress. Head normocephalic and atraumatic. Sclera and conjunctivae normal with EOM intact. No gross deformities of the ears bilaterally and no obvious hearing deficits. Oropharynx clear without erythema or exudates. No cervical lymphadenopathy. Normal respiratory effort. Bowel sounds were normoactive with no tenderness to palpation, no masses, and no organomegaly. There was no costovertebral angle tenderness and no pelvic tenderness. Normal mood and affect. No visible skin lesions.

DIFFERENTIAL DIAGNOSIS:
1. Pyelonephritis
2. Post streptococcal glomerulonephritis
3. Rhabdomyolysis
4. Nephrolithiasis
5. Cancer
6. IgA nephropathy
7. Idiopathic exercise induced hematuria

TESTS & RESULTS:
CMP: unremarkable
ANA screen: negative
C3/C4: normal
Antistreptolysin: normal
ANCA screen: negative
24 hour urine total protein: normal
Renal/bladder ultrasound: unremarkable

FINAL WORKING DIAGNOSIS:
Thin basement membrane disease

TREATMENT AND OUTCOMES:
-Patient is believed to have thin basement membrane disease at this time. Her hematuria workup has been negative to this point. It was determined that she has a brother with thin basement membrane disease.
-Referred to nephrology for further recommendations
-Cleared to continue normal activities for cross country
-Though likely benign, we may need to obtain further testing including possible biopsy to prove benign diagnosis

F-51   Free Communication/Poster - **Energetics**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2718   Board #1   June 1 2:00 PM - 3:30 PM

Energetic Profile of a Wheelchair Racing 1500 m Simulation Test

Lingling Zhang[1], Xueping Wu[2], Yongming Li[2]. *[1]Shanghai University of Finance and Economics, Shanghai, China. [2]Shanghai University of sport, Shanghai, China.*

(No relevant relationships reported)

Wheelchair racing has been one of the official events in Paralympic Games since 1964. Understanding the energetic profiles in wheelchair racing may provide information in developing training strategies. However, there is lack of concrete quantitative research on energetic profile of Wheelchair Racing 1500m.
PURPOSE: To quantify the energy contribution of wheelchair racing 1500 m in high level athletes.
METHODS: Eight males (24±5 years, 174.4±5.9 cm, 67.3±9.1 kg, training experience of 15±10 years) from the Chinese national team participated in the research for a graded exercise test and a 1500 m all-out test. A portable gas analyzer(K4b[2], Cosmed,Italy) was used to measure VO_2 at every breath.A GPSports (GPSports HPU, Canberra, Australia) and heart rate belt (Polar Accurex Plus,Ploar Electro Oy,Finland) were used to monitor speed and HR changes. Capillary blood was taken from the earlobe before and after the warm-up, immediately before the time trials and the during the $1^{st},3^{rd},5^{th},$and 7th minute of the recovery. Then it was assessed with a lactate analyzer (Biosen C_line, EKF, Gemany). The energetic contribution was measured with the maximal accumulated oxygen deficit (MAOD).
RESULTS: Results showed that the accumulate oxygen deficit, the maximal heart rate and the peak blood lactate values were 2667.3±894.5 ml, 188.9±9.0 bpm, and 11.1 ± 2.3 mM, respectively. The total energy contribution of the 1500 m test was 205.5±29.2 kJ. The aerobic and anaerobic energy contributions were 146.6±21.6 kJ (71.7%) and 58.9±18.9 kJ (28.3%), respectively. Significant (P<0.05) negative correlations were noted between race performance,the peak blood lactate and accumulated blood lactate for the 1500 m test(r=−0.638 and −0.735, respectively).
CONCLUSION: Wheelchair racing 1500 m is an aerobic-dominated event. The knowledge of energy supply in this event underestimates the importance of aerobic contribution. Anaerobic glycolysis exerts a significant influence on the performance of this event.
Supported by Shanghai Key Lab of Human Performance(Shanghai University of sport) (NO. 11DZ2261100).

2719   Board #2   June 1 2:00 PM - 3:30 PM

Leucocyte Telomere Length of Master Endurance Athletes is Associated to Resting Nitric Oxide: Possible Role of Redox Balance.

CAIO V. SOUSA, SAMUEL S. AGUIAR, PATRICK A. SANTOS, LUCAS P. BARBOSA, LYSLEINE A. DEUS, THIAGO S. ROSA, ROSÂNGELA V. ANDRADE, HERBERT G. SIMÕES. *UNIVERSIDADE CATÓLICA DE BRASÍLIA, BRASÍLIA, Brazil.*

(No relevant relationships reported)

PURPOSE: Leukocyte telomere length (LTL), a biological marker of aging, is longer in elderly endurance runners than age-matched controls, but the underlying mechanisms are poorly investigated. The LTL, nitric oxide (NO) and redox balance of master endurance runners (ER) were analyzed and compared to untrained middle-aged (MC) and young controls (YC). We hypothesized that NO and redox balance at baseline would be related to longer LTL in ER. **METHODS**: Participants (n = 38) from both ER (n = 10; 51.6 ± 5.2yrs; 28.4 ± 9.4yrs of experience), MC (n = 17; 46.6 ± 7.1yrs) and YC (n = 11; 21.8 ± 4.0yrs) attended to the laboratory for anamnesis, anthropometrics and blood collection for biochemical and molecular analyzes. Pro and antioxidant measures as well as DNA extraction were performed using commercial kits following the fabricant protocols. Relative LTL was measured using qPCR analysis. **RESULTS**: The LTL of YC group (T/S = 1.85 ± 1.59) was longer than MC (T/S = 0.47 ± 0.51; *p* < 0.05) but did not differ from ER (T/S = 0.89 ± 0.50; *p* > 0.05). A large *effect-size* between TL of ER and MC (*d* = 0.85) was also observed. The comparison of antioxidant/pro-oxidant ratios indicated a better redox balance for the ER and young adults in comparison to middle aged untrained participants, which showed lower values for TEAC/TBARS, SOD/TBARS and CAT/TBARS (*p* < 0.05). Furthermore, the NO levels for the ER (175.2 ± 31.9μM) were higher (*p* < 0.05) than MC (67.2 ± 23.3μM) and YC (129.2 ± 17.3.μM), with a positive and strong correlation with LTL (*r* = 0.766; *p* = 0.02). **CONCLUSIONS**: In conclusion, master endurance runners have longer LTL than age-matched controls, what in turn may be related to their better NO bioavailability and redox balance status.

2720   Board #3   June 1 2:00 PM - 3:30 PM

The Energy Expenditure and Relative Exercise Intensity During Pound

Abigail L. Ryskey, John P. Porcari, 54601, FACSM, Kimberly Radtke, Susan Bramwell, Carl Foster, FACSM. *University of Wisconsin - La Crosse, La Crosse, WI.* (Sponsor: John Porcari, FACSM)

(No relevant relationships reported)

A new fitness program that has become popular is Pound®. Pound® incorporates both Pilates and drumming movements into a full-body workout. During a session of Pound® participants use Ripstix. Ripstix are drumsticks that weigh a quarter of a pound (0.11 kg) each and are used to "pound" to the beat of the music together with choreographed body movements. **Purpose:** This study was designed to determine the energy expenditure and relative exercise intensity of a Pound® cardio-jam session. Twenty-two volunteers (6 males; 16 females) between the ages of 18-25 years performed a maximal exercise test on a treadmill. Each subject then completed 2-3 practice session of Pound®, following a DVD. Once proficient, they completed a 38-minute Pound® cardio-jam session. Heart rate and VO_2 were monitored every minute throughout the workout and perceived exertion was recorded approximately every 4 minutes throughout the session using the Borg 6-20 RPE scale. **Results:** It was found that both % HRmax (males: 68 ± 5.2; females: 73 ± 6.8) and % VO_2max (males: 39 ± 4.5; females: 42 ± 6.6) were within ACSM guidelines for improving cardiorespiratory endurance. Throughout the workout subjects considered the workout to be of "somewhat hard" intensity (average RPE = 12.7 ± 1.91). Energy expenditure for both males (280.8 ± 41.38 kcal/session) and females (221.8 ± 34.35 kcal/session) was within ACSM guidelines. Males had a significantly higher energy expenditure than females due to higher body mass (75.1 ± 8.9 kg vs. 67.9 ± 7.3 kg). **Conclusion:** The Pound® cardio-jam session meets standards set forth by ACSM for improving cardiorespiratory fitness and body composition. Collectively, the findings of this study suggest that Pound® may be an enjoyable option for individuals seeking an alternative to traditional aerobic exercise programs.

2721   Board #4   June 1 2:00 PM - 3:30 PM

Validation of Overall Energy Expenditure Measurements in the Fitbit Charge HR 2 and Apple Watch

Kaigang Li, Kayla Nuss, Elizabeth A. Thomson, Ashley Comstock, Sophie Blake, Steven Reinwald, Richard E. Pimentel, Brian Tracy, FACSM. *Colorado State University, Fort Collins, CO.*

(No relevant relationships reported)

PURPOSE: To determine the validity of the energy expenditure (EE) estimation for the Fitbit Charge HR 2 and the Apple Watch devices. **METHODS**: Thirty young adults (15 females, 15 males, aged 23.5±3.0 years) completed the Bruce Protocol. Gross EE of participants was measured by PARVO metabolic cart and estimated by Fitbit Charge HR 2 and Apple Watch devices. A concordance correlation coefficient (CCC, r_c) was conducted to examine the strength of the relationship of PARVO measured EE with EE estimated by each device. Relative error rates (RER) were calculated to indicate the difference between each device and PARVO. **RESULTS**: For the Apple Watch, the relative error was 24.25% for overall, 18.58% for males, and 29.93% for females. For the Fitbit, the relative error was 20.07% for overall, 24.17% for males, and 16.72% for females. Moderate Concordance correlations between estimated EEs and PARVO measured EEs were found for both Apple Watch (r_c = 0.65, 0.43, and 0.39 for overall, males and female) and Fitbit Charge HR 2 (r_c = 0.53, 0.39, and 0.21 for overall, males and females). In addition, stronger relationships were found between PARVO EE and Apple Watch EE than those between PARVO EE and Fitbit Chare HR 2 EE for overall, males and females. **CONCLUSIONS**: This was one of the first studies to examine the accuracy of overall energy expenditure estimated by Apple Watch and Fitbit Charge HR 2. Neither of the two devices showed accurate results compared to the measured EE by the standard approach. The Apple Watch revealed overestimated EE for females but underestimated EE for males. The Fitbit underestimated EE for both males and females. Researchers, practitioners and personal users should consider these results when designing programs or personal training plans targeting physical activity related EE with a wearable device.

2722   Board #5   June 1 2:00 PM - 3:30 PM

Comparison of Reported Energy Expenditure from Polar M430 vs. Polar V800 vs. Actual Energy Expenditure

Olivia Hanzel, Grace Shryack, Joshua Patterson, Courtney Willoughby, Bryan Smith. *Southern Illinois University Edwardsville, Edwardsville, IL.*
(No relevant relationships reported)

INTRODUCTION: The Polar M430 (M430) uses optical technology to measure heart rate (HR) from a sensor that is built into the back of the watch. The Polar V800 (V800) uses a wireless chest transmitter that is held in place by a chest strap. Both of these watches estimate exercise energy expenditure (ExEE) for numerous types of exercise. Although there is evidence that suggests that the wireless transmitters provide accurate estimates of ExEE, there is little information that shows that watches equipped with optical sensors provide accurate measurements of ExEE. **PURPOSE**: The purpose of this study was to compare the ExEE values obtained from the M430 and the V800 to ExEE values measured using indirect calorimetry during different bouts of exercise. **METHODS**: Two females (age = 20 ± 1 y, BMI = 24.2 ± 2.0 kg/m²) and ten males (age = 22.8 ± 1.0 y, BMI = 26.1 ± 1.3 kg/m²) reporting to the lab and were fitted with a chest strap HR transmitter (Polar H7) to measure and transmit HR data to the V800. The M430 was fitted on the participant's wrist according to the manufacturer's instructions. Participant's then completed four, 5-min bouts of exercise which consisted of the following; walking 3.5 mph at 0% grade, walking 3.5 at 5% grade, running at 5.5 mph at 0% grade, and running at 5.5 mph at 5% grade. Indirect calorimetry was used to measure actual ExEE.
RESULTS: There were no significant differences between the three methods when walking at 0% or 5%. When running at 0% there was a significant difference between methods (p=0.044), with the M430 underestimating ExEE when compared to indirect calorimetry (5.8±2.0 kcal, p=0.045). When running at 5% there was a significant difference between methods (p=0.001). The M430 underestimated ExEE when compared to the V800 (7.5±2.1 kcal, p=0.018) and when compared to indirect calorimetry (14.5±3.7 kcal, p=0.008).
CONCLUSIONS: The V800 provided accurate estimates of ExEE during each bout of exercise. The M430 provide accurate estimates of ExEE only when walking. When running, the M430 consistently underestimated ExEE and the underestimation increased with exercise intensity. At the highest exercise intensity, the M430 underestimated ExEE when compared to both the V800 and indirect calorimetry. Caution should be taken when using the ExEE values obtained from the M430 when running.

2723   Board #6   June 1 2:00 PM - 3:30 PM

Comparison of Exercise Energy Expenditure Values Obtained from the Garmin Forerunner 230 and 235

Courtney A. Willoughby, Olivia Hanzel, Joshua Patterson, Grace Shryack, Bryan Smith. *Southern Illinois University Edwardsville, Edwardsville, IL.*
(No relevant relationships reported)

The recent trend in activity tracking has increased the demand for smart watches that can provide estimates of exercise energy expenditure (ExEE) during different types of exercise based upon the heart rate response to that exercise. The Garmin Forerunner 230 (230) and Forerunner 235 (235) are similar watches with the only difference being how heart rate (HR) is measured. The 230 uses a wireless chest transmitter that is held in place with a chest strap while the 235 uses an optical sensor that is built directly into the watch. **PURPOSE**: The purpose of this study was to compare the ExEE values obtained from the 230 and the 235 to ExEE values measured using indirect calorimetry during different bouts of exercise. **METHODS:** Two females (BMI=24.2 ± 2.8 kg/m², age=20 ± 1.4 y) and ten males (BMI=26.1 ± 4.1 kg/m², age=22.8 ± 3.3y) reported to the Exercise Physiology Lab at Southern Illinois University Edwardsville where they were fitted with a wireless chest transmitter and chest strap for the 230. The 235 was fitted on the participant's wrist according to the manufacturer's instructions. The exercise consisted of two, 5-min walking intervals (3.5 mph + 0% incline and 3.5 mph + 5% incline) and two, 5-min running intervals (5.5 mph + 0% incline and 5.5 mph + 5% incline) with 3-min of rest between each exercise bout. Indirect calorimetry was used to measure actual ExEE. **RESULTS:** There were no significant differences between the three methods during the 5% walk or the 0% run. During the 0% walk, there was a significant difference between methods (p=0.048) with the 235 overestimating ExEE when compared to the 230 (7.2±3.2 kcal, p=0.044). During the 5% run, there was a significant difference between methods (p=0.002). Both the 230 and 235 underestimated ExEE when compared to indirect calorimetry (12.3±3.6 kcal, p=0.024 and 10.0±3.3 kcal, p=0.043, respectively). **CONCLUSION:** The 230, which uses a wireless chest transmitter, provides accurate estimates of ExEE in all but the most intense exercise bout. The 235, which uses an optical sensor, varies in its ability to estimate ExEE in that it overestimates at the lower exercise intensities

and underestimates at the highest exercise intensity. Caution should be taken when using ExEE values from both the 230 and 235 for weight management or exercise prescription purposes.

2724   Board #7   June 1 2:00 PM - 3:30 PM

Predicting Energy Expenditure of an Acute Bout of Resistance Exercise in Men and Women

Danielle M. Kravits[1], Brad S. Lambert[2], Jason R. Lytle[1], Stephen E. Martin[1], John S. Green, FACSM[1], Stephen F. Crouse, FACSM[1]. *[1]Texas A&M University, College Station, TX. [2]Houston Methodist, Houston, TX.* (Sponsor: Stephen F. Crouse, FACSM)
(No relevant relationships reported)

Energy expenditure from resistance exercise (RE) is an important consideration for exercise prescription, yet prediction models are lacking. **PURPOSE:** To develop regression equations to predict energy expenditure (kcal) for RE involving each major muscle group using commonly measured demographic & exercise variables as predictors. **METHODS:** Fifty-two healthy, active subjects (27 men, 25 women, age 20-58 yrs, height 174.1 ± 10.5 cm, weight 188.7 ± 42.6 kg, VO_{2max} 36.8 ± 9.2 ml/kg/min) were strength tested to determine their 3-5 repetition max (RM) on commercial pneumatic RE equipment 1 week prior to their experimental RE bout. Body composition was assessed using DEXA. For the experimental RE, a warm-up set followed by 2-3 sets of 8-12 reps at 60-70% predicted 1RM were performed for each exercise. Each set started every two minutes. Exercises progressed order: leg press, chest press, leg curl, lat pull, leg extension, triceps extension, biceps curl. VO_2 was measured continuously throughout the RE bout via automated metabolic cart. Total exercise volume (TV) was calculated as sets*reps*weight lifted. Multiple Linear Regression (Stepwise Removal) was used to determine the best model to predict kcal consumption based on the highest adjusted R^2 and least amount of variance inflation. **Results:** Table.

| EXERCISES | REGRESSION COEFFICIENT | | | | | | | | MODEL FIT | |
	HT (cm)	AGE (y)	GENDER (m=1, F=0)	FATMASS (kg)	LEANMASS (kg)	WEIGHT (kg)	VOLUME m3 (kg)	CONSTANT	R Square	SEE
TOTAL	0.874	-0.596		-1.016	1.638		2.461	-110.742	0.773	28.465
LEG PRESS	0.12	-0.093		-0.252	0.297		1.169	-13.837	0.83	4.40
CHEST PRESS	0.186	-3.173		-0.198	0.271		4.211	-28.468	0.68	4.70
LEG CURL		-0.129			0.245	-0.1	5.189	6.633	0.62	5.36
LAT PULL		-0.165		-0.128	0.187		4.725	8.483	0.67	4.96
LEG EXTENSION		-0.08	-1.635	-0.185	0.394		4.252	1.444	0.70	5.31
TRICEPS PUSH	0.255		-5.124	-0.239	0.39		1.919	-44.891	0.72	4.99
BICEPS CURL	0.292	-0.091	-7.068		0.351	-0.156	15.059	-44.262	0.62	5.603

CONCLUSIONS: Energy expenditure for a total RE bout and for specific RE exercises can be reasonably estimated in adult men and women using commonly measured demographic and RE variables. With regards to fitness, performance, and weight management, these equations will aid practitioners and exercising adults in documenting kcal expenditure from RE.

2725   Board #8   June 1 2:00 PM - 3:30 PM

The Garmin Vivosmart HR vs the Cosmed K4B2 Metabolic Backpack: Validating Measurement of Energy Expenditure

Brandi R. Washell. *Coastal Carolina University, Conway, SC.* (Sponsor: George Lyerly, FACSM)
(No relevant relationships reported)

Wearable fitness trackers are relatively cheap and convenient tools that track an individual's physical activity. Such qualities have led to an emergence of various fitness trackers available on the market for consumers, but does convenience and relatively low cost compromise accuracy? For this study, we compared Garmin Vivosmart HR (G) watch and the Cosmed K4b2 Metabolic backpack (C) to determine if the cheaper and more user friendly, G is as accurate as the laboratory "gold standard" C.
PURPOSE:The purpose of this study is to compare G and C's accuracy in determining energy expenditure via kcals (EE).
METHODS: 19 recreationally active students and professors volunteered to participate. Prior to the start of the study, participants had their height, weight, BP and resting HR recorded. The participants were asked to wear both G and C while walking at a low to moderate intensity on a treadmill for 10 minutes.
RESULTS: The mean EE for C was 49.91 ± 8.2 and G was 47.42 ± 19.7.
CONCLUSIONS: Our data indicate that there was no correlation between G and C with an r-value = -0.273; p = 0.273. Further research is warranted with a more extensive population to determine the accuracy of the Garmin Vivosmart HR, and by how many more calories.

2726   Board #9   June 1 2:00 PM - 3:30 PM
Validating The Garmin Vivosmart Hr Vs The Actigraph Gt3x Accelerometer In Measuring Energy Expenditure.

Ethan Hayes. *Coastal Carolina University, Conway, SC.* (Sponsor: George Lyerly, FACSM)
(No relevant relationships reported)

In the field of exercise science, the Actigraph GT3X (A) accelerometer is regarded as one of the most accurate field measurement devices for physical activity (PA). Many PA devices have recently been added to the market to measure PA for individuals. The Garmin Vivosmart HR (G) watch is currently among the top devices on the market to measure PA. The underlying question that needs to be answered is; how accurate is the G watch? In this study, we compared the accuracy of the G to A in regards to measuring energy expenditure in kcals (EE). **Purpose:** To compare the accuracy of G to A in measuring EE. **Methods:** Individuals were recruited via word of mouth to participate in this study. The study required individuals to attach the G to the left wrist and A placed around the waist with the measuring device on the left side of the subject. The duration of the study consisted of a ten minute low-moderate intensity walk on a treadmill. Prior to exercise, weight, height, RBP, and RHR were obtained. We recruited 19 subjects, 18 years and older, of varying activity levels. **Results:** The mean EE from A was 83.92 ± 24.58, while G was 47.42 ± 19.72. **Conclusion:** The data showed no correlation between the two devices in regards to EE (r-value = -0.194; p-value = 0.456). Our data suggests further research is needed in order to determine which device is more accurate when measuring energy expenditure.

F-52   Free Communication/Poster - **Methodology**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2727   Board #10   June 1 2:00 PM - 3:30 PM
Haematological Response To Altitude And Differentiation From rHuEpo Abuse

Shaun Sutehall. *University of Cape Town, Cape Town, South Africa.* (Sponsor: Yannis Pitsiladis, FACSM)
(No relevant relationships reported)

Injections of recombinant human erythropoietin (rHuEpo) have been shown to increase endurance performance and has been banned by the World Anti-Doping Agency (WADA). Recently a study has identified several gene transcripts differentially expressed after rHuEpo administration (Wang et al, 2017). There is a lack of knowledge on the effect altitude has on these genes and if they can identify rHuEpo abuse from altitude exposure. **Purpose:** The primary aim of this study is to investigate the haematological and transcriptomic changes induced by altitude exposure. The secondary aim of this study is to compare these alterations with those caused by rHuEpo (analysis ongoing). **Methods:** Fourteen endurance trained athletes were recruited, blood samples were taken at sea level, during altitude exposure and after return to sea level. Subjects traveled to Suluta, Ethiopia (~2800 m) for 27 days and provided blood for 27 days on return to sea level. Samples were analysed for haemoglobin concentration (HGB), haematocrit (HCT) and reticulocyte percentage (RET%). **Results:** Compared with baseline, HGB significantly increased 9 days after arrival at altitude (14.1±0.7 vs 15.4±0.7 g dL^{-1}, $P<0.01$) and remained significantly elevated 27 days after return to sea level (14.7±0.7 g dL^{-1}, $P<0.01$). HCT significantly increased upon arrival compared with baseline (41.3±2 vs 43.8±2%, $P<0.01$) and remained significantly elevated 27 days after return (44.6±2%, $P<0.01$). There were no significant differences in RET%. These results show HGB and HCT increased by 14.2% and 13.6% respectively, which is similar to the increase following rHuEpo administration (10.5% and 11.5%, respectively, Wang et al, 2017). **Conclusion:** Following 27 days of altitude exposure, there are significant increases in HGB and HCT but a blunted response in RET%. There appears to be a similar response to altitude exposure and rHuEpo on HGB and HCT, further analysis is required. Ongoing analysis of transcriptomic markers may aid differentiation between altitude and rHuEpo abuse.
This work was supported in part by a grant from WADA.

2728   Board #11   June 1 2:00 PM - 3:30 PM
Validity Of Pushup As Predictor Of Success In Law Enforcement

Paul O. Davis, FACSM. *First Responder Institute, Burtonsville, MD.*
(No relevant relationships reported)

Selection of prospective law enforcement officers can be facilitated with the use of simple, field-expedient fitness tests. Identification of qualified candidates has been demonstrated to significantly reduce costs for work-related injuries.
PURPOSE: Develop a simple, field expedient, pre-hire muscular fitness tool to predict success in effecting an arrest and other essential job functions in the form of a Criterion Task Test (CTT).
METHODS: A Job Task Analysis (JTA) was conducted via survey, on-site observations, and interviews of incumbent federal officers (n=1025) with the objective of creating a surrogate (CTT) for the essential function of foot pursuit and effecting an arrest. Respondents were asked to provide best estimates of distances, heights, and weights associated with critical and arduous tasks.
SUBJECTS: Applicants ($N = 641$, including 55 females (9%)) who presented for employment served as subjects for this study. Because they had received no prior physical screening these subjects represent a sample of applicants that was not range restricted on physical ability. A test for maximum pushups in 2-minutes was administered twice, separated by one day to determine test-retest reliability (intraclass coefficient= 0.95, $p <0.001$, $n = 444$).
RESULTS: Incumbent and supervisory personnel, (n = 77) acting as Subject Matter Experts (SMEs) independently reviewed and rated (acceptable or unacceptable) five representative paces of an actor performing the CTT. The cutpoint for graduation success was established through a consensus model (2/3rd agreement). A two-way contingency table for sensitivity and specificity was developed to demonstrate the predictive power of the 2-minute push-up test. There was no evidence of sex bias for any of the fitness predictors. The ability to perform pushups was highly correlated with success on the CTT (pushups predict 42% of the variance in CTT, $p <0.001$).
CONCLUSIONS: The ability to perform a minimum of 10 push-ups correctly predicted a pass rate of 89% (sensitivity); conversely, failure identified 100% (specificity) of those who failed the CTT.]
Supported by the Department of Homeland Security

2729   Board #12   June 1 2:00 PM - 3:30 PM
Diagnostic Value Of An Impedance-technology Based Health Risk Assessment For Hypertension, Hyperglycemia And Hyperlipidemia

Wang xiaofei[1], Zhu Weimo, FACSM[2], Zhang Bing[1]. *[1]Tsinghua University, Beijing, China. [2]University of Illinois, Urbana, IL.*
(No relevant relationships reported)

PURPOSE: To explore the diagnostic value of an impedance-technology based health risk assessment system (ITHRAS) for hypertension, hyperglycemia and hyperlipidemia, which is an important part of pre-exercise evaluation and assessment.
METHODS: 200 retirees(93 males, 117 females, age = 66.1±5.4 yr.)from Tsinghua University in China were tested using ITHRAS(subjects removed metal articles, took off their shoes and stockings, laying hands and feet on the electrode plate and two electrodes are attached to the head. During the test, the subjects kept quiet and relaxed.), which uses the electrical impedance tomography technology to obtain biomedical information related to human physiological and pathological conditions according to the electrical characteristics of human tissues and organs, their hypertension, hyperglycemia and hyperlipidemia were also tested by sphygmomanometer and blood biochemistry analyzer on the same day. Predictive validity of ITHRAS on hypertension, hyperglycemia and hyperlipidemia was evaluated by chi-square test and ROC curve.
RESULTS: There was no significant difference ($p > .05$) between the true health status and classified by ITHRAS , according to the chi-square tests (see Table 1 for details. The area under ROC curve (AUC) of the system for hypertension, hyperglycemia and hyperlipidemia were 0.947, 0.933, 0.808 (AUC>0.7), respectively. The results indicate that ITHRAS has high predictive validity in terms of the hypertension and hyperglycemia.

Table 1. Statistical Summary of Predictions by ITHRAS

	Hypertension	Hyperglycemia	Hyperlipidemia
True Health Status (%)	38.272	32.099	49.383
Prediction by ITHRAS (%)	40.741	35.802	45.679
Chi-square test (p-value)	0.774	0.629	0.581
ROC (AUC)	0.947	0.933	0.808

CONCLUSION: The predictive validity of ITHRAS in preliminary screening of hypertension and hyperglycemia was confirmed. But the accuracy of hyperlipidemia

detection also needs to be improved. Due to its non-invasive, short detection time, and non-radiation characteristics, ITHRAS should be applicable and welcomed in large-scale hypertension and hyperglycemia status screening.

2730   **Board #13**   June 1 2:00 PM - 3:30 PM

Determining Consistency And Agreement Of Scores Across Two Measurements Of The Visual System: Test-retest Reliability

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(No relevant relationships reported)

Some authors have suggested concussion symptoms may be due to subtle visual problems because they are similar to those that occur with difficulty focusing the eyes. Although binocular vision tests (BVTs) are frequently used to evaluate visual symptoms, their reliability has not been evaluated. The 10 BVTs under investigation measure: 3D vision (gross stereoscopic acuity (GSA)), saccades, anatomic deviation (AD) at 30cm and 3m, and the eye's ability to move/focus in-sync [convergence motor punctum proximum (CMPP), binocular fusion with convergence (BFC) and divergence (BFD) at 30cm and 3m, convergence fusional proximum (CFP)]. **PURPOSE**: To determine the one-week test-retest reliability of 10 BVTs in healthy participants. **METHODS**: One clinician examined each participant at their earliest convenience (T1), and one week after their first visit (T2). We assessed test-retest reliability using intraclass correlation coefficient (ICC) and limits of agreement (LoA). We judged an ICC of $\leq$0.5 as poor, 0.51-0.74 as moderate, 0.75-0.89 as good, and $\geq$0.90 as excellent reliability. We present 95% LoA for the % difference i.e. the difference in scores (T1-T2) divided by the average of the scores (T1+T2)/2 times 100. **RESULTS**: We tested 20 participants (1 lost at T2, excluded from analysis). There were 10 males and 10 females with a mean age of 25.5 (SD = 4.0) years. Our ICC results suggest good reliability for AD 3m (0.88), and moderate reliability for GSA (0.62), AD 30cm (0.69), CMPP (0.54), BFC (0.54) and BFD (0.66) at 30cm, and CFP (0.64). There was poor reliability for saccade (0.34), and BFC (0.49) and BFD (0.43) at 3m. LoA was best for saccade ($\pm$34%) and worst for AD 30 cm ($\pm$121%), and ranged from $\pm$58% to $\pm$70% for 7/8 other tests. For AD 3m, LoA ($\pm$200%) did not provide an accurate summary as it assumes a Normal distribution of values. In fact, 18/20 pairs of measurements were identical, one paired scored 0 and 1, the other scored 0 and 2. **CONCLUSIONS**: Our results demonstrate moderate to good test-retest reliability for 7 out of 10 BVTs, and poor reliability for saccades, and BFC and BFD at 3m. LoA results suggest the effect of concussion must have a moderate to large effect on the scores of most of the tests if they are to be clinically helpful.

2731   **Board #14**   June 1 2:00 PM - 3:30 PM

Hit Or Miss: Kinematic Predictors Of In-game Performance In Collegiate Pitching

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(No relevant relationships reported)

Baseball coaches, scouts, and statisticians argue over the variables that lead to a successful season. Among pitchers, earned run average (ERA), strikeouts per inning (SPI), and fielding-independent pitching (FIP) are useful metrics to evaluate the quality of a pitcher. Kinematic predictors of these measurements can provide strength coaches and athletic trainers with valuable information for exercise prescription. **PURPOSE**: To assess kinematic predictors of success in collegiate pitchers via SpartaTrac measurements. **METHODS:** We collected data on 30 Division 1 baseball pitchers. Independent variables were height, weight, year in school, Sparta force plate data (Load, Explode, and Drive), vertical jump, and pitch speed. SpartaTrac data were recorded as the best of six trials and were collected at multiple times throughout a season. Dependent variables were winning percentage, ERA, SPI, and FIP; each of these was calculated as a season statistic. Multiple linear regressions tested the SpartaTrac outputs on dependent performance variables, holding significant confounders constant. **RESULTS**: In our cohort of pitchers, winning percentage was 41.9% $\pm$ 26.2%, ERA was 6.5 $\pm$ 5.1, FIP was 6.0 $\pm$ 3.5, and SPI was 0.8 $\pm$ 0.5. Holding confounding variables constant, predictors of winning percentage were Load (β=0.004; p=0.047), Explode (β=-0.011; p<0.001), and Drive (β=-0.016; p<0.001); the overall model was significant (R2=0.516; p<0.001). Predictors of ERA were Load (β=-0.138; p=0.008) and Explode (β=0.213; p<0.001); the overall model was significant (R2=0.442; p<0.001). Predictors of SPI were Load (β=-0.095; p=0.013), Explode (β=0.267; p<0.001), and Drive (β=0.161; p=0.001); the overall model was significant (R2=0.501; p<0.001). Predictors of SPI were Load (β=0.012; p=0.039) and Explode (β=-0.034; p<0.001); the overall model was significant (R2=0.313; p<0.001). **CONCLUSIONS:** SpartaTrac data correlate with on-field performance of collegiate

pitchers, although the effects are not always encouraging. Out of the four evaluated performance metrics, Load and Explode each improved two and worsened two. Drive improved one, worsened one, and was irrelevant in two. Before coaches, scouts, and trainers can predict how Sparta data affect pitching performance, more analyses must be done on larger pools of pitchers.

2732   **Board #15**   June 1 2:00 PM - 3:30 PM

Gender Differences In The Association Of Grip Power With Other Physical Strength Among Japanese

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(No relevant relationships reported)

Coming super-aging society, grip power has been regarded as a vital sign among older adults, since it can be evaluated with ease and safety and is associated with a lot of health-related consequences. **PURPOSE**: The purpose of the study is to evaluate the association between grip power and more time-consuming assessments of physical strength, especially focusing on the gender differences. METHODS: Among a total of 236 Japanese subjects (F127/M109, 59$\pm$14 yrs, BMI26.2$\pm$5.9), various physical strength including grip power, one foot standing (balance), finger-foot distance (FFD, flexibility), quadriceps muscle strength by hand-held dynamometer, 2 step length (surrogate index for gait speed), and peak oxygen uptake by stress test using gas-analyzer (aerobic fitness), were assessed. Quadriceps muscle strength and 2 step length were expressed as a percentage of body weight, and that of height, respectively. RESULTS: Despite of the similar age (F 59$\pm$14, M 59$\pm$14 yrs) and BMI (F 26.2$\pm$6.6, M 26.3$\pm$5.2), grip power, quadriceps/weight, 2 step/height, and peak oxygen uptake were much lower in women vs men (22.7$\pm$4.8 vs 36.1$\pm$8.7 kg, 44$\pm$13 vs 57$\pm$15 %, 1.37$\pm$0.18 vs 1.45$\pm$0.20, 22.8$\pm$6.1 vs 25.7$\pm$7.6 ml/min.kg, respectively, all p<0.01), whereas FFD was much greater in women vs men (4.1$\pm$10.3 vs -7.3$\pm$12.8 cm, p<0.01). The association of grip power with quadriceps/weight was much stronger in men (r=0.55, p<0.01), while it was not significant in women (r=0.18, ns). Similarly, grip power was associated with other physical strength to a lesser degree in women. This was partly due to negative association between BMI and various physical strength including quadriceps/weight (r=-0.42, p<0.01), only in women, while only grip power was positively associated with BMI (r=0.44 in women, r=0.33 in men, both p<0.01). **CONCLUSION**: Grip power was associated with other physical strength in men, whereas the association was not significant or present to a lesser degree in women, partly due to declined physical strength except grip power with increasing BMI.

2733   **Board #16**   June 1 2:00 PM - 3:30 PM

The Validity Of Age-based Maximal Heart Rate Equations In Youth: A Systematic Review And Meta-analysis

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(No relevant relationships reported)

Maximal heart rate (MHR) is an important physiological reference for prescribing and monitoring exercise in both clinical and sports settings. Because obtaining a true MHR via graded exercise test (GXT) is often impractical or undesirable, equations are used to predict MHR from age. Unfortunately, these equations were developed in adult populations, potentially limiting their applicability to youth populations. **PURPOSE:** The primary aim of this systematic review and meta-analysis was to examine the validity of age-based MHR prediction equations in children and adolescents. **METHODS:** Included studies were peer-reviewed, published in English, and compared measured MHR to predicted MHR using the Fox and/or Tanaka equations in participants <18 years of age. The difference between measured and predicted MHR was assessed using Hedges' d effect size (ES) to adjust for small sample bias, and random-effects models were used to calculate the mean ES and explore potential moderators. **RESULTS:** Six articles published between 2011 and 2015 met our inclusion criteria. The cumulative results of 18 effects indicated that MHR prediction equations may not be accurate in children and adolescents (ES = 0.7317, 95% CI 0.2967 to 1.1666). Post-hoc analyses indicated that the Fox equation (MHR = 220 - age) overestimated MHR by roughly 12.933 BPM, (k = 11, ES = 1.4131, 95% CI 1.1035 to 1.7227), and the Tanaka equation (MHR = 207 - 0.7*age) underestimated MHR by roughly 2.0999 BPM (k = 7, ES = -0.3850, 95% CI -0.7578 to -0.0122). **CONCLUSIONS:** The Tanaka equation resulted in smaller mean differences between measured and predicted MHR than the Fox equation. However, neither equation accounted for the large range in variability of MHR between subjects, which suggests that age may not be the only predictor of MHR in younger populations. Caution should be exercised when using these equations for prescribing and monitoring exercise intensity in children and adolescents.

2734   Board #17   June 1 2:00 PM - 3:30 PM

Effect of Cold Water Immersion versus Phase Change Material Cooling On Core and Intramuscular Temperature

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(No relevant relationships reported)

PURPOSE: Lowering intramuscular temperature is thought to enhance recovery from strenuous exercise. Cold water immersion (CWI) is a popular form of cryotherapy but is limited by a short treatment duration due to safety considerations and the impracticality of repeated treatments. Phase change material (PCM) cooling packs fitted in wearable garments can provide prolonged post-exercise cooling that facilitates recovery without safety concerns; however, the efficacy of PCM cooling on body temperature is not clear. To compare intramuscular and core temperature changes with CWI versus PCM cooling treatments.
METHODS: In a randomized crossover design, 11 male subjects (27 ± 6 y, 184 ± 9 cm, 81 ± 12 kg) wore compression shorts fitted with either $15°C$ PCM cooling packs, covering the quadriceps for 3 h (PCM treatment) or were immersed to the iliac crest in a temperature regulated water bath maintained at $15\pm1°C$ for 15 min (CWI treatment). Vastus lateralis intramuscular temperature (at 1 and 3 cm) and core temperature were recorded during, and for 2 h after CWI, and for 3 h during, and 1 h after PCM cooling. Treatment effects were assessed using time by treatment repeated measures ANOVA.
RESULTS: Intramuscular temperature was decreased ($p<0.001$) with both CWI and PCM, with initially greater effects with CWI, and ultimately greater effects with PCM (Treatment by Time $P<0.0001$; Fig. 1). Core temperature was reduced with PCM and CWI treatments ($p<0.001$; $-0.23°C$ 30 min post CWI, $-0.19°C$ 2 h post CWI; $-0.16°C$ at 2 h post PCM application, $-0.24°C$ 1 h post PCM removal) with no difference between treatments. **CONCLUSIONS**: The PCM cooling provided substantial, prolonged, muscle cooling ($<30°C$ for 2.5 h at 3 cm and for 3.5 h at 1 cm) that was well tolerated, and compared very favorably to CWI ($<30°C$ for 0.75 h at 3 cm and 1.25 h at 1 cm). PCM cooling garments provide a practical means of delivering prolonged cooling to the musculature.

Vastus Lateralis Intramuscular Temperature
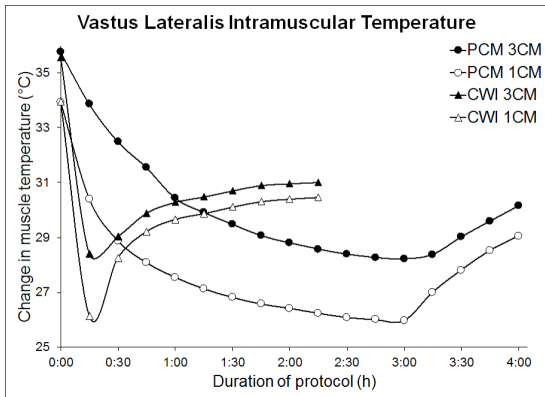
2735   Board #18   June 1 2:00 PM - 3:30 PM

Validity Of A High Incline Vo$_2$max Walk Test

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Reported Relationships: D.E. Lankford: *Consulting Fee; Icon Health and Fitness.*

PURPOSE: The purpose of this study was to validate two high incline graded exercise VO$_2$max tests designed for individuals not accustomed to running on a treadmill. **METHODS**: Participants consisted of 31 (18 men, 13 women) individuals aged 18-29 yrs. All participants completed a Bruce Protocol VO$_2$max test as well as two high incline graded exercise tests in a randomized order. The high incline VO$_2$max tests were performed at a constant speed of 3.6 mph and increased in incline 5% every 3-minutes until volitional exhaustion. The difference between the two high incline protocols (5-5, 10-5) was the starting incline following a 30-second warmup. The first stage of the 5-5 test was 5% grade and the first stage of the 10-5 test was 10% grade. A 1x3 repeated measures ANOVA was used to compare VO$_2$max data between tests. Pearson Correlation and Bland-Altman plots were used to analyze relationships between the two high incline tests (5-5, 10-5) and the Bruce Protocol individually.

RESULTS: There were no differences in VO$_2$max between tests (Bruce= 46.9 ± 7.7, 5-5= 45.7 ± 7.9, 10-5= 44.7 ± 78.3, p = 0.51). VO$_2$max of the Bruce Protocol was strongly related to both 5-5 (r= 0.96) and 10-5 (r= 0.90) tests. Bland-Altman plots between 5-5 test and the Bruce Protocol revealed 93% of data falls within ± 4.5ml*kg^{-1}*min^{-1} and 100% fall within 5ml*kg^{-1}*min^{-1}. **CONCLUSIONS**: These results suggest that both the 5-5, and 10-5 tests are valid alternatives to the Bruce Protocol. Additionally, these results demonstrate that a non-running VO$_2$max test is effective in determining VO$_2$max in a healthy population.

2736   Board #19   June 1 2:00 PM - 3:30 PM

Validity of Heart Rate Measurements for the Apple Watch and Fitbit Charge HR 2

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(No relevant relationships reported)

Abstract:
Only a few studies have examined the validity of heart rate (HR) measurements for the Apple Watch and Fitbit Charge HR devices. **PURPOSE**: This study examined the validity of heart rate measurements for the Fitbit Charge HR 2 (Fitbit) and the Apple Watch devices. **METHODS**: Thirty young adults (15 females, 15 males, age 23.5 ± 3.0) completed the Bruce Protocol while HR measurements were recorded from the electrocardiogram (ECG) and each device every minute. Average HR for each participant was calculated for very light, light, moderate, vigorous and very vigorous intensities based on ECG-measured HR. A concordance correlation coefficient (CCC, r_c) was conducted to examine the strength of the relationship between the ECG measured HR and the device measured HR. Relative error rates (RER) were calculated to indicate the difference in HR measurement between each device and ECG. **RESULTS**: The HR from the Apple Watch was significantly lower compared to the ECG HR (122.78 ± 13.40 vs. 128.83 ± 9.46 BPM, P<.01) for moderate intensity. For very vigorous intensity, the Apple Watch HR was significantly lower compared to the ECG HR for females (174.47 ± 8.79 vs. 180.3 ± 9.13 BPM, P<.05). The HR measured by the Fitbit Charge HR 2 was significantly lower compared to the ECG measured HR for light intensity (100.25 ± 6.93 vs. 104.24 ± 9.09 BPM, P<.01), for moderate intensity (116.66 ± 23.74 vs 127.79 ± 10.27 BPM, P<.01), for vigorous intensity for males (143.00 ± 13.61 vs 159.39 ± 9.58 BPM, P<.001) and for females (137.24 ± 18.86 vs 155.11 ± 9.86 BPM, P<.05) and for very vigorous intensity (157.47 ± 15.44 vs 181.35 ± 9.44 BPM, P<.001). The Apple Watch also showed lower RER (2.4%-5.1%) compared with the Fitbit (3.9%-13.5%) for all exercise intensities. For both devices, the strongest relationship between the device measured HR and the ECG measured HR was found for very light intensity with a very high CCC (r_c>.90). The strength of the relationship declined as exercise intensity increased for both the Apple Watch and the Fitbit. **CONCLUSION**: Our study indicated an inverse association between exercise intensity and HR measurement accuracy for the Apple Watch and the Fitbit Charge HR 2. The Apple Watch revealed lower error rates for all exercise intensities compared to the Fitbit Charge HR 2.
Keywords: heart rate measurement; wearable devices; validity

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Wingate Test-Retest Variability in Healthy Subjects

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(No relevant relationships reported)

Learning effects, biological changes, and motivation contribute to variability in performance on standardized exercise tests. Performance improvement on short-duration, high-intensity tests, such as a 30-second Wingate test of anaerobic power, may be more sensitive to motivational and learning changes in novice, healthy subjects. **PURPOSE**: To examine performance changes during serial Wingate tests in healthy college-age students. **METHODS**: Twenty college students were recruited to do three 30-second Wingate tests over three days. They were given identical instructions before each test. Sleep and nutrition were controlled. Standard Wingate parameters were collected. Multivariate analysis was used to examine changes in performance parameters; data are highlighted for the singular variable: peak power. **RESULTS**: Eighteen subjects completed all three tests. The overall multivariate analysis for test number was not significant, and there were no significant differences across test days for peak power, power decline, average power, minimum power, power at max speed, or total energy expended. For peak power; averages for test 1 (1.72 ± 0.31 W/kg), test 2 (1.74 ± 0.28 W/kg), and test 3 (1.79 ± 0.32 W/kg) were similar, but examination of percent changes in performances illustrates why results appear homogenous. Thirteen of the subjects improved their performance with repeated trials. The average improvement in peak power for those subjects was 9.8 ± 5.2%. Five subjects had performance declines from the first trial of 4.9 ± 3.9%. One subject had no change in performance. **CONCLUSION**: The fluctuation from zero to as high as 22% illustrates high variability of these power measurements (power decline ranged as much as 97% within one subject). This degree of variability is well outside

what would normally be expected for biological variation and could be construed as problems with equipment calibration. Without application of criteria for subject effort, such as applied to cardiopulmonary exercise testing, it is difficult to make objective intra-group or intra-subject comparisons for Wingate testing.

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Bilateral Deficit: A Comparison Of Maximal Strength Between The Bilateral And Unilateral Leg Press Exercise

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(No relevant relationships reported)

The bilateral deficit (BLD) is a phenomenon in which the maximal strength of both limbs contracting simultaneously is less than the sum of the weight lifted by each limb contracting in isolation. The connection between the BLD and how it influences performance is unknown.
Purpose: To determine if the BLD is present during a dynamic leg press in trained participants. **Methods:** Thirty volunteers (19 male, 11 female; 19-37 years old) reported to the EMU Running Science Laboratory on three separate occasions 72 hours apart. On day 1, participants performed a movement screening consisting of 8-10 repetitions at 30% of one repetition maximum (1RM) for both the bilateral and unilateral dynamic leg press training conditions to ensure that all exercises were safely performed. On day 2, participants were randomly assigned to either the maximal bilateral or maximal unilateral condition. For both conditions, participants performed 6-8 repetitions at 50%1RM, followed by a single repetition at 70% of 1RM. Afterwards, the amount of weight lifted was increased by 10% between each successful lift to ensure standardization. This process continued until participants could no longer increase weight for either testing condition. On day 3, participants completed whichever condition, maximal bilateral or maximal unilateral, that was not completed on day 2 following the same procedures. A paired samples t-test was conducted to determine if there was a significant difference between the maximal bilateral condition and the sum of the left and right maximal unilateral conditions ($p<0.05$).
Results: The 30 participants were 22.96 ± 3.72 years old, had a height of 170.1 ± 9.3 cm, and weighed 73.7 ± 11.50 kg. A significant difference was observed and the maximal strength was greater for the bilateral condition (495 ± 209 lbs) compared to the unilateral condition (387.7 ± 208 lbs). **Conclusion:** A BLD was not observed in this study. Research suggests that the BLD is associated with unilateral training while bilateral training reduces the phenomenon. The participants in this study reported the consistent use of bilateral training, which may explain the lack of BLD. Future investigations are necessary to determine how various resistance training protocols influence the BLD.

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Inter-individual Variability in Metabolic and Neuromuscular Responses During Continuous Exercise Above and Below Critical Power

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Reported Relationships: H.C. Bergstrom: *Honoraria; GNC talk at the NSCA national conference.*

Theoretically, critical power (CP) reflects the demarcation of the heavy and severe exercise intensity domains, which are defined by distinct metabolic responses and motor control strategies. **PURPOSE:** This study examined the metabolic (oxygen consumption rate [VO_2]) and neuromuscular (electromyographic amplitude [EMG AMP]) responses during exercise above and below CP. **METHODS:** Six women and six men (mean $\pm$ SD age: 21 ± 2 year) performed a graded exercise test to exhaustion (GXT) to determine the VO_{2peak} and peak power output (W_{peak}). During separate visits, CP was determined from the 3-min all-out test followed by two, randomly ordered, rides to exhaustion at CP minus 10% ($CP_{-10\%}$) and CP plus 10% ($CP_{+10\%}$). The VO_2 and EMG AMP (measured from the vastus lateralis) as well as times to exhaustion (T_{lim}) were recorded during the GXT and continuous rides. The VO_2 at exhaustion from the $CP_{-10\%}$ and $CP_{+10\%}$ rides were compared with VO_{2peak} using a one-way repeated measures ANOVA and follow-up pairwise comparisons ($p < 0.05$). Linear regression was used to examine the individual VO_2 and EMG amplitude responses after the first 3 min to T_{lim}. **RESULTS:** The $CP_{-10\%}$ ($74\%W_{peak}$) and $CP_{+10\%}$ (90% W_{peak}) rides resulted in T_{lim} of 24.61 ± 9.29 min (range = 15.02 - 38.87 min) and 7.67 ± 4.08 (range = 3.65 - 15.57 min), respectively. The mean VO_2 at exhaustion for $CP_{-10\%}$ (3.086 ± 0.995 L·min⁻¹), but not $CP_{+10\%}$ (3.511 ± 1.170 L·min⁻¹), was significantly lower than O_{2peak} (3.488 ± 1.060 L·min⁻¹). Two of the 12 subjects at $CP_{-10\%}$ and 9 of the 12 subjects at

$CP_{+10\%}$ reached VO_{2peak} at exhaustion. The VO_2 increased for all 12 of the subjects from 3 min to T_{lim} at $CP_{-10\%}$ and for 9 of the 12 subjects at $CP_{+10\%}$. At $CP_{+10\%}$, there was no change over time for 3 of the 12 subjects and the VO_2 was maintained within 3% of VO_{2peak}. The EMG AMP increased for 6, decreased for 4, and did not change for 2 of the 12 subjects at $CP_{-10\%}$. At $CP_{+10\%}$, the EMG AMP increased for 6 and did not change for 6 of the 12 subjects. **CONCLUSION:** These findings suggested CP does not demarcate the heavy from severe exercise intensity domains for all subjects as ~17% of subjects reached VO_{2peak} at $CP_{-10\%}$. In addition, the EMG AMP suggested there was individual variability in motor control strategies (i.e., muscle activation) above and below CP and EMG AMP was dissociated from VO_2 for 50% of the subjects at both intensities.

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Relationship Of %HRmax And %VO$_2$Max For Running And Cycling In Trained Triathletes

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(No relevant relationships reported)

Since relative maximum heart rate (%HRmax) correlates highly ($r\geq0.98$) with relative maximum oxygen uptake (%VO$_2$max) for all modes of exercise (cycling, running, swimming, kayaking, rowing) it can be used by athletes and coaches to accurately determine the usage of certain %VO$_2$max for training and racing purposes by knowing only the value of HRmax. The effect of equal cycle and running training (Triathlon) on the relationships of the %HRmax with %VO$_2$max for cycle and running exercise is not clear. PURPOSE: The purpose of this study was to examine the relationships among %HRmax and %VO2max in trained triathletes during running and cycling exercise. METHODS: Sixteen male trained triathletes (33.2 ± 4.3 yr 78.61 ± 3.42 kg, 12.6 ± 1.8 % body fat) performed an incremental maximal exercise test to exhaustion on cycle ergometer (30-watt increment 3min stages) and on a treadmill (1km.h⁻¹ increment 3min stages) with 3-4 days apart. Individual linear regressions based on HR and VO_2 values measured of each stage and maximum, were used to calculate slopes and intercepts, to predict %VO$_2$max from %HRmax, for given exercise intensities (50, 60, 70, 80, 90 and 100%HRmax). RESULTS: Mean prediction $\pm$ sd of the %VO$_2$max from %HRmax was significantly higher ($p<0.01$) during running compared to cycling exercise from 50-80%HRmax (50%: 32.03 ± 7.46 v 19.77 ± 6.75 ; 60%: 45.18 ± 5.85 v 35.80 ± 5.65; 70%: 58.53 ± 4.37 v 51.65 ± 4.54; 80%: 71.59 ± 3.03 v 67.45 ± 4.07). The prediction of the running %VO$_2$max was significantly ($p<0.01$) overestimated at 50, 60, 70 and 80% HRmax by 62.0, 26.2, 13.3 and 6.1% respectively compared to cycling. The regression equations are: Run%VO$_2$max = 0.738*%HRmax + 26.67 and Cycle%VO$_2$max = 0.620*%HRmax + 37.85 (R^2=0.99). Mean %VO$_2$max corresponding with 90 and 100%HRmax was not different ($p>0.05$) between exercise modes. CONCLUSIONS: For submaximal (<90%HRmax) exercise intensities during running and cycling the use of the above regression equations may produce reasonably accurate exercise intensity for training and racing purposes and help athletes better quantify training stimuli, stress and adaptations.

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The Creation of Effective Standardized Instructions for a Novel Flexibility Test

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(No relevant relationships reported)

Previous research has demonstrated the validity and reliability of a new test of hip and lower back flexibility that can be performed with minimal equipment.
PURPOSE: This study's purpose was to determine if an individual could perform the test correctly using only standardized instructions.
METHODS: 44 college age subjects attempted to perform the test procedures correctly, followed by a measurement by a trained technician. Based on the results, changes were made to the instructions to account for the most common errors. 45 new subjects then completed the revised procedures to the best of their ability, followed again by a measurement by a technician. The results of the individuals were compared to those of the technician by Pearson correlation and a Paired T-test.
RESULTS: For both groups, when the values of the individuals who performed the test correctly were compared to the technician's values, a very high correlation was found ($r=0.969$ for group 1, $r=0.868$ for group 2). The technician's scores tended to indicate greater flexibility, with a significant difference found for the first group ($p<0.01$ for group 1, $p=0.095$ for group 2). This was expected, as the technician's measurements were always made after the individual's effort, and with repeated stretches flexibility tended to improve. A noticeable number of subjects in the first group made an error (21 of 44 subjects), primarily mathematical in nature. When the instructions were revised, the mathematical error did occur less frequently, though overall more errors occurred (28 of 45), primarily not performing the procedure three

times. In some cases a mistake led to minimal error (e.g. performing the procedure only once), while in other cases the error completely invalidated the results (e.g. bending the knees). As expected, when all subjects were analyzed, significant differences (p<0.01 for groups 1 and 2) and poor correlations (r=0.265 and r=0.288 for groups 1 and 2, respectively) were found.

CONCLUSION: When performed correctly, individuals can obtain a score on the new test comparable to that of a trained technician. The study also demonstrates, however, that great care must be taken by both a test developer in the creation of instructions for a protocol, and by the test administrator in reading and adhering to the standardized instructions for a protocol.

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Ramp Incremental Cycling Protocol Underpredicts VO$_{2max}$ in Sedentary Normal-Weight and Overweight/Obese Adults

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(No relevant relationships reported)

The maximum rate of oxygen consumption (VO$_{2max}$) is the gold-standard index for assessing cardiorespiratory fitness. The presence of a VO$_2$/work-rate plateau at the highest work rates during incremental testing represents the primary way to confirm that a "true VO$_{2max}$" was attained; however, such a plateau is often lacking. Instead, VO$_{2max}$ is often confirmed using "secondary criteria" based on arbitrarily-determined values for heart rate, RPE, RER and/or blood-lactate concentration. A constant-work-rate "verification bout" can also confirm VO$_{2max}$; however, support for this practice comes predominantly from studies performed on recreationally-active/athletic populations. **PURPOSE:** To compare the peak VO$_2$ responses from an incremental and verification bout in sedentary normal and overweight/obese adults. **METHODS:** Twenty-eight sedentary, but otherwise healthy normal-weight (*n*=15; BMI, 22.6±1.4 kg/m^2) or overweight/obese (*n*=13; BMI, 31.3±2.9 kg/m^2) subjects (male/female, *n*=15/13; age, 28.1±4.9 years) performed a "ramp" incremental cycling test (15-20 W·min^{-1}) to limit of tolerance on a lower-body ergometer followed (10 minutes) by constant-work-rate cycling to limit of tolerance at the highest work rate attained. **RESULTS:** Intraclass correlation coefficient (.980) and coefficient of variation (4.64±3.69%) indicate good reliability for peak VO$_2$ measurement across protocols; however, the value was significantly higher during the verification bout (2.19±0.57 vs. 2.10±0.56 L/min; p=0.001) with 18 of 28 subjects demonstrating a value ≥ 2% above that derived from incremental testing. This implies that incremental testing does not reveal a true VO$_{2max}$ for a substantial proportion of these subjects. However, the peak incremental response would have been accepted as VO$_{2max}$ in all but eight subjects if the method often used (i.e., attainment of two of three criteria based on heart rate, RPE and RER) was employed. Indeed, despite the lower peak VO$_2$ response, peak heart rate and RPE were not lower for the incremental bout while peak RER was higher (1.23±0.09 vs. 1.18±0.09; p=0.003). **CONCLUSION:** The ramp incremental protocol revealed an underprediction of VO$_{2max}$ in normal and overweight/obese sedentary adults. Use of secondary criteria resulted in false VO$_{2max}$ acceptance in 32% of subjects.

2743   Board #26   June 1 2:00 PM - 3:30 PM

Ultrasonic Device as a Novel Method for Assessing Muscular Power During Vertical Jump

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(No relevant relationships reported)

Purpose: Vertical jump can be assessed using a number of different methods including the Sargent jump, a force platform and methods based on the time-of-flight. The Sargent jump has the advantage of being simple and inexpensive, but is known to lack precision. The force platform is the most accurate method but is very costly. The methods based on time-of-flight offer a good compromise but are dependent on the take-off and landing positions. To alleviate this constraint, we propose a novel method of assessing vertical jump height using a low cost ultrasonic ranging technology. The proposed method consists of placing the system on the ceiling and continuously measuring the distance to the closest body part (head). The purpose of this study is to demonstrate the proposed principle and determine its validity. **Methods:** The validity of the device was tested both in a static and a dynamic context. Static tests were performed by placing the ultrasonic sensor at 10 known distances from the top of the participant's head, ranging from 20cm to 110cm. Average and maximum errors were calculated. In the dynamic portion of the test, a participant was asked to perform 5 test jumps and to land in the same position as the one during take-off. The height of each jump was evaluated using both a time-of-flight device and the proposed method. The measurements from both devices were compared using the Student t-test for repeated measures. **Results:** No significant differences were observed between the proposed

method (22.1±3.1 cm) and the time-of-flight method (22.6±3.1 cm). The correlation coefficient was excellent between the two types of measurement systems (r=0.97). **Conclusion:** The proposed device is not sensitive to the landing position (biggest drawback of the time-of-flight system). The main difficulty of the proposed device is to ensure that the participant remains in the area covered by the ultrasonic beam. Indeed, if the participant has a large horizontal displacement during the jump, it may provide incorrect measurements. A possible solution could be to perform a 2nd order polynomial curve-fitting in order to filter erroneous data. The proposed device is an excellent alternative to evaluate vertical muscular power. In addition to being low cost, the proposed device does not suffer from the drawbacks associated to time-of-flight methods.

2744   Board #27   June 1 2:00 PM - 3:30 PM

Comparison of Physiological Stress in Two Different Step Test Exercise Protocols in Elderly People.

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(No relevant relationships reported)

Step tests are a simple and cost-effective method for determining cardiorespiratory performance. To estimate the maximum oxygen uptake in multi stage step tests, the linear relationship between workload, submaximal exercise heart rate (HR) and oxygen uptake (VO$_2$) based on the ACSM´s stair-stepping equation is used. Increasing the workload in multi-stage step tests is usually carried out by increasing the stepping frequency. Due to impairments, changing the stepping frequency can be a problem for elderly people.
PURPOSE
To examine whether an increase by the step height, representing the same physical performance like an increasing stepping frequency, lead to similar physiological responses in elderly people.
METHODS
33 elderly volunteers without cardiovascular diseases (67 ± 5 years, 170 ± 10 cm, 76 ± 15 kg) underwent two different step test protocols with five stages, in a randomized order. In protocol 1 (P1), the step height was constant at 25 cm. The load was increased by the climbing frequency (5 steps per minute (spm), every two minutes, from 10 to 30 spm). In protocol 2 (P2), the load was increased by the step height (5 cm, every two minutes, from 10 to 30 cm) at a constant stepping frequency of 25 spm. HR, VO$_2$, blood lactate (La) and evaluation of perceived exertion (RPE) was recorded before (T$_{Rest}$), at the end of each stage (T$_1$ - T$_5$) and three minutes afterwards (T$_{Recovery}$). For comparison of the differences, the root mean square error (RMSE) was calculated.
RESULTS
All five stages were achieved by 27 probands, five probands aborted at stage four and one at stage three. Between the protocols, the RMSE of the HR differed from 5.7 to 7.8 bpm independently of measuring time point. The lowest deviations of La were found in T$_{Rest}$, T$_1$, T$_2$ and T$_4$ (0.23 - 0.38 mmol/l), the highest differences were found in T$_3$, T$_5$, and T$_{Recovery}$ with 0.52 - 0.66 mmol/l. The VO$_2$ differs about 0.9 - 2.3 ml/min/kg, with the highest amount in T$_5$. RPE was significantly higher at T$_2$ in P2 (Wilcoxon p<0.05).
CONCLUSION
The measured differences are close to the expected day by day variations in step tests. Despite the modest differences in the protocols, both are suitable for practical application in elderly people. Considering the differences in HR between the protocols, an adaptation of the maximum oxygen uptake estimation could be necessary.

2745   Board #28   June 1 2:00 PM - 3:30 PM

The Reliability of the Anaerobic Dummy Throw Test in High School Wrestlers: A Pilot Study

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(No relevant relationships reported)

Anaerobic power (AP) output is an important physical characteristic that is required to succeed in sports such as wrestling. The Wingate test is considered the Gold Standard for assessing AP but is not specific to the sport of wrestling. **PURPOSE:** The purpose of this study was to examine the reliability of a novel field test known as the Lopez Dummy Throw Test (LDTT) for the assessment of AP. **METHODS:** The participants were male high school wrestlers (n=10: age: 17.0±0.8 yrs, mass: 70.9±10.2 kgs). The participants met on one occasion in order to complete the testing protocol. The protocol initiated with the participants completing a 10-15 minute dynamic warm-up (WU) that included three practice dummy throw attempts (dummy mass=31.75 kgs). Following the dynamic WU (≈5 minutes), the participants performed two trials of the LDTT. In order to perform the LDTT, wrestlers stood behind the wrestling dummy in a low squat position with legs bent at 90 degrees. Next the wrestlers wrapped their arms

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around the waist of the dummy and on the signal "go" the wrestlers quickly exploded up, lifting the dummy by getting triple extension with the ankles, knees and hips as one would in a power clean. After the wrestler was fully extended, he turned in midair in order to drive the dummy onto its stomach on the ground, where the wrestler was on top of the back of the dummy (a common position after an opponent has been thrown). The participant then repositioned the dummy to the original position to execute another throw. The participants completed as many dummy throws as possible during the one minute trials. The LDTT trials were separated by 15 minutes. **RESULTS:** The trial scores were 15.6±2.5 and 17.2±1.5 throws respectively. The interclass and intraclass reliability coefficients were r=0.84 and ICC=0.80. The standard error of the measure was SE_m=1.0 throws with 90% confidence limits of U_L: 1.7, L_L: 0.7. The mean difference between trials was 1.6±1.4 throws (90% confidence limits of U_L: 2.4, L_L: 0.8). Bland-Altman plots suggested agreement between trials with no evidence of heteroscedasticity. **CONCLUSION:** The LDTT exhibits moderate to high reliability as an assessment of AP. The inclusion of additional dummy throw trials to the assessment protocol may enhance the degree of reliability of the dummy throw test as a measure of AP.

2746 Board #29 June 1 2:00 PM - 3:30 PM

Test-retest Reliability of Velocity Assessments for Free Weight and Machine Exercises

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(No relevant relationships reported)

Muscular power is the rate at which work can be performed and is evaluated by obtaining velocity measurements. Currently, there are several devices available to measure muscular power through velocity measurements, including the Tendo Fitrodyne Sports Power Analyzer (Tendo Sports Machines, Slovakia). However, the ability for such devices to produce consistent results is still questioned. Additionally, the reproducibility of measurement between free weight and machine exercises has yet to be examined. **PURPOSE:** To determine the test-retest reliability of peak velocity during barbell bench press and leg press exercises at 20-80% of one repetition maximum (1RM). **METHODS:** Fifteen men (height 183.1 ± 10.0 cm; weight 85.3 ± 12.4 kg) and fifteen women (height 169.6 ± 7.0 cm and weight 68.9 ± 7.7 kg) performed 1RM testing for the bench press and leg press (total n = 30, $\bar{x}$ leg press = 189.5 ± 49 kg and bench press 66.8 ± 32.4 kg; females n = 15, $\bar{x}$ leg press = 163.2 ± 33.3 kg and bench press = 40.9 ± 13.8 kg; males n = 15, $\bar{x}$ leg press = 206.3 ± 53.6 kg and bench press = 90.2 ± 30.5 kg). Following at least 48 hours, each subject returned to perform one repetition at 20, 30, 40, 50, 60, 70, and 80% of their 1RM for each exercise, in randomized order with the Tendo Unit attached to each device. To determine test-retest reliability, the subjects returned to the lab one week later to perform the velocity assessment again at each intensity, in randomized order. **RESULTS:** The test-retest intraclass correlation coefficients (ICC) at each percentage of 1RM, averaged across all subjects were 0.982, 0.951, 0.892, 0.884, 0.722, 0.638 and 0.777 for leg press and 0.935, 0.945, 0.981, 0.981, 0.970, 0.952 and 0.816 for the bench press. When reliability was assessed based on gender, the average ICC for leg press and bench press was 0.816 and 0.689 for females and 0.832 and 0.745 for males, respectively. **CONCLUSION:** The findings from this study found stronger correlation coefficients for lower percentages of 1RM (20-60%) compared to higher loads (70-80% 1RM), especially for the leg press compared to the bench press. Additionally, males had slightly stronger test-retest correlations compared to the females.

2747 Board #30 June 1 2:00 PM - 3:30 PM

Development and Validation of an Equation to Estimate Peak Power from Vertical Jump in Youth

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(No relevant relationships reported)

Lower body muscular power is related to bone density in youth and is therefore a component of health-related physical fitness. **PURPOSE**: To develop and validate an equation to estimate peak power from vertical jump performance, body mass, age, and sex. **METHODS**: Peak power (PP) and vertical jump (VJ) were assessed on 217 youth between the ages of 9 and 18 years (mean = 14.5 ± 2.5 years). Two samples were combined for analyses. In one sample VJ was assessed with a Vertec and PP was assessed with a triaxial force plate. In the other sample, PP and VJ were assessed with a Quattro Jump Portable Force Platform System. Participants performed three maximal effort countermovement jumps. The highest of the three trials was used for statistical analyses. Multiple regression analysis was used to develop an equation to predict PP on a random sample of two-thirds of participants (n = 145). The resulting equation was cross-validated on the remaining one-third (n = 72). Two previously published equations were also cross-validated for comparison. Paired t-tests, effect size estimates, and regression were used to quantify the relationships between measured and estimated PP. **RESULTS**: Results from the validation sample indicated that estimates of PP from VJ and body mass were accurate (R = .95, SEE = 405 W). Age and sex did not add substantially to the model. Upon cross-validation, accuracy was maintained (R = .96, SEE = 429 W) and similar to previously published equations from Sayers et al. (R = .95, SEE = 490 W) and Duncan et al. (R = .95, SEE = 458 W). A small mean bias was observed for the Sayers et al. (p = .04, ES = 0.08) and Duncan et al. (p < .01, ES = 0.15) equations, but not for the new equation (p = .98, ES = 0.00). **CONCLUSIONS**: The following equation developed on the entire sample (N = 217) can be used to estimate PP: Watts = -1613.26 + (59.54 * VJ [cm]) + (34.89 * body mass [kg]), R = .95, SEE = 414 W. This equation was developed on youth participants and can be considered for use by teachers and practitioners in field-based settings where measurement of PP from a force platform is not available.

2748 Board #31 June 1 2:00 PM - 3:30 PM

Countermovement Jump Reliability when Performed With and Without an Arm Swing in NCAA Division 1 Basketball Players

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(No relevant relationships reported)

The countermovement jump (CMJ) is routinely used to quantify adaptions to training, as well as monitor neuromuscular readiness and fatigue in athletes. However, controversy remains in whether to incorporate an arm swing during the CMJ or keep the hands placed on the hips. Some suggest incorporating the arms yields a higher degree of sport-specificity that may produce improved reliability, especially in skilled jumpers. Conversely, others suggest the hands-on-hips approach isolates lower extremity force production and eliminates potential arm-swing variation. **PURPOSE: :** To establish the reliability of CMJ performance metrics obtained during a single CMJ performed with and without the arm swing. **METHODS:** Twenty-two (men=14, women=8) NCAA Division 1 collegiate basketball players performed 3 CMJs with an arm swing and 3 CMJs without an arm swing, in a randomized order. To assess the test-retest reliability, participants returned one week later to perform 3 more CMJs with an arm swing and 3 without. Intraclass correlation coefficients (ICC) and coefficients of variation (CV) were utilized to assess intraday and interday reliability for the various CMJ metrics. **RESULTS:** A variety of CMJ metrics for both CMJ with an arm swing and without an arm swing demonstrated high levels of intraday and interday reliability. Flight time displayed the highest levels of reliability for both arm swing (men: ICC=0.808, CV=5.9%; women: ICC=0.728, CV= 5.3%) and without an arm swing (men: ICC=0.906, CV=5.4%; women: ICC=0.736, CV= 5.8%), while eccentric mean power demonstrated the lowest reliability for both the arm swing (men: ICC=0.316, CV=41.0%; women: ICC=0.442, CV=25.8%) and without the arm swing (men: ICC=0.527, CV= 25.8%; women: ICC=0.793, CV=30.0%). **CONCLUSIONS**: The present study supports the reliability of select variables of CMJ when performed with either an arm swing or without an arm swing. Neither CMJ protocols emerged as clearly superior in displaying a higher degree of reliability in the various CMJ measurements observed.

2749 Board #32 June 1 2:00 PM - 3:30 PM

Characterizing The Ventilatory Response To Constant Load Exercise Above And Below Critical Power

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(No relevant relationships reported)

Critical power (CP) is considered a distinct exercise threshold, where at workloads above CP a metabolic steady state is not achieved causing task-failure to occur in a predictable manner. During exercise at intensities below CP, a steady state in whole-body and intra-muscular metabolic parameters is thought to be achieved, allowing exercise to be maintained for a long duration (>30 min). The ventilatory responses to constant load exercise below and above CP are yet to be determined. **Purpose:** to characterize ventilatory responses during cycling exercise performed at workloads 10% below and above CP. **Methods:** Ten highly trained subjects (6M/4W; age: 24 ± 4 yrs; height: 1.76 ± 0.10 m; weight: 66.3 ± 9.1 kg; VO_2max: 59.1 ± 7.3 ml/kg/min) performed a ramp incremental test, a 3MT (275 ± 75 W), and two constant load cycling trials to exhaustion at 10% below (CP_{-10}) and 10% above (CP_{+10}) CP. CP was determined as the mean power output over the last 30 s of the 3MT. Ventilatory [e.g. minute ventilation (VE), breathing frequency (fb), tidal volume (TV), end-tidal partial pressure of CO_2 ($PetCO_2$), ventilatory equivalents for O_2 (VE/VO_2) and CO_2 (VE/VO_2)] and metabolic

parameters, dyspnea and arterial oxyhemoglobin saturation (SpO_2) were compared at 25, 50, 75 and 100% of time to exhaustion (TTE) *within* each trial. The same variables were compared *between* CP_{-10} and CP_{+10} at exhaustion.
Results: TTE was 1215 ± 396 and 288 ± 95 s for CP_{-10} and CP_{+10}, respectively. Within each constant load trial heart rate, fb, VE/VO_2 and VE/VCO_2 were significantly ($p <$ 0.05) higher and $PetCO_2$ significantly ($p < 0.05$) lower at 75 and 100% compared to 25% of TTE. During CP_{-10} VE, TV, VO_2 were also different ($p < 0.05$) between 75 and/ or 100% compared to 25% TTE. However, measured variables were not different at 75 and 100% of TTE within each trial indicating a delayed steady state was achieved at both CP_{-10} and CP_{+10}. VE, TV, $PetCO_2$, VE/VCO_2, SpO_2, VO_2 were different ($p < 0.05$) at exhaustion between CP_{-10} and CP_{+10}.
Conclusion: Despite reaching different values at exhaustion, ventilatory parameters stabilized during exercise at 10% below and above CP. Furthermore, subjects reached exhaustion, on average, within <25 min at CP_{-10}, suggesting CP may be overestimated in highly trained subjects when CP is defined using the 3MT.

2750   Board #33   June 1 2:00 PM - 3:30 PM
Evaluation Of The Accuracy Of The ACSM Walking Metabolic Equations During The Bruce Protocol
Kayla Brennan, Kristofer Wisniewski, Patricia Fitzgerald. *Saint Francis University, Loretto, PA.*
(No relevant relationships reported)

Evaluation of the Accuracy of the ACSM Walking Metabolic Equations During the Bruce Protocol
Kayla E. Brennan, Patricia I. Fitzgerald, Kristofer S. Wisniewski, Saint Francis University, Loretto, PA
The metabolic equations from the American College of Sports Medicine (ACSM) are used to determine energy expenditure during exercise. However, the equations have been shown to overestimate the measured value of oxygen uptake (VO_2). **PURPOSE:** To determine the validity of the ACSM walking metabolic equations in predicting the VO_2 during stages 1-3 of the Bruce Protocol Treadmill Test. **METHODS:** 50 subjects (25 males, 25 females) aged 31.6 ± 13.1 years and BMI of 25.0 ± 3.4 kg/m² completed a maximal treadmill test using the Bruce Protocol. A Parvo Medics TruOne 2400 system was calibrated before each test and used to collect and measure VO_2. Steady state, defined as a heart rate ± 5 bpm for the last 2 minutes of each stage, was attained in all subjects. The measured VO_2 values during the last minute of each stage were compared to predicted values calculated using the ACSM walking metabolic equation. **RESULTS:** Dependent t-tests were used to compare predicted against measured VO_2 values for each stage. Predicted and mean measured values ± SD of stages 1-3 were 16.3 ml/kg/min and 15.5 ± 1.8 ml/kg/min (p < 0.05), 24.7 ml/kg/min and 22.3 ± 2.3 ml/kg/min (p = 0.0001), and 35.6 ml/kg/min and 32.0 ± 4.2 ml/kg/min (p = 0.0001), respectively. The equation overestimated VO_2 during stages 1-3 in 38 (76%), 47 (94%), and 44 (91.7%) subjects, respectively. **CONCLUSION:** The ACSM walking metabolic equation consistently overestimated the measured VO_2 for all three stages. The ACSM states the metabolic equations can have up to 7% error. However, the predicted VO_2 for stages 2 and 3 were both 11% greater than the measured. Due to the variability between the predicted and measured VO_2 values, caution should be taken when using the ACSM walking metabolic equation to estimate VO_2 during stages 1-3 of the Bruce protocol.

2751   Board #34   June 1 2:00 PM - 3:30 PM
Reproducibility of Force-Velocity Test Outputs Using 10-s Sprints Against Different Braking Forces
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(No relevant relationships reported)

PURPOSE: The current study was aimed to examine the reproducibility of estimated peak power (PP) and estimated pedal velocity (PV) in a multi-trial 10-s all-out cycling test among adult athletes of different sports. **METHODS:** The sample comprised 22 adult male athletes (23.50±4.73 years). Stature, sitting height and body mass were measured. Leg length was estimated as stature minus sitting height. Thigh volume was estimated from anthropometry. Body volume was obtained from air displacement plethysmography and was subsequently converted to fat mass. Fat-free mass was derived. The short-term power outputs were assessed from the force-velocity test (FVT), using a friction-braked ergometer on two repeated occasions. Differences between repeated measurements were examined with paired t-test and effect sizes calculated. **RESULTS:** Mean values for session 1 (898 Watt, 142 rpm) and session 2

(906 Watt, 142 rpm) did not differ (p>0.05). Moreover, test-retest procedure evidenced reasonable intra-individual stability for estimated PP output. Technical error of measurement (TEM) was 31.9 Watt; % coefficient of variation (CV) was 3.5% and intra-class correlation coefficient (ICC) was 0.986. For PV, TEM was 5.4 rpm, %CV was 3.8 and ICC was 0.924. **CONCLUSIONS:** Estimated PP derived from the optimal load and correspondent PV outputs seemed to be reproducible in adult athletes. Future research may examine the agreement between the estimated outputs from the Force-Velocity Test (FVT) and measured outputs using the Wingate Anaerobic Test protocol using the optimal load from the FVT.

2752   Board #35   June 1 2:00 PM - 3:30 PM
A Validated Model to Predict Maximal Oxygen Consumption Using a 9-minute Walk Test
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(No relevant relationships reported)

Introduction: Assessing maximal oxygen consumption (VO_{2max}) is not always feasible, so alternative testing methods to predict VO_{2max} have been established. The purpose of this study was to assess and validate a field test to predict VO_{2max} using measures obtained during a 9-minute walk test. **Methods:** A subsample of 147 adults, age 18-79 years, completed this test. Demographic variables included resting heart rate (RHR), age, gender, and body mass. Participants completed three 3-min walking stages at a less than, normal and greater than normal walking pace. Heart rate (HR), distance covered, and gait speed was calculated for each stage. Recovery HR was collected every 30-seconds for 2-minutes after the end of the 9-min test. Hierarchal multiple regression analysis was used to predict VO_{2max}, utilizing variables of age, gender, and mass, and variations of heart rate, distance, speed, and recovery data. The validity of the final prediction equation to estimate VO_{2max} was assessed using jackknife cross-validation. Root mean square error (RMSE) and percent bias was calculated. **Results:** 57.7% of the sample was female, with an average age of 46.4 ± 17.2 years, BMI 25.8 ± 4.6 kg/m², VO_{2max} 34.7 ml/kg/min, and RHR 60.5 ± 9.2 bpm. Model 1 included age, gender, and body mass (R^2=.717). Model 2 included variables from model 1 entered in step 1, with the addition of gait speed for each 3-min stage (R^2=.740). The final model included all steps from model 2, and recovery HR after 30-seconds. This model accounted for 80.4% of the variance in VO_{2max} (R^2=.804, RMSE=4.651 ml/kg/min). Bias between the original model and the jackknife sample (R^2=.804, RMSE=4.651 ml/kg/min, Bias Adjusted RMSE=4.6220 ml/kg/min) was <0.1% for each variable entered into the model. **Discussion:** The final model accounts for ~80% of the variance in VO_{2max}, which is in line with previously published field tests.

2753   Board #36   June 1 2:00 PM - 3:30 PM
Your Activities of Daily Life, YADL_Ballet: An Image-based Survey Technique for Healthy and Injured Dancers
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(No relevant relationships reported)

Under ideal circumstances, clinicians and educators seek to detect risk for injury prospectively, often through screening efforts. It is known that screening has been very useful for rapport building, improving health literacy and facilitating entryways to local healthcare systems. However screening, as we have been conducting it, has still not proven to be predictive of injury despite implementation of preventative interventions such as pre-season conditioning programs. This may be due, at least in part, to the fact that most screenings are annual in their periodicity whereas athlete schedule loads and health status changes are very dynamic. PURPOSE: To describe a daily monitoring approach to assess patient self-rated outcome (PRO) using a personal device, image-based patient reported survey functional measure (YADL_Ballet) that possesses concurrent validity with the SF-12 Physical Component Summary, which when measured by factor analysis, explains 61.2% of percent return to activity following injury (p<0.000). METHODS: 241 elite classical dancers (21.5±5.0 years; 69 men, 172 women) who received regular onsite care consented to participate in preseason screenings, ongoing PRO monitoring and injury surveillance. Data were analyzed with a multivariate logistic regression model for the outcome variables "injured in subsequent season" and "visits in subsequent season". RESULTS: PRO variables were associated with the primary outcome variables (p=0.003, R^2=0.492, R^2=0.242, adjusted R^2=0.205). CONCLUSION: Compliance with personal device image-based survey data capture was excellent, further suggesting that injury prevention screening tactics for dancers should include serial PRO score assessments to predict those at greatest risk for time loss injury. <!--EndFragment-->

2754   **Board #37**   June 1 2:00 PM - 3:30 PM

The Test-retest Reliability And Learning Effect Of The Modified Ctsib Balance Protocol

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the test-retest reliability of the modified Clinical Test of Sensory Integration and Balance (CTSIB) test on a clinical balance system. A secondary purpose was to study if short term balance training could improve proprioceptive integration that could be used for studying populations that are prone to balance difficulties. **METHODS:** Twenty individuals who were free of concussion, lower leg injury or balance conditions volunteered to participate in the study. The participants were randomly separated, and counterbalanced for gender, into an experimental group (n=10) and a control group (n=10). All testing was conducted on the Biodex Balance System SD to determine center of pressure sway using the modified CTSIB protocol which consisted of four 30-second trials under different conditions; eyes-open firm surface (EO-S), eyes-closed firm surface (EC-S), eyes-open soft surface (EO-U) and eyes-closed soft surface (EC-U). Both groups were tested on days one, two and seven; however, the experimental group received two ten-minute balance training sessions on hard and soft surfaces between days two and six. A 3 (day) x 4 (condition) x 2 (group) ANOVA with repeated measures was conducted to determine significance (p < 0.05). **RESULTS:** The main effect of day was not significant (p = 0.43). The main effect of group was significant (p < 0.001). The training group had less sway than the control group (1.04 $\pm$ 0.03 vs (1.18$\pm$ 0.03). The main effect of condition was significant (p < 0.001). A Fisher LSD was used to follow up this effect. As balance conditions became more difficult sway increased. EO-F (0.54$\pm$ 0.04) had less sway than EC-F and EO-S (0.85$\pm$ 0.04 and 0.87$\pm$ 0.04, respectively) which were lower than EC-S (2.81$\pm$ 0.04). There were no interaction effects. **CONCLUSION:** The modified CTSIB demonstrated strong reliability for multiple day comparisons suggesting no learning effect between trials. In addition, the results suggest that a short term (1 week) training program could result in reduced sway. Finally, the CTSIB uses multiple conditions across the testing protocol which stresses the sensory feedback system needed to maintain balance. The results indicate that sway increases as sensory input is challenged this could have application translate to balance training or rehabilitation.

F-53   **Free Communication/Poster - Monitoring**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2755   **Board #38**   June 1 2:00 PM - 3:30 PM

Adapted Wii Fit Controller for Active Videogaming in Individuals with Mobility Impairments

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(No relevant relationships reported)

Individuals with physical disabilities have few choices for enjoyable physical activity. One option is playing active video games (AVG), but many are inaccessible or offer limited play options. Making AVGs accessible offers an innovative approach to overcoming many barriers to participation. **PURPOSE:** To examine energy expenditure and enjoyment in persons with mobility impairment during AVG play using an off-the-shelf (OTS) and an adapted Wii Fit balance board (WFBB). **METHODS:** Participants completed a functional assessment and familiarization period. Metabolic data (COSMED) were collected during 20-minute baseline, followed by four 10-minute bouts of game play. Participants performed two 10-minute bouts of select Wii Fit Plus games on the OTS and adapted WFBB. During rest participants completed the PACES enjoyment scale. Data were analyzed by player ability game play groups: 1) both boards standing (StdStd), 2) seated OTS board, standing adapted board (xStd), and 3) seated on OTS board only (xSit). **RESULTS:** Sample included 58 participants, 31 men, mean age 41.21 (±12.70) yrs. Energy expenditure (METs) during game play was significantly greater than rest for all players. Only 17 participants (StdStd group) were able to play using the OTS board. During game play on the adapted WFBB average MET values for the three groups on the two game sets respectively were: xSit (n=31) 2.26±0.72, 2.23±0.75 kcal/kg/hour; xStd (n=10) 3.15±1.03, 2.99±1.12; StdStd (n=17) 2.89±0.82, 2.88±0.90. PACES scores indicated that all players enjoyed the AVGs with median scores of 4 on a 5-point scale. **CONCLUSION:** The adapted WFBB provided an opportunity for persons with mobility impairments, including wheelchair users, to engage in AVG. All participants were able to utilize and enjoyed the adapted WFBB activity. Although average MET values achieved during AVG represented light intensity exercise, several participants

achieved moderate intensity (3-6 METs) on at least one game set. Factors not accounted for that may have influenced exercise intensity include: 1) game selection, 2) limited familiarization, and 3) discomfort wearing COSMED system. Next step includes further development of adapted gaming controller and assessment of associated health and fitness outcomes. Supported by NIDLRR grant 90RE5009-01-00.

2756   **Board #39**   June 1 2:00 PM - 3:30 PM

Differences of Skin Temperature during a Treadmill Test in High vs Moderately Fit Male Triathletes

Jonathan Galan Carracedo[1], Myriam Guerra Balic[1], Andrea Suarez Segade[2]. *[1]Blanquerna, Ramon Llull University, Barcelona, Spain. [2]Clinical Center, Cornella, Barcelona, Spain.* (Sponsor: Dr. Bo Fernhall, FACSM)

(No relevant relationships reported)

Skin temperature (Tskin) is the predominant input for the heat balance maintenance and temperature regulation during rest and exercise, providing negative and positive auxiliary feedback to the thermoregulation system. During exhausting exercise it depends on the individual's metabolic rate and capacity for heat exchange with the environment. Depending on the type of exercise, the effectiveness of the thermoregulatory response is influenced by the individual's acclimatization state and aerobic fitness. **Purpose**: To evaluate the thermoregulatory response through the Tskin, and the aerobic capacity in high (HT) and moderately fit (MT) male triathletes. Further, we aimed to determine the relationship between Tskin peak and cardiorespiratory fitness for these groups. **Methods**. Ninety-two trained male triathletes were classified into HT (n=37; age 33±9 yrs.; VO₂peak 57.1±3.4 ml/kg/min) and MT (n=55; age 39±7yrs; VO₂peak 47±4.4 ml/kg/min). HT and MT levels were defined by their cardiorespiratory fitness classification (VO₂peak) based on ACSM. Tskin (left upper chest) and cardiovascular data were continually monitored during a progressive treadmill running, followed by a recovery period of five minutes. All the tests were performed in a controlled environment (humidity= 40-60% and temperature=23-24 ºC). **Results**. MT exhibited lower VO₂peak (p=.000), Tskin peak (p=.026), peak run speed (p=.000), HR (p=.001); VE (p=.000), Tskin baseline (p=.003) and were older (p=.004) with higher BMI (p=.000) compared with HT. Tskin peak correlated with VO2peak, age and RER (p<0.05). **Conclusion**. Our data show that higher levels of VO2 peak are positively associated with a better thermoregulatory response, while age has a negative association with temperature control in male triathletes. These data may have implications for exercise safety in hot environments in male triathletes.

Table 1. Cardiorespiratory Fitness and Skin Temperature data for HT and MT groups

Variables	HT (n=37)	MT (n=55)	p		
Age (years)	33±9	39±7 †	.004*		
BIM (kg.m-2)	22.9±1.6	24.8±2.1	.000*		
Peak run speed (km/h)	7.3±1.4	14.8±1.3	.000*		
VO2 peak (ml/kg/min)	57.1±3.4	47.1±4.4	.000*		
HR (bpm)	185±9.7	178±8.9	.001*		
RER	1.05±0.53	1.04±0.51 †	0.327		
VE (l/min)	146.5±19.9	129.1±15.6	.000*		
Tskin baseline (ºC)	34.55±0.73 ‡	34.06±0.77 †	.003*		
Tskin peak (ºC)	35.97±0.94	35.45±1.14	.026*		
Tskin end (ºC)	35.20±1.40 ‡	35.03±1.46 †	0.594		
Tskin recovery (ºC)	35.97±1.25 ‡	35.55±1.20 †	0.111		

Note: values are mean (Standard Deviation) Abbreviations: BMI (body mass index); VO2 peak (peak oxygen uptake); HR (heart rate); RER (respiratory exchange ratio); VE (ventilation); Tskin (skin temperature).

* Between-groups differences (p < .05). ‡ Significant correlation with Tskin peak in HT (p < .05). † Significant correlation with Tskin peak in MT (p < .05).

Table 2. Overall correlation between skin temperature peak and cardiorespiratory fitness data

Variable		Age	BMI	Peak Run	VO2 peak	HR	RER	Tskin Bas	Tskin End	Tskin Rec
Tskin peak (ºC)	r	-0.3	-0.12	-0.269	0.279	0.08	-0.227	0.62	0.903	0.882
	p	.004*	0.256	.009*	.007*	0.43	.030*	.000*	.000*	.000*

* Significant correlation (p < .05)

2757   **Board #40**   June 1 2:00 PM - 3:30 PM

Use Of Player Worn Sensors To Identify Fatigue During A USA Select National Hockey Development Camp

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(No relevant relationships reported)

Purpose: To monitor national team development camp ice hockey players with player worn sensors (PWS) to identify fatigue by reduced on-ice accelerations and changes in heart rate. **Methods:** 46 (15 yr; 174.83 ± 7.53 cm; 72.17 ± 11.80 kg) USA Hockey 15 national development camp participants consented to procedures approved by the EMU-HSRC. PWS measured tri-axial accelerations (ACC) and heart rate (HR) (Zephyr, MD) for each on-ice session (n=7) during the 5-day camp. Exponentially weighted Dynamic Accelerations (DYNA) were calculated from raw ACC. Three traditional games (G1, G2 and G3) were played on days 2, 4 and 5 and a 3v3 small-sided game on day 3. Peak ACC (g's) were divided into neuromuscular (NM) (10 sec), anaerobic (AN) (20, 30,40, 60 sec) and aerobic (AE) (90, 120, 180, 300, 600, 1200, 1800, ⋯ 3600s) time domains to determine relevant physiological fatigue factors. DYNAs (g's) were determined for time frames longer the AN domain. Peak HR (bmp) were divided into AN and AE domains at same time frames as ACC. MANOVAs for G only, P only and G vs P were performed (α = .05), in the case of significance a Tukey's *post hoc* was performed using SPSS 24.0 (IBM, NY). **Results:** ACC were greater for G vs P in the NM (10 s), AN (20-60 s) and AE (90 -180 s), while P were greater than G for ACC from 300 - 3600 s; (p<.05). DYNAs were greater for G than P for AN (60 s) and AE (90 - 180; 1200 - 1800 s; p<.05) respectively. HR was greater at AE (300 - 1200 s; p<.05) domain for P vs G. Non-significant, small effects (η_p^2= .01 - .042) were seen for reduced accelerations in the NM (10 s), AN (20-60 s) and AE domains (90-2700 s) from G1 to G3. Significant decreases in ACC were observed in NM (10 s) AN (20-60 s), AE (90 - 2400 s) and DYNAs in the AN (60 s), AE (90 and 2400 s) domains from P1 to P3 (p<.05). HR also declined in the AE domain (60 - 1200 s; p<.05) from P1 to P3. **Conclusion:** Games elicited increased ACCs and DYNAs for majority of the time points observed between 10 and 180 s, while practices elicited greater ACC and HR for durations longer than 300 s. Along with the fact that DYNAs were higher for games vs practices, these data indicate that games exhibit a more intense exertion profile with greater emphasis on anaerobic energy systems than practices. Although not as profound as expected, effects for declining ACC and DYNA from G1 to G3 indicate fatigue was evident.

2758   **Board #41**   June 1 2:00 PM - 3:30 PM

The Accuracy of Wrist-Worn Heart Rate Monitors Across a Range of Exercise Intensities

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(No relevant relationships reported)

PURPOSE: This study investigated the accuracy of four wrist-worn HR monitors (Apple Watch Series 1, Fitbit Charge, TomTom Touch, and Mio Fuse). **METHODS**: Eighteen adults completed three trials on a cycle ergometer wearing a chest-worn HR monitor (Polar). Trial 1 established the HR-power output relationship, and resting and maximum HR. In trials 2 and 3, participants were fitted to an electrocardiogram (ECG) and completed a step test consisting of 5 x 3 minute stages at 40 - 80% of HR reserve (determined in trial 1) whilst wearing two wrist-worn HR monitors.
RESULTS: Relative to ECG, there were no differences in HR between the devices during exercise (p = 0.239), and no device × exercise intensity interaction (p = 0.370). There were no instances where ECG and Polar data differed by ≥ 5 b·min-1. Conversely, there were two instances (2.2%) with the Apple, four (4.4%) with the Mio, 10 (11.1%) with the TomTom, and 19 (21.1%) with the Fitbit.
CONCLUSIONS: A chest-worn HR monitor offers greater accuracy compared to wrist-worn devices.

2759   **Board #42**   June 1 2:00 PM - 3:30 PM

Validity And Reliability Of A Shirt-based Integrated Gps Sensor

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(No relevant relationships reported)

PURPOSE: To examine the validity and reliability of a novel shirt-based 10Hz GPS and inertial movement device (TeamPRO®, Polar Electro Oy., Finland) for the assessment of distance during linear and agility-based movements.
METHODS: Fifteen male collegiate soccer players (mean± SD, age 20±1 years; height 177.0±7.5 cm; mass 71.57±7.17 kg) volunteered to participate in this study. Subjects performed a linear task consisting of two trials at each velocity: walking 4.8-7.9 km·h^{-1} (W), jogging 8.0-12.7 km·h^{-1} (J), running 12.8-20.0 km·h^{-1} (R), and sprinting >20.1 km·h^{-1} (S) with timing gates placed at 40m and 100m. Peak velocities were verified using a laser gun. Subjects also performed two trials of an agility task (team-sport simulated circuit, TSSC) through a 120m course, at various velocities, accelerations, decelerations, changes in direction, and stopping. Validity of total distance (TD) during the linear tasks and TSSC were established using the mean difference (MD) and independent t-tests (p<0.05) compared to criterion measures. Reliability for TD was determined independently during linear and TSSC tasks via coefficient of variation (%CV).
RESULTS: TD during the 40m was significantly less than the criterion measure during the J (MD±SD, -1.04 ±1.18m, p<0.001), R (-1.48±1.22m, p<0.001), and S (-2.78±2.99m, p<0.001). TD during the 100m was overestimated during the W (1.18±1.18m, p<0.001), but underestimated during the S (-2.28 ±2.63m). With the exception of the S during the 40m (%CV=8.02), the reliability (%CV) of the units for measuring TD during the 40m and 100m tasks was <5% for the W, J, R, and S. The device did not differ compared to criterion (tape measured distance) for TD during the TSSC (0.23±1.15m; p=0.339) with a very small error (<1.0%). TD during the TSSC was found to be reliable (CV=0.96%).
CONCLUSIONS: Overall these results indicate that the novel shirt-based GPS device was a valid measure of TD during the 100m for the R and J velocity zones. As velocity increased, MD for TD was also increasingly underestimated. Reliability data for TD suggest that the shirt-based sensor demonstrated good levels of consistency in all but one linear (40m S) and sport-specific tasks. The practical value of this device for athletes and coaches should be noted despite the statistically significant differences.

2760   **Board #43**   June 1 2:00 PM - 3:30 PM

Using the Hexoskin Smart Garment to Measure Cardiorespiratory Variables During High Intensity Functional Training

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(No relevant relationships reported)

Wearable devices are common in the health and fitness industry, and provide valuable information to improve and achieve fitness goals. **PURPOSE**: The purpose of this pilot study was to compare the Hexoskin smart garment (Hx) to established methods during a maximal graded exercise test (GXT) and a High-Intensity Functional Training (HIFT) session. **METHODS**: Eight healthy individuals (31.0 ± 7.6 years, 76.4 ± 11.4 kg; 1.7 ± 0.1 m) volunteered for this study and completed a GXT and a HIFT exercise session. During both testing sessions, respiratory measures [Respiratory Rate (RR), and Respiratory Volume (RV)] were assessed using a portable metabolic system (Cosmed K$_4$b^2; K$_4$), and heart rate (HR) was determined via ECG in a standard 12-lead configuration. The Hx was worn during both sessions. HR, RR, and RV were collected and monitored continuously at rest (Rt), throughout both exercise bouts (GXT & HIFT) and during cool down (Cd). **RESULTS**: Repeated measures ANOVA revealed significant differences between Hx and K$_4$ for RR-Rt (15.5 ± 5.3 vs. 33.0 ± 4.8 breaths/min, p< 0.001) and RR-Cd (29.5 ± 4.8 vs. 44.4 ± 7.0 breaths/min, p<0.001) during the GXT, as well as for RV-GXT (57.8 ± 14.9 vs. 77.3 ± 18.2 L/min, p = 0.004). During HIFT, HR-HIFT was significantly lower for the Hx when compared to ECG (141.5 ± 36.5 vs. 167.0 ± 13.2 beats/min, respectively; p = 0.038). Additionally, differences existed between the Hx and K$_4$ for RR-Rt (18.4 ± 3.9 vs. 35.6 ± 4.9 breaths/min, p< 0.001) and RR-Cd (27.8 ± 9.8 vs. 47.7 ± 7.9 breaths/min, p = 0.001). **CONCLUSION**: The results of this pilot study suggest that the Hx smart garment may be suitable to measure cardiorespiratory data during a GXT (i.e. HR & RR) and HIFT bout (i.e. RR & RV). However, additional studies should be conducted to elucidate the differences seen in HR measurement during HIFT.

Abstracts were prepared by the authors and printed as submitted.

2761   Board #44   June 1 2:00 PM - 3:30 PM

Not All Are Created Equal: A Meta-Analysis of Wearable Devices for Tracking Physical Activity.

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(No relevant relationships reported)

TITLE: Not All Are Created Equal: A Meta-Analysis of Wearable Devices for Tracking Physical Activity.
Wearable physical activity trackers have become popular and many vendors introduce various products. Currently, there are more than fifteen vendors competing in a share-market that projected over $19 billion by 2018. Physical activity trackers are being used in research studies as well as self-monitoring, reinforcement, and measurement. Many previous studies have examined the quality of commercially available devices. However, fragmentary results from individual studies may not help users when selecting physical activity trackers for multiple purposes, including tracking and monitoring their daily physical activity patterns. **PURPOSE:** To compare convergent validity of different commercially available trackers from various vendors using meta-analysis. **METHODS:** Four databases including Medline, were searched using key words representing physical activity tracker, physical activity, and validation studies. Inclusion criteria were the studies examining convergent validity evidence between consumer wearable activity trackers and research graded accelerometers (e.g., ActiGraph GT3X+). Physical activity trackers that had less than two previous independent studies were excluded. A total of 70 studies were identified through the systematic search and thirteen articles met the inclusion criteria, including nine different products introduced by seven different vendors. **RESULTS:** The sample sizes from individual studies were varied, ranging from 19 to 99. A wide range of confidence intervals (CI) in several products was found. Using the criteria of convergent validity coefficient of .8, three products demonstrated good validity and had both the mean validity coefficient and CIs were above the criteria. The mean validity coefficients of four products were the above .8, but lower limits of CIs were bellow the criteria while the mean validity coefficients of two products were below expected value. Interestingly, the cost of these trackers was not related to the strength of validity evidence. **CONCLUSION:** Since the accuracy of physical activity trackers is a contributing factor to continue engaging in physical activity (Kaewkannate & Kim, 2016), it is important to carefully examine validity evidence.

2762   Board #45   June 1 2:00 PM - 3:30 PM

Accuracy Of The Polar M430 To Predict VO^2_{max} Using Optical Technology

Grace Shryack, Joshua Patterson, Olivia Hanzel, Courtney Willoughby, Bryan Smith. *Southern Illinois University - Edwardsville, Edwardsville, IL.*

(No relevant relationships reported)

There are a number of fitness watches currently on the market that can predict VO^2_{max} based upon resting heart (HR) values. Traditionally these watches have measured HR using a wireless chest transmitter but the Polar M430 uses optical technology which is built into the watch to measure HR. There is evidence that suggests this optical technology will accurately measure resting HR but there is limited information that suggests this new technology will accurately estimate VO^2_{max}. **PURPOSE:** The purpose of this study was to compare predicted VO^2_{max} values obtained from the Polar M430 watch (M_{max}) and actual VO^2_{max} values (A_{max}) obtained from indirect calorimetry. **METHODS:** Seven females (age = 24.0 ± 4.5 y, BMI = 26.3 ± 5.9 kg/m^2) and fourteen males (age = 24.9 ± 4.5 y, BMI = 28.1 ± 5.2 kg/m^2) reported to the lab, provided their informed consent, and then were instructed to lie in a supine position to rest for 10 minutes. During this time, their information (age, height, weight, gender, self-reported training hours) was entered into the watch. Following the rest, the M430 was then fitted to the participant according to the manufacturer instructions and the resting fitness test was started in order to obtain (P_{max}). A treadmill ramp protocol using indirect calorimetry was used to obtain A_{max}. **RESULTS:** There were no significant differences between M_{max} and A_{max} (48.2±13.5 and 45.3±9.4 ml/kg/min, respectively). In males, there were no significant differences between M_{max} and A_{max} (52.5±13.6 and 50.4±5.8 ml/kg/min, respectively). In females, there were no significant differences between M_{max} and A_{max} (41.8±10.4 and 38.1±10.5 ml/kg/min, respectively). **CONCLUSIONS:** This evidence suggests that the optical technology used in the M430 provides an estimate of VO^2_{max} based upon resting HR that is comparable to a VO^2_{max} obtained via indirect calorimetry. The ability to accurately estimate VO^2_{max} under resting conditions removes many of the barriers that are associated with a true VO^2_{max} test. Removing barriers of a true VO^2_{max} test will allow individuals to quantify and make their training more efficient.

2763   Board #46   June 1 2:00 PM - 3:30 PM

Comparison of Two Heart Rate Technologies to Predict VO_{2Max}

Joshua Patterson, Olivia Hanzel, Grace Shryack, Courtney Willoughby, Bryan Smith. *Southern Illinois University Edwardsville, Edwardsville, IL.*

(No relevant relationships reported)

Currently, there are heart rate (HR) monitors manufactured by Polar® that estimate VO_{2max} from resting conditions. A majority of these monitors measure HR via a wireless chest transmitter but they also have monitors that measure HR via optical sensors that are built directly into the watch. Although the optical sensors have the ability to accurately measure resting HR when compared to a wireless chest transmitter, it is not known if the VO_{2max} estimates from optical sensors are comparable to the values obtained from a wireless chest transmitter. **PURPOSE:** The purpose of this study was to compare VO_{2max} estimates obtained from the Polar M430 which utilizes optical sensors (O_{max}) to measure HR to values obtained from the Polar V800 which utilizes a wireless chest transmitter (CT_{max}) to measure HR. **METHODS:** Seven females (BMI = 26.3 ± 5.9 kg/m^2, age = 24.0 ± 4.6 yrs) and 14 males (BMI = 28.1 ± 5.2 kg/m^2, age = 24.9 ± 4.5 yrs) reported to the lab and then were instructed to lie in a supine position to rest for 10-min. Following the 10-min rest, participants were fitted with a wireless chest transmitter which was held in place with a chest strap. This transmitter sent HR information to the V800. The M430 was then fitted to the participant's wrist according to the manufacturer's instructions. Once HR values were being displayed on all watches, the resting fitness test was started in order to obtain VO_{2max} values from each watch. At the end of the test, the VO_{2max} values were recorded from the watch. **RESULTS:** There were no significant differences between O_{max} and CT_{max} (48.2±13.5 and 48.3±12.9 ml/kg/min, respectively). In males, there were no significant differences between O_{max} and CT_{max} (52.0±14.2 and 51.9±13.8 ml/kg/min, respectively). In females, there were no significant differences between O_{max} and CT_{max} (41.8±10.4 and 42.2±9.2 ml/kg/min, respectively). **CONCLUSIONS:** This data shows that there are no significant differences between the VO_{2max} estimates based upon resting HR values obtained from optical sensors (M430) or from a wireless chest transmitter (V800). Although both technologies produce similar estimates of VO_{2max}, this project does not examine the accuracy of these estimates when compared to an individual's actual VO_{2max}.

2764   Board #47   June 1 2:00 PM - 3:30 PM

Comparing Positional Differences In Physical and Performance Assessments Among Acrobatics and Tumbling Athletes

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(No relevant relationships reported)

Physical and physiological profiles are biomarkers of athlete's performance level. The fitness profile of positional differences has been described in collegiate football, basketball, and soccer, but not in Acrobatics and Tumbling (A & T). A & T is a new and emerging collegiate sport for competitive female athletes, thus there is not enough physical and performance data. **PURPOSE:** The purpose of this study was to compare the anthropometric characteristics and fitness levels of A & T athletes based on the two positions which include tops (T) and bottoms (B). **METHODS:** Subjects were 21 Fairmont State University female athletes who participated in the sport Acrobatics and Tumbling (20±0.9 years of age). A test of the five-fitness component's, which included body composition, flexibility, muscular endurance and strength and cardiorespiratory endurance, was given to each participant. **RESULTS:** The mean value of flexibility (cm ± SD) was significantly higher in tops (T=43.9±2.2, B= 37.5±7.0, $p< .05$). Body Composition (% ± SD) showed a difference between the groups Body composition showed a significant difference ($p<0.05$) within the tops and bottoms (T=23.7±2.2, B=26.4±2.2, $p< .05$). Muscular strength and endurance, cardiovascular endurance and vertical jump height do not show significant differences. **CONCLUSIONS:** The current study describes the important positional differences in body composition and flexibility in collegiate A & T athletes. Coaches can use these physical and physiological profiles to determine which positions that the athletes are suited for.

2765   Board #48   June 1 2:00 PM - 3:30 PM

Accuracy Of VO$_{2max}$ Prediction Using A GPS Watch Following A 15-minute And Three Subsequent Runs

Andrew G. Pearson, Brandon Bastianelli, Andrea D. Workman, Christopher W. Herman, Jeff Schulz, Andrew Cornett, Rebecca W. Moore. *Eastern Michigan University, Ypsilanti, MI.* (Sponsor: Lanay Mudd, FACSM)

(No relevant relationships reported)

Commercially available GPS sports watches are now able to estimate VO$_{2max}$. **Purpose:** To examine predicted VO$_{2max}$ from a GPS watch compared to measured VO$_{2max}$. A secondary purpose was to determine if fitness level affects the ability of the watch to predict VO$_{2max}$. **Methods:** Twenty-eight participants, (14 M, 14 F; age 18-55 yr) came to the laboratory on two occasions. On day one, participants completed a treadmill graded exercise test to determine measured VO$_{2max}$ (MVO$_{2max}$). Participants completed the test using a self-selected pace while grade increased 2% every two minutes until exhaustion. On day two, participants were fitted with a GPS watch and completed a 15-minute submaximal outdoor run to determine predicted VO$_{2max}$ (PVO$_{2max}$). PVO$_{2max}$ was predicted based on subject characteristics, distance, pace, time, and heart rate measured at the radial pulse. Participants were then required to record three additional runs of at least 30 minutes on their own time to produce a modified VO$_{2max}$ (ModVO$_{2max}$). Participants were separated into two groups determined by MVO$_{2max}$ (high (n=17, VO$_{2max}$ > 50 ml/kg/min) or low (n=11, VO$_{2max}$ < 50 ml/kg/min)). A two-way repeated measures ANOVA was conducted to determine if there was a significant difference among MVO$_{2max}$, PVO$_{2max}$, and ModVO$_{2max}$. A one-way repeated measures ANOVA was conducted to determine if a significant difference in recorded VO$_{2max}$ values was observed within groups ($P < 0.05$). **Results:** The 28 participants were 24.7 ± 5.7 yr, 169 ± 7 cm tall, and weighed 67 ± 15 kg. Overall, there were significant differences between all VO$_{2max}$ variables (MVO$_{2max}$: 55 ± 10 ml/kg/min, PVO$_{2max}$: 52 ± 5 ml/kg/min, and ModVO$_{2max}$: 51 ± 6 ml/kg/min, $P < 0.05$ for all). After participants had been separated by fitness, a significant difference remained between MVO$_{2max}$ and PVO$_{2max}$ (mean difference = 6.9 ml/kg/min, $P < 0.05$) and MVO$_{2max}$ and ModVO$_{2max}$ (mean difference = 7.6 ml/kg/min, $P < 0.05$) in only the high fitness group. No significant difference was observed between any values in the low fitness group ($P > 0.05$). **Conclusion:** In healthy adults, the GPS watch was unable to accurately predict VO$_{2max}$. After subjects had been stratified into groups based on measured VO$_{2max}$, the GPS watch was able to accurately predict VO$_{2max}$ in the low fitness group but was unable to accurately predict VO$_{2max}$ in the high fitness group.

2766   Board #49   June 1 2:00 PM - 3:30 PM

The Validity Of A Commercially-available, Low-cost Accelerometer In A Free-living Setting

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(No relevant relationships reported)

Wearable activity monitors are a popular tool for the measurement of physical activity in the consumer market. However, much of the existing evidence assessing the validity of these commercially-available activity monitors is laboratory-based. Because these monitors will typically be used by consumers outside of a laboratory setting additional research assessing the validity of wearable activity monitors in free-living environments is warranted. **Purpose:** To assess the ability of a low cost, wearable activity monitor marketed to consumer (Movband 3) to measure physical activity behavior in a free-living setting against a previously-validated, research-grade accelerometer (Actigraph GT1M). **Methods:** Sixteen participants (n = five females, 27.0 ± 6.0 years old) were given both the commercially-available Movband (mounted on the wrist) and the research-grade Actigraph (mounted on the waist) to wear over the period of one week during free-living activity. Participants were required to simultaneously wear the two monitors for a minimum of five hours per day on five of the seven days. Participants completed daily diaries indicating the time of day in which the two monitors were worn. Physical activity data from each monitor was then divided by the duration of time participants wore the two monitors. Therefore, physical activity data for each monitor was expressed as activity counts/minute worn for each day. Pearson's correlation analyses were then performed to assess the relationship between counts/minute of the two monitors for each participant individually across all days the two devices were worn for a minimum of five hours. These individual correlation coefficients were then averaged across all participants and presented as a single value. **Results:** There was a large, positive effect size for the association (r = 0.57) between Movband and Actigraph activity counts/minute during free-living activity. In other words, as physical activity counts/minute increased in the Movband, activity also increased in the Actigraph. **Conclusion:** The low-cost, commercially-available wearable activity monitor (Movband) appears to provide a valid assessment of physical activity behavior in a free-living setting.

2767   Board #50   June 1 2:00 PM - 3:30 PM

Validating Heart Rate In The Garmin Vivosmart HR Monitor Versus The Cosmed K4b2 Metabolic Backpack

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(No relevant relationships reported)

In today's fitness society, the growth of activity monitors is becoming more notable. The Cosmed K4b2 (K4) is one of the most highly accurate systems used to measure heart rate (HR), while the Garmin Vivosmart HR (GV) is one of the newest and more advanced activity monitors on the market. The GV has yet to be tested to prove its accuracy of its heart rate monitor in comparison to the K4B2. With a growing number of people relying on these activity monitors to give them accurate data on their activity levels, it should be known how accurate the data being given is. PURPOSE: To determine the accuracy of the heart rate monitor of the GV to that of the K4b2. METHODS: 19 individuals wore both the GV and the K4 while walking on a treadmill for 10 minutes. The measures taken were HR on both devices. Prior to exercise, participants had their weight, height, BP, and HR measured. Participants were asked to walk normally and not hold on with GV hand. RESULTS: The mean HR for the K4B2 was 102.00 ± 13.77, while GV was 100.26 ± 12.66. CONCLUSION: Our data indicated a positive correlation found between the K4B2 and GV with an r-value = 0.550; p-value = 0.022. Thus, the data suggests that the GV is as accurate as the K4 in measuring heart rate. The data also suggests that the GV may be a cheaper alternative to the K4 for tracking HR with researchers. Further testing with a larger population is warranted to help determine the accuracy between both pieces of equipment.

2768   Board #51   June 1 2:00 PM - 3:30 PM

Validation Of Step Frequency Estimation From A Wearable Device On A Treadmill And Indoor Track

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(No relevant relationships reported)

Wearable fitness tracking devices have become common tools for runners of all levels. Using accelerometers, GPS, and heart rate, these devices are able to estimate running variables such as maximum oxygen capacity, step frequency, stride length, and ground contact time which can be used to evaluate technique and performance. PURPOSE: The purpose of this study was to validate the step frequency estimation on a Garmin Forerunner 630 for both treadmill and indoor track running. METHODS: Six male and 5 female volunteers (23 ± 4.1 years, 171.8 ± 9.0 cm, 73.9 ± 12.5 kg) performed five total running trials in random order, two on a 200 m indoor track (jogging pace and sprint pace) and three on a treadmill (6 mph, 7 mph, and 8 mph). Each trial was video recorded to count strides for 15 s which were converted to steps per minute and then compared to the estimated step frequency by the Garmin wearable device. Paired t-tests were used to compare the actual measurements to the estimated data for each of the running trials. RESULTS: There was no significant difference between any of the running trials actual step frequency count and the Garmin wearable device's estimated step frequency (Table 1). CONCLUSION: The Garmin Forerunner 630 is an accurate estimate of running step frequency when using it in an indoor setting, both on the treadmill and an indoor track.

	Step Frequency (steps·min^{-1})				
	Treadmill 6 mph	Treadmill 7 mph	Treadmill 8 mph	Indoor Track Jog	Indoor Track Sprint
Actual	160.0 ± 9.8	165.8 ± 11.4	172.7 ± 12.4	168.7 ± 10.6	213.5 ± 18.0
Garmin	161.6 ± 9.3	166.5 ± 10.8	171.7 ± 12.1	169.1 ± 10.1	206.7 ± 24.5
Significance	.08	.21	.31	.45	.27

Table 1. Mean ± SD of actual step frequency and estimated step frequency from the Garmin wearable device for each of the 5 running trials.

Abstracts were prepared by the authors and printed as submitted.

F-54   Free Communication/Poster - **Injury/Injury Prevention/Recovery/Rehabilitation**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2769   Board #52   June 1 3:30 PM - 5:00 PM

Use of Mesenchymal Stem Cells to Treat Muscle Strain Injuries

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(No relevant relationships reported)

Muscle strains are one of the most common complaints treated by physicians. Standard therapy for acute muscle strains usually involves rest, ice, and nonsteroidal anti-inflammatory medications, but currently there is no clear consensus on how to accelerate recovery. It is now known that mesenchymal stem cells (MSCs) have myogenic potential by contributing to development of new muscle and enhancing satellite cell function. A treatment that shortens recovery time could have a large impact in athletics, but could have a tremendous impact in patients with muscular dystrophies. **PURPOSE:** To determine the effects of MSCs on injured muscle. We tested the hypothesis that MSC delivery at the site of muscle injury will shorten recovery time. **METHODS:** The tibialis anterior muscles (TAs) of anesthetized Sprague-Dawley rats (N=9) were injured by lengthening contractions. The injured TA was injected with either MSCs (1E5, Lonza Biotechnologies), "sham" treatment (equivalent volume of sterile saline), or received no treatment (N=3 per group). Maximal torque was measured at optimal muscle length pre- and post-injury, and at days 1, 3, 5, 7 and 9 after injury until recovery was complete. **RESULTS:** All animals sustained almost identical loss of muscle force after injury (60 +/- 2%). MSC-treatment had a beneficial effect at within 3 days after injury, resulting in a faster, and overall greater, recovery of function compared to sham and no treatment groups. The sham injections had no effect compared to no treatment. **CONCLUSIONS:** We conclude that MSC injection may be a promising treatment option for muscle strain injuries. Our long-term goal is to inject injured muscle with MSCs containing superparamagnetic iron oxide nanoparticles (SPIONs), which can be tracked by MRI and delivered to a targeted sites in-vivo for predetermined periods of time. This method could further improve muscle regeneration and subsequent functional recovery of the injured muscle.

2770   Board #53   June 1 3:30 PM - 5:00 PM

The Effect of Tissue Temperature on Ligament Laxity in Healthy Individuals

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(No relevant relationships reported)

The use of heat and ice is commonly used in the clinical setting. Heating before exercise is reported to increase range of motion and tissue pliability while icing after exercise is reported to decrease the inflammatory response and pain. **PURPOSE:** To examine the effects of hot and cold on ligament laxity of the ankle joint. **METHODS:** Seventy-five subjects (39 females, 36 males, age = 20.1 ± 1.7 yrs; height =173.8 ± 9.5 cm, mass = 71.2 ± 13.8 kg) with no history of an ankle sprain were recruited for this study. Participants were randomly divided into three groups (hot, cold, control) and an ankle was randomly selected for testing. The experimental groups either received a hot pack or an ice bag wrapped around their ankle for the 20 minute intervention period. Prior to the intervention, anterior displacement (AD) and inversion-eversion rotation (IE) was measured by an ankle arthrometer. Next, participants received the intervention of their assigned group. After the intervention, another measurement was taken. Three trials of each measurement was taken and averaged. Data were analyzed using a repeated measures ANOVA among the three groups between the pre-and post-measurements. **RESULTS:** A significant main by group interaction was found for AD (p=0.004), but not IE (p=0.859). In the AD direction, there was a significant increase in ligament laxity in the hot group and a significant decrease in ligament laxity in the cold group. However, no changes were detected in the IE direction in any groups. **CONCLUSION:** As expected, the application of heat increased tissue pliability while cold decreased it. However, changes were only found in the AD direction but not the IE direction. Ankle joint motion can be restricted by both ligaments and muscles. Perhaps, alterations from temperature changes differ among different tissue types. However, further research is necessary to determine the molecular changes in different types of tissue (connective, muscular) with temperature changes.

Means, SD, and p-values among groups					
	Pre-AD (mm)	Post-AD (mm)	p-value	Pre- IE (degrees)	Post-IE (degrees)	p-value
Hot	8.97 ± 2.71	9.77 ± 2.92	0.029	43.75 ± 11.49	44.22 ± 12.67	0.613
Cold	9.28 ± 2.43	8.54 ± 2.65	0.023	41.67 ± 11.94	41.48 ± 10.73	0.875
Control	9.30 ± 3.34	9.36 ± 3.40	0.767	45.59 ± 13.14	46.54 ± 10.82	0.703

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Artificial CO_2-water Leg-bath Facilitates Recovery From Muscle Hardness Caused By Resistance Exercise

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(No relevant relationships reported)

Facilitation of the blood stream and oxygen consumption of the muscle by a local immersion of the extremities into high concentration carbon dioxide water (CO_2-water, $CO_2 \geq 1000$ppm), suggests an improvement of muscle performance and joints flexibility. **PURPOSE:** In the present study, we investigated whether the immersion of extremities including agonist muscles into artificially made CO_2-water influenced recovery of the increased muscle hardness induced by a resistance exercise. **METHODS:** The healthy male college students (n=11, age; 18-19 yrs, height; 168.6±4.5 cm, weight; 66.2±9.3 kg) participated in this study. The subjects performed 100 times calf raise resistance exercise and immersed lower legs into tap-water or artificial CO_2-water at 35 °C for 10 minutes immediately after the exercise. Blood flow in the immersed skin (BF_{skin}) and electrocardiogram (ECG) were recorded continuously throughout the experiment. Hardness of the gastrocnemius medialis (MG) was evaluated using ultrasound real-time tissue elastography. Visual analog scale test on muscle pain (VAS) and muscle hardness measurements were performed at 3 time points (prior to exercise, immediately after exercise, at 10 min after exercise). The strain ratio (SR) between the MG and a reference material was calculated. **RESULTS:** BF_{skin} in the CO_2-water leg-bath was significantly higher than that in the tap-water leg-bath (CO_2-water vs. tap-water, 5.5±1.8 vs. 2.1±1.2 ml·min^{-1}·100g^{-1}, p<0.05). At 10 min after exercise, CO_2-water treatment compared with the tap-water treatment, SR decreased significantly quicker (1.37±0.28 vs. 0.67±0.08, p<0.05). In addition, VAS at recovery 10 min became smaller in the CO_2-water than the tap-water (18.1±10.2 vs. 33.9±16.2 mm, p<0.05). **CONCLUSIONS:** We reported previously that the muscle blood flow in the immersed part was larger in CO_2-water than tap-water of a same temperature. In addition to a local effect of CO_2, suppression of muscular sympathetic activity may also contribute to the increase in local blood flow. Facilitation of muscle hardness recovery shown in this study might be caused by the increased muscle blood flow. The present study suggested that high concentration artificial CO_2-water immersion may contribute to rapid recovery from the high intensity exercise-induced muscle fatigue.

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Cold-Water Immersion Attenuated Muscle Soreness after Plyometric Training while having no Impact on Sprint Performance.

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(No relevant relationships reported)

PURPOSE: This study aimed to test the effectiveness of lower body cold-water immersion (CWI) on Delayed Onset Muscle Soreness (DOMS) and sprint performance after acute plyometric exercise in Division II athletes. **METHODS:** Female (n=12) and male (n=6) Division II athletes, aged 20.6 ± 1.3 (n=18) were asked to perform two maximal 40-yard (36.58m) dash trials. After which the times were averaged together to determine a pre-treatment value. Twenty-four hours after the 40-yard dash trials all athletes returned and asked to rate their level of soreness on a 1-10 visual analog scale (VAS). Then each athlete participated in a plyometric workout consisting of a warm-up, workout (210 ground contacts), and cool-down. The control group (Con) sat in a chair for 10 mins and the experimental group (CWI) sat submerged to their waste in a cold-water tank (15.5°C or 60°F) for 10 mins. Participants returned 48 hrs after Con or CWI treatment and asked to rate their perceived muscle soreness on the same VAS. For the post-treatment values, participants performed the same warm-up, 40-yard dash trials, and cool-down. All procedures were approved by Fairmont State University's IRB and informed consent was given by each participant. **RESULTS:** The average VAS for muscle soreness increased (p≤0.05) from pre-workout (1.2 ± 0.42) to post-workout (2.2 ± 0.43) to 48hrs post workout (6.4 ± 1.8). The 48hrs post workout Con group also reported greater (p≤0.05) levels of soreness as compared to 48-hrs post workout CWI experimental group (8.1 ± 0.78 vs 4.67 ± 0.5). There was no significant difference (p≤0.05) found between the Con or CWI group in the pre-treatment 40-yard dash (5.66 sec ± 0.47 vs 5.53 sec ± 0.53). Furthermore, there was no significant

difference (p≤0.05) found between the Con or CWI group in the post-treatment trials (5.52 sec ± 0.52 vs 5.57 sec ± 0.53). **CONCLUSIONS:** Forty-eight hours after high-intensity plyometric training, perceived muscle soreness was elevated when compared to pre-workout values. Cold-water immersion attenuated the reported increase in DOMS but did not prevent reports of elevated soreness. However, the increase in perceived DOMS had no significant effect on 40-yard dash time 48 hours after high-intensity plyometric training in either the control or cold-water immersion group.

2773   Board #56   June 1 3:30 PM - 5:00 PM

Effects of Two Maximal Isometric Contractions Attenuate Eccentric Exercise-induced Muscle Damage on Surface Electromyographic Activity

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(No relevant relationships reported)

Tseng et al. (2016) reported that changes in MaxECC-induced muscle damage (EIMD) of the preconditioning MVC training of the knee extensors (KE) for untrained men was significantly smaller than control group. No studies have recruited untrained participants, and targeted on hamstring muscle strains in which are the most frequent sporting injuries to clarify whether non-damaging exercise of MVC can be attenuated muscle damage induced by MaxECC of knee flexors (KF). **PURPOSE:** This study investigated the neural factors (surface electromyography, EMG) of two maximal isometric contractions (2MVC) at 20° knee flexion on changes in indirect muscle damage markers following 60 MaxECC of KF performed 2 days later. **METHODS:** Sixteen untrained young males were randomly placed into the control group (CON) that did not perform 2MVC, or the experimental group (2d, n = 8 per group) who performed 2MVC 2 days before MaxECC. Changes in muscle soreness (SOR), non-dominant upper thigh circumference (CIR), resting knee angle (RANG), maximal voluntary isokinetic concentric contraction (MVC-CON), and surface EMG [median frequency (MF), root mean square (RMS)] before, immediately after, and 1-5 days after MaxECC were compared between groups by a mixed-design of two-way ANOVA. **RESULTS:** 1). Significant (p < .05) changes in some dependent variables after 2MVC compared to baseline for the 2d group; 2). Changes in the muscle damage variables (e.g. MVC-CON: -13.1%; CIR: +1.5 mm) following MaxECC immediately for the 2d group were smaller than CON group (-22.4%; +4.8 mm); 3) Changes in the surface EMG activity following MaxECC for the 2d group showed smaller changes (MF: 60.2 ± 9.1 Hz) than CON group (70 ± 13.2 Hz). **CONCLUSION:** These results suggest that protective effect conferred by non-damaging exercise of 2MVC against subsequent MaxECC-induced muscle damage is likely to be related to neural adaptations. Therefore, the RBE protocol of this study may provide some useful information for men to minimize muscle damage when they start to participate exercise. It is also required to further understand the underpinning mechanisms of the repeated bout effect in both physiological and pathological contexts.

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Systemic and Local Alterations in Extracellular RNA (exRNA) Following Traumatic Knee Injury Implicate Catabolic and Inflammatory Pathways

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(No relevant relationships reported)

Traumatic injuries are strong risk factors for future osteoarthritis (OA) of the knee. Molecular changes initiated soon after the trauma may lead to this increased susceptibility. Identification of these pathways could lead to early intervention and potential limitation of damage. One such mechanism may be the release of RNA molecules by the affected tissues. **PURPOSE**: This study set out to characterize systemic extracellular RNA (exRNA) by characterizing RNA from plasma following traumatic injury. **METHODS**: Our cohort consisted of 14 subjects (ages 19 to 47) undergoing ACL and/or meniscal repair surgery (0.5 to 180 months post injury). Radiograph analysis found no existing OA at the time of surgery, though Outerbridge chondral damage assessment indicated average scores across four knee compartments ranging from 0-1.25. Plasma was isolated from whole blood via centrifugation to remove cells and platelets. Total RNA was extracted from .05mL of plasma and analyzed via massively parallel sequencing for quantification and characterization of exRNA. Generalized linear models were used to identify RNA differentially present in low vs high (0.5) average Outerbridsge scores and acute vs chronic duration of injury (4 months). **RESULTS**: exRNA profiles indicated more than 10,000 types of RNA present including fragments of protein coding genes and miRNAs. Profiles were consistent across the samples with no differences when comparing Outerbridge scores or injury

duration. There was noted expression of inflammatory genes (*CXCL5, CCL5,* and *IL16*), catabolic genes (*MMP -21, -17, and -13,* and *ADAMTS8*), and previously reported miRNA biomarkers of arthritis (*MIR16, MIR20b,* and *MIR146a*). **CONCLUSIONS**: There is an unmet need for determining the etiology and potential novel treatment approaches in patients with knee trauma to mitigate future progression of OA. This study demonstrates that exRNA can be isolated and characterized from plasma in a high throughput manner. Our results indicate that plasma from subjects with injured knees contains inflammatory, catabolic, and potential arthritic biomarkers. Future studies are required to more fully characterize the biological roles of these exRNA and the timing and cadence of their respective release that may lead to translational treatment options for patients with post-traumatic OA.

2775   Board #58   June 1 3:30 PM - 5:00 PM

Effects of Isometric Contractions on Eccentric Exercise-induced Muscle Damage of the Knee Extensors

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(No relevant relationships reported)

The previous studies proposed that two maximal voluntary isometric contractions (2MVCs) at 20° elbow flexion did not change any variables for exercise-induced muscle damage (EIMD) and delayed onset muscle soreness (DOMS) (Chen et al., 2012, 2013). These results may not apply for real outcomes resulting from the lower limb [ex: knee extensors (KE)].
PURPOSE: To investigate the protective effect conferred by MVCs of the KE on changes in muscle damage markers and pulse wave velocity (PWV) by maximal eccentric contractions of the same muscle performed 1 day later. **METHODS:** Twenty untrained male students were randomly assigned to a control group that did not perform 2MVCs or 1d group who performed 2 MVCs at 120° knee flexion 1 day before 60 maximal isokinetic (30°/s) eccentric exercise (MaxEC). Changes in maximal isokinetic contraction torque (MVC-CON), range of motion (ROM), DOMS, PWV and blood creatine kinase (CK) activity were compared between the groups by two-way repeated measures ANOVA. **RESULTS:** No significant changes in any variables were evident after 2MVCs (p < .05). The changes in all variables after MaxEC showed smaller for the 1d group compared with control group. **CONCLUSION:** The results of this study show that isometric contraction of KE at a longer muscle length did not induce muscle damage and produced a protective effect.

2776   Board #59   June 1 3:30 PM - 5:00 PM

Nitric Oxide Donor Treatment Affects Skeletal Muscle Myeloperoxidase And Fibronectin After Contusion Injury In Rats

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(No relevant relationships reported)

Trauma to skeletal muscle results in tissue and membrane damage and an inflammatory response. Current treatments are merely management strategies. Nitric oxide (NO)-donation has shown therapeutic promise in mouse models of muscular dystrophy, and therefore, may be beneficial for the treatment of acute muscle injuries. **PURPOSE:** To clarify the role of treatment-derived NO on muscle tissue response to trauma. **METHODS:** Using a contusion injury model (n=10 uninjured controls and n=58 injured), rats were treated with either placebo (Plac) or NO-donor administered with gelatine blocks immediately and one day after the injury. Time points for sample collection were 1, 3, 5 and 21 days post-intervention. Content of two selected proteins in the injured tissue homogenates were assessed with Western blots and band density normalized to uninjured untreated control samples. Myeloperoxidase (MPO) and fibronectin (45+50 kDa bands combined) were used to assess inflammatory and membrane damage respectively. Data presented in arbitrary densitometric units (AU) as mean ± standard deviation. Statistical analysis: Mixed Models ANOVA with post-hoc LSD test. **RESULTS:** MPO peaked five days after injury in placebo (D1: 0.73 ±0.32 AU; D3: 0.47 ±0.45; D5 8.36 ±4.92; p < 0.0001) and NO-treated groups (D1: 1.00 ±0.23 AU; D3: 0.32 ±0.29; D5 5.57 ±6.80; p < 0.01) and resolved by D21 in both groups (Pla: 0.97 ±0.70 and NO-donor: 1.21 ±0.71 AU). The modulation of MPO on D5 by NO-donor was 33% with large individual variation between animals (Pla versus NO-donor D5: not significant). Fibronectin was >1000-fold elevated on D5 in both groups (Plac: 1290 ±1441 and NO-donor 1024 ±549 AU), but fibronectin resolved better with NO-donor by D21 (Plac: 12.4 ±5.6 versus NO-donor: 3.7 ±0.8; p<0.005 between groups). **CONCLUSION:** Five days after injury, NO-donor treatment reduced evidence of inflammation and membrane damage. This may be due to enhanced clearance of inflammatory radicals from injured muscle and less secondary injury.

2777   Board #60   June 1 3:30 PM - 5:00 PM
The Effect Of Nitric Oxide Donor Treatment On Skeletal Muscle Repair Following Contusion Injury In Rats

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(No relevant relationships reported)

Muscle injuries often lead to structural and functional deficits and recurrent injuries. Nitric oxide (NO) is an endogenous bioactive molecule with multiple physiological roles. Pharmacological NO inhibition negatively effects regeneration, with excessive fibrosis, suggesting that treatment with NO may prove to be beneficial. **PURPOSE:** To assess a) anti-fibrotic and pro-regenerative roles of NO following muscle trauma and b) muscle function recovery following injury by treating with either NO donor or inhibitor. **METHODS:** The gastrocnemius of adult male rats were contusion injured (250g drop-mass) followed by one of four treatments (placebo, NO-donor, NO-inhibitor or combination) administered immediately and one day post-injury and in un-injured controls. Rats were sacrificed at 5 (D5) and 21 (D21) days after intervention (n=6/group; total n=78). *In situ* mechanics testing was done pre-injury and before sacrifice to determine plantar flexor contractility. Fibrosis staining was done using Masson's trichrome and Sirius red. Embryonic MHC (eMHC) was used to identify new and regenerating muscle fibers, including cross-sectional area (CSA). **RESULTS:** Maximal isometric force was significantly reduced D5 post-injury (19.5 ±3.1 N/kg) compared to pre-injury (26.0 ±2.5 N/kg; p < 0.0001). D21 maximal force was significantly higher in the NO-donor group (27.2 ±3.3 N/kg) versus L-NAME (21.7 ±3.7 N/kg; p < 0.05) and combination (21.6 ±3.8 N/kg; p < 0.05). NO-donor significantly increased eMHC protein expression (5.29 ±2.64 AU versus Plac: 0.65 ±0.64; L-NAME: 0.58 ±0.51; Comb: 0.45 ±0.9 AU; p < 0.001) and new fiber CSA (501 ±34 um^2) versus other treatments (Plac: 421 ±27 p< 0.01; L-NAME: 240 ±38 p<0.001; Comb: 313 ±36 um^2; p<0.001). Picrosirius red staining indicated that NO-donor treatment reduced fibrosis (7.33 ±1.87 %; Plac: 18.28 ±3.94; p< 0.0001). Masson's trichrome staining indicated a significant increase in fibrosis following NO inhibition (22.88 ±1.57 %; p<0.01). **CONCLUSION:** Maximal force production recovered fully 21 days after injury in placebo-treated rats. NO influenced recovery of physiological function resulting in further increased maximal force production at D21, compared to a reduction following L-NAME treatment. This may be due to improvement in regenerative myogenesis and reduction in fibrosis.

2778   Board #61   June 1 3:30 PM - 5:00 PM
Myotonometric Effect of Foam Rolling Following Strength Training

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(No relevant relationships reported)

Foam Rolling (FR) is widely used as an intervention therapy device to alleviate, treat, and possibly prevent myofasciatic condition in exercise and in high performance sports. Its use may be beneficial on the pressure sensitive muscle tissue via regeneration therapy; however, these effects have not been sufficiently investigated. **PURPOSE:** The aim of this investigation was to assess whether the use of FR may benefit muscle tissue compliance via myotonometric intervention training (MMT) and subsequent muscle regeneration after exhausting high intensity strength training experiment (EXP). **METHODS:** Twenty sport students (7 male and 13 female; age 24.7±2.9 yrs, BMI 22.2±2.4 kg.m²) performed a single exhausting strength training session (leg extension with both legs) followed by FR session (using right leg only). The FR session (2x45s) was conducted again after 24, 48 and 72 hours. The left leg served as a control (CON). Prior to exhaustion and after every FR session, we determined muscle tissue compliance of rectus femoris muscle (MMT). We utilized Hz-frequency analysis to assess tissue compliance. **RESULTS:** The time effect was as follows: (pre: EXP 14.53±1.12, CON 14.37±0.99; post 0: EXP 14.60±1.28, CON 14.63±1.01; post-24: EXP 14.56±1.31, CON 14.25±1.11; post-48: EXP 14.36±1.22, CON 14.33±1.16; post-72: EXP 14.33±1.31, CON 14.25±1.15 Hz). The investigation revealed significant increase in Hz-frequency (greater compliance) immediately post exhausting strength training session but returned to base values day after (*P*=0.006). There was no significant main effect between EXP and CON (*P*=0.8). There was also no interaction effect for FR (*P*=0.399). **DISCUSSION:** Although scientific literature report fatigue and recovery effects; however, we did not find regenerative effects of FR when using MMT. From practical point of view, we were able to document at least partially the regenerative use of MMT immediately after the EXP but we were not able to ascertain that even repeated FR treatment daily will beneficially effect muscle compliance and the desired outcome. Future studies utilizing different dose, duration, and repetitions may yield results that are more promising.

2779   Board #62   June 1 3:30 PM - 5:00 PM
Dysregulated Inflammation And MAPK Signaling In Aged Human Muscle Following Exercise-induced Damage

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(No relevant relationships reported)

The remarkable capacity of skeletal muscle to adapt and repair following injury is attenuated with age. Studies in young organisms suggest that acute changes in both extrinsic and intrinsic factors in the muscle environment are critical in regulating reparative potential. **Purpose:** To uncover potential factors involved in the impaired regenerative response of aged human skeletal muscle, we comprehensively assessed the molecular stress response following muscle damage in young and old individuals. **Methods:** 11 young (22.7 ± 2.25 yrs) and 8 physically active old (70.9 ± 7.5 yrs) subjects completed a bout of 300 lengthening contractions (LC) on a Biodex dynamometer. Functional tests were performed as an indirect assessment of muscle damage and muscle biopsies were taken pre-exercise and at 3, 24, and 72 hours post-exercise. High throughput multi-plexing bead assays were used to analyze biopsy samples for content of inflammatory cytokines and protein concentrations of the mitogen activated protein kinase (MAPK) signaling pathway. **Results:** After the bout of LC's, muscle damage was evident by the loss of isometric force production in both groups (Young: 54.11 ± 22 and Old: 33.86 ± 17%). Old muscle displayed higher expression of MCP-1 (group, p=0.019) that appeared at the later 24 and 72 hour time points. There was also a rapid increase in NF-kb activity in the old following the bout of lengthening contractions (group x time, p=0.05). In the old, p38 protein content increased significantly at the 3 hour time point (Young: 0.8 ± 0.09 vs Old: 1.70 ± 0.47 fold) before returning to pre-exercise levels (group x time, p=0.0043). Additionally, by 3 hours post-exercise total JNK protein levels increased only in the old (Young: 1.6 ± 0.26 vs Old: 5.1 ± 0.77 fold) and remained significantly elevated (Young: 0.76 ± 0.20 vs Old: 4.5 ± 0.46 fold) 24 hours post-exercise (group x time, p=0.038) before returning to pre-exercise levels. **Conclusion:** skeletal muscle of physically active older individuals is characterized by a dysregulated and asynchronous inflammatory and MAPK response, each of which may individually or collectively contribute to the deterioration of muscle repair mechanisms that accompanies aging.

2780   Board #63   June 1 3:30 PM - 5:00 PM
Risk Factors for Knee Arthroplasty in Patients with Knee Osteoarthritis Treated with Hylan G-F 20

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Reported Relationships: M. Runa: *Salary; Exponent Inc..*

PURPOSE: Knee osteoarthritis (OA) is a common condition that often results in knee arthroplasty (KA), a costly procedure with potentially adverse clinical sequelae. Viscosupplementation with hyaluronic acid (HA) derivatives such as hylan G-F 20 can be used to treat knee OA pain. Data from a large medical claims database were analyzed to identify factors associated with KA risk for patients with knee OA treated with hylan G-F 20.
METHODS: Health claims data from the Optum Clinformatics Data Mart database from 2006-2016 were used. Patients were aged ≥18 years, had data for 6 months before and ≥6 months after knee OA diagnosis, and had ≥1 treatment course of hylan G-F 20 (hylan G-F 20 or hylan G-F 20 single intraarticular injection) as the only HA therapy. Patients were grouped by treatment with hylan G-F 20, hylan G-F 20 single intraarticular injection, or both. Kaplan-Meier curves were generated for the adjusted risk of KA with propensity scores from the first treatment with hylan G-F 20 to KA. KA risk factors were determined using multivariate Cox regression adjusted for age, race, region, gender, treatment group, year of HA therapy, Charlson comorbidity index (CCI) score, number of HA courses, arthroscopy, physical therapy, ultrasound use, and prescriptions for non-steroidal anti-inflammatory drugs, opioids, or corticosteroids. **RESULTS:** From 4,027,848 knee OA patients, 62,033 were treated with hylan G-F 20 and/or hylan G-F 20 single intraarticular injection; 76% treated avoided KA over the 10-year study period. Kaplan-Meier analysis showed that 60-64% of patients treated with hylan G-F 20 and/or hylan G-F 20 single intraarticular injection were able to avoid KA at 8 years following their first injection. Risk factors for KA from first hylan G-F 20 treatment were increased age (hazard ratio [HR] ranging from 2.84-8.20 for ≥40 years of age vs 18-39 years; P<0.001 for all), fewer hylan G-F 20 treatments (HR 0.63, 0.47, 0.38, and 0.36 for 2, 3, 4, or ≥5 treatments, respectively, vs 1 treatment; P<0.001 for all), and no use of ultrasound (HR 0.93 with ultrasound; P<0.001). **CONCLUSIONS:** In this analysis of a large claims database over a 10-year period, younger patients, those who had more courses of hylan G-F 20 treatment, and those who received hylan G-F 20 injections with ultrasound guidance were less likely to receive KA. Funded by Sanofi

FRIDAY, JUNE 1, 2018

2781   Board #64   June 1 3:30 PM - 5:00 PM

Efficient Concentration of Plasma and Platelet-WBC-Rich Plasma Proteins Using a Polyacrylamide Device

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(No relevant relationships reported)

Concentration of functional proteins has used methods such as dialysis, precipitation, and freeze-drying, which are poorly scalable, not compatible with cell viability, and often damages proteins. Currently, platelet-poor-plasma (PPP) is a discarded waste product of platelet-rich plasma (PRP) and may contain valuable chondrogenic proteins. PURPOSE: to determine the efficiency of a novel patient-side method of concentrating plasma and platelet- and white blood cell (WBC)-rich plasma as a potential adjunctive therapy for OA. METHODS: A laboratory study was conducted, with IRB and IACUC approval, using residual human clinical plasma (PPP) and equine blood samples. Samples and products were characterized for platelet, WBC, and total protein content then quantified by enzyme-linked immunosorbent assays specific to IGF-1, TGF- ß, IL-1ra, and IL-1 ß as anabolic and inflammatory mediators to cartilage. RESULTS: Plasma total and IGF-1 protein were concentrated by the device in both human (P<0.001) and equine (P<0.0001) plasma. TGF- ß, IL-1 and IL-1ra were very low in plasma. The polyacrylamide concentrator device highly concentrated platelets, WBCs, and plasma proteins over PRP and whole blood, most dramatically TGF- ß (P<0.001; 29-fold over blood) and IL-1ra (P<0.001; 70-fold over plasma) resulting in a > 2000-fold increase in IL-1/Il-1ra ratio over plasma (P<0.001) and 1668-fold increase over PRP (P<0.001). Interestingly, patients with OA had a lower anabolic protein profile (IGF-1 and TGF- ß) and a higher inflammatory-related protein profile (IL-1 ß and IL-1ra) compared to healthy equine athletes without OA. This work identified concentrated plasma as a unique resource for IGF-1 not found in PRP and that further protein concentration of PRP can produce greater platelet proteins such as TGF- ß and greater anti-inflammatory proteins such as IL-1ra. CONCLUSION: the polyacrylamide device efficiently concentrated plasma and PRP proteins and is commercially available as an injectable biotherapy.

2782   Board #65   June 1 3:30 PM - 5:00 PM

Hip Muscle Strength Analysis of Individuals with Chronic Low Back Pain

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(No relevant relationships reported)

Chronic Low back pain (CLBP) is a common clinical disease, and most individuals require long-term treatment.
PURPOSE:Analysis the hip joint muscle characteristics of individuals with CLBP, in order to provide reference for rehabilitation and prevention of chronic low back pain. METHODS: 64 subjects with CLBP (age: 35.2±1.5 years, 34 males and 30 females, body weight: 66.5±3.7kg) were recruited as C group (experimental group), while 29 health subjects (age: 39.2±1.8 years, 16 males and 13 females, body weight: 64.8±3.2kg) were recruited as Y group (control group). Recorded the degree of pain (VAS, Visual Analogue Scale/Score) questionnaire, and used the isokinetic muscle testing System (Contrex System Top) to test the hip isokinetic muscle strength. Analysis the differences between C group and Y group, and the differences between the CLBP ones with different degree of pain (according to the VAS).
RESULTS: 1) There were no differences of hip flexor, extensor or adductor between C group and Y Group(P> 0.05); 2) Hip flexor/ extensor ratio (isokinetic strength) of C group were significant higher than Y group bilaterally, about 2.2 times higher(p < 0.01); This interesting result indicated that although the flexor or extensor as an independent index shows no difference between CLBP individuals and healthy individuals, but when it comes to consider the flexor and extensor as a functional group of body posture and movement, the CLBP individuals show a decrease of extensor compares with the flexor, and this also indicate the coordination of these two muscle groups maybe decrease in the CLBP ones ; 3) Hip abductor isokinetic muscle strength of Y group was significantly higher than C group, about 26% higher (p < 0.05), which means muscle strength of hip abductor of the CLBP individuals dereased; 4) In C group, according VAS score, the strength of flexor, extensor and abductor of mild ones(VAS 0-3) were significantly higher than moderate ones(VAS 4-7) (P< 0.05), the differences were 37%, 38% and 31% respectively.
CONCLUSIONS: The significant reduce of muscle strength of hip abductor is related to CLBP; CLBP individuals show a decrease of extensor compares with the flexor, and this indicate the coordination of these two muscle groups maybe decrease in the CLBP ones; And the more pain of CLBP, these muscle strength decrease more.

2783   Board #66   June 1 3:30 PM - 5:00 PM

High Incidence Of Lumbar Intervertebral Disk And A Possible Risk Factor For Collegiate Weightlifters

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(No relevant relationships reported)

Weightlifters experiences high mechanical stresses in their lumbar region. The intervertebral disks act as shock absorbers between each of the vertebrae in the spinal column. The disks of weightlifters may be injured by repetitive overload during weightlifting maneuvers. Previous studies have shown that excessive trunk rotation is a major risk factor for lumbar intervertebral disk degeneration (LIDD) in athletes. Although trunk rotation is not included in most weightlifting maneuvers, we hypothesized that there would be a high incidence of LIDD in collegiate weightlifters. PURPOSE: The purpose of this study was to examine the prevalence of LIDD in collegiate weightlifters. We also investigated possible risk factors for LIDD, except for excessive trunk rotation. METHODS: Forty Japanese collegiate weightlifters (25 men and 15 women; age, 19.6±1.1years; starting age, 15.1±0.9years; height, 164.7±8.0cm; weight, 71.9±14.kg). LIDD were evaluated using T2-weighted magnetic resonance images. Pfirrmann's classification was used to define LIDD and classify the subjects into either the LIDD group or the non-LIDD group. We also investigated physical characteristics such as body composition (height, weight, muscle mass, fat mass), joint range of motion (thoracic, lumbar, and hip), and lumbosacral alignment (lumbar angle, sacral angle, and lumbosacral angle). Student's t-test and logistic regression were used for statistical analyses. **RESULTS:** The prevalence of LIDD among weightlifters was 55.0%(22/40).Weight(77.3±16.40 vs. 65.7±10.24, $p=0.02$), fat mass(18.5±8.07 vs. 12.5±4.15, $p=0.07$), and body mass index(27.7±4.78 vs. 24.71±2.10, $p=0.02$) in the LIDD group were significantly higher than those in the non-LIDD group. Hip flexion angle (left: 121.5±10.10 vs. 126.9±6.15, $p=0.05$; right: 121.9±8.00 vs.127.9±7.06, $p=0.04$) and lumbar angle(18.3±6.04 vs. 24.2±4.65, $p=0.01$) were lower in the LIDD group compared to the non-LIDD group. By using logistic regression analysis including sex differences, lumbar angle was found to be a significant independent variable for LIDD (odds ratio, 1.34; 95%confidence interval 1.08-1.67, $p=0.01$). **CONCLUSION:** A high incidence of LIDD was observed in Japanese collegiate weightlifters. Lumbar angle is a possible risk factor.

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Relationship Between Rotator Cuff Strength & Functional Scores After Bankart Repair

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(No relevant relationships reported)

PURPOSE: The anterior instability is representing approximately 95% of all shoulder instabilities that mainly caused by an abduction, extension, and external rotation of the shoulder movement. However capsular laxity and unstable glenohumeral joint which make the most frequently dislocated joint in shoulder have closely related with rotator cuff weakness. This study examines the association between strength and functional indices in patients with Bankart repair. The purpose of the study is the relationship between internal rotator and external rotator muscle strength, shoulder functional indices (ROWE and ASES scores) post one year of the Bankart repair.
METHODS: This was a cross sectional study comprising of 40 patients, all males (24.5±13.5 yrs, ht 169.3±8.5 kg, and wt 67.8±11.4 kg) with Bankart lesion who may be treated arthroscopically. Isokinetic internal rotator(IR) and external rotator(ER) strength were evaluated with a CSMI dynamometer, with the subject seated and the shoulder abducted 45 in the scapular plane. Tests were performed at 60 /sec concentric mode for both sides. Shoulder strength was analyzed by comparison between involved side strength deficit and uninvolved side (side-to-side differences). Preoperatively and postoperatively, all the ROWE and ASES(American Shoulder and Elbow Surgeons) score was recorded that included subscores for ROM, muscle strength, pain, motion, and function.by the same exercise physiologist.
RESULTS: The patients were divided into 4 groups for comparison in muscle strength deficit- Q1 (less than 20% difference in muscle strength deficit), Q2 (21-35% deficit), Q3 (36-50% deficit), and Q4 (more than 50% difference in muscle strength deficit). In our study, ROWE and ASES score (r = - .305; r = - .382) were significantly correlative difference in Q1 (less than 20% deficit) group with IR and ER muscle strength.
CONCLUSIONS: This study suggests that muscle strength of the shoulder after Bankart repair will affect the functional ability more than any other factor. The muscle strength deficits in shoulder joint have significant negative consequences for the long term functional outcome after Bankart lesion. Therefore, it is deemed necessary to measure the muscle strength of the rotator cuff and continue rehabilitation exercise needed for recovery of muscle strength.

2785   Board #68   June 1 3:30 PM - 5:00 PM

Kinesio Tape Fails to Affect Characteristics of Skeletal Muscle Recruitment

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(No relevant relationships reported)

Kinesio Tape (KT) is a popular therapeutic intervention in sports, aimed at optimizing athletic performance and preventing musculoskeletal injury. The manufacturers of KT claim it can alter characteristics of skeletal muscle recruitment, facilitating or inhibiting contraction depending on the nature of its application. Evidence of this claim is conflicted. **PURPOSE**: To assess the effectiveness of KT in changing recruitment properties of the rectus femoris. **METHODS**: Twenty college-aged, recreationally-active men and women with no history of injury were enrolled (11 men, 9 women). A Cybex Humac Norm dynamometer measured force output in the dominant leg in 3 taping conditions: 1) No tape applied (control), 2) KT applied to enhance muscle recruitment (facilitation), and 3) KT applied to impair muscle recruitment (inhibition). Subjects were tested on 3 separate days with 48 hours of rest between each; they performed no other exercise prior to and throughout the testing protocol. Subjects performed all 3 trials (control, facilitation, and inhibition) during each testing session, with randomization of the testing order. A certified KT practitioner applied the tape to each subject; subjects were blinded to the orientation of the tape (facilitation vs. inhibition). Mixed-design ANOVA tested differences in taping conditions (and taping conditions by gender) on force output. The between-subjects factor was gender; the within-subjects factor was taping condition. Differences in the within-subjects factor were tested with the Bonferroni post hoc correction. **RESULTS**: There were no differences between taping conditions (F=0.190; P=0.829) nor effects of treatment group by gender (F=1.634; P=0.226). Post hoc tests using the Bonferroni correction revealed no differences between any two treatment groups (p=1.000 for each comparison). **CONCLUSIONS**: The application of KT did not elicit changes in muscle recruitment patterns. KT neither facilitates skeletal muscle contraction nor inhibits it based on its application.

2786   Board #69   June 1 3:30 PM - 5:00 PM

Comparison Between Platelet-rich Plasma Hyaluronic Acid Treatment For Talar Osteochondral Lesions; A Network Meta-analysis Of Randomized Controlled Trials

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(No relevant relationships reported)

Background: Both platelet-rich plasma (PRP) and hyaluronic acid (HA) with or without surgical intervention can enhance healing and improve function in talar OCLs. However, recent studies on OCLs have not thoroughly investigated the effects among PRP, HA, and conventional treatment.

Purpose: To synthesize evidence by comparing the effects (pain score and foot and ankle condition scores) among PRP, HA, and conventional treatment strategies for talar OCLs with or without surgical intervention.

Methods: All relevant research articles were included using related terms in the PubMed, EMBASE, Web of Science, ScienceDirect, and Cochrane library databases from their inception to June 2017. The screening criteria for this systematic review were as follows: randomized controlled trials (RCTs) that compared PRP with HA, PRP with control, or HA with control in patients with talar OCLs. The risk of bias in the included studies was assessed using the Cochrane Risk of Bias Tool. Data were extracted and recorded as weighted mean difference (WMD) and their standard deviations (SDs) with 95% confidence intervals (CI), consistency H, and I²for continuous data in the network meta-analysis.

Results: A total of 1199 references were identified, of which five RCTs were included in the final synthesis. These studies randomized 197 patients into the PRP, HA, and control groups. PRP caused higher reductions in the visual analog scale score than HA and conventional treatment, and the WMDs were −1.109 (95%CI: −1.716, −0.502) and −2.301 (95%CI: −2.825, −1.777). Moreover, PRP improved the American Orthopedic Foot and Ankle Society score more than the other treatment methods, and the WMDs were 12.448 (95%CI: 7.224, 17.672) and 18.617 (95%CI: 13.536, 13.698).

Conclusion: PRP reduced pain and improved ankle conditions to a greater extent than HA and conventional treatment. Therefore, PRP might be recommended for the treatment of talar OCLs. Further investigation is required to guarantee the safety and efficacy of different surgical treatments.

F-55   Free Communication/Poster - **Chronic Ankle Instability**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2787   Board #70   June 1 3:30 PM - 5:00 PM

Influence of Prophylactic Ankle Tapes on Lower Extremity Kinematics during Stop-jump in Chronic Ankle Instability

Songah Chae[1], Youngmin Chun[1], Adrian Pettaway[1], Emi Takahashi[1], Russell Baker[1], Sae Yong Lee[2], Hyung-Pil Jun[1]. *[1]University of Idaho, Moscow, ID. [2]Yonsei University, Seoul, Korea, Republic of.* (Sponsor: Lee Brown, FACSM)

(No relevant relationships reported)

Nuremous tape applications have been used with patients who suffer from chronic ankle instability (CAI). The goal is to control the increased mechanical laxity associated with their condition during dynamic activity. The effect of these prophylactic ankle tapings on lower extremity kinematics has not been fully identified at this time. **PURPOSE:** To investigate the effects of traditional tape (TT), fibular repositioning tape (FRT), and kinesiology tape (KT) on peak joint angles of the lower extremity in individuals with CAI. **METHODS:** 14 individuals with CAI (age: 24.07±4.46 years; height: 175.06±5.09 cm; weight: 82.24± 10.38 kg; CAIT = 17.64 ± 4.14; FAAM-ADL = 86.69 ± 6.71; FAAM-SS = 75.45 ± 6.70) participated in the study. The Foot and Ankle Ability Measure Activity of Daily Living (FAAM-ADL), the FAAM Sports Subscale (FAAM-SS), and the Cumberland Ankle Instability Tool (CAIT) were used to screen subjects for CAI. The order of application of the taping conditions (TT, FRT, and KT) was randomly assigned. Peak angles of the hip, knee, and ankle joint during a stop-jump task, with and without the tape application, were collected using a 3D motion capture system. The following peak angles were measured: hip flexion (Flex), hip adduction (ADD), hip internal rotation (IR), knee Flex, knee abduction (ABD), knee IR, ankle dorsiflexion (DF), ankle inversion (IV), and ankle ADD. To examine differences across the conditions (Baseline, TT, FRT, KT), a repeated measures ANOVA was performed. **RESULTS:** A statistically significant difference in peak angle of each joint across the conditions was not found (hip Flex.: $F_{(3,39)}$ = .85, p = .47; hip ADD: $F_{(3,39)}$ = 1.90, p = .15; hip IR: $F_{(3,39)}$ = .67, p = .58; knee Flex.: $F_{(3,39)}$ = 1.85, p = .15; knee ABD: $F_{(3,39)}$ = 1.02, p = .39; knee IR: $F_{(3,39)}$ = .44, p = .73; ankle DF: $F_{(3,39)}$ = .66, p = .58; ankle IV: $F_{(3,39)}$ = 0.85, p = .47; ankle ADD: $F_{(3,39)}$ = 2.23, p = .10). **CONCLUSION:** The application of different taping techniques did not significantly change peak joint angles of the lower extremity during a stop-jump task. The results contradict previous research suggesting ankle taping restricts joint range of motion. Therefore, further investigation is needed to examine the influence of different prophylactic ankle taping techniques on sports performance, as well as muscle activation, during dynamic tasks.

2788   Board #71   June 1 3:30 PM - 5:00 PM

Bracing Effects on Lower Extremity Movement Dynamics in Individuals With and Without Chronic Ankle Instability

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(No relevant relationships reported)

INTRODUCTION: Ankle bracing is used ubiquitously as an injury prophylactic in both healthy and chronic ankle instability (CAI) populations. However, research shows that during walking ankle bracing diminishes coordination variability in the lower extremity in individuals with and without CAI, potentially limiting the adaptability of the motor system. An understanding of the systemic kinetic adaptations that drive coordination patterns is necessary to bolster aforementioned findings. Analysis of support moment (MS) variability during walking can provide information of systemic kinetic adaptations that occur in response to constraints acting on the system. **PURPOSE:** Examine bracing effects on MS variability during walking in healthy (H), ankle sprain "coper" (LAS), and CAI groups. **METHODS:** 48 individuals (16 per group) participated in the study. Participants performed 15 trials of walking during NB and B conditions. Position data were collected using a motion capture system, and reaction forces were obtained from force platforms. Joint kinetics were calculated using inverse dynamics, and the MS was calculated as the sum of ankle, knee, and hip moments in the sagittal plane. Variability of the MS was expressed as the percent coefficient of variation (%CV) across stance phase. A mixed ANOVA was conducted to compare the effects of condition across groups. **RESULTS:** A significant condition by group interaction was observed [F(2, 45) = 7.51, p = .002, partial η² = .25]. Paired samples t-tests revealed that for H, %CV was significantly lower during

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B (11.85±3.06%) compared to NB (16.17±8.61%) (p =.02). For LAS, %CV was significantly greater during B (23.66±9.84%) compared to NB (20.06±6.48%) (p =.05). **CONCLUSION:** Bracing had a diminishing effect on %CV in the H group suggesting a limited capacity to adapt to task and environmental perturbation. Bracing had the opposite effect in the LAS group, suggesting that the motor system of "copers" may be more attuned to adaptation in response to neuromusculoskeletal constraints. More research is needed to explore how individual joint kinetic adaptations contribute to the %CV measure across groups and in response to bracing.

2789   Board #72   June 1 3:30 PM - 5:00 PM

History of Ankle Sprains Related to Hindered Proprioception in College-Age Male Soccer Players

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(No relevant relationships reported)

A deficit in proprioception following lateral ankle sprains (LAS) has been observed using various methods. The majority of studies on ankle proprioception focus on joint position sense, which measures the accuracy of position replication. However, threshold to detect passive motion (TTDPM) assesses one's ability to detect a change in positional homeostasis and tests the sensitivity of the slow-adapting mechanoreceptors required to adequately signal musculature to contract correctly during perturbations. **PURPOSE:** To examine the role of ankle injury history on TTDPM. **METHODS:** Fifty-eight male, club-level soccer players were divided into two equal groups: those with chronic ankle instability as a result of LAS (CAI-LAS; n=29, 22.8±4.5 yr, 78.1±11.1 kg, 180.0±8.7 cm) and those with no history of ankle injuries (CON; n=29, 21.5±3.1 yr, 78.2±11.6 kg, 180.6±6.7 cm). Subjects were positioned in an isokinetic dynamometer testing chair to align the heel with the axis of rotation. Visual and auditory cues were masked during testing. Trials were initiated at ~7 degrees of inversion, with the dynamometer moving at 0.25°/sec. When movement could be detected, subjects pressed a button to stop the dynamometer. Six successful trials were randomly collected and averaged for inversion and eversion. The primary outcome variable was angle error, measured as the number of degrees toward inversion or toward eversion from the initial position. Higher TTDPM values indicate worse proprioception. Following tests for normality of data distribution, Mann-Whitney U tests were used to compare group differences. Alpha level of 0.05, 2-sided was set *a priori* as a significance level. **RESULTS:** There was a significant difference between groups for inversion (p=0.016), with a 56.5% greater median angle error in CAI-LAS. Although there was not a statistically significant difference for eversion (p=0.181), CAI-LAS had 24.1% greater median angle error compared to CON. **CONCLUSION:** If TTDPM is used as a screening tool, it may highlight individuals at an increased risk of injury, signifying the requirement for corrective balance and/or strength training to be implemented as a means of preventing injury occurrence.

2790   Board #73   June 1 3:30 PM - 5:00 PM

Effects of Three Prophylactic Tape Methods on Kinematics and Muscle Pre-activation in Chronic Ankle Instability

Adrian Pettaway[1], Youngmin Chun[1], Emi Takahashi[1], Songah Chae[1], Russell Baker[1], Sae Yong Lee[2], Hyung-pil Jun[1]. [1]University of Idaho, Moscow, ID. [2]Yonsei University, Seoul, Korea, Republic of. (Sponsor: Lee Brown, FACSM)
(No relevant relationships reported)

Prophylactic taping of the ankle is commonly used to prevent ankle sprains. Data supports the use of ankle taping strategies for limiting excessive range of motion often associated with ankle injuries. However, there is a paucity of evidence regarding the effects of ankle taping techniques on kinematics and muscle pre-activation in patients with chronic ankle instability (CAI). **PURPOSE:** To observe the effects of traditional tape (TT), fibular repositioning tape (FRT), and kinesiology tape (KT) on kinematics and muscle pre-activation during a stop-jump task in individuals with and without CAI. **METHODS:** A total of 28 subjects (14 healthy: age = 27.57 ± 3.23 years, height = 169.61 ± 8.33 cm, weight = 76.98 ± 17.95 kg; 14 CAI: age = 24.07 ± 4.46 years, height = 175.06 ± 5.09 cm, weight = 82.24 ± 10.38 kg) participated in the study. After collecting EMG data of reference voluntary contraction (RVC) by maximal vertical jump, all 6 EMG signals (tibialis anterior [TA], soleus [SOL], rectus femoris [RF], peroneus longus [PL], biceps femoris [BF], gluteus medius [GM]) were normalized by RVC. % RVC and lower extremity kinematics in the frontal and sagittal planes were collected at 100 ms prior to initial contact. All participants were assigned to three different tape applications applied in a randomized order. Participants executed the stop-jump task baseline assessment without tape and then with TT, FRT, and KT respectively. To examine differences in muscle pre-activation and kinematics, a 2-way mixed ANOVA (2 groups * 4 condition) was performed. **RESULTS:** A significant

interaction was observed in soleus pre-activation ($F_{(3,78)} = 5.913$; p < .05; $\eta^2 = .185$). The CAI group demonstrated significantly decreased SOL pre-activation after applying FRT and KT (baseline = 3.76 ± 2.41%; FRT = 1.40 ± 1.22 %, P< .05; KT = 1.45 ± 1.08 %, P < .05). The healthy group only displayed significantly reduced SOL pre-activation after receiving the KT application (baseline = 2.70 ± 1.47 %; KT = 1.20 ± 1.14 %, P< .05). No significant differences in joint angles were found between condition or group. **CONCLUSION:** In contrast to previous findings, KT application reduced SOL pre-activation. Further research is needed to examine if reduced SOL pre-activation after KT and FRT influences joint mechanics, which may affect the efficacy of the taping techniques.

2791   Board #74   June 1 3:30 PM - 5:00 PM

Prolonged Kinesiotaping Does Not Improve Balance and Functional Performances in People with Chronic Ankle Instability

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(No relevant relationships reported)

Individuals with chronic ankle instability (CAI) often have balance and performance impairments. The use of Kinesio Tape (KT) to address these impairments has mixed findings with little evidence beyond immediate effects.
PURPOSE: To assess the prolonged use of KT versus a sham tape on static balance and functional performance in individuals with CAI.
METHODS: Twenty people with CAI (Age: 23.4±3.1 years; height: 169.3±8.3 cm; mass: 71.7±12 kg; Cumberland Ankle Instability Tool: 19.3±3.5) were randomly assigned to the KT (n= 10) or sham (a non-elastic) tape (ST) (n=10) group. Both groups had tape applied in consistent manner on the tibialis anterior, fibularis longus, and from the medial malleolus, across the plantar surface of the foot, to the lateral malleolus. The tape was worn for 3 days. Participants performed a single limb standing balance test (SLSB) on a force plate for 20s with eyes closed and a side hop test (SHT) 10 times laterally and medially. They were tested before (T1), immediately after (T2), and 3 days after taping (T3). Primary outcome measures included the velocity (cm/s) of the center of pressure in the mediolateral direction ($VCOP_X$), anteroposterior direction ($VCOP_Y$), and total excursion ($VCOP_T$) during SLSB and total time (s) to perform SHT. A two-way repeated measure multi-analyses of variance was used for data analysis.
RESULTS: There was no significant interaction effect between time points in the KT compared to ST groups on SLSB and SHT (p >.05). While $VCOP_X$ (T1: 5.02±1.46, T2: 4.53±1.71, T3: 4.13±1.91), $VCOP_Y$ (T1: 6.19±2.6, T2: 5.3±2.54, T3: 4.79±2.66), $VCOP_T$ (T1: 8.83±3.08, T2: 7.7±3.25, T3: 7.02±3.57), and the total time (T1: 11.47±4.21, T2: 10.12±3.36, T3: 9.48±2.95) decreased steadily over time in KT group, this was not a significant decrease compared to ST group $VCOP_X$ (T1: 5.08±1.69, T2: 4.83±1.93, T3: 5.32±2.43), $VCOP_Y$ (T1: 6.62±3.36, T2: 6.36±3.41, T3: 5.99±2.7), $VCOP_T$ (T1: 9.32±3.92, T2: 8.87±4.1, T3: 8.93±3.89), and total time (T1: 8.9±1.49, T2: 8.11±1.34, T3: 7.67±1.19) with *p*-values of .48, .58, .43, and .09 for each variable.
CONCLUSION: The prolonged use of KT on the ankle joint is not helpful to improve static balance and functional performance in people with CAI.

2792   Board #75   June 1 3:30 PM - 5:00 PM

Altered Movement Dynamics Between Individuals With and Without Chronic Ankle Instability Before and After Bracing

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(No relevant relationships reported)

INTRODUCTION: Sports medicine paradigms stress the importance of introducing variability into interventions aimed at improving function in individuals with chronic ankle instability (CAI). However, questions remain surrounding systemic variability patterns exhibited by CAI groups, particularly when additional constraints (i.e. brace) are imposed on the system. Analysis of support moment (MS) variability during walking can provide information of systemic kinetic adaptations that occur in response to neuromusculoskeletal constraints acting on the system. **PURPOSE:** Examine MS variability characteristics during walking in healthy (H), ankle sprain "coper" (LAS), and CAI groups during brace (B) and no brace (NB) conditions. **METHODS:** 48 individuals (16 per group) participated in the study. Participants performed 15 trials of walking during NB and B conditions. Position data were collected using a motion capture system, and reaction forces were obtained from force platforms. Joint kinetics were calculated using inverse dynamics, and the MS was calculated as the sum of ankle, knee, and hip moments in the sagittal plane. Variability of the MS was expressed

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Abstracts were prepared by the authors and printed as submitted.

as the percent coefficient of variation (%CV) across stance phase. A mixed ANOVA was conducted to compare group effects during B and NB conditions. **RESULTS:** A significant condition by group interaction was observed [$F(2, 45) = 7.51$, $p = .002$, partial $\eta^2 = .25$]. Post-hoc tests for NB revealed that CAI ($13.04\pm3.46\%$) had significantly lower %CV compared to LAS ($20.09\pm6.48\%$) ($p = .011$). For B, CAI ($13.06\pm2.93\%$) and H ($11.85\pm3.06\%$) had significantly lower %CV compared to LAS ($23.66\pm9.84\%$) ($p < .001$). **CONCLUSION:** Individuals with CAI exhibit less %CV compared to LAS during stance phase of walking. This finding suggests that dysfunction leading to CAI may be associated with more rigid kinetic patterns following ankle injury. Additionally, bracing added to the disparity in %CV between CAI-LAS groups, and H-LAS groups. It is possible that LAS individuals have a greater capacity to adapt to imposed neuromusculoskeletal constraints (e.g. bracing) compared to healthy and CAI populations. More research is needed to explore how individual joint kinetic adaptations contribute to the %CV measure across groups and in response to bracing.

2793   Board #76   June 1 3:30 PM - 5:00 PM

Effects of Three Tape Methods on Static Postural Control of Individuals with Chronic Ankle Instability

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(No relevant relationships reported)

Individuals with chronic ankle instability (CAI) display poor static postural control due to impaired proprioception. While previous researchers have reported specific ankle tape applications enhance neuromuscular control, many clinically used applications have not been evaluated in patients with CAI. **PURPOSE:** To examine the effects of traditional tape (TT), fibular repositioning tape (FRT), and kinesiology tape (KT) on static balance control in individuals with CAI. **METHODS:** A total of 14 subjects with CAI (age = 24.07 ± 4.46 yr; height = 175.16 ± 5.10 cm; weight = 82.24 ± 10.38 kg; CAIT = 17.64 ± 4.14; FAAM-ADL = 86.69 ± 6.71; FAAM-SS = 75.45 ± 6.70) participated in the study. Participants performed three trials of a single-leg balance task on a force plate with a 10 second eyes-open (EO) and 10 second eyes-closed (EC) condition. The task was performed before and after applying TT, FRT, and KT. Dependent variables were standard deviation of the mean center of pressure (COP) displacement (SD_{ML}, SD_{AP}), COP excursion ($Range_{ML}$, $Range_{AP}$), the velocity of COP (Vel_{ML}, Vel_{AP}) in mediolateral ($_{ML}$)and anteroposterior ($_{AP}$) directions, and area of COP excursion (COP area). A repeated measure ANOVA was performed to examine differences across the conditions (baseline [BL], TT, FRT, KT). **RESULTS:** A significantly reduced Vel_{ML} was observed after applying FRT (BL = 2.67 ± 0.29cm/s; FRT = 2.34 ± 0.36cm/s; p<.05) with EO. With EC, a significant decrease in Vel_{ML} (BL = 5.21 ± 0.83 cm/s; FRT = 4.43 ± 0.68 cm/s; p<.05) and Vel_{AP} (BL = 4.47 ± 0.70 cm/s; FRT = 3.85 ± 1.01 cm/s; p<.05) was also found. The application of KT significantly reduced Vel_{ML} (BL = 5.21 ± 0.83 cm/s; KT = 4.60 ± 0.69 cm/s; p<.05). Significant differences between BL and tape interventions were not found for SD_{AP}, $Range_{AP}$, and COP area. The application of TT produced increased SD_{AP} (TT = 1.33 ± 0.20 cm, FRT = 1.20 ± 0.16 cm; p<.05), $Range_{AP}$ (TT = 5.98 ± 0.98 cm; FRT = 5.67 ± 0.68 cm; p<.05), and COP area (TT = 26.52 ± 6.33 cm², p<.05; FRT= 22.83 ± 4.86 cm, p<.05) compared to FRT application. **CONCLUSION:** Based on our findings, FRT is a more effective technique to enhance static postural control than TT, KT, or no tape. Further study is needed to investigate the effect of FRT on dynamic postural control, as well as kinematics during specific movements, to guide FRT application in clinical practice.

2794   Board #77   June 1 3:30 PM - 5:00 PM

Altered Movement Neuromechanics during Jump Landing and Cutting in Patients with Chronic Ankle Instability

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(No relevant relationships reported)

Lateral ankle sprains are common lower extremity injury during sport activities, which often lead to chronic ankle instability (CAI). However, no one has comprehensively examined the effects of CAI on lower extremity movement neuromechanics during a multiplanar, single-leg landing and cutting task for CAI patients. **PURPOSE**: To investigate the effect of CAI on landing and cutting lower-extremity kinematic, electromyography (EMG), and ground reaction force (GRF). **METHODS**: 100 CAI patients (22 ± 2 yrs, 174 ± 10 cm, 71 ± 14 kg, $82\pm9\%$ FAAM ADL, $62\pm13\%$ FAAM Sports, 4.5 ± 2.6 ankle sprains) and 100 controls (22 ± 3 yrs, 172 ± 13 cm, 72 ± 18 kg, 100% FAAM ADL & Sports) participated. Participants performed five successful trials of a jump landing and cutting task. Sagittal and frontal planes of ankle, knee and hip joint angles, EMG activation, and GRF were collected during jump landing and cutting. Functional analyses of variance (FANOVA) were used to evaluate between-group differences for these dependent variables throughout the entire ground contact

phase of the task. **RESULTS**: Figure 1. Relative to the control group, the CAI group revealed (i) reduced dorsiflexion and hip flexion angles, (ii) increased inversion and reduced hip abduction angles, (iii) increased posterior and vertical GRF during initial landing, and reduced posterior and vertical GRF, and (iv) increased EMG activation of peroneus longus, and gluteus medius during mid-landing and cutting phase. **CONCLUSION**: Our data suggest that CAI patients demonstrated different movement strategies during jump landing and cutting. Compared to controls, patients with CAI utilized the proximal (hip) joint with heightened corresponding muscle activation to compensate for a potentially unstable distal (ankle) joint (e.g., more inversion and less dorsiflexion angle) in an attempt to reduce ground impact force. This apparent compensation may be due to sensorimotor deficits in the ankle.
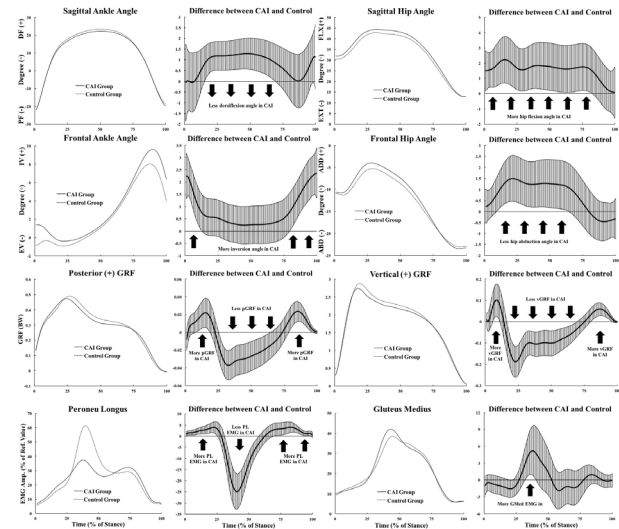
Figure 1. Plantarflexion/dorsiflexion (PF/DF), hip flexion/extension (FLX/EXT), inversion/eversion (IV/EV), hip abduction/adduction (ABD/ADD) angle, posterior and vertical ground reaction force (GRF), and EMG amplitude for peroneus longus (PL) and gluteus medius (GMed) during stance phase of jump landing/cutting tasks. Mean differences (bold solid curve) and corresponding 95% CI (shaded area) are plotted as a function of time. When the shaded area does not overlap with the zero line (bold horizontal line), a significant difference (p <0.05) is indicated between groups.

2795   Board #78   June 1 3:30 PM - 5:00 PM

Dorsiflexion Range of Motion Alters Energy Absorption and Generation during Landing/Cutting in Chronic Ankle Instability

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(No relevant relationships reported)

Decreased dorsiflexion range of motion (DFROM) has been identified as a risk factor for ankle sprains. Patients with chronic ankle instability (CAI) demonstrate reduced DFROM during walking, running, landing, and cutting. However, variation in DFROM exists within a CAI population. It remains unclear whether varied DFROM affects lower extremity joint energetics during a jump landing/cutting task. **PURPOSE**: To examine a relationship between varied DFROM within the CAI population and lower extremity energy absorption (eccentric power) and generation (concentric power) during jump landing/cutting. **METHODS**: 100 CAI subjects were classified into 3 subgroups based on DFROM, measured by the weight-bearing lunge test: a Hypo (14M, 10F; $\leq 39°$; $35\pm2.5°$, 23 ± 2 yrs, 176 ± 13 cm, 80 ± 13 kg), Normal (25M, 32F; 40-50°; $46\pm2.6°$, 21 ± 2 yrs, 174 ± 7 cm, 72 ± 14 kg), and Hyper DFROM group (11M, 8F; $\geq 51°$; $54\pm3°$, 22 ± 2 yrs, 175 ± 11 cm, 74 ± 14 kg). Subjects performed 5 jumps consisting of a max vertical jump-landing plus a side-cut. Functional liner models were used to detect between-group differences. If 95% confidence intervals did not cross zero, differences were significant. **RESULTS**: Figure 1 shows that CAI subjects with Hypo DFROM showed decreased ankle and knee energy absorption and generation power and increased hip absorption and generation power compared to Normal and/or Hyper DFROM groups (p < 0.05). **CONCLUSIONS**: While CAI subjects with Normal and Hyper DFROM show similar lower extremity energetic patterns during the task, CAI patients with Hypo DFROM appear to have a limited ability to absorb and generate kinetic energy in the ankle and knee, which seems to increase a kinetic compensation at the hip (greater energy absorption and generation). These kinetic alterations may increase injury risk and performance deficits.
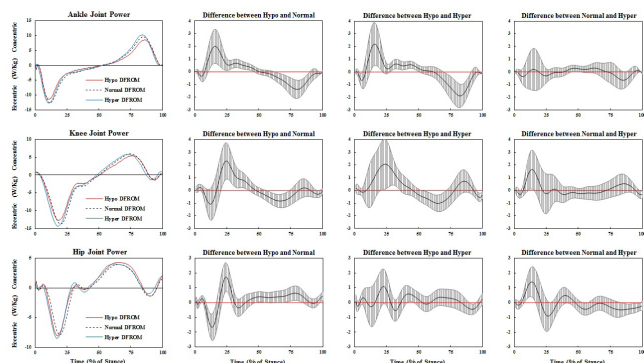
Figure 1. Grand ensembles for sagittal-plane joint energetics in the lower extremity during a jump landing/cutting task between the Hypo, Normal, and Hyper DFROM groups. 0% of stance indicates initial foot contact, 50% of stance indicates peak ankle dorsiflexion and knee flexion, and 100% of stance indicates toe-off during the task. When 95% confidence intervals (shaded area) did not cross the zero (horizontal red line), between-group differences were significant.

2796   Board #79   June 1 3:30 PM - 5:00 PM

Immediate Effects of Ankle Tapes on Dynamic Postural Control and Kinematics in Chronic Ankle Instability

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(No relevant relationships reported)

Numerous taping methods have been used to prevent ankle sprains in patients with chronic ankle instability (CAI). The effects of different taping methods on dynamic postural control in patients with CAI, however, are not fully understood. **PURPOSE**: To examine the effects of traditional taping (TT), fibular repositioning taping (FRT), and kinesiology taping (KT) on joint angles and modified Y-balance test (YBT) performance in participants with and without CAI. **METHODS**: A total of 28 subjects (14 CAI: age = 24.07 ± 4.46 yr, height = 175.16 ± 5.10 cm, weight = 82.24 ± 10.38 kg; 14 Healthy: age = 27.57 ± 3.23 yr, height = 169.61 ± 8.33 cm, weight = 76.98 ± 17.95 kg) participated in the study. Subjects performed three trials of the modified YBT before and after receiving TT, FRT, and KT. Hip, knee, and ankle joint angles in sagittal and frontal planes at the moment of maximum reach distance in the anterior (Ant), posterolateral (PL), and posteromedial (PM) directions were collected. Each reach distance was measured and a composite score (CS) was calculated. A 2-way mixed ANOVA (2 groups * 4 conditions) was performed to examine differences across treatments (baseline [BL], TT, FRT, KT). **RESULTS**: Significant interactions were not found. However, a significant decrease in PM reach distance was found across all tape applications for both groups ($F(1.97, 51.16) = 55.58$, $p < .05$, $\eta2 = .68$). KT and FRT resulted in significant improvement in the modified YBT CS compared with TT (Healthy: KT = $92.24 \pm 5.72\%$, $p < .05$, TT = $89.76 \pm 5.97\%$; $p < .05$, FRT = $91.83 \pm 6.53\%$; $p < .05$; CAI: KT = $90.01 \pm 6.49\%$; $p < .05$, TT = $86.63 \pm 6.83\%$; $p < .05$, FRT = $87.88 \pm 8.39\%$; $p < .05$). The CS was also significantly increased when comparing KT to BL (Healthy: BL = $90.91 \pm 7.28\%$; $p < .01$, KT = $92.24 \pm 5.72\%$, $p < .05$; CAI: BL = $87.47 \pm 6.62\%$; $p < .05$, KT = $90.01 \pm 6.49\%$). Analysis of kinematic data revealed a significant increase in dorsiflexion during the PM reach when KT was applied ($F(2.26, 58.66) = 3.89$, $p < .05$, $\eta2 = .13$). **CONCLUSIONS**: Even though PM reach distance significantly decreased after applying any of the tape conditions, only KT significantly increased DF and an improved YBT CS compared to BL. The findings suggest KT might enhance dynamic postural control more than the other tape applications. Further research is necessary to explain the mechanism for these changes after KT application.

2797   Board #80   June 1 3:30 PM - 5:00 PM

Joint Stiffness Alterations, Grouped by Movement Strategy, in Chronic Ankle Instability

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(No relevant relationships reported)

Subgroups of ankle instability (AI) subjects, based on specific movement strategies, allow for evaluation of neuromechanical deficits that are specific to the adopted movement. Joint stiffness provides important information as to stability and loads directed to each of the lower extremity joints. **PURPOSE**: to describe lower extremity stiffness of 6 subgroups (clusters) of patients with AI compared to an uninjured control group. **METHODS**: 200 CAI patients (22 ± 2.2 yrs, 174 ± 10 cm, 73 ± 14 kg, $84 \pm 7\%$ FAAM ADL, $65 \pm 11\%$ FAAM Sports, 4.1 ± 2.4 ankle sprains) and 100 controls (22 ± 3 yrs, 172 ± 13 cm, 72 ± 18 kg, 100% FAAM ADL & Sports) participated. Participants performed five successful trials of a jump landing/cutting task. Lower extremity sagittal and frontal plane kinematics (ankle, knee, and hip) were reduced to single

representative curves using principle component analysis, and the resultant curves were simultaneously used to cluster movement with a Dirichelet process. Six distinct clusters were identified, and joint stiffness values for each of the clusters were calculated and compared to a control group using functional linear models ($P<0.05$). **RESULTS**: Table 1. Several clusters demonstrated reduced stiffness at the ankle (C1, 3, 5), reduced stiffness at the knee (C1-4), and increased stiffness at the hip (C1, 2, 6). **CONCLUSIONS**: Multiple, distinct joint stiffness patterns were identified in clusters of AI subjects. Generally, distal joint stiffness was less than controls, while proximal joint stiffness was greater than controls, supporting the idea that the hip plays a key role in controlling lower extremity movement in AI subjects. Joint stiffness varies according to the movement strategy adopted by each AI subject, and alterations in joint stiffness patterns are a potential source of acute and chronic (re)injury.

Table 1. Joint stiffness means ± SD (Nm/kg/°) for each of the clusters.
* Represents different from control ($P \geq 0.05$).

Cluster	Ankle	Knee	Hip
C1	0.044±0.014*	0.047±0.020*	0.11±0.12*
C2	0.048±0.019	0.041±0.020*	0.15±0.31*
C3	0.047±0.035*	0.041±0.017*	0.088±0.052
C4	0.046±0.020	0.040±0.016*	0.092±0.062
C5	0.048±0.012*	0.056±0.021	0.10±0.078
C6	0.062±0.034	0.055±0.025	0.13±0.076*
Normal	0.055±0.031	0.058±0.022	0.092±0.065

2798   Board #81   June 1 3:30 PM - 5:00 PM

Recommended Number of Trials for Balance and Hopping Tests between Male and Female CAI Subjects

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(No relevant relationships reported)

The recommended number of practice trials for the Biodex static balance (3 trials) and star excursion balance test (SEBT; 4-9 trials) are available in the literature, but, previous studies on these tests did not report the recommendations for male and female and used a small sample size (n = 16-20). Moreover, no data are available for the recommended number of practice trials for triple cross-over hop and figure 8 hop tests. Considering physiological differences in gender, a large sample size is necessary to clarify this issue. **PURPOSE**: To determine the number of practice trials necessary to achieve functional performance for static and dynamic balance and hopping tests between male and female. **METHODS**: 50 male (22 ± 2 yrs, 182 ± 8 cm, 81 ± 12 kg) and 50 female (21 ± 2 yrs, 166 ± 6 cm, 67 ± 12 kg) subjects with chronic ankle instability (CAI) performed 6 practice and 3 test trials of the Biodex static balance test (single-leg), SEBT (anterior, posterolateral, posteromedial), triple cross-over hop for distance test, and figure 8 hop for time test, 2-3 days apart. The order of the tests were randomized. One-way repeated-measures ANOVAs with multiple comparisons using Dunnett's Method were used to detect time and gender effect ($p < 0.05$). **RESULTS**: Table 1 shows that the required number of practice trials for the hopping tests is 3-4 for male and 2-3 for female subjects prior to testing. The number of required trials for the SEBT is 2-5 for male depending on the direction and 3 for female. For the Biodex static balance, 5 practice trials are needed for both male and female prior to testing. **CONCLUSIONS**: Considering physiological differences in gender, the required number of practice trials appears to vary in the SEBT, triple cross-over and figure 8 hop test between genders. Male subjects may need more practice trials than female to achieve their best performance. Researchers should allow subjects to perform practice trials based on gender to obtain accurate data on these functional performance tests.

Table 1. Results of the recommended number of practice trials for each of four functional tests.

	Practice 1		Practice 2		Practice 3		Practice 4		Practice 5		Practice 6		Test 1	
Gender	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Figure 8 hop (sec)	11.4±1.7*	13.9±2.9‡	10.9±1.5*	13.8±2.8‡	10.8±1.5*	13.5±2.6	10.6±1.4	13.4±24	10.5±1.3	13.4±23	103±1.4	134±2.2	100±1.2	129±2.1
Triple cross-over (m)	4.7±0.8*	3.5±0‡	5.0±0.9*	3.8±0.7‡	5.2±0.9*	3.8±0.7‡	5.3±0.9*	3.8±0.7	5.4±1.0	3.9±0.7	5.6±0.9	4.0±0.7	5.7±0.9	4.1±0.7
Biodex Static Balance (overall stability index)	1.1±0.3*	1.0±0.3‡	1.1±0.3*	0.93±0.3‡	0.99±0.3*	0.88±0.3‡	1.0±0.3*	0.94±0.4‡	0.97±0.3*	0.92±0.3‡	0.85±0.2	0.87±0.2	0.84±0.2	0.76±0.2
SEBT-ANT (%)	59±7.2*	61±6.5‡	60±7.2*	63±6.2‡	61±7.6	64±6.6‡	62±7.6	65±6.6	62±7.5	65±7.0	62±7.0	66±7.3	63±7.4	66±6.9
SEBT-PM (%)	100±7.9*	98±10‡	102±9.3*	100±8.9‡	104±8.3*	101±8.0‡	105±7.9*	103±7.3	105±7.7*	104±6.7	107±7.2	104±7.0	108±7.1	105±6.9
SEBT-PL (%)	96±9.4*	93±9.9‡	96±9.6*	94±9.8‡	98±8.5*	95±10‡	99±8.5	96±9.6	100±8.9	97±10	101±8.8	98±9.8	102±8.5	100±9.7

Abbreviations: SEBT, star excursion balance test; ANT, anterior; PM, posterolateral; PL, posteromedial.
Triple cross-over hop distance was normalized to leg length (anterior superior iliac spine to medial malleolus).
SEBT reaching distance was normalized (% of leg length x 100).
Test 1 score was mean of the best 2 of 3 test trials, and acquired 2-3 days after the practice trial session (Practice 1 – 6 trials).
*Significant difference from Actual 1 for male ($P < .05$).
‡Significant difference from Actual 1 for female ($P < .05$).

Abstracts were prepared by the authors and printed as submitted.

F-56   Free Communication/Poster - **Jumping and Landing**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2799   Board #82   June 1 3:30 PM - 5:00 PM

Force- and Velocity-Profile Differences Between Good and Poor Countermovement Vertical Jumpers

John R. Harry[1], Leland A. Barker[2], Janet S. Dufek, FACSM[2], C. Roger James, FACSM[3]. [1]Texas Tech University, Lubbock, TX. [2]University of Nevada, Las Vegas, Las Vegas, NV. [3]Texas Tech University Health Sciences Center, Lubbock, TX. (Sponsor: Janet S. Dufek, FACSM)
(No relevant relationships reported)

Good countermovement vertical jump (CMVJ) performers, as defined by CMVJ height, exhibit quicker countermovements than poor jumpers via quicker unloading phases. Still, it is unknown how good jumpers manipulate ground reaction force (GRF) and velocity to more quickly complete unloading. **PURPOSE:** To assess GRF and velocity profiles between good and poor jumpers. **METHODS:** 12 men (27.3 ± 3.0 y; 88.1 ± 16.4 kg; 1.8 ± .1 m) performed 8 CMVJ as GRF data were obtained. Velocity was computed from GRF. Data were normalized to 101 data points to define the time from unloading to takeoff. Mean and standard deviation profiles were computed per participant. Good (n = 6; .45 ± .05 m) and poor (n = 6; .33 ± .05 m) groups were determined by the median CMVJ height ($v_{to}^2/2g$) for the sample. Groups were compared at each data point using effect sizes (large ≥ .80). The unloading, eccentric, and concentric phase times were compared visually from the mean GRF and velocity data. **RESULTS:** Good jumpers unloaded less bodyweight and showed shorter unloading and longer concentric phases (Fig 1). For GRF and velocity, trivial, small, moderate, and large differences were detected for 25%, 42%, 26%, and 8% and for 18%, 64%, 11%, and 8% of the CMVJ, respectively (Fig 2). **CONCLUSION:** Good jumpers perform quicker unloading phases by unloading lesser bodyweight. Thus, they achieve greater GRF and velocity prior to takeoff. Poor jumpers might benefit from performance cues promoting quicker unloading and enhanced eccentric braking. Such cues might allow for enhanced CMVJ performance.
Partially supported by a National Strength and Conditioning Association Foundation Grant.
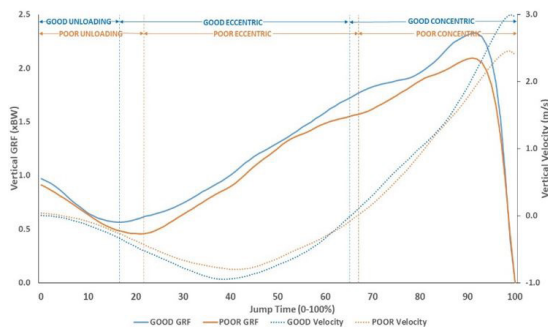
Figure 1. Ensemble Mean Vertical GRF and Velocity Profiles for Good and Poor Jumpers
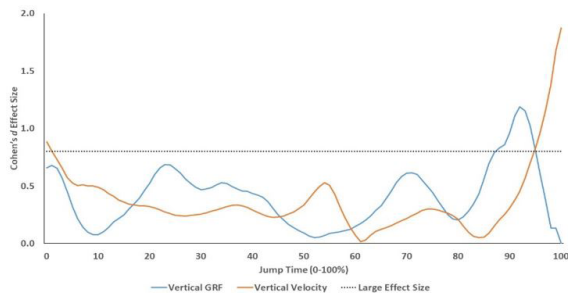
Figure 2. Cohen's *d* Effect Sizes for the Vertical GRF and Velocity Comparisons Between Good and Poor Jumpers

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2800   Board #83   June 1 3:30 PM - 5:00 PM

Medial Post Foot Orthotic Influences Knee Valgus Angle Excursions During a Vertical Jump Task

Jerry Zoubek, Timothy Kranz, Lindsay Perotti, Elle Stark, Michelle Stella, Adam S. Lepley. University of Connecticut, Storrs, CT.
(No relevant relationships reported)

Medial posting is a common therapeutic midsole foot orthotic that is used to control excessive pronation movement, and creating a more supinated position of the foot. Consequently, these altered biomechanics may also create more favorable movements at other joints, such as the knee. Knee valgus angle has been identified as a risk factor for lower extremity joint injury, and medial posting may reduce excessive valgus during dynamic tasks, therefore decreasing the risk of injury. **Purpose:** Investigate if medial post orthotics influence knee valgus and performance outcomes during a vertical jump. **Methods:** Thirty healthy participants volunteered (18m/12f; age 24.8 ± 3.1y; height 173.94 ± 8.72cm; mass 73.7 ± 13.2kg). Six maximal vertical jump trials were recorded using electromagnetic 3D biomechanical and force plate assessment. Three trials were performed with bilateral medial posting orthotics, and three without, with the order randomized. Max vertical jump height, jump power, and total valgus range of motion (excursion) during the take-off phase were extracted for each limb and averaged across the three trials for analysis. Paired samples t-tests were performed to assess differences in outcomes between orthotic conditions. Alpha level was set a priori at P ≤ 0.05. **Results:** There were no differences in vertical jump height between the orthotic (46.9 ± 9.0cm) and no orthotic conditions (46.1 ± 8.6cm, t = -0.58, p = 0.56). Jump power also was the same between the orthotic (1219.4 ± 520.9) and no orthotic conditions (1243.5 ± 456.5W, t = 0.35, p = 0.72). Both the left (orthotic: 15.2 ± 7.4°; no orthotic: 18.3 ± 10.5°; t = 2.46, p = 0.02) and right (orthotic: 17.9 ± 8.6°; no orthotic: 19.9 ± 12.4°; t = 1.96, p = 0.05) limbs demonstrated significantly less knee valgus excursion when using the orthotic. **Conclusions:** The medial post orthotic was successful at reducing knee valgus excursion angles during a maximal vertical jump, while also maintaining vertical jump performance, measured via vertical jump height and power. Although medial posting is a common orthotic to correct excessive pronation at the foot, it may also have therapeutic efficacy at knee joint injury prevention during dynamic tasks.

2801   Board #84   June 1 3:30 PM - 5:00 PM

Influence of Holding a Lacrosse Stick on Jump Landing Mechanics

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(No relevant relationships reported)

Female athletes are at an increased risk for anterior cruciate ligament (ACL) injuries by noncontact mechanisms. Close to 60% of all severe injuries sustained during a game are lower extremity strains and knee internal derangements, frequently involving the ACL. No research has been done to investigate the alteration of movement patterns as a result of holding a lacrosse stick. The Landing Error Scoring System (LESS) is a biomechanical movement screen able to detect and quantify these abnormal movement patterns. **PURPOSE**: To determine the effect of holding a lacrosse stick on jump landing mechanics in female collegiate players during a standardized biomechanical screen (LESS). **METHODS**: The LESS was used on 20 collegiate women's lacrosse players (19.7±1.4 yo, 60.8±5.6 kg, 1.66±0.06 m) to examine jump landing mechanics with a lacrosse stick (WS) versus without (WO). Participants jumped forward off a 30-cm box to a spot on the floor 50% of their body height, and performed a maximal vertical jump upon landing. Hi-speed video (240Hz) was recorded in the sagittal and frontal planes. Sixteen biomechanical criteria were measured using video analysis software, and averaged across three trials for each stick condition. The independent variable (holding a lacrosse stick) was counterbalanced, and dependent t-tests were used to compare between LESS scores. **RESULTS**: There was a significant relationship between poor landing mechanics and holding a lacrosse stick reflected in the LESS scores (WS=4.46±0.69, WO=3.16±0.79, p<0.05). At initial contact, knee flexion (WS=27.1°±3.7°, WO=30.7°±3.9°, p<.01), hip flexion (WS=28.8°±3.2°, WO=31.7°±3.1°, p<0.01), and trunk flexion (WS=14.1°±5.7°, WO=17.9°±5.5°, p<0.01) angles were significantly reduced when landing with a stick. Joint flexion displacement, however, was not significantly different (p>0.05). **CONCLUSIONS**: Holding a lacrosse stick significantly changed participant's initial landing position with knees being closer together and an overall more extended posture. Sport dependent variation in arm positioning influences lower extremity movement patterns, demonstrated by the LESS scores. Coaches should consider implementing sport specific upper extremity constraint during ACL prevention programs to increase potential transfer to sport-specific movements.

FRIDAY, JUNE 1, 2018

2802   Board #85   June 1 3:30 PM - 5:00 PM

Mechanical Differences between Adolescents and Adults during Two Landing Phases of a Drop Jump Task

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(No relevant relationships reported)

PURPOSE: To investigate the mechanical differences between the first and second landing phases of a drop jump task performed by adolescent and adult males. **METHODS**: Eleven adolescent basketball players (age: 16.5 ± 0.7 years; height: 1.78 ± 0.07 m; mass: 68.9 ± 8.8 kg) and eleven resistance-trained adults (age: 22.3 ± 1.9 years; height: 1.80 ± 0.10 m; mass: 84.3 ± 9.3 kg) performed two trials of a drop jump from a height of 0.40 m. Force plates (1000 Hz) and an 8-camera 3-D motion analysis system (200 Hz) were used to determine vertical landing velocity (v_{LAND}), the duration of the absorption phase (AT), countermovement depth during absorption phase (CM), normalized peak vertical force during absorption (PF_{NORM}), and the normalized peak extensor moments at the hip (PM_{HIP}), knee (PM_{KNEE}), and ankle (PM_{ANKLE}) joints during absorption.
RESULTS: Adults produced significantly greater v_{LAND} than the adolescents (mean difference [MD]: 0.21 m/s, p=0.004) and v_{LAND} of the second landing was significantly greater than the first (MD: 0.24 m/s, p=0.046). Adolescents produced significantly shorter AT (MD: 0.09 s, p=0.014) and significantly lower CM (MD: 0.16 m, p<0.001) compared to the adults. CM during the second landing was significantly lower than that during the first (MD: 0.08 m, p=0.002). Adolescents produced significantly greater PF_{NORM} during each landing compared to the adults (MD: 1.34 BW, p=0.003) and PF_{NORM} during the second landing was significantly greater than that during the first (MD: 1.88 BW, p<0.001). The adolescents produced significantly greater peak joint moments compared to the adults (MD: 1.48 Nm/kg, p=0.001) and the peak moments during the second landing for both groups were significantly greater than those during the first (MD: 0.65 Nm/kg, p=0.024). PM_{HIP} was significantly greater than PM_{KNEE} (MD: 1.75 - 3.48 Nm/kg, p≤0.001) while PM_{KNEE} was significantly greater than PM_{ANKLE} (MD: 1.73 Nm/kg, p<0.001). The increase in the PM_{ANKLE} between the first and second landing was significantly greater than PM_{HIP} (MD: 1.89 Nm/kg, p=0.003) and PM_{KNEE} (MD: 0.93 Nm/kg, p=0.010).
CONCLUSIONS: The neuromuscular strategy utilized by adolescent males when landing that results in greater forces exerted during shorter absorption phases may predispose them to musculoskeletal injuries.

2803   Board #86   June 1 3:30 PM - 5:00 PM

Alternate Forms Reliability of Reactive Strength Assessments during Depth and Repetitive Countermovement Jumping

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(No relevant relationships reported)

Reactive strength assessments are most commonly made using either a depth or repetitive countermovement (RCM) jumping protocol. Reactive strength measures, such as the Coefficient of Reactivity (CoR), Reactive Strength Index (RSI), and Reactive Strength Kinetic (RSK) can be modified for computation using either of the two jumping protocols. Since researchers and practitioners assume comparability of scores across protocols, it is important to assess the extent that reactive strength scores achieved in the depth jump protocol translate to scores achieved in the RCM jumping protocol.
PURPOSE: The purpose of this study was to assess the alternate forms reliability of reactive strength scores achieved in the depth jumping protocol and in the RCM jumping protocol.
METHODS: Thirty-four young adults from the general community and 21 NCAA Division I basketball players performed five RCM jumps and depth jumps from 0.51 m, 0.66 m, and 0.81 m above the laboratory floor. The CoR, RSI, and RSK were computed using tri-axial force platform data and two-dimensional videography. Linear Regressions and intraclass correlation coefficients (ICC) were used to assess the alternate forms reliability of depth jump and RCM reactive strength scores.
RESULTS: Collapsed across sex and sport participation, ICC's comparing reactive strength scores in depth jumping and RCM jumping ranged from 0.71 to 0.77 (RSK), 0.84 to 0.88 (RSI), and -0.01 to -0.05 (CoR). Regressions detected significant associations between RSK (R^2=0.31 - 0.48, p<0.000) and RSI (R^2=0.53 - 0.59, p<0.000) scores in depth jumping versus RCM jumping. Regressions failed to detect significant associations between CoR scores in depth jumping versus RCM jumping (R^2=0.00)
CONCLUSION: RSK and RSI scores in depth jumping explained between 31 and 59% of the variance in reactive strength scores in RCM jumping. These results suggest that scores obtained from the RCM jumping protocols are not necessarily predictive of reactive strength scores in depth jumping. Additionally, these results suggest that the RCM jumping protocol may not be as specific of an assessment of reactive strength in young adults when compared against the depth jumping protocol.

2804   Board #87   June 1 3:30 PM - 5:00 PM

Differences in Joint Mechanics Between Adolescent and Adult Males Performing Countermovement and Drop Jump Tasks

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(No relevant relationships reported)

Purpose: To investigate the differences in joint mechanics between adolescent and adult males performing countermovement and drop jump tasks. **Methods:** Eleven adolescent basketball players (age: 16.5 ± 0.7 years; height: 1.78 ± 0.07 m; mass: 68.9 ± 8.8 kg) and eleven resistance-trained adults (age: 22.3 ± 1.9 years; height: 1.80 ± 0.10 m; mass: 84.3 ± 9.3 kg) performed two trials of a countermovement jump (CMJ) and a drop jump from a height of 0.40 m (DJ). Force plates (1000 Hz) and an 8-camera 3-D motion analysis system (200 Hz) were used to determine the following kinetic variables for the hip, knee, and ankle joints during the propulsive phase of each jump: normalized work performed by the moment (JW_{NORM}), normalized power output of the moment (JPO_{NORM}), and normalized joint stiffness (JS_{NORM}). **Results:** The adults produced significantly greater JW_{NORM} across the two jumps (mean difference [MD]: 0.32 J/kg, p=0.014). JW_{NORM} at the knee was greater than that at the hip (MD: 2.09 J/kg, p<0.001) and the ankle (MD: 2.61 J/kg, p<0.001), while JW_{NORM} was greater at the hip compared to the ankle (MD: 0.52 J/kg, p=0.001). The adults performed greater JW_{NORM} at the hip compared to the adolescents (MD: 0.75 J/kg, p=0.005). JPO_{NORM} at the knee was greater than at the hip (MD: 4.49 W/kg, p<0.001) and ankle (MD: 4.32 W/kg, p<0.001) across the two jumps while JPO_{NORM} was significantly greater in DJ compared to CMJ (MD: 0.49 W/kg, p=0.10). The adolescents produced significantly greater JPO_{NORM} at the ankle compared to the adults (MD: 1.35 W/k, p=0.002). The adolescents produced significantly greater JS_{NORM} compared to the adults (MD: 0.021 Nm/kg/deg, p=0.046). Both groups produced significantly greater JS_{NORM} in DJ compared to CMJ (MD: 0.015 Nm/kg/deg, p=0.001) with significant increases in JS_{NORM} at the knee joint from CMJ to DJ (MD: 0.02 Nm/kg/deg, p<0.001). The increase in JS_{NORM} at the hip (MD: 0.025 Nm/kg/deg, p=0.033) and knee (MD: 0.023 Nm/kg/deg, p=0.046) between CMJ and DJ was significantly greater in adolescents compared to adults. **Conclusion:** Adolescent males produce different joint mechanics compared to adults during jumping tasks and rely on a strategy of increasing joint stiffness at the
hip and knee joints when performing DJ. These differences may have implications for musculoskeletal injuries in adolescent males.

2805   Board #88   June 1 3:30 PM - 5:00 PM

Effect of Fatigue on Leg Muscle Activation and Tibial Acceleration during a Jumping Task

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(No relevant relationships reported)

Lower extremity stress fractures are a common occurrence during load bearing activities of jumping and landing. To detect biomechanical changes during jumping while injured, a fatigue model could be used. **PURPOSE**: To evaluate muscle activation and tibial accelerations in the triceps surae complex, anterior compartment and tibia pre-to-post fatigue following a jumping task. **METHODS**: Thirty active college-aged subjects with and without a previous history of stress fractures were recruited (15 male, 15 female, 21.5±5.04 yrs, ht=173.5±12.7cm, wgt =72.65 16.4±kg) resulting in 177 leg trials for evaluation (control, stress fracture injured and stress fracture contralateral). EMG activity and acceleration of the proximal tibia were recorded pre-to-post fatigue. The EMG protocol consisted of surface electrodes placed on the medial gastrocnemius (MG), soleus (SOL), and tibialis anterior (TA) following a standardized placement protocol. A triaxial accelerometer was attached to the proximal anterior surface of the tibia. Subjects performed a maximal vertical jump on one leg 3 times with arms folded across the chest pre-to-post fatigue. Standing heel raises on a custom built platform at a pace controlled by a metronome until task failure was reached was used for the fatiguing protocol. Legs were tested using a randomized testing order. Pre-to-post fatigue measurements included the linear envelopes of the MG, SOL and TA and peak accelerations (resultant acceleration in take-off and landing). **RESULTS**: There was an interaction for leg and test for TA (P=.050) with a difference between stress fracture and control posttest (P=.05). Decreases in EMG linear envelope following fatigue (P<0.01) were evident for the MG (P<0.01) and TA (P=0.12), but not for the soleus (P=.111). There was a significant difference for tibial acceleration for leg (P=.029) in the stress fracture contralateral leg in comparison to the control leg at takeoff (P=.042). At landing, there was a significant difference for test (P<0.01) as tibial acceleration increased post-test (P<0.01) and leg (P=.019) where there was a difference between stress fracture injured with stress fracture contralateral (P=.014). **CONCLUSIONS**: Attention should be directed to the MG and TA muscles and in providing landing and take-off guidance upon return to activity.

Abstracts were prepared by the authors and printed as submitted.

2806　　Board #89　　　　　June 1 3:30 PM - 5:00 PM

L5S1 Excursion Reflects Knee Flexion Angle During A Drop Landing Task

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(No relevant relationships reported)

Drop landing tasks are used to screen for anterior cruciate ligament (ACL) injury risk. Soft landing with greater knee and hip flexion is considered ACL protective. Greater vertical excursion of the center of mass is thought to improve shock attenuation by reducing ground reaction forces and increasing the contribution of hip extensors. It is not known if vertical excursion of the L5S1 accurately reflects sagittal plane flexion at the knee and/or hip. **Purpose:** To examine the relationship between L5S1 displacement with peak knee and hip flexion during the deceleration phase of a drop landing task. **Methods:** Female soccer players (n=93; 14 ± 2.49 years; 52.9 ± 12.4 kg) performed a drop land (36cm box). Kinematic data was collected (250 Hz) with 8 camera motion system. Peak knee (pkkn) and hip (pkhp) flexion angles were identified during deceleration (contact to minimum L5S1). Total flexion (totflex) was calculated as the sum of pkkn and pkhp. Data were averaged between limbs. Vertical L5S1 excursion (L5S1ex) was calculated as the difference between minimum L5S1 and L5S1 in standing and normalized by standing L5S1. A stepwise linear regression was used to determine which variables best explain L5S1 excursion during a drop land task. **Results:** L5S1ex was positively correlated with pkkn (r=0.95; p<0.00), pkhp (r= 0.74; p<0.00) and totflex (r= 0.892; p<0.00). Of these variables, pkkn was the only predictor of nL5S1ex (r^2= 0.91; p<0.00; prediction equation: L5S1ex=-0.27+(0.005 * pkkn)). **Conclusion:** Vertical L5S1 excursion during a drop land is reflective of knee flexion angle explaining 91% of the variance. When considering the difference between actual pkkn and pkkn calculated with the prediction equation the differences ranged from 0.03-11.37 degrees (average: 3.03 ± 2.37 degrees). L5S1ex may be used as a surrogate for knee flexion angle during ACL risk factor screening with a drop land. Further research is needed to investigate the relationship between L5S1ex and shock attenuation.

Total Knee Flexion vs Normalized L5S1 Excursion
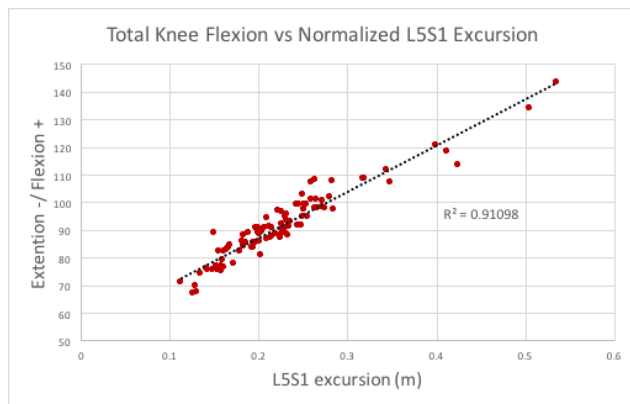
2807　　Board #90　　　　　June 1 3:30 PM - 5:00 PM

Saggital And Frontal Plane Knee Angles Between Pre-adolescencent Sexes Are Not Different During Jump-landing.

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(No relevant relationships reported)

Adolescent and post-adolescent females experience injury to the anterior cruciate ligament (ACL) more frequently than do their male counterparts in similar sports. It has been observed that females tend to land with less knee flexion and greater knee valgus angles than their male peers. These landing patterns are associated to the non-contact ACL injury mechanism.
PURPOSE: The purpose of this study is to examine the knee kinematic landing patterns in youth in the frontal and sagittal planes to determine whether these same kinematic differences exist between pre-adolescent males and female.
METHODS: Thirty-two subjects (16 females and 16 males; aged 6 to 10 yrs) volunteered for participation in the study. They were asked to perform maximal jump and landing motions while being recorded for biomechanical analysis utilizing a 10-camera infrared system (200 Hz; all XYZ coordinates filtered at 20 Hz) and an imbedded force plate (1,000 Hz; filtered at 20 HZ). Values for knee flexion and valgus angles at touchdown and at maximal flexion were extracted from the data and compared between genders with an unpaired *t*-test: alpha ≤ 0 .05.

RESULTS: Valgus angle at initial contact displayed no difference (males: -4.81±7.83°; females: -3.01±8.99°; *p*=0.40). It was found that knee flexion at initial contact was different (males: 16.1±10.5°; females: 20.7±8.10°; *p*=0.05). No differences were observed in valgus ROM (males: 2.75±17.3°; females: 6.68±14.2°; *p*=0.32) nor knee flexion ROM (males: 37.1±19.0°; females: 40.2±10.7°; *p*=0.42).
CONCLUSIONS: These results suggest that the knee kinematic profiles for non-contact ACL injury are not present in pre-adolescent subjects and may develop during maturation.

2808　　Board #91　　　　　June 1 3:30 PM - 5:00 PM

Mechanics of Countermovement and Drop Jump Tasks Performed by Adolescent and Adult Males

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(No relevant relationships reported)

Purpose: To investigate the mechanical differences between adolescent and adult males performing countermovement and drop jump tasks. **Methods:** Eleven adolescent basketball players (age: 16.5 ± 0.7 years; height: 1.78 ± 0.07 m; mass: 68.9 ± 8.8 kg) and eleven resistance-trained adults (age: 22.3 ± 1.9 years; height: 1.80 ± 0.10 m; mass: 84.3 ± 9.3 kg) performed two trials of a countermovement jump (CMJ) and a drop jump from a height of 0.40 m (DJ). Force plates (1000 Hz) and an 8-camera 3-D motion analysis system (200 Hz) were used to determine the jump height (JH), the duration of the propulsion phase (PT), countermovement depth during the absorption phase (CM), normalized work during the propulsive phase (W_{NORM}), normalized peak power output during the propulsive phase (PO_{NORM}), and normalized vertical stiffness (VS_{NORM}) during each jumping task. **Results:** JH (mean difference: 0.05 m, p<0.001) and PO_{NORM} (mean difference: 2.4 W/kg, p=0.031) were significantly greater during CMJ compared to DJ with no significant differences between the adolescents and adults. PT were significantly greater during CMJ compared to DJ (mean difference: 0.03 s, p=0.033). The adolescents produced significantly shorter PT (mean difference: 0.08 s, p<0.001) and significantly lower CM (mean difference: 0.13 m, p<0.001) than the adults across the jumping tasks. Significantly greater W_{NORM} was performed during the CMJ compared to the DJ task (mean difference: 1.10 J/kg, p<0.001) and the adults performed more work during the propulsive phases of both jumping tasks compared to the adolescents (mean difference: 1.48 J/kg, p<0.001). The adolescents produced significantly greater VS_{NORM} during both jumps compared to the adults (mean difference: 39.6 kN/m/kg, p<0.001). **Conclusion:** Adolescent and adult males use different neuromuscular strategies to attain similar power outputs during jumping tasks with the adolescents producing shorter propulsion times through the modulation of vertical stiffness while the adults generate a greater amount of work over a longer duration.

2809　　Board #92　　　　　June 1 3:30 PM - 5:00 PM

Patellofemoral Joint Loading During a Variation in Jump-landing Movements

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(No relevant relationships reported)

Patellofemoral pain syndrome (PFPS) is common in athletes. Increased patellofemoral joint stress (PFJS) may contribute to PFPS. Few studies have investigated PFJS during jump-landing. PFJS may be different during jump-landing in different directions.
PURPOSE: Examine PFJS during bilateral (B)/unilateral (U) jump-landing and the effect of direction (side (S)/ forward-backward (FB)). **METHODS:** Nineteen males (Age:22.2±1.6yrs.; Height:177.7±8.1cm; Mass:74.5±11.1kg) performed 4 jump-landing variations: bilateral (B) forward-backward (FB), bilateral (B) side (S), unilateral (U) forward-backward (FB), and unilateral (U) side (S). Kinematic and kinetic data were collected. Quadriceps muscle forces (QF) were determined from static optimization. PFJS were estimated using a patellofemoral joint model. A repeated measures multivariate analysis of variance with two within-subjects factors [leg (U/B) and direction (S/FB)] was used to examine differences in knee range of motion (KROM), quadriceps force (QF), and PFJS (α=0.05). **RESULTS:** There were multivariate effects for leg (U/B) (p<.001) and a leg (U/B) by direction (S/FB) interaction (p<.001). No direction (S/FB) main effect (p=.081) occurred. Univariate tests revealed greater KROM (p<.0001) and lower QF and PFJS during B jump-landing (p<.0001). Leg by direction interaction indicated KROM had greater differences between directions (S/FB) during the U jump-landing (p=.012) showing lower KROM during S jump-landing. The interaction also revealed higher QF and PFJS during the B S jump-landing compare to the B FB jump-landing (p<.0001). QF and PFJS were lower during the U S jump-landing compared to the U FB jump-landing (p<.0001). **CONCLUSION:** U jump-landing had greater PFJS than B jump-landing. The effect of direction (S/FB) depended on leg use (U/B). Results may provide insight into both training and rehabilitation efforts in those with PFPS.

2810   Board #93   June 1 3:30 PM - 5:00 PM

Knee Kinematics During a Single-Leg Backwards Jump-Landing With and Without External Load

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(No relevant relationships reported)

External load may increase the demand on the neuromuscular system to safely control knee motion above its capacity, resulting in knee injury. **PURPOSE:** To assess the influence of external load on knee motion during a backwards single-leg jump-landing. It was hypothesized that external load would increase motion in the frontal plane, but not in the sagittal plane. **METHODS:** Eleven recreationally active participants (23.1 ± 3.3 y, 1.78 ± 0.08 m, 78.2 ± 11.6 kg) performed backwards single-leg jump-landings without (BW) and with (BW10%) external load applied via a weight vest worn around the torso. Participants jumped backwards over a 15 cm hurdle on the dominant leg, landed on the same foot on the force plate, and stabilized. Three trials were completed per condition and averaged for analysis. Frontal and sagittal plane knee angles were identified at initial contact (IC) and peak vertical ground reaction force (vGRF). Effect size (d) was used to evaluate differences in the means between conditions. **RESULTS:** Participants were in greater knee flexion at IC with external load compared to without ($d = 0.40$; BW10% = 42.3° [36.0 - 48.7]; BW = 38.8° [33.4 - 44.2]). During the weight acceptance phase participants extended at the knee in both conditions, but extension was greater with external load than without ($d = 0.53$; BW +10% = 7.9° [0.5 - 15.2]; BW = 2.4° [-4.2 - 8.9]) resulting in similar sagittal plane angles at peak vGRF ($d = 0.20$; BW10% = 34.5° [28.2 - 40.7] BW = 36.4° [30.2 - 42.6]). Participants were in a comparable valgus position at IC ($d = 0.00$; BW10% = 2.2° [-1.1 - 5.4]; BW = 2.1° [-1.3 - 5.5]) and moved similarly towards a varus position during the weight acceptance phase ($d = 0.08$; BW10% = -1.7° [-3.0 - -0.4]; BW = -1.5° [-2.4 - -0.7]), ultimately resulting in comparable valgus positions at peak vGRF ($d = 0.02$; BW10% = 0.5 [-2.1 - 3.0]; BW = 0.6° [-2.4 - 3.6]). **CONCLUSIONS:** Frontal plane knee kinematics were similar between conditions, possibly because the external load was not great enough to exceed the ability to safely control knee motion. Participants landed in greater knee flexion with external load but extended the knee during the weight acceptance phase, possibly due to the unique movement challenges of a backwards jump. This may heighten vertical stiffness, challenge the lower extremity's passive stability, and increase the risk for knee injury.

2811   Board #94   June 1 3:30 PM - 5:00 PM

Trunk Muscle Fatigue and Activation are Associated with Drop Jump Performance

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(No relevant relationships reported)

Although the importance of core muscles on human motions has been recognized, little is known about the effect of trunk muscle fatigue and activation on drop jump (DJ) performance.
PURPOSE: To examine how trunk muscle fatigue and activation relate to DJ performance.
METHODS: The study included 7 healthy, well-trained males (age 20.8 ± 1.4 years, height 168.4 ± 5.7 cm, weight 67.1 ± 8.0 kg). Subjects held vertical trunk position against a wire with one end attached to the posterior thorax, pulling the trunk posteriorly, with the other end attached to a weight corresponding to 25% of maximal voluntary isometric contraction force. Before and after this fatiguing task, maximum voluntary isometric trunk flexor contraction force (MVIC), and double- and single-leg DJ height (DJH), contact time (CT), and DJ index (DJI; DJH/CT) were measured. Surface electromyography was recorded from the dominant side of the anterior and posterior trunk musculature during DJs. Mean differences before and after the fatiguing task were examined using paired-sample t-tests. Simple linear regression analyses tested the relation of relative changes before and after the fatiguing task in the jump performance index and trunk muscle activation during preactivation, braking, and push off phase of each DJ.
RESULTS: After the fatiguing task, MVIC was significantly decreased to $68.8\pm11.5\%$ ($p<0.01$). DJI (Pre vs. Post fatigue for double- and single-leg DJ: 1.18 ± 0.31 vs. 0.94 ± 0.36, 0.52 ± 0.13 vs. 0.41 ± 0.15) and DJH (Pre vs. Post fatigue for double- and single-leg DJ: 22.12 ± 5.09 cm vs. 20.01 ± 5.24 cm, 13.21 ± 3.04 cm vs. 11.07 ± 3.64 cm) were significantly decreased ($p<0.01$), and CT (0.19 ± 0.02 s vs. 0.22 ± 0.03 s) was significantly extended ($p<0.01$). Regression analyses revealed that greater ensemble trunk muscle preactivation reduction rate was associated with CT lengthening rate in double-leg DJ (R2=0.582, B=-0.257, p=0.046), and DJI reductions rate in single-leg DJ (R2=0.910, B=0.309, p=0.001) and that greater rectus abdominus (R2=0.779, B=0.138, p=0.008) and external oblique activations reduction rate during breaking phase (R2=0.703, B=0.276, p=0.018) were associated with greater DJI reduction rate.

CONCLUSIONS: Trunk muscle fatigue and decreased trunk flexor muscle activation during DJ have negative effects on both double- and single-leg DJ.

2812   Board #95   June 1 3:30 PM - 5:00 PM

Effect of Cognitive Dual Tasks on Lower Extremity Kinematics and Ground Reaction Force during Repeated Tuck Jump Landings

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(No relevant relationships reported)

Effect of Cognitive Dual Tasks on Lower Extremity Kinematics and Ground Reaction Forces during Repeated Tuck Jump Landings

Jae P. Yom[†], Amber Schnittjer[†], Janet Simon[†], Dustin Grooms[†]
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Many sports-related injuries occur due to a combination of physical, high joints load during sport-specific maneuvers and cognitive factors, such as keeping other players or the ball in short-term memory. This addition of cognitive challenges can degrade physical performance and increase joint loading. However, previous studies have focused on a single movement and it is unknown how cognitive load influences repeated landing that better simulate the continuous demand of athletic performance. **PURPOSE:** To determine if a cognitive challenge during tuck jumping affect lower extremity landing biomechanics. **METHODS:** Recreational collegiate athletes (N=20, 71.7 ± 11.9kg, 171.1 ± 9.7cm) participated in this study. A baseline: BASE condition of repeated tuck jumps and a cognitive: COG condition of tuck jumps while performing an addition problem from a stream of digits on a computer screen. The tuck jump consisted of 3 sets of 10 seconds repeated double leg vertical tuck jumps. Dominant-side sagittal plane lower extremity angular kinematics and vertical ground reaction forces (VGRF: 1,000 Hz) were compared between the two conditions paired t-tests ($p<.05$). **RESULTS:** COG, compared to the BASE, resulted in increased ankle angle ($30.1\pm1.7°$ and $29.3\pm0.7°$) and decreased knee angle ($20.5\pm0.6°$ and $21.5\pm0.6°$) at initial contact. Also, decreased ankle ($21.8\pm1.4°$ and $22.4\pm1.0°$) and knee ($63.0\pm0.7°$ and $67.9\pm0.9°$) maximum angle occurred. Additionally, COG resulted in an increased ankle ($52.6\pm0.9°$ and $51.6\pm0.9°$), decreased knee ($42.5\pm1.2°$ and $46.4\pm0.8°$) and hip ($31.7\pm1.1°$ and $33.0\pm0.7°$) displacements. No significant differences were found in VGRF between conditions. **CONCLUSION:** We surmised that COG, compared to the BASE, change lower extremity biomechanics that may increase injury risk and knee loading. The more extended knee position at initial contact and reduced sagittal displacement during the COG condition may contribute to increased injury risk when under cognitive load. However, greater ankle displacement during the COG condition may be adaptation strategy to protect the knee under cognitive load.

2813   Board #96   June 1 3:30 PM - 5:00 PM

Effect of External Load on Lower Extremity Stiffness and Time to Stabilization During Jump-Landing

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(No relevant relationships reported)

External loads similar to common protective athletic equipment may impair the ability to effectively control motion during a jump-landing, increasing non-contact anterior cruciate ligament (ACL) injury risk. **Purpose:** To determine the effect of external load on time to stabilization (TTS) and lower-extremity vertical stiffness (K_{vert}) during backwards single-leg jump-landings. It was hypothesized that both TTS and K_{vert} would be greater in the loaded condition compared to the non-loaded condition. **Methods:** Eleven recreationally active males and females (23.1 ± 3.3 y, 1.78 ± 0.08 m, 78.2 ± 11.5 kg) completed three trials of a backwards single-leg jump-landing on the dominant leg with and without a weight vest on that was adjusted to 10% body weight in a randomized order. Participants jumped backwards off their dominant foot over a 15 cm hurdle, landed on the same foot, and stabilized. Trials were performed on an in-ground force plate and kinematics were quantified using three-dimensional motion capture. TTS was defined as the time required for vertical ground reaction force (vGRF) to stabilize within 5% of the participant's body mass, which was adjusted for external load condition, for one second after landing. K_{vert} was calculated as the relative peak vGRF divided by the change in center of mass vertical position between initial contact and peak vGRF. Effect size (d) was used to assess the magnitude of the standardized difference in the means between conditions. **Results:** Small effects ($d = 0.20$) were demonstrated between conditions for TTS because the participants took slightly longer to stabilize in the loaded condition (1.31 s [0.98 - 1.65]) than in the non-loaded condition (1.21 s [0.88 - 1.55]). Small effects ($d = 0.49$) were also demonstrated between conditions for K_{vert} since the participants had greater stiffness during the weight acceptance period in the loaded condition (0.25 kN m^{-1} kg^{-1} [0.19 - 0.31]) compared to the non-loaded condition (0.21 kN m^{-1} kg^{-1} [0.17 - 0.26]). **Conclusion:** Greater TTS and K_{vert} when externally loaded with a weight similar to protective athletic equipment may challenge the neuromuscular system's ability to safely

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Abstracts were prepared by the authors and printed as submitted.

attenuate ground reaction forces. Although small, these impairments may increase ACL injury risk and be heightened with greater loads, fatigue, and unanticipated movements.

2814   Board #97   June 1 3:30 PM - 5:00 PM

Effects of Increased Gluteus Muscle Activation on Hip and Trunk Kinematics during Single-leg Landing

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(No relevant relationships reported)

The gluteus maximus (GM) has a triplanar function at the hip joint. It was hypothesized that increased GM activation before and after foot contact (FC) on landing would affect triplanar hip and trunk kinematics and anterior cruciate ligament (ACL) injury risk. **PURPOSE:** To examine how increased GM activation before and after FC affect hip angles and trunk inclination during single-leg landing. **METHODS:** A double-leg drop jump from a 30-cm box, followed by single-leg landing onto a force plate, was performed by 13 males and 15 females in both control (CC) and experimental conditions (EC). In EC, transcutaneous electrical stimulation was applied to increase GM activation immediately before FC and during single-leg landing. Kinetic and kinematic data were collected using a force plate and 3-dimensional electromagnetic motion tracking system, respectively. Hip joint angles and sacrum and thorax inclination angles in space on FC, peak ground reaction force (GRFpk), and peak knee extensor moment (KEMpk) during single-leg landing were calculated. Comparisons were performed using two-way (sex×conditions) repeated measures analysis of variance with a significance level < .05. **RESULTS:** The hip joint exhibited more abduction (EC vs. CC at FC, GRFpk, and KEMpk, respectively: -13.2 ± 7.8° vs. -9.5 ± 6.3°, -8.9 ± 7.7° vs. -4.9 ± 6.8°, -3.3 ± 8.9° vs. -.2 ± 6.5°) and external rotation (-14.8 ± 8.5° vs. -9.8 ± 9.9°, -8.0 ± 3.6° vs. -3.6 ± 9.7°, -6.1 ± 9.7° vs. -1.6 ± 11.2°) at all time points in EC than in CC. The sacrum showed more lateral inclination toward the supporting leg at all time points (14.3 ± 6.4° vs. 11.1 ± 6.4°, 12.1 ± 6.4° vs. 9.0 ± 6.1°, 8.9 ± 7.1° vs. 6.7 ± 6.2°) and more erect position at KEMpk in EC (-1.0 ± 10.6°) than at CC (-4.6 ± 10.5°). No significant differences were observed in thoracic inclination angles. No significant interactions were observed among all variables. **CONCLUSIONS:** Increased GM before and after FC on single-leg landing may have positive effects on frontal and transverse plane hip motion to reduce ACL injury risk. However, excessive GM activation may result in excessive trunk lean toward the supporting leg and more erect position, which increase risk for ACL loading. Thus, appropriate GM activation is necessary to protect the ACL during single-leg landing.

2815   Board #98   June 1 3:30 PM - 5:00 PM

Relationship between Take-Off Force Profiles and Single Leg Hop Distance

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(No relevant relationships reported)

The anterior single leg hop for distance test (SLHOP) is a functional performance task that is often used to assess return to play criteria following ACL reconstruction. Clinicians primarily assess SLHOP distance, but the way an individual completes the task may be important when determining return to play status. Recent research has indicated that non-uniformity in vertical ground reaction force (VGRF) profiles may be related to pathomechanics during a vertical jump, but little research has been done to explore the relationship between force profiles and SLHOP distance. **PURPOSE:** To determine the correlation between a force profile ratio and SLHOP distance. **METHODS:** Twenty-three female collegiate soccer players (19.1±1.5 years; 166.9±7.1 cm; 62.6±8.3 kg) performed three SLHOP tests for maximal distance off a tri-axial force plate. The SLHOP was performed on the dominant limb. Ground reaction force (GRF) data were collected during SLHOP take-off phase to produce force-time curves that were used to calculate the ratio between the instantaneous and average force profile between three events. Force profile ratios were calculated between: A) the minimum GRF after initiation of the countermovement and the peak GRF prior to takeoff, and B) the point during the countermovement when body weight is reached and peak GRF. Ratio A and B where calculated in both the vertical (z) and anterior-posterior (y) axes. All forces were normalized to body weight, and SLHOP distances were normalized to leg length (cm/cm). The strength of the association between each of the aforementioned force profile ratios and maximum SLHOP distance were calculated using Pearson correlation coefficients with an alpha level set *a priori* at p<0.05. **RESULTS:** There were no significant correlations between any combination of force profile ratios and SLHOP distance (p-value range: 0.19 to 0.62, r range: -0.11 to -0.26). **CONCLUSION:** Force profile ratios between straight-line

and trace-line distance are not significantly related to average or maximum SLHOP distance. Further research should explore the relationship between other phases within the force-time curve, pathomechanics, and SLHOP distance.

2816   Board #99   June 1 3:30 PM - 5:00 PM

The Relationship Between Side Hop Test Endurance And Energy Absorption

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(No relevant relationships reported)

Many factors are associated with an athlete being able to safely return to sport (RTS). Frontal plane control and endurance in the frontal plane is recognized as important factor in RTS. The ability to absorb energy while fatigued is critical to help dissipate forces and minimize injury risk. Current RTP guidelines do not evaluate fatigue and power absorption. A new 30-second endurance side hop test could provide a means of clinically evaluating this ability. **PURPOSE:** Compare the change in energy absorption over a 30-second side hop test in healthy subjects. **METHODS:** 17 healthy subjects (11 M, ages 22.4 ± 3.14, BMI 22.96 ± 3.06) with no prior lower extremity injuries performed an instrumented single limb lateral hops between two force plates 15.24 cm apart as many times as possible in 30 seconds. Errors were subtracted from total successful hops and included landing between the force plates or putting the non-stance limb down. The change in energy absorption from beginning to the end of the test was also calculated. Pearson product moment correlation was used to evaluate the relationship between the average number of hops to the change energy absorption over 30 seconds. We also assessed the difference in hops between those who maintained versus those who had a reduction in power absorption with an independent samples t test. **RESULTS:**Subjects performed an of 29.4± 6.6 lateral hops over 30 seconds. There was a strong, significant correlation between the number of hops to energy absorption (r=0.68, p= 0.003). There was also a significant difference (p=0.04) in the number of hops between those who maintained energy absorption (32.3± 4.4 J) versus those who did not (26.1± 7.3 J).
CONCLUSIONS: This 30-second side hop endurance test was significantly correlated to energy absorption. Those who performed the best were able to maintain energy absorption throughout the testing protocol. Potentially, the ability to maintain the ability to absorb energy while fatigued may reduce of injury, as these athletes are better able to attenuate loads. Having established the relationship to energy absorption, future studies should evaluate the test's relevance to injury prediction.

2817   Board #100   June 1 3:30 PM - 5:00 PM

Relationship between Single Leg Hop Distance and Descending Phase Force Variables

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(No relevant relationships reported)

Anterior single leg hop for distance (SLHOP) is a common functional assessment used to evaluate lower extremity power and dynamic postural stability. Peak force and rate of force development (RFD) have been used to quantify strength and power, but little is known of the relationship between these measures and SLHOP distance. **PURPOSE**: To determine the relationship between vertical and anterior force variables during the descending phase and SLHOP distance. **METHODS**: Twenty-three female collegiate soccer players (19.1±1.5 years; 166.9±7.1 cm; 62.6±8.3 kg) performed SLHOP for maximal distance on their dominant limb, taking off a tri-axial force plate. Kinetic data were collected during the descending phase of the SLHOP to identify peak force in the vertical (Fz) and anterior-posterior (Fy) axes and average rate of force development (RFD), the rate of change in the force-time curve. Two start events were used to calculate RFD: 1) RFDnegative: point of maximum center of mass downward acceleration (subject moving down, acceleration negative) and 2) RFDzero: point when ground reaction force equals body weight (subject moving down, acceleration zero). The RFD end event was peak force (near the lowest point of descending). Forces were normalized to body weight and SLHOP distances were normalized to leg length. A linear regression with best subset selection method was performed to identify which combination of variables were most related to SLHOP distance with an alpha level set a priori at p<0.05. **RESULTS**: Peak Fy (Beta=189.32, 95%CI=133.04, 245.61, p<0.001) and RFDzero in the vertical axis (Beta=-2.94, 95%CI=5.48, -0.40, p=0.03) were significantly related to SLHOP distance (model adjusted R^2=0.69). **CONCLUSION**: Female soccer players who maximized anterior force and minimized vertical RFD during the descending phase of SLHOP achieved greater SLHOP distances. Results suggest maximal SLHOP distance warrants both vertical and anterior force generation. However, these movement strategies may not translate across different jump tasks (i.e. vertical jump, etc.) or different sports. Further research is

warranted to examine the relationship between force and RFD profiles and other jump tasks. Future studies should examine the effect of sex and sport on the relationship between SLHOP distance and force variables.

F-57   Free Communication/Poster - **Children and Youth**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2818   Board #101   June 1 2:00 PM - 3:30 PM

Evaluation Of The Implementation Of An Academically-integrated Intervention Targeting Obesity-related Health Behaviors In Preschooler-age Children

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(No relevant relationships reported)

Obesity related health behaviors [ORHBs; physical activity (PA), diet, and sleep] interventions targeting preschool-age children implemented within childcare centers have shown mixed results. The variability of these findings could be related to process evaluation measures, which are frequently not reported. **PURPOSE**: To describe the process evaluation (feasibility, acceptability, and fidelity) outcomes of a 12-week preschool intervention targeting ORHBs that was integrated into early education learning standards (state mandated policies) in preschoolers. **METHODS**: Two preschools (classrooms, n = 7) were randomized to either the 12-week Physical Activity, Diet and Sleep (PADS) intervention or control condition. The PADS program was led by research staff and teachers and included ORHB lessons and activities implemented on four days/week (three days of morning PA, three days of afternoon PA, one day of diet, and one day of sleep). PADS PA intervention intensity was assessed on one randomly selected weekday morning/week with accelerometers. Other process evaluation outcomes were assessed (daily, weekly, and at 12-weeks) using semi-structured questionnaires completed by research staff and teachers. **RESULTS**: Fifty, 33.3, 77.8, and 100.0% of observed lessons were implemented as planned for diet, sleep, morning PA, and afternoon PA, respectively. Only $44.7 \pm 8.6\%$ of the morning PA lessons were spent in moderate-to-vigorous intensity. Among all observed lessons at least 50% of the students participated and the majority of students seemed to enjoy the activities. Teacher encouragement was present in 62.5% (diet) - 72.2% (morning PA) of observed lessons. Greater than 90% of the lessons were perceived as effective and would be used in the future by teachers. **CONCLUSIONS**: This pilot data suggests that integrating ORHBs into education learning standards is feasible and acceptable by preschool teachers and students. PADS PA lessons had the highest levels of implementation, whereas modifications were recommended for some diet and sleep lessons. Implementation of all lessons may also improve with greater teacher encouragement.

2819   Board #102   June 1 2:00 PM - 3:30 PM

Mixed-method Analysis Of An After-school Program To Increase Physical Activity

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(No relevant relationships reported)

Physical activity (PA) is essential for adolescent health and prevention of chronic diseases. After-school programs and time spent outdoors are important for addressing health behaviors, particularly PA. **PURPOSE**: The purpose of this study was to increase PA through an afterschool program that utilized outdoor resources. **METHODS**: Get Outside - After School Activity Program (GO-ASAP), a 20-wk (2d·wk[-1] for150-180 mins) PA program designed to increase lifestyle PA. Participants (N = 18) were recruited from a local middle school. The Physical Activity Questionnaire for Children (PAQ-C), as well as accelerometers, was used to assess PA. Assessment of social cognitive (SCT) and self-determination (SDT) constructs were measured on a 5-point Likert scale. All assessments were administered pre- and post-intervention. Focus groups were conducted post-intervention to assess self-confidence and enjoyment. **RESULTS**: Participants (male = 11, female = 7) were 12.9 ± 0.9 years of age. Accelerometer-derived PA indicated an increase in MVPA min·hr[-1](2.9 ± 0.8 to 3.9 ± 2.4) but was not significant (p=0.28). Self-reported PA increased from baseline to post (2.06 ± 0.56 to 2.54 ± 0.92; p=0.042). There were no significant changes noted in SCT or SDT constructs. Five themes emerged from focus groups: (1) students liked participating in the GO-ASAP, (2) students learned new skills and activities while exercising outdoors, (3) participation in the GO-ASAP had a positive effect on confidence and self-esteem, (4) Participation in the GO-ASAP had a positive effect on life-long commitments to fitness, and (5) there is a positive interaction between students and GO-ASAP leaders. **CONCLUSIONS**: Results of this pilot project indicated that outdoor-based PA programs might yield small effects in PA. Additional explorations with larger sample sizes are warranted to fully investigate the efficacy of these findings. The need for after school programs involving activities promoting PA into adulthood should be explored.

2820   Board #103   June 1 2:00 PM - 3:30 PM

Changes On Neuroendocrine Parameters (cortisol, Melatonin) And Anxiety Levels After A School-based Exercising And Nutrition Counseling Intervention In School-aged Obese Adolescents From Monterrey méXico.

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(No relevant relationships reported)

BACKGROUND.
Recent studies point to high prevalences of obesity in adolescent populations worldwide. Its implications derive in various disorders, among which are inflammatory processes, as well as disorders related to sleep-wake, both processes involved in stress situations. There are two neuroendocrine parameters (cortisol and melatonin) two hormones associated with the same sleep-wake process that lead to a certain level of anxiety in obese subjects. Both cortisol and anxiety have been evidenced in various investigations as obesogenic factors. For its part, the practice of physical exercise has been indicated as a factor associated with the increase in melatonin levels, which has anti-inflammatory and recovery functions.**PURPOSE.**
To assess the changes in the levels of neuroendocrine parameters (cortisol, melatonin) and anxiety after an intervention of nutritional counseling and exercise in school age obese adolescents of Monterrey Mexico
METHODS: Experimental study with a sample of 51 adolescents (13 ± 2) randomly assigned in three work groups had participation during 4 months. The control group (CG) did not receive any treatment; experimental group 1 (EG1) participated in a health program composed of 4 weekly sessions of 60 minutes of physical activity; Experimental group 2 (EG2) 4 weekly sessions of 60 minutes of physical activity sessions of nutritional guidance and 2 weekly sessions of light therapy of 45 minutes. The values of cortisol and melatonin were taken in saliva and for anxiety the questionnaire of state anxiety (STAI) was used.
RESULTS: After comparing initial and final values, the results showed significative changes into EG2 increasing melatonin (p > 0.001). Salivary cortisol showed significant decreases into EG1 (p = 0.004) and also into EG2 (p =0.006). Anxiety state showed a significant increase into CG (p<0.001), and significant decreases into EG1 (p< 0.005) and into EG2 (p< 0.001)
CONCLUSIONS:
The School-based Exercising And Nutrition Counseling shows favorable effects in the reduction of cortisol levels y ansiedad, both factors associated with inflammation. The use of light therapy seems to help into the recovery processes increasing secretion of melatonin and recovery after exercise. we suggest analize sleep variables for further studies

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2821   Board #104   June 1 2:00 PM - 3:30 PM

Impact of After-School Jump Rope Program on Psychological Outcomes

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(No relevant relationships reported)

As childhood obesity increases and physical activity (PA) in youth populations decreases, it is crucial to implement programs which successfully increase PA while providing positive psychological experiences for growth. After-school program offer opportunities for youth to not only engage in PA but to experience varied types of PA and social interactions which can positively impact their perceptions on PA, exercise, and how they view themselves. **PURPOSE**: The purpose of this study was to explore the impact participating in an after-school jump rope program had on self-perceptions, PA enjoyment, goal orientation, and weekly PA. **METHODS**: Students ages 8-12 years old from two elementary schools (n=28) participated in a 12-week after-school jump rope program that met twice a week for 90 minutes each session. Participants practiced individual and group jump rope skills and learned a team routine that they performed at the end of the 12 weeks. Participants completed pre and post-test measures including Harter's Self Perception Profile, the PA Enjoyment Scale, a combination of the Sport and Classroom Goal Orientation Scale, and the Self-Administered PA Checklist. **RESULTS**: There were no changes in self-perceptions from pre to post-test measures.

Abstracts were prepared by the authors and printed as submitted.

After controlling for pre-test scores, athletic ($F(1, 25)$= 18.577, $p<.001$, η^2 = .426) and scholastic ($F(1, 25)$= 4.462, $p<.05$, η^2 = .151) competence increased for non-minority and decreased for minority participants. There were no significant changes in PA enjoyment. Ego goal orientation decreased among male participants $F(1, 26)$ =5.972, $p<.05$. Weekly physical activity minutes increased from pre to post-test, $F(1, 27)$ =53.115, $p<.001$, η^2 =.663. **CONCLUSIONS**: Participating in the after-school jump rope program did not show consistent increases in assessed psychological variables however there were positive trends in goal orientation, weekly PA, and. Participants were involved in multiple after-school programs which may have influenced the data. Accelerometer data shows that the jump rope program elicited 45.3 minutes of MVPA including an average of 9 minutes of very vigorous PA creating an interval training type program. Further examination of how this type of program impacts self-perceptions is needed.

2822   Board #105   June 1 2:00 PM - 3:30 PM

Cardiorespiratory Fitness Moderate the Prospective Association Between Physical Activity & Cardiometabolic Risk Factors in Children

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(No relevant relationships reported)

Physical activity (PA) and cardiorespiratory fitness (CRF) are independently associated with lower cardiometabolic risk, and may affect risk through different pathways. PA and CRF are two different constructs (behaviour vs trait), and CRF has a genetic component suggesting that some may be predisposed to higher CRF in whom associations between PA and cardiometabolic health might be less pronounced than in those with low CRF. Therefore, CRF might moderate the association between PA and cardiometabolic risk, however, only cross-sectional studies have examined such an influence of CRF on this relationship so far. **PURPOSE**: To examine if CRF moderate the prospective association between PA and cardiometabolic outcomes in 10-year-old children. **METHODS**: In total, 718 children (50.3 % boys) had valid measures of PA measured by accelerometry (GT3X), and CRF assessed by the Andersen intermittent running test, as well as the cardiometabolic outcomes; systolic blood pressure, waist circumference (WC), total cholesterol, high-density lipoprotein, triglycerides, glucose, and insulin. Outcomes were analyzed individually, and as a clustered cardiometabolic risk score (sum of z-scores). PA and cardiometabolic risk factors were measured at baseline and follow-up seven months later. Linear mixed modelling was used to examine the prospective associations between PA exposures and cardiometabolic risk outcomes, including the interaction term ($PA\times CRF$) in the model to assess moderation by CRF. **RESULTS**: CRF modified the association between baseline PA (counts per minute) and between moderate-to-vigorous PA (MVPA) (min/day) with clustered cardiometabolic risk at follow up ($P<0.026$). Moreover, CRF modified the association for PA and MVPA with insulin resistance independent of WC ($P<0.022$). When stratified by CRF level (low/high), PA and MVPA predicted lower insulin resistance [MVPA β-0.119 (95% CI: -0.207, -0.038); P=0.008] and clustered cardiometabolic risk [MVPA β -0.092 (95% CI: -0.166, -0.018); P=0.014] in children with low CRF, but not among their fitter peers ($P>0.323$). **CONSLUSION**: CRF moderate the prospective association between PA and clustered cardiometabolic risk; this moderation was most pronounced for insulin resistance. Our findings suggest that PA may be especially important in children with low CRF.

2823   Board #106   June 1 2:00 PM - 3:30 PM

Physical Activity Influence On Behavior Of Children With ADHD & DBD During Instruction Using Classroom Observation

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(No relevant relationships reported)

Evidence suggests physical activity influences children's neurocognitive function and ADHD symptoms. ADHD and Disruptive Behavior Disorder (DBD) are highly comorbid. Extra-curricular physical activity programs may improve academic achievement in ADHD and DBD by increasing academic engagement levels during instruction closer to those of typically developing peers. However, few studies have tested the impact of physical activity on objectively-measured classroom behavior in children with ADHD and/or DBD. **PURPOSE**: To evaluate the impact of physical activity on behavior for children with ADHD and/or DBD using a tool which objectively measures classroom behavior.

METHODS: African American children with ADHD and/or DBD were randomized to a 10-week after-school physical activity program (n=19) or a sedentary control program (n=16). Only 18% had ever received mental health services despite 87% meeting positive or intermediate criteria for ADHD and/or DBD. At posttest, 3 systematic classroom observations were conducted for each student using the BOSS (Shapiro, 2004). For comparison, each BOSS observation also assesses behavior among non-participant classroom peers. ANOVA tested differences in academic engagement and off-task motor (OFT-M) and verbal (OFT-V) behaviors among the physical activity group, control group, and classroom peers. Bivariate correlations tested relationships between program attendance and classroom behavior. **RESULTS**: Omnibus tests revealed differences in OFT-M (F[2,23]=16.9, $p<.001$) and a trend for academic engagement (F[2,23]=2.6, p=.09). Pairwise comparisons revealed that the physical activity and control groups evidenced 52% and 49% more OFT-M (ps<.01), 34% and 33% more OFT-V (ns), and 11% and 15% less academic engagement (ns) than classroom peers. No differences were evident between intervention groups. Large non-significant correlations were found between program attendance and academic engagement in both physical activity (r=.45, p=.08) and control (r=.45, p=.11) groups. **CONCLUSION**: Neither after-school program improved classroom behavior of children with ADHD and/or DBD to levels of classroom peers. Extra-curricular physical activity programs will require greater intentionality to impact classroom behavior in this population.

2824   Board #107   June 1 2:00 PM - 3:30 PM

The Strong Influence of Vigorous Physical Activity on Cardiorespiratory Fitness in Children

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(No relevant relationships reported)

The influence sedentary time has on cardiorespiratory fitness and health has recently received increased attention. Children become less physically active and more sedentary as they advance through childhood to adulthood, contributing to decrements in cardiorespiratory fitness. **PURPOSE**: The current study examined the relationship among objectively measured cardiorespiratory fitness, physical activity, and sedentary time in children.

METHODS: Participants (n = 35; 15 girls, 20 boys) had cardiorespiratory fitness measured by a maximal treadmill test with VO_2 assessed continuously. Sedentary time and physical activity were objectively assessed by accelerometry for 7 days. Multiple linear regression analyses were performed to identify independent associations of sedentary time, light, moderate, and vigorous physical activity with cardiorespiratory fitness. ANCOVA was used to evaluate whether VO_2peak varied by high/low physical activity/sedentary time groups (high physical activity, low sedentary time; high physical activity, high sedentary time; low physical activity, low sedentary time; low physical activity, high sedentary time). **RESULTS**: VO_2peak was negatively associated with sedentary time and positively associated with light, moderate, and vigorous physical activity (p < 0.05). Further analysis revealed sedentary time (β = -0.03), waist circumference (β = -0.63), and age (β = 2.06) were significant predictors of VO_2peak when not accounting for physical activity in the model. When accounting for physical activity, vigorous physical activity (β = 0.18), waist circumference (β = -0.92), age (β = 2.26), and sex (β = -4.51) were significant predictors of VO_2peak. Lastly, VO_2peak was higher in the low sedentary/high physical activity and high sedentary/high physical activity groups compared to the high sedentary/low physical activity group (p < 0.05). **CONCLUSIONS**: These results suggest cardiorespiratory fitness is predicted by vigorous physical activity, waist circumference, age, and sex but not sedentary time in children. Strategies aimed to promote and improve cardiorespiratory fitness and health in children should emphasize vigorous physical activity.

2825   Board #108   June 1 2:00 PM - 3:30 PM

The Correlations Between Families' SES and Physical Activity Levels of School-aged Children in China

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(No relevant relationships reported)

In recent 30 years, China has made great changes in social and economic. These changes have made a significant impact on health and lifestyle as witnessed by an increased level of physical inactivity among school-aged children. Previous studies have indicated that families' socioeconomic status (SES) can influence children'physical activity (PA), but few studies have explored the correlation between the SES of families and the PA levels of children in China using a large sample survey. **PURPOSE**: To determine the correlation between SES of families and the PA levels of school-aged children in China.

METHODS: Cross-sectional analyses of data from the 2016 Physical Activity and Fitness in China - the Youth Study. Participants were 90,712 primary, junior middle, and junior high school children aged 9-17 years old, recruited from 1204 schools across 32 administrative provinces in the Mainland of China. Participants' moderate-to-vigorous physical activity (MVPA) levels and SES of family were collected via a questionnaire completed by the children and guardians.
RESULTS: Analysis of covariance revealed that 9-11-year-old boys from high SES families spent more minutes per day in MVPA (Mean ±SE: 55.4±1.1) than those who from mid-SES and low SES families (50.1±0.6, 47.9±0.6, P<0.001). Regarding the girls aged 12-14 years, those who from high SES families spent more minutes per day in MVPA (47.9 ±0.8) than those who from mid-SES and low SES families (47.2 ±0.5, 45.2 ±0.4, P<0.001).Logistic regression analysis showed that 9-11-year-old children those who from low SES families were less likely to meet MVPA recommendations (boy: adjusted odds ratio (aOR) =0.74, 95%confidence interval (CI): 0.66-0.83; girls: aOR =0.83, 95%CI: 0.75-0.93) compared with children from high SES families. However, girls in age 15-17 years old who from low SES families were found to be more likely to meet recommendations compared with who from high SES families (aOR =1.31, 95%CI: 1.15-1.48).**CONCLUSIONS**: Overall, the average MVPA minutes per day among Chinese school-aged children is low, and families SES may be considered in the development of PA interventions and policies.

2826   Board #109   June 1 2:00 PM - 3:30 PM

Physical Activity in Latina Caregivers of Children with Developmental Disabilities

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(No relevant relationships reported)

Latina caregivers of children with developmental disabilities (DD) have more chronic health conditions and poorer health compared to both White and Latina caregivers of children without DD. It has been well documented that Latina women, in general, report less than recommended levels of physical activity (PA). A challenge of Latina caregivers is that they focus on caring for the family and the child with DD and take less time to care for themselves which contributes to the low levels of leisure-time PA and exacerbates already existing health disparities in this population. **PURPOSE**: To describe PA levels of Latina caregivers of children with DD and identify if one educational session led to changes in PA. **METHODS**: An 8-week caregiver intervention pilot was conducted with 24 caregivers of children with DD. *Promotoras de Salud,* community health worker (CHW) provided health education. Participants met with CHW in two-hour home visit sessions once a week. One entire session was dedicated to PA, which included the importance and benefits of PA, incorporating PA in everyday routines, and a stretching exercise activity. Participants had a wrist-worn ActiGraph GT3X+ accelerometer for 7 days at baseline and 8 weeks. **RESULTS**: This analysis included accelerometer data from baseline and post-test of 18 caregivers, M_{age}=44.2, all foreign born. The majority of this sample was highly active with a range of 7132 to 19620 steps/day at baseline and 72% and 67% of the participants exceeding 10,000 steps/day at baseline and at post-test, respectively. Participant's average step count significantly decreased at post-test (M=11092, SD=2705) from baseline (M=12055, SD=3247), t(17)=2.10, p=0.025. **CONCLUSIONS**: The present study suggests that Latina caregivers of children with DD are physically active. However, we were not able to identify whether this activity was from leisure-time, occupational or caregiving as we were only able to report on step count from wrist-worn accelerometer data. The program was designed to promote and sustain positive health behaviors, and one 2-hour educational session was not enough to promote PA. PA Interventions for Latina caregivers of children with DD should promote leisure-time PA to address the health disparities in this population.

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Weight Status Influences Effectiveness of Need-Supportive Physical Activity Summer Camp in Girls

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(No relevant relationships reported)

PURPOSE: Habitual physical activity (PA) is a major factor related to obesity risk. Research has shown PA interventions among adolescents to be moderately successful in the short-term but limited to sustained behavior change. Self-determination theory (SDT) postulates that a psychological need-supportive environment (i.e. one that supports competence, autonomy, and social relatedness) is effective in maintaining volitional motivation which can lead to sustained positive behavioral changes including PA. Although research has supported the central tenets of the SDT, there is limited evidence examining whether a summer camp intervention

can sustain improvements in PA motivation and behavior. This study examined the effectiveness of a 1-week need-supportive summer camp to enhance self-determined PA motivation and behavior at 12-weeks post-camp. **METHODS:** Adolescent girls [*N*=42; *n*=18 overweight or obese girls (OW/OB, >85th percentile); M_{age} = 11.7±1.1] attended a one-week (5 days) camp intentional in need-supportiveness and completed follow-up 12 weeks post-camp. Objective PA was measured via accelerometer. Self-determined PA motivation was assessed using Behavioral Regulations in Exercise Questionnaire-3. **RESULTS:** At baseline, compared to OW/OB, healthy weight girls (HW): a) were similar in PA motivation (18.66±3.52, 19.88±3.59; *p*>.05), b) took more steps/day (12,172±2,103 vs. 7,442±3,737; *p*<.05), and c) engaged in greater moderate-to-vigorous intensity PA (MVPA) (291.7±46.4 vs. 185.4±90.8, *p*<.05). In PA motivation, the repeated measures analysis of variance results showed a significant within-subjects effect (*F*[1,38]=6.83, *p*=.019, η^2=.29). The within-subjects contrast analyses examining the growth trajectories showed a linear and positive growth pattern for OW/OB but a quadratic inverted U-shape for HW. Similarly, the analysis of covariance determined that the camp had a significant between-group effect on PA (steps: *F*[1,19]=15.83,*p*=.001, η^2=.46; MVPA: *F*[1,19]=21.63, *p*>.001, η^2=.52) with OW/OB increasing their PA whereas HW PA remained stable. **CONCLUSIONS:** These findings suggest that the psychological need-supportive summer camp may be more effective in improving and sustaining PA motivation and behavior in OW/OB compared to their healthy weight counterparts.

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Safety and Health Outcomes of a Physical Activity Program for Adolescents with Type 1 Diabetes

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(No relevant relationships reported)

Purpose: Evaluate *Bright 1 Bodies (B1B)* intervention for sedentary adolescents with type 1 diabetes (T1D) for safety and health outcomes.
Methods: Eighteen sedentary adolescents with T1D (age 13.7±2.3y, female 67%, Black/Latino 67%, BMI 88±12%'ile, annual income 33% <$20k, 55% <$40k, A1c 9.5±2.3%, 79.9±25.1 mmol·mol^{-1}) participated in group exercise classes (35min @ 60-80%HR_{max}) and self-management education 1x·wk[-1] for 12wk. Anthropometrics, glycemic control, brachial blood pressure, fasting lipids, and cardiopulmonary fitness (15m Progressive Aerobic Cardiovascular Endurance Run modified to slower starting speed, MPACER) were compared at baseline and 12wk using repeated measures ANCOVA for intent-to treat (n=18) and per protocol completers (attended ≥8 sessions, n=10).
Results: Blood glucose (BG) dropped from 12.16±4.35 mmol·L^{-1} at start of exercise to 9.16±2.94 mmol·L^{-1} at completion (p<0.01). Hypoglycemia (BG≤3.89 mmol·L^{-1} with signs and/or symptoms) occurred once (0.6%). Average of 8.6±12.1g carbohydrates were required before, during, and/or after exercise. In the total sample (n=18) there were no changes in BMI, A1c, cardiopulmonary fitness, body fat, waist circumference, mean arterial pressure, or lipid profile (p>0.05). In the 10 completers, cardiopulmonary fitness improved (30.0±17.3vs37.1±20.8 MPACER shuttles, p=0.04), LDL increased but within normal ranges (2.23±0.54vs2.52±0.59 mmol·L^{-1}, p=0.02), and all other variables were unchanged (p>0.05).
Conclusion: B1B was safe for sedentary adolescents with T1D and improved cardiopulmonary fitness among completers. Exercise sessions decreased BG into ADA target range (3.9-10.0 mmol·L^{-1}) with low risk of hypoglycemia and minimal need for supplemental carbohydrates (~35 kcals per 35min exercise session). However, overall glycemic control remained poor and BMI overweight, suggesting this at-risk population needs more intensive interventions.

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Variability In Implementation Of A Classroom-based Physical Activity Intervention: Implications For Disparities In Pediatric Physical Activity Participation

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(No relevant relationships reported)

PURPOSE: Disparities in physical activity (PA) participation remain a public health concern with higher rates of inactivity reported in ethnic minority and low-income

youth. When implemented effectively, classroom-based PA interventions may help to reduce these disparities by providing structured PA at school. The purpose of this study was to evaluate the variability in implementation of Interrupting Prolonged Sitting with ACTivity (InPACT), a classroom-based PA intervention, in three economically and racially diverse schools in Southeast Michigan. **METHODS:** Three elementary schools in Michigan, one suburban (school 1: 90% white; 25% on free/reduced lunch), one rural (school 2: 90% white; 50% on free/reduced lunch) and one urban (school 3: 59% black; 74% on free/reduced lunch) participated in this 16-week study. Prior to the start of the intervention, teachers were trained to incorporate 10, 3-minute moderate-to-vigorous physical activity (MVPA) breaks in their classrooms each day. Throughout the intervention, teachers completed surveys to document the number of MVPA breaks completed per day. Direct observation was also used to assess intervention fidelity. **RESULTS:** There was a significant difference in the number of MVPA minutes completed in the classroom per week by school (school 1: 82±11min; school 2: 98±11min; school 3: 50±13min; p=0.04). There was also a significant difference in the percent of students who engaged in MVPA by school (school 1: 92±0.03%; school 2: 84±0.03%; school 3: 77±0.05%, p=0.02). There was a trend towards a significant difference in the number of activity breaks implemented per day (school 1: 5 breaks; school 2: 6 breaks; school 3: 3 activity breaks; p=0.06). **CONCLUSIONS**: Implementation of the InPACT intervention varied by school with school 3, the low-income, ethnically diverse school accumulating significantly fewer minutes of MVPA in the classroom compared to the higher-income, predominantly white schools. Although this intervention was successful in two of our three target schools, tailored intervention strategies are needed to improve implementation in low-income schools to better address disparities in physical activity participation.

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Effect Of School-based Physical Activity Programs On Hamstring Flexibility: A Meta-analysis

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(No relevant relationships reported)

PURPOSE: Flexibility is an often neglected but very important physical fitness component that is gaining attention regarding its role in correct posture and the incidence of chronic injuries, especially among children and adolescents.The aim of the study was to examine the chronic effect of school-based physical activity (PA) programs on hamstring flexibility (HFlex) and to evaluate potential moderators of this effect using a meta-analytic approach.
METHODS: A computerized literature search was conducted based on five databases: SPORTDiscus, Google Scholar, PubMed, Dialnet Plus, and MEDLINE. Studies needed to meet the following inclusion criteria to be included in the meta-analysis: 1) a randomized controlled trial design, 2) PA program took place in a school setting 3) published in English or Spanish, and 4) reported descriptive statistics that permitted effect size (ES) calculation. A random-effects model with a within-group design was used to calculate the ES. The moderator effects were analyzed either by one-way analysis of variance of independent groups or by Pearson product-moment correlation coefficients, depending on the variable considered.
RESULTS: From 2006 articles, 13 studies representing 18 ES's and totaling 792 participants (males and females, 10.3 ± 0.5 yo) were included in the analysis. The mean quality score for the studies was 3.4 ± 0.7 (on a scale from 1 to 5). A moderate overall ES of 0.38 ($p \le 0.001$; $CI_{95\%} = 0.22$ to 0.87; z=4.58; Q=13.38; I^2=92.48%) was found suggesting a low-moderate effect of the school-based PA programs to enhance HFlex. Neither a) quality of the studies (r = -0.43, p = 0.87), b) number of intervention sessions (r = -0.16, p = 0.52), nor c) minutes per session (r = -0.03, p = 0.91) were significant moderators. Sex could not be included as a moderator because 78% of the studies did not report the effect on HFlex separately by sex. No bias was found according to Egger's regression analysis (*p=0.80*).
CONCLUSION: School-based PA programs have a significant positive overall effect on children and adolescents' HFlex compared with their control peers. Reporting the effect differentiated by gender and including detailed group demographic data (i.e., experimental and control) is recommended for individual studies.
KEYWORDS: hamstring flexibility, school-based physical activity

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Interventions for Increasing Physical Activity in Low-Income, Ethnic Minority Children and Youths: Meta Analysis

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(No relevant relationships reported)

Ethnic minority and economically disadvantaged children and youths often show high levels of risk and vulnerability to physical inactivity and health issues. **PURPOSE:**

To provide a better understanding of and examine the effectiveness of interventions to increase physical activity (PA) in children and youths from low-income families and ethnic minorities (LIEM) through a meta-analysis. **METHODS:** We identified relevant studies through August 2017 from PubMed, Medline, CINAHL Plus, SportDiscuss, ERIC, PsychINFO, Scopus, ProQuest, and The Physical Activity Index. The main outcomes were the general PA levels and moderate-to-vigorous- intensity of PA. Inclusion criteria applied were: (a) necessary statistics to compute effect sizes (ES); (b) PA intervention studies; (c) LIEM participants aged 3-12 years; and (d) full-text articles written in English and published in peer-reviewed journals. A random-effects model was used to estimate the ES. Furthermore, moderator analysis was conducted using five moderators: (1) intervention duration (<13, 13-47, or >47 weeks); (2) participant age (<10, 10-12, or >12 years); (3) intervention delivery (teacher, parents, teacher and parents, or specialists), (4) technology (used or not used); and (5) behavioral modification (used or not used). The ES were calculated using the Comprehensive Meta-Analysis 3.0. The ES were computed using Hedges g with 95% CI, and the group difference was examined using the Q-statistic. **RESULTS:** The results indicate that there were small to medium effects of PA interventions on PA (Overall ES = .325, 95% CI = .088, .561). Moderator analysis did not identify any significant differences across groups. However, ES for groups with less than 13 weeks (ES = .527, 95% CI = .163, .891, *p* = .005), participants aged 10-12 (ES = .540, 95% CI = .185, .895, *p* = .003), interventions delivered by specialist (ES = .535, 95% CI = .104, .966, *p* = .015), interventions without technology (ES = .367, 95% CI= .099, .634, *p* = .007), and interventions with behavioral modification (ES = .314, 95% CI = .046, .582, *p* = .022) were significantly different from zero. **CONCLUSION:** The results from this study indicate that interventions targeting increase in PA in LIEM children and youths were somewhat successful with small to medium effects.

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Standing Desk Intervention In Elementary School Children: Effects On Physical Activity And Sedentary Behavior

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(No relevant relationships reported)

Movement is very important for the growth and development of children. However, according to NHANES accelerometer data, children aged 6-11years spend almost half of their day sedentary. Therefore, identifying ways to increase physical activity is important to the health of children. **PURPOSE:** To determine the effect of replacing traditional sitting desks with standing desks on total daily sedentary behavior (SB) and physical activity (PA) in elementary school children. **METHODS:** A 9- week within-classroom, controlled design, with teacher allocation to either a traditional seated desk (CON) or a standing desk (INT) was conducted during the first part of the school year. Baseline (September) and post assessments (December) included five consecutive weekdays of waking hour, hip-worn accelerometer (Actigraph GT3x+) assessments. Wilcoxon Rank Sum and Kruskal-Wallis Tests were used to detect significant between group differences (p<0.05) in changes in SB, light-intensity PA (LPA), and moderate-to vigorous-intensity PA (MVPA). **RESULTS:** 22 third (8.5 ±0.7y), 36 third (9.7 ±0.5y) and 41 sixth (11.7 ±0.4y) grade students completed the study and provided complete accelerometer data during the school day. During the intervention, students were exposed to the standing desks in the classrooms (homeroom time) for 19h of the possible 34.4 h per week that students attended school. While both groups showed an increase in percent of homeroom time sedentary and a decrease in PA, changes in SB and PA were significantly less in the INT group than the CON group (SB, p=0.033; LPA, p=0.004; MVPA, p=0.003). Specifically, the INT increased SB by 1.9% and decreased MVPA by 0.1% of wear time, while the CON group increase SB by 6.2% and decreased MVPA by 3.1% of homeroom time. Similar trends in PA, but not SB or sitting, were seen when examining the entire school day. **CONCLUSIONS:** As the school year progresses, there is a tendency for student to increase sitting and decrease PA. The introduction of the standing desk was shown to positively curtail these trends. Therefore, standing desks may be useful in preventing sedentary activity in elementary school classrooms, especially among younger children.

2833   Board #116   June 1 2:00 PM - 3:30 PM

Impact Of Coordinated-bilateral Physical Activities On Attention And Concentration In School-aged Children

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(No relevant relationships reported)

PURPOSE: This study examined the effects of a 4-week, daily 6-minute coordinated-bilateral physical activity (CBPA) breaks in classroom on attention and concentration in school-aged children. **METHODS**: 116 fifth graders from two elementary schools were assigned to three groups: two intervention groups (n= 60) and one control group (n = 56). Three groups were pre- and post-tested with the d2 Test of Attention, a cancellation test that measures students' performance in attention and concentration.

One intervention group (n = 31) participated in six minutes of daily coordinated-bilateral physical activity (CBPA) classroom break for four weeks. Another intervention group (n = 29), the Fitbit Only (Fitbit-O), wore Fitbits per day, five school days per week for four weeks without CBPA breaks. Processing Speed, Focused Attention, Concentration Performance, Attention Span, and Accuracy were used as parameters of attention performance for data analysis. The d2 Test had high test-retest reliability coefficients for all parameters, ranging from .95 to .98. A 2 × 3 ANOVA repeated measures were conducted, followed by the post hoc comparisons. **RESULTS**: The repeated measure ANOVA revealed a significant interaction between time × treatment in processing speed ($F_2 = 3.372$, $p = .038$, $= 0.058$), focused attention ($F_2 = 4.37$, $p = .015$, $= 0.074$), concentration performance ($F_2 13.53$, $p = .000$, $= 0.197$), and attention span ($F_2 = 8.04$, $p = .001$, $= 0.128$), but not in accuracy. Subsequently, the post hoc comparisons indicated that the CBPA group showed significant increases in processing speed ($F_1 = 6.876$, $p = .010$), focused attention ($F_1 = 10.688$, $p = .002$), concentration performance ($F_1 = 26.46$, $p = .000$), and attention span ($F_1 = 14.090$, $p = .000$) over the control, but not in accuracy. The CBPA group also showed significant improvement in concentration performance ($F_1 = 24.162$, $p = .000$) and attention span ($F_1 = 6.891$, $p = .011$), compared to the Fitbit-O. No significant changes in all five attention parameters were found between the Fitbit-O and the control. **CONCLUSIONS**: Engaging students in daily, highly-focused, coordinated-bilateral activities is an effective strategy to improve attention and concentration in school-aged children.

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The Impact Of Stand-biased Desks On After-school Physical Activity Behaviors In Children

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(No relevant relationships reported)

PURPOSE: To assess changes in after-school time spent performing sedentary behavior (SB), light-intensity physical activity (LPA), and moderate- to vigorous-intensity physical activity (MVPA) among elementary school children in response to the introduction of stand-biased desks in the classroom. **METHODS:** Thirty-one 6th grade participants were assigned by their teacher to either a traditional (TD) (n=16) or stand-biased (SBD) (n=15) desk. After-school PA and SB were measured using accelerometry on four consecutive weekdays at baseline (prior to introduction of the stand-biased desks), and again following 9-weeks of exposure to either a TD or SBD in the classroom. After-school weather conditions and sport participation were recorded during both measurement periods using National Oceanic and Atmospheric Administration (NOAA) data and the Youth Activity Profile Questionnaire (YAP), respectively. Wilcoxon Rank Sum Tests were used to detect significant differences (p<0.10) in changes in after-school SB and PA between groups. **RESULTS:** No significant between group differences were found during the after-school period in pre-post changes in time spent performing SB (p=0.770), LPA (p=0.740), vigorous-intensity PA (VPA) (p=0.599), or MVPA (p=0.470). Significant between group differences in the median change in proportion of time spent performing moderate-intensity PA (MPA) (SBD: -1.4%; TD: -0.2%, p=0.093) were detected, with the SBD group experiencing a decrease of 4.3 minutes/after-school period relative to a 0.1 minute increase among TD participants. Coinciding with a change in PA, it was found that the average after-school temperature decreased from 60.0 °F at pre to 11.4 °F at post, while daylight also decreased by 81 minutes during the after-school period. Further, after-school sport participation between groups also changed from pre-post, with TD experiencing an increase of two after-school sport participants, while SBD experienced a decrease in after-school sport participation of two participants. **CONCLUSION:** Stand-biased desks did not have a negative impact on children's after-school PA and SB. Instead, seasonal variation and the structure of children's after-school schedule may have a greater influence on after-school activity than a mild classroom-based stand-biased desk intervention.

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Evaluation of Physical Activity and Flexibility Metrics in Children with Congenital Heart Diseases or Obesity Attending a Golf Camp

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(No relevant relationships reported)

PURPOSE: The purpose of this study is to evaluate the effects of a 5-week summer golf camp on cardiovascular fitness and flexibility in youth with obesity and/or congenital heart disease.
METHODS: Twenty-six youth, ages 8 to 13, were recruited for the First Tee golf camp sponsored by the Children's Heart Association. Twelve patients had congenital heart disease and 14 patients were obese. The camp consisted of a 3-day SCRATCH

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golf training program followed by 5 weeks of golf sessions. Golf sessions were 90 minutes long, offered twice weekly, for a total of 13 sessions. Informed consent/assent was obtained for all participants. Pre and post-camp flexibility measurements were assessed via the back saver sit-and-reach test. Subjects completed the PACER test to assess aerobic capacity before and after the completion of camp.
RESULTS: Mean age of participants was 11 years old. Pre and post-test data from the PACER test was obtained from 22 (85%) participants (14 boys, 8 girls). There were significant improvements in PACER scores from baseline (p < 0.0001). 21 (95%) participants improved PACER scores by the conclusion of camp. PRE PACER lap score was (10.0 ± 5.6). POST PACER lap score was (13.3 ± 7.0). Pre and post-test sit and reach data was obtained from 25 of the 26 (96%) camp participants (17 boys, 8 girls). There were significant improvements in right and left leg sit and reach scores for both girls and boys (right side, p < 0.0001; left side, p < 0.0001). Right side PRE sit and reach was (9.7 ± 2.3) compared to POST = (11.3 ± 2.1). Left side PRE sit and reach was (9.5 ± 2.9) compared to POST = (11.4 ± 2.4).
CONCLUSIONS: Youth with congenital heart disease and/or obesity show significant improvements in flexibility and cardiorespiratory fitness after attending golf camp. Camp appears to offer health benefits in addition to learning about golf and may promote children to be outside and active. There is limited research on the effects of participating in a golf camp in pediatric congenital heart disease and obese populations; further studies may identify additional health benefits.

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The Association Of Blood Lipids With Selected Other CVD Risk Factors In Michigan Adolescents

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(No relevant relationships reported)

Cardiovascular disease (CVD) is the leading cause of death in adults in the United States. A concern in U.S. children is the increasing rates of CVD risk factors (obesity, dyslipidemia and low cardiorespiratory fitness) which tend to track into adulthood and are related to premature morbidity and mortality. Specifically, high levels of low-density lipoprotein (LDL), total cholesterol and blood pressure, alongside low levels of high-density lipoprotein (HDL) and cardiorespiratory fitness, have been identified as risk factors for CVD. **PURPOSE:** To identify the association of several CVD risk factors from a pediatric population participating in (S)Partners for Health. **METHODS:** This cross-sectional study included 248 (151 female, 97 male), 9-13 year old students in 2008-2013, from Michigan, who participated in baseline measures for the (S)Partners for Health. Pearson correlations were used to evaluate if LDL, HDL or total cholesterol were directly associated with body weight, percent body fat, waist circumference, body mass index (BMI), mean arterial pressure (MAP) and aerobic performance (20-meter PACER scores). **RESULTS:** There were significant, but weak, correlations among HDL, LDL, total cholesterol and body weight, body fat, waist circumference and BMI (Table 1). **CONCLUSION:** The weak associations between lipid indicators and CVD risk factors measured in (S)Partners for Health align with previous research. Future studies should investigate the modifiability of these variables and use factor analytic or profiling techniques to address the various measurement properties of this extensive CVD risk assessment battery to improve efficiency.

Table 1: Correlation of lipid indicators and other CVD risk factors					
	Body Weight	Body Fat	Waist Circumference	BMI	20-meter Pacer Score	MAP
HDL	-0.268**	-0.292**	-0.264**	-0.239**	0.107	-0.032
LDL	0.305**	0.330**	0.309**	0.334**	-0.151*	0.232**
Total Chol.	0.226**	0.265**	0.241**	0.268**	-0.132*	0.219**
** p<0.01 * p<0.05					

2837   Board #120   June 1 2:00 PM - 3:30 PM

Changes in Physical Activity Enjoyment following HIIT Training in Adolescents

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(No relevant relationships reported)

Pleasurable experiences with exercise appear to be important in the development of positive lifelong physical activity habits in adolescents. High-intensity interval training (HIIT) has been described as being a more pleasurable experience then traditional exercise training. **PURPOSE:** The purpose of this investigation was to describe the impact of HIIT training on enjoyment of physical activity, cardiovascular fitness,

and body composition in male and female adolescents. **METHODS:** Thirteen (6 male, 7 female; Age=12.8$\pm$0.7 years) adolescents completed an 8 week HIIT training program. HIIT training consisted of two 30 minutes sessions a week (5 min warm up, 20 minute stimulus, 5 min cool down). During the stimulus period, subjects completed twenty 30 sec "on", 30 sec "off" intervals. The initial "on" workload was set to be equivalent to 90% of maximal workload recorded during the VO_2max test, while the "off" workload was set to be equivalent to 50% of maximal workload. Intensities were adjusted during each session so that RPE during the last 5 intervals was equivalent to at least 9 out of 10 on the Borg RPE scale. Enjoyment of physical activity (Physical Activity Enjoyment Scale, PACES), VO_2max and body composition were assessed before and after the training program. **RESULTS:** Response to the PACES improved 23% following HIIT training (Pre=52$\pm$3, Post=64$\pm$3; p=0.01). Similarly, VO_2max (18%) (Pre=26.7$\pm$2.0 ml·kg^{-1}·min^{-1}, Post=31.6$\pm$2.7 ml·kg^{-1}·min^{-1}; p=0.002) and maximal workload (58%) (Pre=144$\pm$7 W, Post=228$\pm$18 ml·kg^{-1}·min^{-1}; p=0.001) increased as a result of HIIT. In contrast, body fat (Pre=46.6$\pm$2.5%, Post=44.9$\pm$2.4%; p=0.001) was reduced following HIIT. **CONCLUSION:** The results of this investigation indicate that HIIT training elicits a more positive perception of exercise and beneficial adaptations in cardiovascular fitness and body composition. HIIT training appears to be a good option to develop positive lifelong physical activity habits in adolescents.

2838 Board #121 June 1 2:00 PM - 3:30 PM

Effects Of A Weight Bearing Exercise Program On Bone Mineral Density Of Adolescent Female Athletes

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(No relevant relationships reported)

PURPOSE: Bone Mineral Density (BMD) is a modifiable target of the Female Athlete Triad for intervention. Low BMD can be screened, prevented, and treated. In female adolescents, low BMD is associated with increased risk of fracture and development of osteoporosis. Weight bearing exercise interventions are proven to elicit a substantial bone mineral accrual advantage in childhood. The purpose of this study was to evaluate for a change in BMD in female adolescent athletes after a weight bearing physical activity intervention designed to optimize BMD and bone architecture.
METHODS: : A convenience sample of 19 female high school athletes completed a Dual Energy X-Ray Absorptiometry (DEXA) scan and resting metabolic rate (RMR) as well as eating and activity questionnaires. Girls participated in a one hour program designed to improve BMD twice per week completing 16 sessions in 8-12 weeks. Following the program, girls completed a second DEXA scan. 12 months after the program, girls completed a third DEXA scan. Total Body Less Head (TBLH), lumbar spine, and Total Fat Free Mass (TFFM) were recorded. Energy availability (EA) was calculated using estimated energy intake from eating questionnaire and energy needs were estimated using the activity questionnaire added to their RMR. Girls were diagnosed with decreased EA if they consumed <30kcal/kg FFM per day. Repeated measures ANOVAs were run to examine differences between BMD between three time points.
RESULTS: Average age at the beginning of the study was 16.31±1.19. Fourteen girls were tested immediately after the exercise program and 8 one year after the program. There were no differences in TBLH, lumbar spine or TFFM (p=.22, p=.23, p=.29 respectively) over the program. Girls with decreased EA did not accrue BMD significantly differently than those with adequate EA.
CONCLUSIONS: BMD did not increase following a weight bearing exercise program in adolescent female athletes. EA did not affect accrual of BMD during this short time in this research cohort.

2839 Board #122 June 1 2:00 PM - 3:30 PM

Objectively Measured Physical Activity in Parent-Child Dyads Exercising Together in Five Activities.

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(No relevant relationships reported)

PURPOSE: To objectively measure and compare the intensity of 5 physical activities completed by parent-child dyads.
METHODS: Thirteen children (C) (6.6 ± 1.8 yrs) and their parents (P) (37.1 ± 7.5 yrs) participated in physical activity (PA) sessions. Each parent-child dyad completed 5 different PAs in random order [brisk walking (BRISK), jumping games (JG), dancing (D), body-weight exercises (BWE), and tag games (TG)] together for 8 minutes each. Minutes of PA for each participant was measured using Actigraph GT9X accelerometers worn at right hip. Time spent in moderate (%MPA) and vigorous (%VPA) PA were estimated using validated cut points for appropriate age ranges.

Independent t-tests were used to compare PA between P and C. A repeated measures ANOVA was used to compare PA across 5 different PAs, separately for P and C. Alpha was set at p < 0.05.
RESULTS: [P versus C]: C had more %VPA than P during BRISK (mean difference: 15.8 ± 23.1), JG (21.2 ± 0.1), D (16.2 ± 12.0), and TG (24.7 ± 7.6). P had more %MPA than C during BRISK (mean difference: 22.2 ± 4.9), JG (10.8 ± 3.1), and TG (12.3 ± 0.5). [Brisk walking]: BRISK (68.1 ± 18.8) resulted in more time spent in %MPA for P when compared to JG (28.2 ± 9.6), BWE (31.0 ± 8.8), D (39.7 ± 19.3), and TG (41.7 ± 10.3). C had more %MPA during BRISK (45.9 ± 23.7) than JG (17.4 ± 6.5). [Jumping games]: P had more %VPA in JG (29.4 ± 9.6) when compared to BRISK (00.0 ± 00.0), BWE (13.3 ± 6.3), D (5.3 ± 4.6), and TG (4.5 ± 5.3). C had more %VPA during JG (50.6 ± 9.5) than BRISK (15.8 ± 23.1), BWE (30.9 ± 12.6), D (21.5 ± 16.6), and TG (29.2 ± 12.9). [Body-weight exercises]: P had more %VPA during BWE (13.3 ± 6.3) when compared to BRISK (00.0 ± 00.0), D (5.3 ± 4.6), and TG (4.5 ± 5.3) and C had more %MPA during BWE (22.7 ± 9.6) than JG (17.4 ± 6.5). [Dancing]: P had more %VPA (5.3 ± 4.6) than BRISK (00.0 ± 00.0) (p < 0.05). [Tag Games]: P had more %MPA during TG (41.7 ± 10.3) when compared to JG (28.2 ± 9.6) and BWE (31.0 ± 8.8). C had more %MPA during TG (29.4 ± 9.8) than JG (17.4 ± 6.5). p < 0.05 for all comparisons mentioned.
CONCLUSIONS: C spent significantly more time in VPA during all 5 PAs when compared to P. However, P spent significantly more time in MPA during BRISK, JG, and TG than C. For both P and C, JG had the most VPA when compared to the other PAs. These findings can be used to plan future PA interventions for P and C exercising together.

2840 Board #123 June 1 2:00 PM - 3:30 PM

The Contribution Of A Community-Based Gym And Aquatics Program To Physical Activity In Children

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(No relevant relationships reported)

PURPOSE: To compare physical activity in children accumulated from gym and aquatic instruction during a 2-hour community-based physical activity program.
METHODS: The community-based program consisted of a summer weekday program and a fall Saturday program, with each program including both a gym and aquatics component. Each program served approximately 60-85 boys and girls 3-13 years of age. Observations were conducted over 10-12 sessions for each program to quantify the amount of physical activity engagement. Observations included use of the System for Observing Fitness Instruction Time (SOFIT) to quantify children's physical activity (e.g., sedentary vs. 'very active') and the context of the program (e.g., skill practice vs. free play). SOFIT observations were made by two trained observers, and the inter-rater reliability was greater than 90%. Physical activity and context variables were subjected to linear mixed model analyses, with type of instruction entered as a fixed factor, and multiple observations of the same age or skill group entered as a repeated factor.
RESULTS: Gym and aquatic instruction each contributed approximately 25 min of moderate-to-vigorous physical activity, with the proportion of time spent in moderate-to-vigorous physical activity not statistically different during aquatic vs. gym sessions (53.4% vs. 49.0%, $p = .09$). Compared to the gym session, however, the aquatic session resulted in less time sitting (4.8% vs. 17.2%) and more time 'very active' (25.1% vs. 13.9%, $p<.001$), as well as higher estimated energy expenditure (0.087 vs. 0.079 kcal/kg/min, $p<.001$). Compared with the gym, children spent less time in management contexts (i.e., breaks and transitions; 15.9% vs. 30.2%, $p<.001$) and more time in free play (10.7% vs. 0.7%, $p<.001$) during the aquatic sessions. **CONCLUSIONS:** The results suggest that these types of programs can be effective at engaging children in physical activity during out-of-school time, with the data from the aquatic sessions of particular interest. Additional research is needed to examine whether these results are consistent across different community-based programs and with varying skill level of program instructors, and whether the physical activity achieved with these programs provides health-related benefits in children.

2841 Board #124 June 1 2:00 PM - 3:30 PM

Physical Activity Enjoyment in Different Physical Activities in Parent-Child Dyads When They Exercise Together

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(No relevant relationships reported)

PURPOSE: To objectively measure and compare the enjoyment of 5 physical activities designed for parent-child dyads.
METHODS: Thirteen parent-child dyads (parents mean age = 37.1 ± 7.5 yrs, children mean age = 6.6 ± 1.8 yrs) participated in physical activity (PA) sessions facilitated by trained research assistants. The 6-point Visual Analog Scale (VAS), with 1 meaning 'like it very much' and 6 meaning 'don't like it at all', was used to assess

participants' enjoyment of each PA during the PA sessions. Each parent child dyad completed 5 different PA's together (brisk walking, jumping games, dancing, body-weight exercises, and tag games) in random order for 8 minutes each. Immediately after completion of each of the 5 PA's, research assistants provided the VAS to the parent and child, independently, and asked them to indicate their enjoyment rating of the preceding PA. A Mann-Whitney U test was used to compare enjoyment of the 5 different PA's between parents and children, with a significance level set at p < 0.05. Friedman tests were used to compare the differences in enjoyment of the activities separately for parents and children. Post hoc analyses with Wilcoxon signed-rank tests were conducted with Bonferroni corrections applied, resulting in a significance level set at p < 0.0125 to compensate for multiple comparisons.
RESULTS: Parent's enjoyment was significantly higher for dancing compared to children's (parents mean = 1.46 ± 0.78, children's mean = 3.00 ± 1.58, U = 34.5, p = 0.007). When comparing PA's performed by parents, parents enjoyed tag games (mean = 1.31 ± 0.48) significantly more than brisk walking (mean = 2.38 ± 1.21, Z = -2.547, p = 0.011) and body-weight exercises (mean = 2.77 ± 1.36, Z = -2.859, p = 0.004). When comparing activities performed by children, children enjoyed tag games (mean = 1.23 ± 0.59) significantly more than dancing (mean = 3.00 ± 1.58, Z = -2.825, p = 0.005).
CONCLUSION: Both parents and children enjoyed tag games the most, when compared to the other 5 PA's. These results could aid future PA programming and interventions when recommending activities for families to complete together. Future studies should investigate if varying enjoyment levels of parent-child dyads could impact the likelihood that they would exercise together where enjoyment levels are not matched.

2842   Board #125   June 1 2:00 PM - 3:30 PM

Effects Of An Educational, Nutritional And Recreational Camp Intervention In Health Parameters In Overweight Children

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(No relevant relationships reported)

PURPOSE: To investigate the impact of a Health Educational Program for Children (HEPchild) composed by 5 days of Camp Kids (KIDS) and 12-weeks of follow-up (FOU) on the Physical Activity Level (PAL), Sedentary Behavior (SB), Anthropometric data and Food Intake (FI) in overweight children. **METHODS:** Twelve children attended the HEPchild program which consisted of pre assessments, KIDS and 12 weeks of FOU. The PAL, SB and FI were assessed throughout questionnaires. **RESULTS:** The anthropometric were reduced (p<0.05) after KIDS which was maintained at the 12 weeks of FOU. After the FOU, children increased (p<0.05) their mean level of physical activity by 344 METs/week. In addition 25% of the children became more active (> 1500 and <3000METs/week) after FOU in comparison to pre KIDS. On the other hand, the amount of sedentary children (<600METs/week) decreased by 15% and the insufficiently active (600 at 1500METs per week) increased by 15%. The PAL leisure time increased significantly throughout the weekdays (26.0%) and the weekends (14.1%) after FOU comparing to pre KIDS. The SB showed a significant reduction in 177.14 and 41.43 minutes along the weekdays and the weekends respectively. Before KIDS, the consumption of sugars and candies were out of control (100% inadequate), and, after the intervention, 58.4% started to consume these foods in a balanced way. In addition, the body fat, triceptal and subscapular skinfolds, waist circumference and waist-to-height ratio decreased significantly after KIDS and the results maintained after FOU in comparison to pre KIDS. In addition, it was observed a significant reduction in body fat, triceps and subscapular skinfolds, waist circumference and waist-to-height ratio after KIDS which was maintained after FOU in comparison to pre KIDS. **CONCLUSION:** The HEPchild (5-days KIDS camp + 12 weeks of FOU) contributed to increase the PAL and to reduce the SB and anthropometric data in overweight children.

2843   Board #126   June 1 2:00 PM - 3:30 PM

Six-month Sustained Improvement In Motor Proficiency In Youth After A 24-week Home-based Intervention

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(No relevant relationships reported)

PURPOSE: Motor proficiency and physical activity (PA) levels are below average in youth with Prader-Willi syndrome (PWS), a rare neurodevelopmental disorder causing motor, behavioral, and medical challenges. This study aimed to determine if participation in a 24-week parent-led PA intervention led to sustained improvement in gross motor proficiency (MP) in youth with and without PWS.
METHODS: Participants included 107 youth ages 8-16 with PWS or without PWS but categorized as obese, assigned to an intervention group or to a wait-list control group. After serving as controls, the wait-listed group received the intervention. Follow-up assessments were then conducted six months post intervention. The home-based PA program included playground and interactive console games scheduled 4 days a week. Training and program materials were provided to families at baseline to guide implementation of the program. Gross MP (Bruininks-Oseretsky Test of Motor Proficiency body coordination and strength and agility subtests) was obtained at baseline (pre), after 24 weeks of participating in the intervention (post) and at 6-month FU. Scale scores are reported (Mean ± SE). Intent-to-treat analyses were conducted.
RESULTS: All youth demonstrated improved upper-limb coordination, bilateral coordination, balance, running speed and agility, and muscular strength at post (p<0.04 for all). At FU all youth maintained improvements in bilateral coordination (pre= 9.3±0.4, post=12.0±0.5, FU=11.6±0.6) and speed and agility (pre=9.2±0.4, post=10.8±, FU=11.4±0.5), p<0.05. At FU all youth maintained improvements in upper-limb coordination (pre=10.7±0.5, post=12.2±0.6, FU=12.1±0.8) balance (pre=8.1±0.3, post=9.3±0.4, FU=9.2±0.5) and strength (pre=8.0±0.3, post=9.0±0.4, FU=9.0±0.5), but the FU scores for these tests showed a slight decrease such that they were no longer significantly different from baseline (p<0.05).
CONCLUSIONS: This parent-led game-based PA program resulted in immediate positive changes in gross MP in youth with and without PWS with improvements maintained for six months post intervention. Participation in a PA routine emphasizing motor skill development at home shows promise in leading to sustained improvements in MP in obese youth and in youth with PWS.

2844   Board #127   June 1 2:00 PM - 3:30 PM

Are Graded Task-based Interventions The New Remedy For Unfit Overweight And Obese Female Adolescents?

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(No relevant relationships reported)

Promotion of physical activity and fitness in adolescent girls who are physically unfit and have less opportunity to practice remains a challenge, particularly in low income communities. It is therefore critical to identify new methods for increasing fitness in this population.
Purpose: To determine the efficacy of two graded task-based interventions in improving neuromotor fitness among adolescent girls.
Methods: Fifty-six female adolescents (14.4±0.9years) classified as overweight or obesity participated in the study. Participants were randomly allocated to receive either the graded Wii exercises or task-based functional exercise and attended weekly 45min exercise sessions for 14 weeks. During the training period, the participants received supervised exercise training that was systematically graded with simple objects such as sandbags and plastic bottles over 14 sessions. Outcome measures included motor competence, lower extremity muscular strength (both isometric and functional strength), aerobic and anaerobic fitness. Data on enjoyment and ratings of perceived exertion were collected for each session. A repeated measure ANOVA was used to analyse the data with significance level set *apriori* at p<0.05.
Results: At the end of the intervention, it was observed that both groups had significant improvement in motor competence [F(1,54)=0.465,p=0.001], lower extremity muscular strength (isometric strength) [F(1,54)=592.470,p=0.001], lower extremity muscular strength (functional strength) [F(1,54)=15.993, p=0.001], aerobic [F(1,54)=5.586, p=0.022] and anaerobic fitness [F(1,54)=45.792,p=0.001]. Though the two interventions were equally considered to be enjoyable by the participants, there was no difference in outcomes for the two groups.
Conclusions: The two graded task-based interventions may be useful for increasing neuromotor fitness in this population. People working with girls in this age group could implement either of the two depending available resources. We recommend the adoption of these interventions for physical education and/or fitness promotion programmes among girls in low income settings.

2845   Board #128   June 1 2:00 PM - 3:30 PM

The Effect of Education on Perceived Risk of Diabetes in Traditional-Age College Students

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(No relevant relationships reported)

Type II diabetes is a concern in the United States, and risk factors that contribute to this disease are largely mediated by lifestyle interventions. Identification of those at high risk for type II diabetes and implementation of risk reduction behaviors may prevent onset of the disease. **PURPOSE:** To investigate the effect education on the perceived risk of type II diabetes and intent to adopt healthier lifestyles in traditional-age college students. **METHODS:** 29 participants provided demographic information, physical activity level, anthropometric measures, and a blood sample, as well as completing the Risk Perception Survey-Developing Diabetes (RPS-DD), perceived risk of diabetes visual-analogue scale (PRD-VAS), and the diabetes risk calculator (DRC), with 17 of these participants also providing information on their intent to change fitness behaviors. **RESULTS:** RMANOVAs assessed changes across time in the RPS-DD and PRD-VAS. Kendall's tau-B correlations were conducted to examine relationships between the abovementioned variables. Data analysis revealed six participants at high risk for prediabetes and 12 with at least one risk factor for metabolic syndrome. RPS-DD risk and RPS-DD knowledge scores did not change, but analysis of the PRD-VAS indicated a significant change across time ($p = 0.01$). The DRC did not correlate with prediabetes or metabolic syndrome. Significant interactions between prediabetes status and perceived risk ($p = 0.04$), but not between prediabetes risk and intent to adopt healthier lifestyle ($p = 0.42$) were shown, and between metabolic syndrome and prediabetes risk ($p = 0.03$), as well as criteria for both diseases, excluding HbA1c ($p = 0.15$). **CONCLUSIONS:** Students in this study possessed many risk factors for developing type II diabetes. Those at high risk for such diseases demonstrated an understanding of their risk, but did not express an intent to modify their lifestyle behaviors. Further, the noninvasive prediabetes and diabetes risk calculator did not consistently identify these diseases in this population. Research should be dedicated to determining how to change perceived risk of developing type II diabetes, methods of promoting healthier lifestyles, and development of a validated noninvasive instrument for use among traditional-age college students.

2846   Board #129   June 1 2:00 PM - 3:30 PM

Associations between Chinese College Students' Social Cognitive Beliefs, Physical Activity, and Health: Sex Differences

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(No relevant relationships reported)

PURPOSE: Use of a theoretical framework can offer implications for physical activity (PA) intervention. College students represent a population which might benefit from theoretically-grounded PA interventions. This study investigated the associations among Chinese college students' Social Cognitive Theory-based beliefs, PA levels, and relevant health outcomes while also examining if sex were present for any outcome. **METHODS**: In June of 2017, 220 college students (115 females; $M_{age} = 20.29 \pm 2.37$) were recruited from a South Central Chinese University. Students' PA-related Social Cognitive beliefs (i.e., self-efficacy, enjoyment, family support, friends support, and environment) were assessed using a validated questionnaire. One-week PA levels were recorded via ActiGraph Link accelerometers. Finally, body fat percentage and objective health status were evaluated using the InBody 230 Monitor whereas cardiovascular fitness was assessed via the 3-Minute Step Test. **RESULTS**: Correlation analyses indicated both self-efficacy and environment factors were significantly related to family/friends' support and enjoyment (r range: 0.11 - 0.48, $p < 0.05$), and that friends' support were highly related to family support ($p < 0.01$). Interestingly, regression analyses revealed self-efficacy to negatively predict average MVPA per day ($\beta = -0.21$, $p < 0.01$) but, as expected, that a lower body fat percentage was predictive of improved objective health ($\beta = -0.17$, $p < 0.05$). Finally, significant sex differences were observed for average MVPA per day, $F(1, 213) = 22.2$, $p < 0.01$, $\eta^2 = 0.09$, PA self-efficacy $F(1, 217)=26.5$, $p < 0.01$, $\eta^2 = 0.11$, and PA enjoyment $F(1, 217) = 3.9$, $p = 0.05$, $\eta^2 = 0.02$, wherein males demonstrated higher values for all three outcomes. No other sex differences were observed. **CONCLUSIONS**: Findings suggest that male and female Chinese college students differ with regard to MVPA per day in addition to PA-related self-efficacy and enjoyment. As self-efficacy and enjoyment are predictive of long-term PA participation, PA interventions among college students, particularly females, are needed targeting these Social Cognitive beliefs to improve various health outcomes such as body fat percentage and cardiovascular fitness.

2847   Board #130   June 1 2:00 PM - 3:30 PM

Use And Acceptance Of Sit-to-stand Workstations In The College Classroom

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(No relevant relationships reported)

PURPOSE: To evaluate the impact and acceptance of portable sit to stand workstations in a college class. METHODS: This 10-week pilot study used a non-randomized two-group pre-post comparison design. Half of the students (n=7) had access to sit to stand workstations (STS) during one course (two 75-min class meetings per week). The other half (n=7) retained usual sitting desks (SIT) in all classes. All participants completed questionnaires at baseline, at the end of week 2, and week 10, which captured participant characteristics including age, sex, classroom engagement, and focus. A 7-day log was used to capture classroom sitting and standing at these three time points. After week 10, STS participants were asked about the acceptability of the sit to stand workstations and changes in perceived classroom engagement and focused attention. Mann Whitney U tests compared STS and SIT groups for classroom sitting, and classroom focus. Within the STS group, paired t-tests compared classroom focus between the traditional seated position and the non-traditional standing position. In addition, changes in classroom posture in the class with the sit to stand workstation and acceptability of the sit to stand workstations are reported. RESULTS: At baseline, fourteen students (21.9±1.9 yrs) reported sitting for 89.7% of all their classes (142.4 min/day). Despite no differences in overall classroom based sitting between the groups, the STS group trended towards increased classroom focus when standing compared to the SIT group (week 2: 3.7±0.8 vs 2.8±0.8; p=0.067, and week 10: 4.1±0.7 vs 3.4±0.5; p=0.058). When the STS group had access to the sit-to-stand workstations, sitting time decreased by almost 60% from 74 min/class at baseline to 43 and 44 min/class in weeks 2 and 10, respectively. Students reported that the sit to stand workstations were easy to use, enjoyed having the choice to sit or stand in class, and that engagement and focused attention was improved with the sit to stand workstations compared to traditional sitting. CONCLUSION: Providing college students with access to sit to stand workstations in some classes may reduce sitting, and help them focus.

2848   Board #131   June 1 2:00 PM - 3:30 PM

Examining the Relationships between Physical Activity Participation and Sleep Quality in Chinese College Students

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(No relevant relationships reported)

Purpose: Sleep quality and physical activity (PA) participation are two crucial factors that help individuals maintain a healthy lifestyle. However, evidence regarding associations between sleep and PA in young adults remains unclear. The purpose of this study was to determine the relationships between Chinese college students' objectively-measured daily PA and sleep. **Methods:** A total of 220 college students (115 females, $X_{age} = 20.29 \pm 2.37$, $X_{BMI} = 20.67 \pm 3.12$) were recruited from a university in South Central China. Participants wore a wrist accelerometer (ActiGraph GT9X Link) for 7 consecutive days. Participants' PA was defined by Troiano Adult (2008)'s cut points as follows: sedentary behavior (SB, 0-99 counts per minute [CPM]), light PA (LPA, 100-2019 CPM), moderate to vigorous PA (MVPA, 2020 and above CPM) (Troiano, 2008), while total sleep time (TST, mins/night) and sleep efficiency (SE%, the number of mins in bed/number of mins of sleep periods) were calculated from the same monitors. **Results:** Descriptive statistics indicated that participants spent 77.53% (SD = ± 10.03), 12.12% (SD = ± 2.68), 10.35% (SD = ± 2.73) of their time in SB, LPA, and MVPA, while TST and SE were 341.67 mins (SD = ± 80.65) and 84.12% (SD = ± 4.79), respectively. Correlation analyses revealed there was no significant relationship among SE, LPA, and MVPA (all p > 0.05). However, a significant positive relationship between SE and TST (p < 0.01, r = .31) was observed. Notably, there was an inverse relationship between TST and MVPA (p < 0.05, r = -.16), and between SE and SB (p < 0.05, r = -.16). Although multiple regression suggested the overall model was statistically significant [F (3, 219) = 5.72, p < 0.05, η² = 0.12] when age, gender, and BMI were controlled, SB did not appear to be an ideal predictor of SE. **Conclusion:** Accelerometry-determined daily PA was not related to sleep efficiency, suggesting higher PA participation does not necessarily improve sleep quality in the short-term. Notably, daily increases in MVPA may result in a reduction in TST. Nevertheless, decreased SB may lead to improvement in sleep efficiency. As low PA and low sleep quality are linked to adverse health outcomes, more long-term research with larger diverse samples examining how daily PA impact sleep is warranted.

2849   Board #132   June 1 2:00 PM - 3:30 PM

Research of the Perceived Exertion Scale of Physical Activity Intensity for Chinese Preschool Children

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(No relevant relationships reported)

PURPOSE: In previous studies, a variety of scales were used to evaluate physical activity intensity among children, such as the Children's Effort Rating Table and OMNI Scale of Perceived Exertion scale. However, most of the Perceived Exertion Scales are only applicable to children over six years old. Therefore, it is necessary to design a Perceived Exertion Scale of Physical Activity Intensity for Chinese Preschool Children (PESPAI).
METHODS:The draft scale was designed according to the children's Perceived Exertion Scales and the Observer Evaluation Scale of Physical Activity Intensity for Preschool Children of our previous research. A Zephyr monitor and an ActiGraph triaxial accelerometer were used to measure physical activity of 116 children. The children completed the PESPAI. The revision of the scale was based on the heart rate, Count value and children's feedback. Finally, the reliability and validity of the final scale were analyzed by SPSS Statistics 13.0.**RESULTS**: The PESPAI utilizes cartoon images for the items and contains 6 options. Each option includes a children's cartoon image, a ribbon and description language. Some children questioned the image of gender and minority characteristics. Thus, the revision of the scale was based on that. There was very significant difference between each option index ($P<.01$). It is indicated that the PESPAI can reflect the changes of different activity intensity of preschool children. There was a strong correlation between the scale scores in the first test and second test ($r=.842,P<.01$), indicating that the scale has high reliability. The scale scores of preschool children had a moderate correlation with heart rate only during high intensity activity. It is indicated that the correlation between scale scores and objective indexes is related to the physical activity intensity. When all the data were analyzed, it was found that there was a strong correlation between the scale scores and heart rate($r=.604, P<.01$), indicating that the scale has good validity.
CONCLUSIONS: The PESPAI utilizes cartoon images for the items and contains 6 options. The PESPAI has good reliability and validity, which indicates that the scale can be used to evaluate the preschool children's physical activity intensity. The scale is more applicable to evaluate high intensity physical activity.

2850   Board #133   June 1 2:00 PM - 3:30 PM

Effect of Physical Activity Over 1-Week on Peak Expiratory Flow in Asthmatic Children

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(No relevant relationships reported)

PURPOSE: Asthma is the most common chronic respiratory disease among children in the US, and may be a barrier to physical activity due to breathlessness and chest tightness. The purpose of this study was to determine if airway function was influenced by moderate to vigorous physical activity (MVPA) in asthmatic children over one week. It was hypothesized that as minutes of MVPA increased, peak expiratory flow (PEF) would also increase. **METHODS**: 45 children (6-13 yrs old), who were physician diagnosed with asthma, participated in a five-day asthma camp whose purpose was to improve child knowledge and management of their disease while providing a safe environment for normal summer camp activities. PEF as a measure of airway function was taken by a respiratory therapist for each child daily via a spirometer in the morning (0800). In asthmatic patients, PEF has been reported to correlate with forced expiratory volume in 1-sec (FEV_1). Objective MVPA was recorded daily with hip-worn Actigraph GT3X accelerometers from 0845-1125 and 1445-1625 at 5s epochs. Minutes of MVPA were calculated using validated child cut-points. Pearson correlations were used to examine relationships between minutes of MVPA and PEF across the week and by age group (young (Y) 6-9 yrs; older (O) 10-13 yrs). Repeated measures ANOVA was used to determine differences in daily mean PEF percent change and minutes of MVPA, controlling for short-relief medication use. **RESULTS**: Data from 37 asthmatic children were analyzed (boys: 58.5%) and divided among age groups (Y=50%; O=50%). Over the week, MVPA was 73.3 + 34.2 min/day. Pearson correlation coefficients were nonsignificant for PEF and minutes of MVPA across the week for total sample (r=-0.11, p=0.55) and by age group (6-9 years, r=0.10, p=0.72; 10-13 years, r=-0.28, p=0.25). PEF was not different (p=0.17) from baseline across time. **CONCLUSIONS**: These results suggest that airway function is not influenced by MVPA in asthmatic children over the course of a weeklong asthma camp. Future research should incorporate a longer intervention period and a larger sample.

2851   Board #134   June 1 2:00 PM - 3:30 PM

Are Latino Preschool Children Meeting Recommendations Related To The 5-2-1-0 Message?

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(No relevant relationships reported)

PURPOSE: Almost 17% of Latino preschool children are obese, which is far higher than their racial/ethnic counterparts. To address the key behaviors associated with childhood obesity, the 5-2-1-0 message was developed (>= 5 servings of fruits and vegtables [F/V], <= 2 hours of recreational screen time, >= 1 hour of physical activity [PA], and zero sugary drinks per day). In this study, we examined baseline data from ANDALE Pittsburgh, a culturally-tailored obesity prevention program, to determine whether or not Latino preschool children were meeting recommendations from the 5-2-1-0 message.
METHODS: N=51 parents (33.5±6.1 years) with preschool-aged children (3.5±1.2 years, 59% female) were recruited from community venues in Southwestern Pennsylvania. Screen time (parent survey; n=51), F/V and sugary beverage consumption (food screener; n=51), and PA (accelerometry; n=22) were assessed. For analysis, we used PA guidelines from the Institute of Medicine (IOM) recommendations for preschool children (>= 15 min/hour of total daily physical activity). Sociodemographic and home factors related to the 5-2-1-0 message were assessed via parent survey. A trained researcher measured child height and weight to calculate body mass index and percentiles. We calculated descriptive statistics [mean (SD) and frequencies (n)] in SPSS version 25.0.
RESULTS:Most parents were Mexican (63%), stay-at-home caregivers (71%), completed high school or less (55%), and had low acculturation (86%). On average, children consumed 2.25± 1.44 servings/day of F/V, consumed 15.5± 26 kcals/day from sugary drinks, accumulated 12.9± 2.9 min/hr of total PA, watched 98.7± 74.2 min/day of screen time, and 46% were overweight or obese. Only 6% of children met the F/V recommendation, 54% met screen time recommendations, 27% met the IOM PA recommendations, and 58% met the sugary drinks guideline.
CONCLUSIONS: In this community sample of Latino preschool children, nearly half were overweight/obese and few were meeting recommendations from the 5-2-1-0 message; this suggests our sample is comparable or worse off than the general U.S. preschool population for these key behaviors. Efforts are needed to effectively intervene and improve 5-2-1-0 behaviors associated with excessive weight gain in Latino preschool children.

2852   Board #135   June 1 2:00 PM - 3:30 PM

A Multi-level Analysis Of The Effects Of Epoch Length On Children'S Physical Activity Pattern

Han Chen. *Valdosta State University, Valdosta, GA.*
(No relevant relationships reported)

A Multi-Level Analysis of the Effects of Epoch Length on Children's Physical Activity Pattern
Purpose: Using the new generation ActiGraph GT3X+ accelerometer, the study examined the effects of different epoch lengths on children's moderate to vigorous physical activity (MVPA) generated by five different cut points while monitoring them during activity classes. The study also tested the moderating effects of physical activity (PA) level on the relationship between epoch length and MVPA.
Methods: The participants included both third ($n = 28$) and fourth grade ($n = 35$) students. Students in third grade participated in a Sports, Play, and Active Recreation for Kids (SPARK PE) class while the fourth graders were engaged in an active video game (AVG) class. Data were downloaded using 1s, 5s, 10s, 15s, 30s, and 60s epoch lengths. MVPA was determined by five different cut points. Multi-level analyses were conducted to test the effects of level 1 (i.e., epoch length) and level 2 (i.e., gender, body mass index [BMI], and class content) variables on MVPA. The study also examined the moderating effects of level 2 variables on the relationship between epoch length and MVPA.
Results: When lower cut points suggested by Freedson (2005), Evenson (2008), and Pulsford (2011) were used, MVPA increased, followed by the increase of epoch lengths. This positive relationship between epoch length and MVPA was stronger when the PA level was higher. When MVPA was determined by higher cut points suggested by Puyau (2002) and Mattocks (2007), epoch length was found to negatively relate to MVPA, and this relationship was stronger when the PA level was lower.
Conclusions: Different epoch lengths generate various MVPA levels, and the relationship between epoch length and MVPA is moderated by PA levels.

2853   Board #136   June 1 2:00 PM - 3:30 PM

The Development And Testing Of A Direct Observation Protocol For Children's Free-play Activity

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(No relevant relationships reported)

Traditional real-time direct observation (DO) systems have been used for decades to assess children's free-living physical activity (PA). Using video-taped DO would overcome several methodological issues and allow for more precise assessments of behaviors. **PURPOSE**: To develop and test a novel video-based DO system for children's free-play activity.
METHODS: Following iterative DO system development (The Observer XT, Noldus), 28 children (age=8.4±1.5 years) participated in a 30-minute indoor free-play session. The participants were recorded using a GoPro camera and wore an accelerometer on the hip (AG-H) and non-dominant wrist (AG-W). Researchers coded videos for the main Whole-Body Movement and four modifiers: 1) Locomotion, 2) Limb Movement, 3) Activity Type, and 4) MET value. For intrarater reliability, percent agreement was calculated from six randomly selected videos, using duplicate entries by an expert coder one-week apart. For inter-rater reliability, three videos were used to calculate percent agreement between entries from trained, novice coders (n=6) and the expert coder. To assess construct validity, time spent in activity intensity categories from expert-coded DO MET values were compared with accelerometer estimates using Wilcoxon Rank-Sum tests.
RESULTS: Percent agreement for intra-rater reliability was above 80% except for Locomotion (47%; video 4, 26%; video 3) and Limb Movement, and MET value (19%, 78%, respectively; video 3). Across all variables, percent agreement for inter-rater reliability ranged widely from 12%-96%, 0-100%, and 36%-97% for videos 1, 2 and 3, respectively. Mean estimated time spent in PA intensity categories from AG-H overestimated sedentary (SED; p=0.008), moderate (MPA; p<0.001), and moderate-to-vigorous PA (MVPA; p=0.017) and underestimated light, (LPA; p< 0.001). The AG-W underestimated SED (p=0.03) and LPA (p<0.001) but overestimated MPA (p<0.001) and MVPA (p<0.001).
CONCLUSIONS: The current DO system is feasible for observing detailed changes in children's free-play activity. However, refinement to the system must be made to improve reliability before it is adopted as a criterion measure for free-play activity in children. Supported by: University of Massachusetts Amherst Commonwealth Honors College

2854   Board #137   June 1 2:00 PM - 3:30 PM

Associations Of Physical Activity And Screen Time With Obesity In Chinese Children And Adolescents

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(No relevant relationships reported)

Associations of Physical Activity and Screen Time with obesity in Chinese Children and Adolescents
Zheng Zhu[1,2], Shengxia Ma[1],Yang Bai[3], Yan Tang[1,2], Jie Zhuang[1,2], Yang Liu[1,2] , Peijie Chen[1,2],Zhen-Bo Cao[1,2]
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3. University of Vermont, Burlington, VT
PURPOSE: The objective of this study was to examine the associations of physical activity and screen time with obesity in Chinese children and adolescents.
METHODS: We conducted cross-sectional analyses of 33,399 participants (boys:48.9%, age:12.5±2.5 yr, weight:48.1±14.9 kg, height:154.6±13.8 cm, Body mass index:19.7±3.9 kg/m^2) who completed height and weight measurement and physical activity and sedentary behavior questionnaire (including screen time and time spent in doing homework after school). Based on the criteria set by Working Group on Obesity in China, the participants were categorized into either obesity or not using the body mass index. The associations of physical activity and screen time with weight status were examined, through multiple logistic regressions, after controlling for gender, age and time spent in doing homework.
Results: The children and adolescents who did not meet the recommendation of at least 60 min/day of moderate to vigorous physical activity (MVPA) had 1.21 times the odds of being obese compared to those meeting the guideline (95% confidence interval [CI] of Odds Ratio:1.10-1.33), after adjusting gender, age, time spent in doing homework and screen time. The children and adolescents who did not meet the screen time recommendation of ≤2h/day had 1.16 times the odds of being obese compared to those meeting guideline (95% CI of Odds Ratio: 1.07-1.26) after adjusting gender, age, time spent in doing homework and MVPA. In joint association analysis, children

and adolescents who did not meet physical activity nor screen time guidelines had 0.45 times higher odds of being obese than children and adolescents who met both guidelines (95% CI of Odds Ratio: 1.27-1.66).
CONCLUSION: The results demonstrated that MVPA and screen time are independently but also jointly associated with obesity in Chinese children and adolescents.

2855   Board #138   June 1 2:00 PM - 3:30 PM

Teaching Styles in Physical Education: The Effects on Physical Activity Levels of Middle School Students with Different Motivation Types

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(No relevant relationships reported)

PURPOSE: Self-determination theory (SDT) has been widely investigated as a powerful theoretical framework to understand and change an individual's physical activity behavior in different settings (Deci & Ryan, 1985; De Meyer et al., 2016). However, there is a limited understanding on how entire SDT explains objectively measured moderate to vigorous physical activity (MVPA) levels of adolescents in physical education lessons. To examine if physical educators' teaching style influences student needs that affect student motivation, which in turn predict objectively measured student MVPA levels (i.e., a serial mediator model).
METHODS: A total of 313 students from three middle schools in Wisconsin completed Learning Climate Questionnaire modified from Williams and Deci (1996), Psychological Need Scale and Need Frustration Scale adopted from Chen et al. (2015), and Physical Education Questionnaire modified from (Aelterman et al., 2012) to assess perceptions of autonomy-supportive teaching, experience of need satisfaction and need frustration, and motivational outcomes, respectively. After a week of the survey administration, participants' MVPA levels were recorded using a GT3X+ accelerometer for four consecutive physical education lessons. PROCESS, a regression-based computational procedure program designed for mediation analyses in SPSS, was used to examine the mediating relationships.
RESULTS: Bootstrapping with 10000 samples showed that autonomous teaching behavior significantly influence MVPA levels through relatedness satisfaction and intrinsic motivation (b = .79; 95% CI: .29 - 1.35), autonomous teaching behavior significantly influence MVPA levels through competence satisfaction and intrinsic motivation (b = 1.17; 95% CI: .69 - 1.77), and autonomous teaching behavior significantly influence MVPA levels through competence satisfaction and identified regulation (b = 1.33; 95% CI: .83 - 1.99). In addition, bootstrapping with 10000 samples revealed that controlling teaching behavior significantly affects MVPA levels through autonomy frustration and amotivation (b = -.49; 95% CI: -1.03 - -.08).
CONCLUSIONS: The findings indicates that an autonomy-supportive teaching style may promote MVPA levels of middle school students during physical education lessons.

2856   Board #139   June 1 2:00 PM - 3:30 PM

Relationships of Physical Activity and Academic Achievement in the College Student Attending a Two-Year Institution

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(No relevant relationships reported)

PURPOSE: Physical activity is directly related to a healthy body along with a healthy mind. The relationship between physical activity and academic activity has been studied for decades. Researchers have focused on the effects on K-12 students. Academic performance in college students has been linked with: cognition, sleep, mental health, self-efficacy, diet, and stress. Depression and anxiety tendencies tend to have the highest prevalence of mental health issues in college students. All factors that have been shown to improve with exercise. This study will determine a correlation between organized and leisurely forms of physical activity and academic achievement in college students.
METHODS: Three hundred ninety-nine students, enrolled in classes at Normandale Community College completed a wellness questionnaire. Student participation was voluntary and responses were anonymous. The survey asked students to self- report factors related to: age, GPA, physical activity, sleep, diet, and GRIT (Duckworth's 8-item GRIT scale, a validated measure of Growth, Resilience, Intuition, and Tenacity). Correlation and Regression models were assessed in version 20 of SPSS.
RESULTS: Significant correlations were found between the response variable, GPA, and predictor variables of GRIT Score, students ages 17 and under, and occurrence of eating breakfast. GPA = 2.728 + (GRIT Score * .196) + (Age under 17 * .328) + (Breakfast all of the time * .197) + (Breakfast most of the time * .148). No significant differences were found between physical activity and GPA. The statistical significance for GRIT score and eating breakfast all the time had a p value < 0.001, age 17 and under p-value= 0.01, and eating breakfast most of the time p-value= 0.009.

CONCLUSIONS: This study found statistically significant correlations with GRIT score, age related GRIT score, and breakfast frequency. Results related to physical activity may have been related to social desirability responses. GRIT related to age is likely related to the required academic achievement of Post-Secondary Education Option students. Gender identification was not included in the survey to protect anonymity. Gender identification may change the correlation factors that were found.

2857   Board #140   June 1 2:00 PM - 3:30 PM

Changes In Student Perceptions of Interdisciplinary Collaboration After Community Health Fair Volunteer Experiences

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(No relevant relationships reported)

PURPOSE The purpose of this study was to identify student perceptions of interdisciplinary collaboration in healthcare professions before and after community health fair experiences. **METHODS** Three community health fairs provided an opportunity to introduce pre-healthcare students to interdisciplinary collaboration. A descriptive, mixed-methods design was used with an interdisciplinary convenience sample of pre-healthcare college students who identified as exercise science, Integrative Health Science, nursing, and nutrition majors. Surveys were conducted before and after the health fairs using a 7 item scale developed by Gallagher et al. (2010) and open-ended questions developed by the researchers that measured the impact of the collaborative experience. **RESULTS** A significant increase was observed in knowledge of community agencies that can provide optimum care ($\Delta 0.67$; t=-4.51; p=<0.000), knowledge of the value of an interdisciplinary healthcare team ($\Delta 0.85$; t=-7.17; p<0.000), knowledge of strengths and skills of other disciplines ($\Delta 0.69$; t=-5.95; p<0.000), and experience working with healthcare teams ($\Delta 0.97$; t=-5.43; p<0.000). Students more strongly agreed that other members of the healthcare team are important to their work after the health fair experiences than before ($\Delta 0.15$; t=-2.87; p<0.000). No significant change was found in attitudes towards the importance of communication between team members ($\Delta 0.03$; t=-1.00; p=0.32) or learning from other professionals ($\Delta 0.08$; t=-1.93; p=0.06). In open ended responses students indicated that they were motivated to learn about other healthcare disciplines to improve patient/client care and they experienced challenges in applying the professional values they perceive as important. **CONCLUSION** Students increased their knowledge of the value of an interdisciplinary healthcare team. Students recognized the importance of interdisciplinary collaboration, but engaged in collaboration to varying degrees. The health fairs provided an intentional, foundational experience to support development as future healthcare professionals and effective members of interdisciplinary teams. Using skills in a real-world setting helped students recognize their strengths and areas where their interdisciplinary teamwork skills may need improvement.

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Who Are the Undergraduate Equestrians in the Intercollegiate Horseshows Association, and What Are Their Lifestyle Habits?

Jessie Bitler, Helen Battisti, Shelby Yeager, Diane DellaValle. *Marywood University, Scranton, PA.*
(No relevant relationships reported)

Purpose: Given there is little available research on equestrian athletes, and none about the members of the Intercollegiate Horse Shows Association (IHSA), the purpose of this cross-sectional study was to describe demographic characteristics and lifestyle habits of undergraduate student members of the IHSA.
Method: Participants included 528 undergraduate student members from the eight zones of the IHSA (Age 20.30 ± 1.43 years, 96 % female, 91.7 % white). Participants completed an online survey including demographic characteristics, academics, years of riding experience, sleep, physical activity, fruit and vegetable intake, and alcohol (ETOH) and tobacco use. Body Mass Index (BMI) was calculated based on self-reported height and weight. Participants were divided into two groups (less experience and more experience) based on the sample median of 12 years of riding experience. Independent-samples t test and Chi-Square test of independence were used to assess differences between years of riding experience for characteristics and lifestyle habits.
Results: Participants reported 11.7 ± 4.5 years of riding experience, 55.7 % did not own their own horse and 64.8 % rode English. Mean GPA of participants was 3.4 ± 0.4 and 46.4 % reported majoring in math, science and animal sciences. There were no significant differences found between riding experience groups and BMI (23.2 ± 3.7 kg/m^2), alcohol consumption (34.3 reported none, 46.6 % reported < 1 serving ETOH per day), cigarette smoking (98.1 % non-smokers), fruit consumption (83.6 % reported 1-3 servings/day), vegetable consumption (82.8 % reported 1-3 servings/day), and hours of sleep per night (84.6 % reported 6-8 h/night). There were also no significant differences in physical activity within sport (44.1 % reported 30-60 min/day), vigorous physical activity outside of sport (59.2 % reported 0-30 min/day), and light activity outside of sport (64.8 % reported 15-60 min/day).

Conclusion: There were no differences between riding experience groups and demographics or lifestyle habits in this representative sample of undergraduate members of the IHSA. Given that this study is the first description of nutrition and physical activity habits of this understudied population, it opens the door to further research in this highly-trained group of equestrian athletes.

F-58   Free Communication/Poster - **Physical Activity and Cancer**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2859   Board #142   June 1 2:00 PM - 3:30 PM

Mid-term Effectiveness Of An Unsupervised Exercise Prescription Program In Breast Cancer Survivors

Gabriele Mascherini, Benedetta Tosi, Leonardo Osti, Giorgio Galanti. *University of Florence, Florence, Italy.*
(No relevant relationships reported)

Purpose The efficacy of physical exercise prescription as therapy in breast cancer survivors is largely documented in literature. Unsupervised exercise produces short-term improvements in physical fitness of breast cancer survivors, but regarding the mid-term effectiveness only few studies are available. The purpose of this study was to assess the effects of an unsupervised exercise prescription program on body composition, physical fitness and Health Related Quality of Life of breast cancer survivors. **Methods** Forty-two (average age 52.0 ± 10.1 years) women were enrolled. Assessments performed at baseline and after 6 months of exercise prescription: - body composition (anthropometric parameters and bioimpedance analysis); - physical fitness: aerobic capacity by Six-Minute Walk Test (6 MWT), limbs strength by Hand Grip Test and Chair Stand Test, flexibility by Sit and Reach Test; TOGLIERE PRESSIONI - Health Related Quality of Life (SF-36). Statistical analysis was conducted by Student's t-tests and multiple regression. **Results** Body composition improvements: - BMI (T0=27.3 ± 4.2; T5=26.1 ± 3.9 kg/m^2; p<0,001); - waist circumference (T0=90.2 ± 10.8; T5=85.3 ± 9.8 cm; p<0,001); - extracellular water (T0=17.5 ± 1.9; T5=16.8 ± 1.9 L; p<0,01); - fat mass (T0=25.0 ± 8.1; T5=22.6 ± 7.2 kg; p<0,001). Physical fitness improvements: - 6 MWT (T0=518.6 ± 133.0; T5=584.8 ± 97.2 m; p<0,001); - Hand Grip (T0=24.3 ± 4.8; T5=26.5 ± 4.5 kg; p<0,01); - Chair Test (T0=14.5 ± 3.8; T5=18.3 ± 4.3 repetitions; p<0,001); - Sit and Reach (T0=2.6 ± 9.3; T5=8.5 ± 7.1 cm; p<0,001). Health Related Quality of Life improvements: - Physical Functioning (T0=72.7 ± 24.6; T5=83.7 ± 17.1 %; p<0,001); - General Health (T0=64.7 ± 20.4; T5=69.1 ± 18.9%; p<0,001); - Social Functioning (T0=60.5 ± 24.5; T5=67.6 ± 22.9%; p<0,05); - Mental Health (T0=63.4 ± 14.8; T5=67.3 ± 12.5%; p<0,05). The percentage change in fat mass has been associated with adjuvant cancer therapy (intercept= -0,016; b=8,629; p<0,05). **Conclusions** An unsupervised exercise prescription program improves body composition, physical fitness and Health Related Quality of Life in breast cancer survivors. Longer term follow-up studies to establish the real capacity of this program to induce long-term changes in lifestyle are needed.

2860   Board #143   June 1 2:00 PM - 3:30 PM

The Effects of Smart Watch Intervention on Breast Cancer Survivors' Biomarkers and Health Outcomes

Nan Zeng[1], Chunyuan Han[2], Ning Liao[3], Zan Gao, FACSM[1]. *[1]University of Minnesota, Minneapolis, MN. [2]South China University of Technology, Guangzhou, China. [3]Guangdong People's General Hospital, Guangzhou, China.* (Sponsor: Zan Gao, FACSM)
(No relevant relationships reported)

PURPOSE: Adverse health outcomes are often seen among breast cancer survivors (BCS), with physical activity (PA) a possible solution in disease management. To date, little research has examined how smart watches might promote BCS' health-related outcomes. This study assessed the effectiveness of a smart watches PA intervention on biomarkers and functional fitness in Chinese BCS.
METHODS: Thirty-three BCS ($\bar{X}_{age} = 44.7 \pm 7.1$, $\bar{X}_{BMI} = 21.7 \pm 2.5$) were recruited from Southern region of China. All patients received a Xiaomi smart watch to track their PA behaviors (e.g., steps, *calories burned*, etc.). An individually-tailored exercise prescription (e.g., increasing step counts by $\geq 2,000$ steps/day to reach a daily step counts $\geq 9,000$ steps) was delivered to each patient based on their smart watch data collected via online server every month. Patients' biomarkers triglycerides (TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL), blood glucose (BG), carcinoembryonic antigen (CA), and functional fitness: leg strength and endurance (LSE; 30-second chair stand test); upper body strength and endurance (UBSE; 30-second arm curl test); lower body flexibility (LBF; chair sit and reach test);

shoulder range of motion (SRM; measured by back scratch test); aerobic endurance (AE; 2-minute step test); and mobility and balance (MB; up and go test), were assessed at baseline and 12-months.
RESULTS: Dependent t-tests revealed no significant mean differences in TC, HDL, LDL, and CA from pre- to post-test (all $p > 0.05$). However, significantly change in BG was observed ($p < 0.05$, Cohen's $d = 0.38$) at 12-months. Moreover, functional fitness LBF ($p < 0.05$, Cohen's $d = -0.55$) and MB ($p < 0.01$, Cohen's $d = 0.67$) significantly improved after the intervention. Notably, patients' AE ($M_{dif} = -92.26$, $p < 0.01$, Cohen's $d = -1.26$) demonstrated the greatest improvements among all outcomes.
CONCLUSIONS: A 12-month smart watch-based PA intervention may promote improved biomarkers and functional fitness among Chinese BCS. Such innovative PA intervention has important implications in promoting disease prevention and management in this population. Larger samples with randomized clinical trials are warranted.

2861   Board #144   June 1 2:00 PM - 3:30 PM
Changes in Sedentary Time and Physical Activity of Cancer Survivors Participating in an Exercise Program
Sarah Greterman. *Concordia College, Moorhead, MN.*
(No relevant relationships reported)

Purpose: The purpose of this investigation was to examine changes in sedentary time (SED) and physical activity (PA) of cancer survivors participating in a post-treatment, 12 week, group exercise program.
Methods: Forty-seven cancer survivors volunteered to wear armband activity monitors for seven consecutive days over three different time points of the group exercise program: weeks 1, 6 (midpoint), and 12 (endpoint). A repeated measures ANOVA with mixed model framework and time varying covariate compared time spent in SED, LIT, MOD, and VIG between weeks 1, 6, and 12 was used to analyze the data.
Results: Of the 47 recruited, 15 participants (age = 55.20 ± 13.85) completed week 1 (Group A), 19 participants (, age = 52.17 ± 11.71) completed weeks 1 and 6 (Group B), and 12 participants (; age = 53.08 ± 11.01) completed weeks 1, 6 and 12 (Group C). Participants averaged > 17 hr•day^{-1} of non-sleep activity monitor wear time with no significant differences in wear time (p = 0.05, F = 4.48). Minimal VIG PA resulted in combining MOD and VIG activity into one moderate-vigorous PA group (MVPA). Group C engaged in more PA compared to Groups A and B, but there were no statistically significant differences between Groups A and C (p = 0.24, F = 1.47) during week 1 or between groups B and C during both week 1 (p = 0.54, F = 0.39) and week 6 (p = 0.33, F = 0.98). For Group C, total PA based on wear time increased slightly from weeks 1 to 6 and decreased from weeks 6 to 12, but there were no statistically significant changes over all three time points (p = 0.12, F = 1.83). All three groups averaged more than 40 min•day^{-1} of MVPA. Group C engaged in less SED time compared to Groups A and B, but there were no statistically significant differences between groups A and C (p = 0.64, F = 0.22) or between groups B and C (p = 0.42, F = 0.67). For Group C, SED time was lower at both week 6 and week 12 compared to week 1, but week 12 was slightly higher than week 6. There was a statistically significant difference in change in SED time from weeks 1 to 6 (p = 0.03, t = 2.79) and weeks 6 to 12 (p = 0.03, t = -2.85), but not weeks 1 to 12 (p = 0.9997, t = 0.03).
Conclusion: The fact that participants exceeded the 150 min•week^{-1} CDC recommendation of PA and SED time declined from week 1 to week 12 is promising.

2862   Board #145   June 1 2:00 PM - 3:30 PM
Effect Of Self-control Exercise Practice Dose On Lymphocyte Subsets Of Lung Cancer Patients
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(No relevant relationships reported)

PURPOSE: Self-Control Exercise (SCE), known also as Guolin Qigong, is a mind-body exercise being used in China for cancer survival for more than 40 years. This study was to examine the dose of SCE on lymphocyte subsets of lung cancer patients and the possible mechanisms.
METHODS:33 lung cancer patients (9 males & 24 females; M±SD: Age in yr: 60.24 ± 6.14; Cancer survival yr: 1.67 ± 0.69) were recruited from the Shanghai Cancer Club. All the patients were diagnosed pathologically. The patients began to learn SCE for 3 weeks and then performed 24-week SCE at their will. Cancer history was surveyed, physical activity including SCE was recorded during the intervention. The lymphocyte surface antigen CD3/CD4/CD8/CD28/CD(16+56)/CD19/CD4CD25 were examined by direct immunofluorescence staining and flow cytometry. Pearson correlation coefficient were computed to determine the correlations between the change of lymphocyte surface antigen and the SCE duration (minutes) per week.
RESULTS: The mean SCE practice was 80.91 ± 44.68 minutes per day with a range from 30 to 180minutes per day. It was found that CD4$^+$ increased significantly ($p<0.01$), CD4$^+$CD25$^+$ declined significantly ($p<0.05$) respectively after 24 weeks.

CD3$^+$, CD8$^+$, CD(16+56)$^+$ and CD19$^+$ showed no statistical difference before and after intervention . The change of CD8$^+$CD28$^+$ is moderately correlated with SCE duration per week ($r=0.552$, $p<0.01$).
CONCLUSIONS: SCE intervention improved the cellular immune function of lung cancer patients and is correlated with the duration of the practice.

2863   Board #146   June 1 2:00 PM - 3:30 PM
An Investigation Of Physical Activity And Cardiorespiratory Fitness In Childhood Cancer Survivors.
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(No relevant relationships reported)

Purpose: Survivors of childhood cancer experience an increasing incidence of late sequelae with age, with the effect on health likely compounded by limited physical activity and low cardiorespiratory fitness (CRF). This study aimed to determine survivors' physical activity levels and to objectively measure CRF, compared with controls.
Methods: *Stage 1:* We collected physical activity data from parents of survivors aged 7-18 years, ≥5 years after diagnosis, from 11 Australian and New Zealand hospitals as well as from age-matched controls using the International Physical Activity Questionnaire. We compared moderate-vigorous physical activity levels with American Cancer Society guidelines (≥300 min/week). *Stage 2:* We then assessed CRF in survivors aged 8-18 years, ≥1 year after treatment completion, by cardiopulmonary exercise test using the Bruce Protocol, 6-minute walk test (6MWT), and self-reported fitness (International Fitness Scale).
Results: *Stage 1:* 192 parents of survivors (mean age=12.9 ± 2.3 years) and 111 parents of control children (mean age=12.3 ± 2.7 years) participated. Parents reported child survivors to participate in more physical activity than controls (248.4 ± 217.6 vs 184.8 ± 213.6 min/week, p=0.036), with 31% of child survivors meeting physical activity guidelines, compared with 22.7% of controls (p=0.011). *Stage 2:* To date, 11/42 survivors (mean age=10.7 ± 6.2 years) and 10/42 controls (mean age=10.6 ± 1.1 years) have completed comprehensive CRF assessments. Survivors appear to have similar CRF compared with controls in terms of VO2max (43.1 vs 46.8ml/kg/min, p=0.31; 47th vs 60th percentile, p=0.41) and 6MWT distance (737m vs 690m, p=0.07; 85th vs 78th percentile, p=0.43). Preliminary data suggest little difference in self-reported CRF (p=0.98) and overall fitness (p=0.07).
Conclusion: Only one-third of young survivors of childhood cancer are meeting American Cancer Society's physical activity guidelines. Preliminary data indicate similar fitness levels between survivors and age-matched controls. However, considering the increasing risk of late-effects during aging in survivors, regularly assessing physical activity and CRF provides clinicians with vital information to monitor and encourage survivors to mitigate risks by adopting a healthy lifestyle long-term.

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Association Between Cancer Screening and Physical Activity in Cancer Survivors
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(No relevant relationships reported)

PURPOSE: To determine if cancer survivors who adhere to cancer screening guidelines are more likely to be physically active.
METHODS: A Health Risk Factor Questionnaire was mailed to cancer survivors in Central Pennsylvania who were identified by the PA Cancer Registry in 2017. The survey addressed physical activity levels and participation in regular cancer screenings for breast, cervical, and colorectal cancers. Physical activity levels were categorized as meeting ACSM guidelines for aerobic training, resistance training, or both Adherence to cancer screening guidelines was determined for colorectal, cervical, and breast cancer as put forth by the American Cancer Society, which included a colonoscopy, PAP smear, and mammogram, respectively. Odds ratios were calculated for aerobic, resistance, and combined physical activity levels in people who adhered to cancer screening guideline or not.
RESULTS: Among cancer survivors in Central PA, those who met colorectal cancer screening guidelines are more likely to meet aerobic training guidelines (OR=0.369; 95% CI=0.165 to 0.826) and those that met cervical cancer were more likely to meet aerobic and resistance training guidelines combined (OR=0.255; 95% CI=0.094 to 0.691). No other results were significant.
CONCLUSIONS: Cancer survivors who adhere to colorectal cancer screening guidelines are more likely to meet ACSM guidelines for aerobic exercise and those that adhere to cervical cancer screening are more likely to meet ACSM guidelines for

both aerobic and resistance exercise. Physical activity is an important part of cancer prevention and should be further addressed in a high risk population such as cancer survivors in Central PA.

2865　　　**Board #148**　　　　　June 1 2:00 PM - 3:30 PM

Neuropathy And Fine-motor-function In Survivors Of Childhood Acute Lymphoblastic Leukemia: A Report From St. Jude Life

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(No relevant relationships reported)

Up to 40% of survivors of childhood acute lymphoblastic leukemia (ALL) have persistent neuropathy, which interferes with general mobility and walking. Neuropathy may also interfere with fine motor skills, which potentially impacts activities of daily living and quality of life (QOL). These relationships have not been investigated in long-term survivors of childhood ALL. **PURPOSE**: To evaluate associations between peripheral neuropathy, fine motor skills, and QOL in adult survivors of childhood ALL. **METHODS**: Adult survivors of childhood ALL (N=365, 52% male; age 6.8±4.5 years at diagnosis and 28.6±5.9 years at evaluation) were evaluated using the modified total neuropathy score (mTNS), physical performance test (PPT), and Medical Outcomes Study Short Form Survey (SF-36). Neuropathy was defined as a total score ≥4 on the mTNS. Participants were identified as having fine motor impairments according to timed writing and eating PPT tasks (> 10 seconds). Vincristine and cranial radiation doses from childhood cancer treatment, abstracted from medical records, were included as covariates in logistic regression models. **RESULTS**: 39.7% of ALL survivors had neuropathy (N=145) and 44.1% had fine motor impairments (N=161). Survivors with neuropathy received a mean cumulative dose of vincristine of 47.4 mg/m2; those without neuropathy had a mean cumulative dose of 31.5 mg/m2 (p<0.001). Neuropathy was significantly associated with fine motor impairments (Odds ratio (OR): 1.5, 95% confidence interval (CI): 1.01-2.39), after controlling for current age, sex, and cranial radiation. Fine motor impairments were associated with a 2.20-fold (95% CI: 1.07-4.52) risk of a physical component summary T-score <40 on the SF-36. **CONCLUSIONS**: Adult survivors of childhood ALL with neuropathy are at higher risk for fine motor impairment. In addition, survivors with fine motor impairment are at increased risk for reporting poor physical quality of life. Interventions designed to address loss of fine motor function may improve quality of life in this vulnerable population.

2866　　　**Board #149**　　　　　June 1 2:00 PM - 3:30 PM

Analysis of Cancer Survivor's Accessibility to Exclusively Tailored Exercise Programs in Nebraska

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(No relevant relationships reported)

Exercise has been shown to be an effective way to reduce acute and latent side effects associated with cancer treatment, as well as improve cancer survivor's quality of life. In Nebraska, more than 50% of the state's population lives within two metropolitan areas which poses concern of accessibility to exercise programs for rural residents. **Purpose:** The purpose of this investigation is to examine cancer survivor's accessibility to exercise facilities (EF) and exercise programs designed exclusively for cancer survivors (EPCS) in Nebraska, USA. **Methods:** Geographic Information Science (GIScience) was utilized to construct a spatial database consisting of: cancer patient survivors, EF, and identified EPCS, all geocoded from street addresses. Network analyses were performed to assess distance and travel time to both the nearest EF and EPCS. The U.S. Census Bureau's Core Based Statistical Area (CBSA) definitions for 2013 were used to categorize counties as part of a Metropolitan Statistical Area (MSA) or Micropolitan Statistical Area (mSA) and the balance, rural. **Results:** Multi-level geocoding of cancer survivors achieved a 99.9% match rate with 90.6% successfully geocoded to either a point or street address. Fifty-nine percent of survivors reside in a county classified as an MSA, 19% are in an mSA, and 22% are rural. Survivors living in an MSA had a mean distance of 3.2 ± 5.4 miles (2.0 ± 4.1 minutes) away from the nearest EF and a mean distance of 15.9 ± 28.8 miles (10.9 ± 22.4 minutes) away from the nearest EPCS. Survivors living in an mSA had a mean distance of 6.5 ± 8.6 miles (4.4 ± 6.4 minutes) from the nearest EF and a mean distance of 157.2 ± 122.4 miles (114.9 ± 91.9 minutes) to the nearest EPCS. Similar to mSA, rural survivors had a mean distance of 25.8 ± 20.1 miles (19.3 ± 15.4 minutes) from the nearest exercise facility while having a mean distance of 168.4 ± 124.5 miles (118.8 ± 84.5 minutes) from an EPCS. **Conclusion**: Exercise facilities are accessible to cancer survivors throughout Nebraska, however, EPCS are not located within a reasonable distance to rural survivors to facilitate participation. On-line and prescript EPCS programs and trainings should be developed and shared with rural and mSA exercise facilities to increase accessibility.

2867　　　**Board #150**　　　　　June 1 2:00 PM - 3:30 PM

Adherence To Lifestyle Recommendations Regarding Physical Activity, Diet, Smoking And BMI in Cancer Survivors

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(No relevant relationships reported)

Purpose: Assess adherence to lifestyle recommendations for physical activity, diet, smoking and BMI in cancer survivors in Central Pennsylvania.
Methods: A survey on health-related lifestyle factors was send to cancer survivors in Central Pennsylvania (PA) facilitated by the PA Cancer Registry in 2017. The survey included questions on current BMI, smoking status, physical activity level, and diet. From this, we assessed adherence to the WCRF/AICR recommendations for cancer prevention, as they are also recommended for cancer survivors. Respondents were assigned 1 point for each of the following recommendation they adhered to: BMI between 20-25 kg/m², currently not smoking, consumption of 5 or more servings of fruits/vegetables per day and being physically active at least 30 minutes/day (maximum score 4 points).
Results: The response rate to the survey was ~27%, and varied from 23% (lung) to 30% (breast). The average age of the respondents was 66 years. The overall score for adherence was 1.6 points which was largely driven by the high adherence to the recommendation not to smoke; adherence to the other guidelines was significantly lower. Survivors who adhered to the recommendation on physical activity had a similar score for the other lifestyle recommendations (1.1 out of 3) compared to 1.0 of 3 for survivors who did not adhere to the recommendation on physical activity.

	Total	Breast	Colorectal	Gynecologic	Lung	Prostate
n	585	144	107	131	81	122
Sufficiently active	47%	49%	42%	48%	35%	54%
BMI 20-25	20%	25%	22%	15%	26%	13%
At least 5 servings f/v	0%	0%	0%	0%	0%	0%
Not smoking	91%	93%	92%	94%	82%	93%
Average score	1.6	1.7	1.6	1.6	1.4	1.6

Conclusion: In this survey among cancer survivors in central PA, adherence to lifestyle recommendations was low for all types of cancer. Response rate was 27%; possibly, cancer survivors who were higher educated and more health-conscious were more likely to respond. Thus, the adherence to lifestyle recommendations among cancer survivors in central PA may even be lower than what is presented here.

2868　　　**Board #151**　　　　　June 1 2:00 PM - 3:30 PM

Cardiorespiratory Fitness and Cancer In Women

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(No relevant relationships reported)

The preventive role of cardiorespiratory fitness (CRF) in cancer is not well established among women. **PURPOSE**: The current study sought to evaluate the association between CRF, cancer incidence and cancer mortality in women. **METHODS**: Maximal exercise testing was performed in pilot cohort of 184 women (59.3±15.2 years) free from malignancy at baseline who were followed for a mean of 12±6.9 years. Multivariate Cox hazard analyses were conducted for all-type cancer incidence and cancer mortality. Population Attributable Risks (PAR) and Number Needed to Treat (NNT) were determined for low CRF (<5 METs). **RESULTS**: During the follow-up, 11.4% were diagnosed with cancer and 3.2% died from cancer. CRF was inversely associated with cancer outcomes. For every 1 MET higher CRF there was a 19% reduction in cancer incidence [Hazard Ratio (HR) 0.81, 95% Confidence Intervals (CI) (0.68 to 0.96), p=0.016)] and 38% reduction in cancer mortality [HR 0.62, 95%CI (0.42 to 0.92), p=0.017]. The PARs% and NNT of low CRF was 12.3% and 16.6% and 5 and 8 for cancer incidence and cancer mortality, respectively. **CONCLUSIONS**: Higher CRF is associated with lower risk for cancer incidence and cancer mortality in women, suggesting the possible protective benefits for cancer prevention. Eliminating low CRF as a risk factor would potentially prevent considerable cancer morbidity and mortality and reduce the associated societal-economic burden. Achieving CRF of ≥5 METs could be cost-effective for public health and may play an important role in primary cancer prevention programs. Future large cohorts should ascertain these findings.

2869   Board #152   June 1 2:00 PM - 3:30 PM
The Effect of Radiation Therapy on Cancer Patients Participating in Structured Exercise

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(No relevant relationships reported)

Radiation therapy was first attempted as a treatment for cancer in 1896. Since then, it has become a common modality, and the survival rate among diagnosed patients has increased drastically. While radiation can prolong life expectancy, it can be deleterious to the patients' health. Exercise has consistently demonstrated improvement in anthropometric, cardiometabolic, and functional capacities of cancer survivors, but data concerning the effect of radiation on exercise outcomes are limited. **PURPOSE:** To evaluate the effect of radiation therapy on exercise outcomes in cancer survivors. **METHODS:** Patients participated in a 10-week exercise intervention involving aerobic, resistance, and flexibility training. There were 59 patients who had never used radiation (NR), 63 who had complete radiotherapy (HR), 18 currently undergoing treatment (CR),and 17 who failed to report their status. We analyzed differences among the three radiation exposure groups (NR, HR, and CR) in baseline characteristics, exercise adherence, and improvement in several parameters of health and function using chi-square and multivariate tests; post-hoc analyses tested specific group differences. **RESULTS:** There were no baseline differences between groups in age, health history, body composition, cardiovascular parameters, fatigue, insomnia, or depression. Patients in the NR group performed better on the five times sit-to-stand test than HR patients ($p=0.013$) and better on sit-and-reach ($p=0.037$) and functional reach ($p=0.059$) than CR patients. There were no differences in program completion based on use of radiation ($p=0.404$). Although there were no baseline differences in the six-minute walk ($p=0.987$), CR patients improved more than HR patients ($p=0.038$) and NR patients ($p=0.051$). There were no baseline differences in systolic blood pressure ($p=0.957$) but CR patients experienced greater reductions than patients in the HR group ($p=0.011$) and NR group ($p=0.035$). **CONCLUSION:** Exercise may be an effective way to mitigate some of the health consequences associated with radiation therapy. In our sample, exercise improved blood pressure and six minute walk more in patients who were currently undergoing treatment; however, our low retention rate may create potential bias and fail to accurately characterize expected results.

2870   Board #153   June 1 2:00 PM - 3:30 PM
Effect of an Exercise Program on Fitness and Motivation Outcomes in Overweight Breast Cancer Survivors

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(No relevant relationships reported)

Background/Purpose. Overweight breast cancer survivors are at high risk of recurrence and mortality. Exercise can mitigate these outcomes, but this subset of survivors dropout from exercise programs at a high rate. We tested the Breast Cancer Healthy Lifestyle Intervention Study (BCHLIS) which incorporates evidence-based components to enhance physical fitness and intrinsic motivation(IM). **Theoretical Framework**. Self-determination theory (SDT) and exercise theory informed BCHLIS. We focused evidence-based components of the program on the psychological needs of autonomy (A), competence (C), and relatedness(R). Theoretically, if these are met then IM increases. **Methods.** A descriptive study that used a convenience sample of 14 breast cancer survivors. BCHLIS include individualized aerobic, resistance and flexibility exercise which was delivered for 24 weeks, 12 supervised and 12 in the community. Variables measured included : VO_2max, grip, balance and body composition. Psychological needs and motivation were measured with Basic Psychological Needs for Exercise Scale (BPNES)and Behavioral Regulation of Exercise Questionnaire-2 (BREQ-2), at 0, 3 and 9 months. Descriptive statistics, ANOVA for repeated measures, and bivariate correlation were used to analyze the data. **Results.** 14 women were enrolled, 9 women completed all survey data, 6 women completed both survey and fitness assessments, 5 women dropped out for various reasons: 1 disease related, others personal. Results included significant weight decrease ($p = .023$), increase in Met/hrs/week ($p = .04$), right hand grip strength ($p = .022$), balance ($p = .037$); and clinically relevant increase in VO_2max. Psychological needs satisfaction was noted at 3 months for A, C, and R. Motivation was observed to be maintained in 7/8 survivors, but retained a greater extrinsic than intrinsic source. **Conclusions & Implications**. Participation in BCHLIS resulted in increased physical activity, improved body composition and fitness profile. Motivation was maintained during the program, however a shift to more intrinsic motivation was not realized indicating that exercise programing may require external support beyond the 24 week time frame in overweight breast cancer survivors.

2871   Board #154   June 1 2:00 PM - 3:30 PM
Chemotherapy and the Exercising Cancer Survivor

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(No relevant relationships reported)

Advancements in treatment, such as chemotherapy, have improved survival rates among cancer patients. Today, approximately 67% of patients are at least five-year survivors; however, the combination of cancer and its care often affects the quality of those years. Patients commonly experience psychological symptoms, losses in physical function, and deterioration of cardiovascular health. Exercise ameliorates many of these consequences, but the effect of chemotherapy on exercise outcomes requires further exploration. **PURPOSE:** To evaluate the effects of chemotherapy on exercising cancer survivors. **METHODS**: We enrolled cancer survivors in a comprehensive 10-week exercise program; 40 patients had never received chemotherapy (NC), 80 had a history of chemotherapy (HC), 24 were currently undergoing treatment (CC), and 13 failed to report status. During a pre-exercise evaluation, we gathered demographic, morphological, psychological, cardiovascular, and functional data. Following the intervention, we repeated all assessments. We compared baseline data and analyzed pre-to-post differences in the three exposure groups (NC, HC, and CC) using chi-square and multivariate tests; post-hoc analyses measured specific group differences. **RESULTS:** Patients in the NC group were older ($p=0.013$), weighed more ($p=0.054$), and had a higher body mass index ($p=0.067$); obesity affected 56.7% of NC patients, 39.1% of HC patients, and 19.0% of CC patients ($p=0.026$). The NC group also had a higher incidence of hyperlipidemia ($p=0.058$) and worse performances in the six-minute walk ($p=0.019$), timed up-and-go ($p=0.002$), chair stand ($p=0.043$), and epic lift ($p=0.029$). There were no group differences in exercise adherence ($p=0.414$). NC patients improved the least in arm curls ($p=0.022$) and improved the most in VO_2 max ($p=0.037$) and systolic blood pressure ($p=0.064$). **CONCLUSION:** Patients who had used chemotherapy in the past or were currently undergoing treatment were younger than those with no history of use; age may explain the differences noted. Our results indicate chemotherapy is not a barrier for exercise participation; as long as it is tolerated, exercise should be encouraged throughout cancer survivorship. While chemotherapy did not affect attrition, our low retention rate overall limits the strength of these findings.

2872   Board #155   June 1 2:00 PM - 3:30 PM
Self-Reported Physical Activity at Breast Cancer Diagnosis is Associated with Greater Physical Activity During Chemotherapy

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(No relevant relationships reported)

PURPOSE: Examine the associations among self-reported physical activity levels at breast cancer diagnosis to physical activity levels during chemotherapy. **METHODS:** Prior to beginning chemotherapy, patients were approached by research staff to participate in a walking intervention. 100 early stage (I-III) breast cancer patients participated in the intervention, and were asked to walk 150 minutes per week during chemotherapy. Patient characteristics and physical activity levels were assessed via questionnaire at baseline. Physical activity during treatment was monitored via weekly step totals obtained from a Fitbit Zip and uploaded directly into research computers. A linear regression analysis of self-reported physical activity prior to chemotherapy with mean Fitbit steps per week during chemotherapy was conducted. **RESULTS:** Breast cancer patients (age 48 ± 8 years) who reported higher self-reported walking minutes/week at baseline (79.9 ± 16.7; $p < 0.0001$) and a history of self-reported vigorous physical activity (55% vs 45%; $p < 0.01$) at baseline exhibited greater weekly Fitbit step totals during chemotherapy. **CONCLUSIONS:** In this sample, early stage breast cancer patients with a history of greater physical activity prior to chemotherapy are more apt to remain physically active during chemotherapy. Funding: Breast Cancer Research Foundation, New York, NY.

2873   Board #156   June 1 2:00 PM - 3:30 PM

Time-Course of Muscle Performance Recovery of Hodgkin's Lymphoma Survivors After a Resistance Exercise Session: A Preliminary Study

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(No relevant relationships reported)

Cancer survivors experience several disabling long-term side effects promoted by the cancer treatment and the pathology. Although the American College of Sports Medicine recommend the practice of strength training to cancer survivors similarly to healthy subjects, these recommendations are based on a restricted literature. Cancer survivors may require a longer recovery between sessions due to physiological impairments.**PURPOSE**: To assess the time-course of muscle performance recovery after a resistance exercise session in Hodgkin's Lymphoma survivors. **METHODS**: Four Hodgkin's Lymphoma survivors (age: 28.00 ± 8.16; height: 1.71 ± 0.06m; weight: 68.38 ± 9.83kg) participated in this study. The volunteers attended to the laboratory in four consecutive days. On the first visit, the isokinetic knee extension peak torque was assessed and the volunteers performed an exercise session composed by six sets of ten repetitions at 60º/s and 120-sec rest interval. On the following visits, the peak torque was assessed to determine muscle recover time-course. Repeated measures one-way ANOVA was used to analyze data.
RESULTS: There was no significant time effect (F = 0.036; p = 0.990) for peak torque. There was no difference between pre (178.55 ± 56.87 N.m), 24 hours (178.97 ± 58.54 N.m), 48 hours 177.90 ± 52.09 N.m) and 72 hours (179.75 ± 59.65 N.m).
CONCLUSIONS: Hodgkin's Lymphoma survivors recover muscle strength production capacity 24 hours after a resistance exercise session and do not require longer rests between training sessions.

2874   Board #157   June 1 2:00 PM - 3:30 PM

Objectively Quantified Doses of Activity and Inactivity and Subjective Well-Being in Breast Cancer Survivors

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(No relevant relationships reported)

Introduction: Physically active breast cancer (BC) survivors have higher quality of life (QOL) compared to those who are sedentary. However, exercise programs may introduce compensatory responses to total daily physical activity (PA) and sedentary time (ST) that could undermine the expected benefits of exercise training. The primary aim of this study was to evaluate changes in daily PA and ST following the implementation of an exercise training program in BC survivors. A secondary aim was to examine the relationship between PA/ST and fatigue/QOL.
Methods: 12 postmenopausal BC survivors wore an ActiGraph GT3X monitor on the right hip for 7 consecutive days and completed the EORTC QOL questionnaire and Piper Fatigue Scale prior to and during the final week of a supervised 12-wk exercise training program (45-60 min/day, 2-4 days/wk). The activity data were categorized using the Freedson 1998 cut-points and are presented as a percentage of wear-time spent in each intensity category. **Results:** The table presents PA, ST, perceived fatigue and QOL scores.

	ST (%)	Light (%)	MVPA (%)	Piper Fatigue Score	EORTC QOL Score
Baseline	77.2 (6.41)	17.6 (4.95)	5.2 (3.94)	80.6 (40.40)	5.7 (0.69)
Post-Intervention	71.8* (8.38)	22.7* (6.75)	5.5 (3.29)	66.1* (31.87)	5.9* (0.96)

Note: Data are presented as mean (SD); * indicates significant change from baseline (p<0.05)
By post-intervention these women replaced ST with light intensity activity. The EORTC score was significantly correlated with ST at baseline (R^2=0.33, p=0.05), but this relationship was not significant at post-intervention. There were no significant relationships found between the Piper Fatigue Score and ST.
Discussion: These findings suggest participants did not reduce PA or increase ST during the exercise program. It has been reported that exercise training may lead to compensatory declines in habitual PA and/or increases in ST but our results do not support this. It is possible that as BC survivors increase purposeful exercise, they are able to substitute low levels of PA for ST. The relationship found between QOL and ST suggests that reductions in ST could be a potential target for interventions that aim to improve QOL in BC survivors.

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Effects of a Lifestyle Intervention on Select Social Cognitive Outcomes in Prostate Cancer Patients Undergoing Androgen Deprivation Therapy

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(No relevant relationships reported)

Social cognitive theory (SCT) variables are well-established determinants of lifestyle behavior change. Although exercise consistently improves clinically relevant outcomes in prostate cancer (PCa) patients undergoing androgen deprivation therapy (ADT), knowledge of the effects of lifestyle interventions promoting concomitant change in both exercise and dietary (EX+D) behavior upon key SCT outcomes remains limited. **PURPOSE**: The purpose of the single-blind, randomized controlled Individualized Diet and Exercise Adherence-Pilot (IDEA-P) trial is to evaluate the preliminary efficacy of a combined exercise and dietary (EX+D) intervention, implementing a group-mediated cognitive behavioral (GMCB) approach, relative to standard of care (SC) treatment among PCa patients undergoing ADT. In the current study, we evaluated the effects of the EX+D intervention on select SCT outcomes at the end of the intensive phase of the intervention. **METHODS**: A total of 32 PCa patients (*M* age = 65 years) on ADT were randomly assigned to the EX+D (n = 16) or SC (n = 16) interventions. Measures of select SCT outcomes were obtained at baseline and 2-month follow-up assessments. **RESULTS**: Results of intention to treat ANCOVA analysis of residualized change scores yielded a significant treatment main effect for (p<0.01) for self-regulatory self-efficacy and satisfaction with physical function. Post hoc analysis revealed that the intensive phase of the EX+D intervention resulted in superior improvements in self-regulatory self-efficacy (*d* = .55) and stair climb (*d* = 1.20) performance relative to the SC intervention at 2 months. **CONCLUSIONS**: Findings from the IDEA-P trial suggest that the intensive phase of the EX+D intervention, implementing a GMCB approach designed to promote adoption and adherence to lifestyle behavior change, resulted in superior changes in select SCT outcomes relative to SC approach. These results underscore the utility of a GMCB-based EX+D intervention for promoting meaningful improvement in key SCT outcomes among PCa patients undergoing ADT. Supported by NIH/NCI Grant R03 CA16296901

2876   Board #159   June 1 2:00 PM - 3:30 PM

Changes in Quality of Life of Cancer Survivors Participating in a Group Exercise Program

Sarah Greterman. *Concordia College, Moorhead, MN.*

(No relevant relationships reported)

Purpose: The purpose of this study was to evaluate the overall quality of life (QOL) of cancer survivors participating in the LIVESTRONG® at the YMCA 12-week group exercise program using the Functional Assessment Cancer Therapy – General (FACT-G).
Methods: Thirty-seven cancer survivors, representing a variety of cancer and treatment backgrounds, volunteered to complete the (FACT-G) QOL questionnaire at three different time points of the LIVESTRONG® at the YMCA Program: weeks 1, 6 (midpoint), and 12 (endpoint). The FACT-G includes questions related to social (SWB), emotional (EWB), functional (FWB), and physical well-being (PWB). Repeated measures ANOVA with mixed model framework was used to determine significance differences at weeks 1, 6, and 12. Post-hoc paired t-tests with Tukey-Kramer correction were conducted if significant differences were found.
Results: Of the 37 recruited, 7 participants (age = 55.20±13.85) completed week 1 (Group A), 12 participants (age = 52.17±11.71) completed weeks 1 and 6 (Group B), and 11 participants (age = 53.08±11.01) completed weeks 1, 6 and 12 (Group C). There were no statistically significant differences between total FACT-G score or between each subscale between Groups A and C or Groups B and C at the end of week 1, nor between Groups B and C at the end of week 6. For Group C, there were no statistically significant changes in three of the four subscales: SWB (F = 0.09, p = 0.916), EWB (F = 1.14, p = 0.345), or FWB (F = 0.40, p = 0.679) at all three time points. PWB was the only subscale to show statistically significant changes over the three time points (F = 5.09, p = 0.02). Changes in PWB were statistically significant between weeks 1 and 6 (t = -3.14, p = 0.017), but there was insufficient evidence to suggest any statistically significant differences between weeks 1 and 12 (t = -2.05, p = 0.131) or weeks 6 and 12 (t = 0.28, p = 0.514).
Conclusion: Perceived QOL plays a significant role in life satisfaction, engagement in physical activity, and physical, psychological, emotional, and social well-being. Although little significant differences were observed, the fact that PWB improved may suggest participation in the program has a positive impact on increasing energy levels, reducing pain, and improving ability to meet physical needs.

Abstracts were prepared by the authors and printed as submitted.

2877   Board #160   June 1 2:00 PM - 3:30 PM

Age, Mobility Performance, and Physical Activity in Prostate Cancer Patients Undergoing Prolonged Androgen Deprivation Therapy

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(No relevant relationships reported)

Androgen deprivation therapy (ADT) is a foundation of treatment for men with prostate cancer (PCa). However, ADT is accompanied by adverse effects that increase risk of functional decline. Although some clinical observations suggest that ADT may have a greater impact upon functional status among aged men, empirical evidence addressing age-related differences in the trajectory of adverse effects of prolonged ADT remains limited. **PURPOSE**: The purpose of the present pilot study was to explore differences in change in mobility performance and physical activity (PA) across 6 months among 3 different age cohorts of PCa patients undergoing ADT. **METHODS**: A total of 44 PC patients undergoing prolonged ADT (> 6 months of treatment) were classified into 1 of 3 age cohorts: 55-64 (n=13); 65-74 (n=19); and 75+ years of age (n=12). Measures of mobility performance (400M Walk) and objectively-determined PA were obtained from men at baseline and 6 month follow-up assessments. **RESULTS**: Results of 3 (Age) x 2 (Time) ANOVA analysis demonstrated a significant Age main effect for mobility performance ($p < .05$) while the Age main effect for PA approached significance ($p < .06$). Post hoc analysis revealed patients in the youngest group had more favorable mobility performance relative to the middle ($d = -.71$) or oldest ($d = -1.04$) age groups and patients in the oldest group were accruing less objectively-determined PA relative to the middle ($d = .65$) or youngest ($d = .92$) age groups. However, the Age x Time interaction was not significant for mobility performance ($p < .38$) or PA ($p < .28$) indicating no differences in the trajectory of change were observed for either outcome as a function of age across time. **CONCLUSIONS**: This study provides some of the first preliminary evidence examining potential age-related differences in the trajectory of change in physical function and PA in PCa patients on ADT. Findings revealed that although well-established, anticipated age differences in mobility performance and PA were observed, no age-related differences in the trajectory of change in functional decline or PA emerged among PCa patients undergoing prolonged ADT.

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Aquatic Exercise Training Program Outcomes on Quality Of Life and Lower Limb Lymphedema: Pilot Study

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(No relevant relationships reported)

Lower limb lymphedema (LLL) has a negative impact on many aspects of daily living, including household chores, physical activity, and psychological well-being. Patients with LLL that are not properly managed may become progressively worse and lead to an increases impairment of physical functional capacity and decline in the quality of life. **PURPOSE**: To determine whether patients with LLL can benefit from water immersion exercise to improve quality of life and control-diminish limb volume. **METHODS**: A total of 7 female participants affected by bilateral (n=4) or unilateral (n=3) LLL were included in this pilot study. Patients had primary or secondary LLL as complications of melanoma or gynecological cancers. Water immersion interval training exercise was conducted over a 6-week period (12 sessions of 45 minutes) and consisted of yoga exercises, aqua-jogging, pedaling on a water stationary bike and muscular training on a step and a trampoline. Outcome measures were taken before (pre) and after (post) the exercise program using the quality of life for limb lymphedema questionnaire (LYMQOL), 6 min walk test, handgrip strength test, bioelectrical impedance spectroscopy (BIS) and lower limb circumferences. **RESULTS**: Pre vs post lower limb circumference volumes remained stable, while BIS measurements increased significantly ($R_o = 204.8 \pm 58.5$ vs 220.9 ± 68.3 ohm, p=0.04) indicating a reduction in the extracellular fluid compartment. The distance covered in the 6 min walk test (458.4 ± 117.0 vs 520.0 ± 126.0 meter, p=0.04) and the sum of right and left handgrip strength (32.6 ± 5.6 vs 38.0 ± 10.8 kg, p=0.003) were significantly improved and so did the emotion score (2.1 ± 0.7 vs 1.6 ± 0.6, p=0.03) and overall quality of life (7.09 ± 1.8 vs 8.1 ± 0.8, p=0.05). **CONCLUSIONS**: Water immersion exercise training allowed patients with lower limb lymphedema to lower the extracellular fluid volume, increases physical fitness, and quality of life outcomes.

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The Importance of Adiposity to the Cancer Patient Initiating Exercise

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(No relevant relationships reported)

Each year, more than 600,000 adults are diagnosed with an obesity-associated cancer. Maintenance of a healthy body weight may reduce the likelihood of developing these cancers, slow the deterioration of health, and lower the risk of recurrence. Exercise is a commonly prescribed method of weight management in cancer survivors, but data are limited regarding the individualized benefits experienced by obese versus non-obese patients. **PURPOSE:** To compare the effects of exercise on obese and non-obese cancer survivors. **METHODS:** We enrolled 157 patients in a 10-week exercise program. At baseline, we determined anthropometric and cardiovascular profiles, psychological wellbeing, and physical functioning. Follow-up data were collected on subjects who completed the program (n=58). Obesity was defined by a body mass index ≥ 30 kg/m^2. Cardiovascular variables were blood pressure and heart rate. Wellbeing was assessed with questionnaires evaluating fatigue, insomnia, and depression. Physical function was measured with 13 tests of strength, coordination, aerobic capacity, and flexibility. Independent-samples t tests compared baseline characteristics and changes in outcome measurements of obese and non-obese patients. **RESULTS:** At baseline, obese (40%) and non-obese (60%) patients were similar with the exception that obese patients performed poorer in the six-minute walk (p<0.001) and timed up-and-go (p=0.012) while they were stronger in push (p=0.017) and pull (p=0.040) assessments. Retention rate did not differ by obesity status (p=0.853). From baseline to follow-up, patients improved in wellbeing and most functional tests, but there were no differences in improvement between obese and non-obese patients in any component of their cardiovascular profile, psychological health, or physical functioning (p>0.190). **CONCLUSION:** Obese and non-obese cancer survivors have similar profiles at baseline and generally improve with exercise. Exercise may be more critical to obese patients, not due to cardiovascular, psychological, or functional changes, but because of the risk of recurrence associated with excess adiposity. Our findings reiterate the importance of exercise to the cancer survivor, regardless of body composition, but there is potential for bias owing to the high dropout rate found in our study.

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Cancer Stage Does Not Affect Fatigue or VO$_{2peak}$ Improvements Following an Exercise-Based Cancer Rehabilitation Program

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(No relevant relationships reported)

INTRO: Cancer stage reflects the severity and extent of the disease, with stage IV reflecting advanced cancer and poorer prognosis. Exercise has been shown to improve a number of psychological and physiological variables in cancer survivors, such as cancer-related fatigue (CRF) and cardiovascular fitness (VO$_{2peak}$). However, the effect of stage on these improvements is unknown. **PURPOSE:** To examine whether diagnosed cancer stage affects or modifies improvements in CRF and VO$_{2peak}$. **METHODS:** A total of 384 cancer survivors (57 ± 12 years of age) completed initial assessments of CRF and VO$_{2peak}$ via the Piper Fatigue Scale and the University of Northern Colorado Cancer Rehabilitation Institute's cancer-specific treadmill protocol, respectively. Participants were divided into four groups based on diagnosed cancer stage (I, II, III, and IV). Survivors completed supervised, one-on-one exercise sessions three days per week, 60 minutes per day for 12 weeks. The intervention consisted of individualized and progressive cardiovascular, whole-body strength, balance, and flexibility training. Participants' CRF and VO$_{2peak}$ were reassessed following the intervention. **RESULTS:** Collectively, pre-to-post assessments demonstrated significant overall improvements in CRF (-25%) and VO$_{2peak}$ (11%) across all stages (p<0.01). No significant differences in CRF (p=0.92) or VO$_{2peak}$ (p=0.44) improvements occurred between the stages. When evaluating individual cancer stage CRF, significant improvements (p<0.01) were observed with each stage (I, -32%; II, -27%; III, -29%; IV, -29%). Similarly, significant improvements in VO$_{2peak}$ (p<0.01) occurred with each cancer stage (I, 16%; II, 14%; III, 12%, IV, 11%). **CONCLUSION:** Exercise-based cancer rehabilitation during and following cancer treatment has been shown to have positive effects on CRF and VO$_{2peak}$, but the effect of stage diagnosis on these improvements has been unclear. We observed no significant differences in improvement of CRF and VO$_{2peak}$ between cancer stages, and all stages experienced significant benefits following a 12-week cancer rehabilitation program. These results suggest that reductions in CRF and improved cardiovascular function are possible in all cancer patients, regardless of cancer stage.

F-59   Free Communication/Poster - **Sedentary Behavior**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2881   Board #164   June 1 2:00 PM - 3:30 PM

Recruitment Strategies for Cluster Randomized Controlled Trials Targeting Workplace Sedentary Behavior- a Retrospective Review

Sarah L. Mullane[1], Sarah A. Rydell[2], Miranda L. Larouche[1], Meynard John L. Toledo[1], Linda H. Feltes[3], Brenna Vuong[4], Noe C. Crespo[5], Mark A. Pereira[2], Matthew P. Buman, FACSM[1]. *[1]Arizona State University, Phoenix, AZ. [2]University of Minnesota, Minneapolis, MN. [3]Minnesota Department of Health, Minneapolis, MN. [4]Fairview Health Services, St Paul, MN. [5]San Diego State University, San Diego, CA.* (Sponsor: Matthew P. Buman, FACSM)

(No relevant relationships reported)

Increased demand for sedentary behavior reduction in workplace environments has led to the planning of large-scale interventions implemented at the group level in the form of cluster randomized controlled trials (RCTs). To date, limited evidence is available regarding cluster RCT recruitment strategies. **PURPOSE**: The purpose of this paper is to provide a review of recruitment strategies employed in a large cluster RCT targeting a reduction in workplace sedentary behavior. **METHODS**: Recruitment yields ([N enrolled/N screened] x 100) were calculated. Mean (±SD) and median worksite sizes were calculated at each recruitment step. The percentage of participants who progressed to each recruitment step (of the total N screened per worksite) was calculated to determine the mean percentage of a worksite successfully randomized. Recruitment barriers and modifications were recorded by the research team. A survey was completed by a subset of non-participants (N = 57) and thematic analyses conducted to examine reasons for non-participation, positive impacts and negative experiences. **RESULTS**: Cluster recruitment yield was 43% (24 worksites enrolled/56 screened). Individual recruitment yield was 49% (641 employees enrolled/1317 screened). On average, 52 ± 16% of the worksite was successfully randomized. Eighteen modifications were developed to overcome participant-related, context-related and research-related barriers. **CONCLUSIONS**: Researchers should plan to screen at least 200% of the intended number of worksites and they should target worksites that are approximately double the size of the intended cluster size to avoid loss of statistical power or timeline extensions. Acknowledging temporal fluctuations in worksite-specific workloads, providing options throughout the recruitment process, and adopting a participant-centered approach may facilitate cluster RCT success.

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Validation Of Two Physical Activity And Sedentary Behavior Questionnaires In Orthopedic Trauma Patients

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(No relevant relationships reported)

Orthopedic trauma can be a catalyst for substantially reduced physical activity and increased sedentary behavior that can persist post-recovery. While objective measures (e.g. accelerometry) provide rigorous approaches to assessing physical activity and sedentary behavior, they may be inappropriate for studies with some patient groups. Self-report measures provide potential alternatives, however, their validity must be established. **PURPOSE**: To determine, in orthopedic trauma patients, the agreement and concordance of physical activity and sedentary behavior data from two self-report measures, the International Physical Activity Questionnaire (IPAQ) and the domain-specific sitting questions from the Australian Diabetes, Obesity and Lifestyle General Questionnaire 3 (AusDiab3), with data derived from objective measures. **METHODS**: 64 patients with isolated upper- or lower-limb fractures wore two activity monitors (ActiGraph, ActivPAL) for 10 days, from 2-weeks post-surgery. Participants then completed the IPAQ and AusDiab3 questionnaires relating to the previous 7 days of objective monitoring. Bland-Altman plots, Lin's Concordance Correlation Coefficients (LCCCs) and weighted kappa statistics were used to assess agreement and concordance across several physical activity and sedentary behavior variables. **RESULTS**: The IPAQ overestimated objectively-assessed overall physical activity (median METmins: 550 vs.0) and underestimated median daily sitting time (8.00 vs.10.59 hrs). The AusDiab3 questionnaire underestimated median daily sitting time to a lesser degree than the IPAQ (9.21 vs.10.53hr/day). There was moderate concordance between IPAQ-reported and objectively-derived overall physical activity (ρ=0.431,

p<0.001), weak concordance between IPAQ-reported and objectively derived sitting time (ρ=0.384, p<0.001) and moderate concordance between AusDiab3-reported and objectively measured sitting time (ρ=0.551, p<0.001).
CONCLUSIONS: There was disagreement and discordance between the IPAQ and Ausdiab3 questionnaire and objectively derived data, suggesting that these measures cannot be used interchangeably in orthopedic trauma patients. Modifications could be made in order to more specifically address the activity characteristics of this population.

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Informing Workplace Sedentary Behavior Interventions Through Momentary Affective States And Email-based Prompts.

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(No relevant relationships reported)

PURPOSE: The study aimed to (a) examine the effect of momentary affective states on workplace sedentary behavior (WSB); and (b) test the proximal effects of email-based prompts on WSB. **METHODS:** Office workers with sit-stand desks were recruited in a two-part 20-workday study. In part A, participants completed ecological momentary assessments (EMA; at 3 random times/day) of affective states. Each EMA response was matched with behavioral outcomes (i.e., time spent sedentary, standing, or moving proceeding each EMA response). Part B involved a micro-randomized prompt-based trial. Prompt delivery was randomized to be sent (ST) or not sent (NST) to all participants (probability of 0.5), at eight decision points per day between 9am and 5pm. Half of the prompts encouraged standing and the other half encouraged moving. An activPAL device was used continuously through the 20 days to measure WSB. Multilevel models were used to examine the associations of workplace behaviors and affective states. General estimating equations were used to examine the likelihood of a response to a prompt (i.e., transition from sitting to standing/moving) over the proceeding 5 and 30 min intervals. All models were adjusted for age, gender, race, and job type. **RESULTS:** Participants (N = 18; 56% females) who completed part A contributed 493 EMA responses (27.4±13.3 EMA responses/participant). When examining momentary relationships, individuals sat less (b[SE]= -3.9[1.8], p=.02) and stood more (b[SE]= 3.5[1.6], p=.02) in the hour following higher than usual energy and sat less (b[SE]= -2.8[1.4], p=.04) and moved more (b[SE]= 1.2[0.4], p<.01) following higher than usual intentions to stand/move. Among participants (N = 15; 67% female; age = 50.9 ± 9.5yrs) who completed part B, 1147 decision points occurred when seated. Participants were 42% more likely to transition from sitting to standing within 5 mins when a prompt was sent (OR[95%CI] = 1.4[1.1, 1.8], p<.01). Stand prompts were 25% more likely to elicit a transition (OR[95%CI] = 1.6[1.2, 2.0], p<.01) than move prompts (OR[95%CI] = 1.3[1.0, 1.7], p<.05).
CONCLUSIONS: Prompts may be an effective complementary strategy to encourage sit-stand desks use. Information regarding context (i.e., affective states and intentions) may complement these findings in developing just-in-time interventions.

2884   Board #167   June 1 2:00 PM - 3:30 PM

Impact of 3-Month Changes in Sedentary Time and Light-Intensity Physical Activity on Subjective Sleep Quality

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(No relevant relationships reported)

Regular moderate-vigorous physical activity (MVPA) has been shown to improve sleep quality. However, little is known about whether reducing sedentary time (i.e., replacing sitting with standing) or increasing light-intensity physical activity (LPA) may also improve sleep.
PURPOSE: To examine whether 3-month changes in objectively measured sedentary time and LPA are associated with subjective sleep quality.
METHODS: Participants (N=632, 72.3% female, 71.2% white, 44.6 ± 11.2 years of age) were recruited from 24 worksites in the Phoenix and Minneapolis regions to participate in the multi-component cluster randomized controlled trial 'Stand & Move at Work,' to reduce sitting and increase LPA in the workplace. Participants wore an activPAL accelerometer continuously for seven consecutive days to assess sedentary (i.e., sitting/lying down) and LPA (stepping at < 100 steps/min) behaviors. Daily logs were used to separate data into work and non-work hours and behaviors were standardized to 8hr workdays. The Pittsburgh Sleep Quality Index (PSQI) was administered concurrently with the activPAL at baseline and at 3 months to assess

subjective sleep quality (lower scores = better sleep quality). Mixed-effects regression models adjusted for worksite clustering and age, gender, race, job type, body mass index (BMI), and MVPA. **RESULTS:** Participants spent 333.1 ± 78.0 min/8hr workday and 30.7 ± 14.8 min/8hr workday in sedentary and LPA behaviors at baseline, respectively. Overall, sedentary time was reduced by 33.6 ± 13.6 min/8hr workday and LPA was increased by 0.1 ± 0.9 min/8hr workday. Increases in LPA were associated with 3-month improvements in PSQI sleep latency (b[se]= -.009 [.20], p=.025). No other changes in sedentary or LPA behaviors were associated with PSQI changes.
CONCLUSION: Workplace interventions targeting reductions in sedentary behavior may be effective for improving sleep onset, but not other aspects of sleep quality. Future interventions should examine longer term follow-up periods, assess sleep objectively, and incorporate interventions that target sedentary time and LPA both during and outside of work hours.

2885 Board #168 June 1 2:00 PM - 3:30 PM
Patterns of Sedentary Behavior in Pregnant Women

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(No relevant relationships reported)

Previous research indicates that women become more sedentary during pregnancy. However, very few studies have objectively measured sedentary behaviors in this population. **PURPOSE:** To quantify objectively measured sedentary behaviors, including patterns of sedentary behaviors, in a sample of pregnant women. **METHODS**: Participants included pregnant women enrolled in a behavioral nutrition and physical activity intervention. Participants wore an Actigraph accelerometer during all waking hours for seven consecutive days. The total volume of sedentary behaviors was quantified (% of day), as was the amount of time spent sedentary according to time of day (morning [6am-12pm], afternoon [12pm-6pm], evening [6pm-12am]) and type of day (weekday, weekend). Surveys were administered to assess demographic characteristics. Descriptive statistics calculated the percentage of time spent sedentary, in addition to the percentage of type and time of day spent sedentary. **RESULTS:** On average, the participants (n=41) were 28.0±4.4 years of age, 17.8 ±2.3 weeks gestation, and had a pre-pregnancy body mass index (BMI) of 27.0 ±7.5. The majority of the sample were Caucasian (82.5%), married (68.3%), and had some college education (72.3%). Overall, participants spent 59.1% of waking hours sedentary. When looking at type of day, participants were sedentary 60.2% of the day on weekdays, and 55.6% of the day on weekend days. When looking at time of day, participants were sedentary 57.7% of time during morning hours, 58.6% during afternoon hours, and 61.3% during evening hours. **CONCLUSION:** Results indicate that pregnant women spend a majority of their day engaged in sedentary behaviors. When looking at type and time of day, the data indicate that our sample was more sedentary on weekdays and during evening hours. Given the benefits of regular physical activity during pregnancy for both the mother and baby, and the high rates of sedentary behaviors, interventions aimed at decreasing sedentary time during pregnancy are needed. Replacing sedentary behaviors with even light activity may be a first step in successfully decreasing the total volume of sedentary behavior.

2886 Board #169 June 1 2:00 PM - 3:30 PM
Associations Between Sedentary Behavior And Metabolic Syndrome Are Mediated By Cardiorespiratory Fitness But Not Mvpa

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(No relevant relationships reported)

Sedentary behavior is negatively associated with individual metabolic syndrome (MetS) risk factors in young adults but little research has investigated these associations using a clustered risk score. **PURPOSE:** To determine whether sedentary behavior is associated with a clustered MetS score independent of moderate-to-vigorous physical activity (MVPA) and cardiorespiratory fitness (VO_2peak) in young adults. **METHODS:** 146 participants (age 22.0±3.7 years, BMI 25.0±3.9 kg.m^{-2}, VO_2peak 43.9±8.5 ml.kg.min^{-1}) volunteered for the study. Total minutes and bouts of sedentary behavior (<150 counts/minute) and MVPA (≥2,690 counts/minute) were measured by an accelerometer worn during waking hours for 7 consecutive days. MetS risk factors measured were waist circumference, blood pressure, and fasting glucose, triglycerides and high-density lipoprotein cholesterol. VO_2peak was measured using an incremental treadmill test to exhaustion. Confirmatory factor analysis (CFA) was used to construct a model for MetS and individual indicator variables. Structural equation modeling (SEM) was used to determine the associations among sedentary behavior, VO_2peak, MVPA and MetS. Goodness-of-fit indices were used to assess model fit for CFA and standardized estimates with an alpha level of 0.05 were used for SEM models. **RESULTS:** The clustered score was a valid model of MetS (χ^2=12.9, p=.12;

CFI=.93; RMSEA=.07). On average, participants engaged in 503.4±87.4 minutes/week of sedentary behavior and 190.9±145.2 minutes/week of MVPA in 10-minute bouts. Total sedentary behavior was significantly and positively associated with MetS (β=.24, p=.03). This association was independent of MVPA (β=.23, p=.04) but mediated by relative VO_2peak (β=.25, p=.29). Similarly, sedentary behavior in bouts of 10, 20, 30, and 60-minutes or longer were all significantly and positively associated with MetS independent of MVPA (β range .23 to .29, p<.05) but not VO_2peak (β range .16 to .25, p>.05). **CONCLUSIONS:** Our findings suggest sedentary behavior is associated with clustered metabolic risk in young adults, independent of MVPA, and that bouts of 20 minutes or longer may have the greatest impact on MetS risk. Additionally, fitness may play an important role in attenuating the effects of sedentary behavior on MetS in this population.

2887 Board #170 June 1 2:00 PM - 3:30 PM
Adapting Sedentary Video Games to Require Physical Activity

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(No relevant relationships reported)

Approximately $117 billion in annual healthcare costs are associated with physical inactivity. The Pew Research Center reports that about 49% of American adults play video games (VG). Adapting traditionally sedentary VG controls to require physical activity using low-cost devices may increase opportunities to adhere to physical activity guidelines. **Purpose:** To determine the effects of adapting sedentary VG to require physical activity on exercise intensity, perceived exertion, enjoyment, and VG performance. **Methods:** Six women and nine men 19 to 52 years of age played PAC-MAN Championship Edition DX+ (NAMCO) in three conditions: sedentary play (SED), standing active play using gestures recognized by a motion sensor (AVG-G), and standing active play using buttons (AVG-B). Each participant started with SED and the two adapted conditions were counterbalanced. Exercise intensity was assessed by recording continuous heart rate using a chest strap monitor. Ratings of perceived exertion (RPE) were reported using the Borg 6 to 20 scale. Enjoyment was reported using an abbreviated Physical Activity Enjoyment Scale. VG performance was represented by the in-game score. Repeated measures ANOVA tests were used to compare heart rate, RPE, enjoyment, and VG performance across conditions. **Results:** There was a significant effect of game condition on heart rate, percent of age predicted heart rate maximum (APHRM), RPE, and VG performance (p < 0.001). Enjoyment was not significantly different across conditions (p = 0.216). Post hoc analysis indicated that AVG-G and AVG-B elicited a higher mean (±SD) heart rate (108±16 and 97±15 BPM), percent of APHRM (58±10 and 51±9%), and RPE (13±2 and 12±2) versus SED (72±13 BPM, 39±8% APHRM, 7±1 RPE). Participant VG performance was lower during AVG-G and AVG-B (51.75±28.07 and 68.84±35.52 arbitrary units) versus SED (202.11±91.08 arbitrary units). **Conclusion:** These results suggest that the majority of participants achieved and sustained moderate to vigorous physical activity during adapted sedentary VG for at least 10 minutes. Enjoyment did not suffer as a result of active play despite lower VG performance.

2888 Board #171 June 1 2:00 PM - 3:30 PM
Impact of HealtheSteps Lifestyle Prescription Program on Healthful Eating and Sedentary Time in At-Risk Adults

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(No relevant relationships reported)

Chronic diseases (CDs) account for two-thirds of deaths worldwide. Physical inactivity and unhealthy eating are key risk factors contributing to the global CD burden. **PURPOSE:** 1) To determine whether a 6-month lifestyle prescription program [Health*e*Steps (H*e*S)] can improve healthy eating and decrease sedentary time in adults at-risk for CD; 2) To explore long-term maintenance of these behaviours. **METHODS:** Pragmatic randomized controlled trial of adults with ≥1 CD risk factor (metabolic syndrome or type 2 diabetes; body mass index >25 kg/m²; exercise <150 min/wk; sit ≥3 hr/d; eat <8 servings of fruit and vegetables/d) from 5 primary care settings in Ontario, Canada. Individuals (N = 118; mean age 57 (SD=12) years; 76% female) were randomized to intervention (H*e*S) or comparator (wait-list; WL). From baseline (V0) to 6 mo. (V1), H*e*S included 4 bimonthly coaching sessions (lifestyle prescriptions; strategies to achieve goals) and access to *e*Health technologies (phone coaching; social network; apps; website). From V1 to 12 mo. (V2), participants only had access to *e*Health technologies; from V2 to 18 mo. (V3), access included only publically available technologies. We examined *within* and *between* group differences in mean healthful eating (Starting the Conversation, STC; score 0-16, lower=better) using linear mixed models (LMM) adjusted for age, sex and site (covariates). Quantile

regression was used to examine *between* group differences at V1 in median sitting time (International Physical Activity Questionnaire; min/d, typical wk day), adjusted for baseline and covariates. A log-transformation was applied and changes in sitting time *within* H*e*S were examined via a LMM. **RESULTS:** By V1, H*e*S improved healthful eating more than WL [mean change in STC score (95% CI), p-value for difference: [H*e*S: -1.84 (-2.56, -1.13); WL: -0.35 (-1.03, 0.34); p=0.002] and maintained these improvements to V2 (p<0.001) and V3 (p=0.002). By V1, H*e*S decreased sitting time more than WL [difference between groups in median change (95% CI), p-value: -66.16 (-117.68, -14.64) min/d; p=0.01] and maintained decreased sitting time in the long-term (V2: p=0.002; V3: p=0.04).

CONCLUSION: Compared to usual care, H*e*S improved healthful eating and decreased sitting time in at-risk adults over 6 months, with strong potential for long-term sustainability.

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Reproducibility Of Free-living Physical Activity/ sedentary Behaviors In College Undergraduates

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(No relevant relationships reported)

PURPOSE: To determine the reproducibility of free-living physical activity/sedentary behaviors in college undergraduates. **METHODS:** Twice during an academic semester, 20 college students wore activPAL and Actiwatch monitors for seven consecutive days. Subjects were instructed to wear the devices at all times. These devices were worn according to manufacturer's instructions. Sleep and non-wear time were determined via the Actiwatch; waking physical activity and inactivity parameters were determined with the activPAL. The weekly means of these parameters were compared via paired t-tests and used to determine the typical error (TE) and coefficient of variation (CV). **RESULTS:** For the following waking day parameters, there were no significant differences between weeks one and two, so the average of both weeks are reported as the mean ± SD together with the TE and CV: total number of steps (9647.0 ± 4614.2, 1744.3, 18.2%), minutes spent stepping (104.0 ± 47.9, 16.5, 15.5%), sedentary minutes (737.2 ± 138.2, 53.7, 7.5%), MET-hours (25.0 ± 3.2, 1.3, 5.2%), minutes spent standing (163.2 ± 87.9, 34.4, 21.1%), minutes of light intensity activity (1.5-2.99 METs; 192.2 ± 99.1, 37.9, 19.4%), number of breaks from sitting/lying (48.1 ± 15.9, 5.2, 11.1%), the number of breaks per sitting/lying hour (4.1 ± 1.7, 0.6, 14.4%), the minutes of sitting/lying bouts that last at least 30 (475.5 ± 163.3, 52.5, 11.1%) and 60 minutes (271.4 ± 166.8, 59.7, 21.2%), percent of day spent sedentary (73.4 ±11.5, 0.04, 6.2%), percent of day spent in light intensity (19.1 ± 9.5, 0.04, 19.0%), and percent of day spent in moderate-to-vigorous activity (≥3 METs; 7.6 ± 3.6, 0.01, 17.4%). In contrast, total time spent in moderate-to-vigorous intensity activity (≥3 METs) was significantly different between weeks one (78.9 ± 39.6) and two (70.8 ± 33.9; p<0.05). In addition, the number of minutes meeting the ACSM physical activity guidelines were also significantly different between weeks one (27.7 ± 32.2) and two (20.2 ± 22.9; p<0.05). **CONCLUSION:** For college students, waking physical activity and sedentary behaviors assessed by activPAL are reproducible within an academic semester with the exception of moderate-to-vigorous physical activity. These results are likely explained by the lifestyle requirements demanded of a full-time college undergraduate.

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The Effect Of A Sit And Resistance Training Program On Sedentary Behavior

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(No relevant relationships reported)

PURPOSE: Previous research has shown that Sprint Interval Training (SIT) is effective in eliciting physiological responses comparable to continuous forms of training. Despite these physiological benefits, there is some evidence that vigorous exercise is linked to negative affective states and may discourage continued exercise participation or result in compensatory behaviors. Therefore, the purpose of this study was to determine if physical activity compensation occurred following a 10-week exercise intervention and to examine how compensation affective intervention variables examined. **METHODS:** 39 women aged 19-35 (25.4±4.5 years) completed a 10-week exercise training study consisting of SIT and resistance training three times a week for a total of 30 sessions. Pre and post assessments included body composition by iDXA, VO$_{2max}$ and an accelerometer measured physical activity and sedentary behavior for seven days. Validated cut points determined the percentage of time spent in moderate to vigorous physical activity and sedentary behavior. **RESULTS:** Participants spent on average 600 ± 50.5 minutes of each day (82% of the day) in sedentary behavior prior to the intervention. After posttest, participants

spent on average 530.4 ± 101.4 minutes (78% of the day) in sedentary behavior, which is a 3.24% reduction (p<.001). There was no effect of MVPA on VO$_{2max}$ (p = .421), however, participants who lost fat mass over the course of the study spent significantly more time (p=.008) in MVPA outside of the study. **CONCLUSIONS:** Overall, participants did not compensate following an exercise intervention by increasing their sedentary behavior. However, differences in MVPA outside of the study affected changes in fat mass.

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Accelerometer-determined Physical Activity and Sedentary Behavior among Majority-minority Sample of Adults: The Houston Train Study

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Based on self-reported data, minority populations are often found to be less active compared to whites, which may contribute to overall health disparities. The Houston Travel Related Activity in Neighborhoods (TRAIN) Study provides an opportunity to examine differences in accelerometer-determined (PA) levels among a majority-minority sample of adults.
PURPOSE: To describe and examine differences in accelerometer-determined PA and sedentary behavior among TRAIN participants at baseline, by race/ethnic groups and sex.
METHODS: Study participants were part of an ongoing natural experiment of transportation-related PA. At baseline, a group of participants self-selected to wear an ActiGraph wGT3X-BT monitor for 7 consecutive days during waking hours. Participants with ≥4 days with ≥ 10 hours/day were included in analysis. Freedson cut-points were used to quantify time spent sedentary (min/d) and in light- and moderate and vigorous-intensity physical activity (MVPA) (min/d). Vector magnitude (VM) estimates are also reported. Kruskal-Wallis tests were used to compare accelerometer based estimates by 1) race/ethnicity, and 2) sex and race/ethnicity groups.
RESULTS: 365 TRAIN participants had valid accelerometer data, 62.1% were female and 28.7% and 37.8% were black and Hispanic, respectively. There was a significant difference in VM (counts/min/day) across race/ethnicity groups with blacks and Hispanics having the highest and lowest median values, respectively (p<0.05). There were also differences for intensity-specific estimates. Median sedentary time (min/d) was highest in whites (591.0) and lowest in blacks (533.3), light intensity PA (min/d) was highest in blacks (256.2) and lowest in Hispanics (211.4), and MVPA (min/d) was highest in whites (17.9) and lowest in Hispanics (10.8) (p<0.05). Race/ethnicity differences were further stratified by sex. Among Hispanics, VM estimates were higher among men (461.5) than women (390.9) (p<0.05), which was also reflected in MVPA (min/d). In blacks, MVPA was higher among men (21.3) than women (11.3) (p<0.05). No other significant differences were noted.
CONCLUSIONS: For blacks, findings conflict with results typically found with self-reported data. Yet, findings for Hispanics align with existing literature, with the majority of disparity shown in women.

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The Effectiveness of Standing on a Balance Board for Increasing Energy Expenditure while Performing Sedentary Work

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(No relevant relationships reported)

It is estimated that occupational energy expenditure has decreased by 100 kcal·d^{-1}. Analogous to sitting, too much standing that is static with little movement poses health risks. Innovative technologies such as balance boards have been developed for use within an office setting to replace sitting and encourage movement while standing, yet little is known whether physiological benefits exist or if productivity is affected.
PURPOSE: To investigate differences in energy expenditure (EE), heart rate (HR), productivity, fatigue, and pain while performing desk work while sitting (SIT), standing (STAND), and standing on a balance board (BOARD).
METHODS: Thirty healthy adults (60% female; age 39.7 ± 11.8 y; BMI 26.7 ± 5.0 kg·m^{-2}) employed in sedentary-based jobs volunteered for this randomized crossover trial. Participants performed typing work in three different positions: SIT, STAND, and BOARD; each condition lasting 30 min. Oxygen consumption (VO$_2$) was measured via indirect calorimetry and EE was calculated using respiratory quotient and corresponding caloric equivalent values. Productivity was quantified by measuring words typed per min, accuracy, and typing mistakes. Overall feelings of fatigue and

pain were self-reported three times during each position using validated 10-cm visual analog scales. Repeated measures ANOVA were used to assess differences in outcome variables across conditions.
RESULTS: VO$_2$ was significantly different among all conditions regardless of current standing desk use (SIT 3.35 ± 0.53; STAND 3.77 ± 0.48; BOARD 3.92 ± 0.54 mL·kg^{-1}·min^{-1}, p<0.001). EE (kcal·min^{-1}) also differed (p<0.001) among SIT (1.27 ± 0.22), STAND (1.42 ± 0.26) and BOARD (1.48 ± 0.29). Compared to sitting (67 ± 9 bpm), HR was higher in STAND (76 ± 11 bpm) and BOARD (76 ± 11 bpm, p<0.001). Measures of productivity were similar across conditions (p>0.05). Mean self-reported fatigue and pain levels were similar across conditions (p>0.05). Fatigue progressively increased over each 30 min condition (p<0.001) whereas pain in SIT and BOARD increased from min 10 to 20, then leveled off between min 20 to 30. For STAND, pain continued to increase over time.
CONCLUSION: Compared with sitting, a balance board may be effective for increasing EE without interfering with productivity in an occupational setting.

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Intervention Targeting Reductions In Sedentary Time In Older Cancer Survivors: Characteristics Of Responders Versus Non-responders

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(No relevant relationships reported)

PURPOSE
We conducted a 16-week randomized controlled trial among older cancer survivors to disrupt sedentary time with short bouts of standing and stepping using prompts from a Jawbone UP2 tracker and smartphone app. Technical support was provided via 5 telephone calls. Primary analyses revealed limited change between intervention and control groups regarding reduction and breaks in sedentary time, and time spent stepping. The purpose of this secondary analysis is to provide insight as to the characteristics and behaviors of the participants that improved during the intervention (responders) versus those who did not improve (non-responders).
METHODS
Sedentary behavior and physical activity were measured in 26 older cancer survivors (mean age 69±3.1 years), using an ActivPAL activity monitor for 7 days pre- and post-intervention. The intervention group was divided into non-responders (n=12) and responders (n=14) based on improvement defined as: a decrease in daily sedentary time of 30 minutes or more, or an increase in daily light-intensity activity (LPA) of 30 minutes or more, or an increase in moderate-intensity physical activity (MPA) of 10 minutes or more. Independent sample t-tests were used to evaluate differences between groups regarding baseline demographic factors (age, sex, BMI), health characteristics (pain interference, fatigue, self-reported physical function, physical performance), sedentary behavior [sedentary minutes, breaks from sitting], and physical activity (LPA, MPA).
RESULTS
There were no significant differences in demographic factors (p-values 0.13 to 0.89) or baseline health characteristics (p-values 0.44 to 0.75) between responders and non-responders. Responders had more sedentary minutes/hour (42.4±4.3 vs. 36.1±8.1; p=0.03) and less LPA minutes/hour (standing + stepping: 14.3±3.4 vs.20.3±7.8; p=0.03) at baseline compared to non-responders.
CONCLUSION
These findings suggest that the greatest effect was observed in older cancer survivors who stood to benefit most from the intervention. Additional behavioral change techniques are needed to achieve more improvement.
FUNDING: American Cancer Society Institutional Research Grant and University of New Mexico Comprehensive Cancer Center Pilot Award.

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Effects of a 16-Week Treadmill Exercise on Physical Activity and Sedentary Time in Older Women

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(No relevant relationships reported)

Aging is often accompanied by a decrease in physical activity (PA) and increase in sedentary time. Low PA and excessive sedentary time have been linked to adverse health outcomes. Less is known about whether exercise training influences sedentary time and PA in various intensities, and whether body weight and cardiorespiratory fitness (CRF) play a role in any of the associations. **PURPOSE:** To examine the influence of a 16-week treadmill walking protocol on time spent being sedentary and time spent performing light PA (LPA) and moderate-to-vigorous PA (MVPA), in older women, and to examine the influence of body weight and CRF. **METHODS:** Older

women (n=61; age=65.5±4.3 years) participated in a 16-week moderate-intensity treadmill walking program (35-65 minutes/session, 3 days/week). Women wore a SenseWear Mini Armband consecutively for 14 days, except during water activities, at baseline and at the end of intervention. The software provided by the manufacturer was used to estimate the metabolic equivalents (METs), and to classify PA into LPA (1.5 to ≤ 3.0 METS) and MVPA (> 3.0 METs). Sedentary time was calculated by subtracting time being asleep from time with METs < 1.5. Body weight and CRF (by a graded exercise test) were measured at baseline and end-intervention. Repeated measure analyses were used to compare between baseline and end-intervention in the time being sedentary and performing PA. Body weight and CRF were used as time-varying covariates. **RESULTS:** Time being sedentary significantly reduced from baseline to end-intervention by approximately 38 minutes (p<0.001). Contrary to sedentary time, LPA significantly increased by approximately 17 minutes (p<0.002), and MVPA significantly increased by 20 minutes (p<0.0001). Body weight was associated positively with sedentary time (p=0.007), and negatively with LPA (p=0.001) across the intervention, but not with MVPA (p=0.24). CRF was associated negatively with sedentary time (p=0.002), and positively with both LPA (p=0.04) and MVPA (p<0.0001) across the intervention. **CONCLUSION:** A 16-week moderate-intensity treadmill-based intervention decreased sedentary time, and increased time spent performing LPA and MVPA. Interestingly, MVPA time was associated with CRF, but not body weight.

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Accelerometer-Assessed Physical Activity And Sedentary Time Profiles Of Kidney Transplant Recipients

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(No relevant relationships reported)

Physical activity may improve quality of life among kidney transplant recipients. Studies that have examined physical activity and sedentary time prevalence among kidney transplant recipients have used self-reported assessment tools, which may result in biased reporting. A better understanding of physical activity and sedentary patterns among transplant recipients is needed for the optimal design of targeted interventions. **PURPOSE:** To objectively assess physical activity and sedentary time profiles among kidney transplant recipients, and examine possible demographic and clinical correlates of physical activity and sedentary time. **METHODS:** Transplant recipients (diagnosed between 1993-2016) were recruited from the Northern Alberta Renal Program's Nephrology Information System database. Participants (N=133; 11% response rate) wore an Actigraph® GT3X+ accelerometer on their hip during waking hours for seven consecutive days. Commonly accepted activity count cutoffs (Freedson) were used to differentiate between sedentary, light, and moderate-to-vigorous intensity physical activity (MVPA). Accelerometer data were processed in 60-second epochs. **RESULTS:** Participants' average age was 58.4 years (SD=14.7), 57% were female, and the average duration since transplant was 27.2 months (SD=21.5). Participants wore their accelerometer for 6.5 days (SD=6.5). Participants recorded 9.4 (SD=4.1) hours per day of total sedentary time and averaged 3.7 bouts (SD=1.7) of sedentary time per day accumulated in at least 30-minute bouts, for a total of 2.9 hours (SD=1.5). For active behaviors, participants recorded 20.7 minutes of total MVPA per day and 5.7 minutes per day of MVPA accumulated in at least 10-minute bouts. Participants <60 years of age reported significantly more minutes of MVPA than participants ≥60 years of age (Mean Δ=15.8 min/day, CI: 9.7 to 22, p<.001). MVPA and sedentary time were not significantly associated with gender, BMI, or months since transplant. **CONCLUSION:** Accelerometer assessment of daily activity patterns indicated kidney transplant recipients showed high volumes of sedentary time, and low volumes of health-enhancing physical activity. Further research on effective interventions to favorably change this ratio and improve health outcomes of these patients is needed.

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Comparison Of Activpal And Actigraph On Detecting Sitting Vs. Standing In Three Classroom Postures

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(No relevant relationships reported)

PURPOSE: In the premise of reducing sedentary behavior as a preventive means to minimizing the risk of developing chronic diseases, efforts have been put forth to modify workplace and classroom setting to be more activity-permissive. In order to monitor postural changes and their impact on health, appropriate selection of monitoring devices becomes critical. The purpose of the study, therefore, was to

examine the accuracy of activPAL and ActiGraph (AG) devices in differentiating sitting on a physio-ball, standing still, and sitting in a chair during a lecture-based classroom setting.
METHODS: A total of 28 males and females, aged 18-25 years, from two classes of the same 50-minute course participated in the study. Each participant wore activPAL3 on non-dominant thigh and AG GT3X-bt on right hip in three conditions, which were randomly ordered: 1) sitting on a physio-ball, 2) standing, or 3) sitting in a chair. For the purpose of standardization of the analyses, the first and the last five minutes were excluded from the analyses, thus, comparison of sitting and standing (min) between activPAL and AG devices was made during the mid-40 minutes of each class.
RESULTS: One participant missed a day of physio-ball, analyses involving values obtained during physio-ball consisted of 27 participants. During physio-ball sitting, activPAL detected the behavior as 38.33 ± 4.40 min of sitting and 1.35 ± 3.56 min of standing, while AG detected the behavior as 14.60 ± 12.97 min of sitting and 25.29 ± 13.02 minutes of standing. During standing, activPAL detected 38.34 ± 7.53 min of standing, while AG detecting 32.13 ± 10.28 min of standing. During sitting in a chair, activPAL measured 39.26 ± 1.44 min of sitting vs. AG measured 17.42 ± 15.50 min of sitting. Paired samples t tests indicated significant differences in sitting on physio-ball, standing, and sitting in a chair between the two devices ($p <. 001$, $p = .020$, and $p < .001$, respectively).
CONCLUSIONS: The activPAL devices were more accurate in identifying the three classroom postures. Further examination of the accuracy of AG worn on other body parts (e.g., wrist and thigh) in differentiating sitting vs. standing in a classroom or occupational setting is warranted.

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Sedentary Time And Steps Across Methods For Determining End Of Daytime During 24-hour Activpal Monitoring

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(No relevant relationships reported)

PURPOSE: Best practices to identify daytime end during 24-hour activPAL monitoring are not clear. **METHODS:** This study included 25 overweight/obese adults (64% male, mean (SD) age: 42 (12) yrs) from a randomized crossover study. Posture, activity (activPAL) and sleep (Actiwatch) were monitored for 24 hours on two simulated workdays (with/without use of a sit-stand desk) followed by free-living evening behavior. Average time spent sedentary and steps were calculated using four methods to determine daytime end: 1) criterion method using actigraphy and a standardized scoring algorithm to indicate bedtime, 2) standard 10PM bedtime, 3) participant diary-reported bedtime, or 4) hybrid approach combining activPAL data with participant diary. Validity between criterion and alternative methods was evaluated by calculating average magnitude of error, Pearson's correlations, and Bland-Altman plots. **RESULTS:** Criterion mean (SD, %) sedentary time was 11.5 (1.3, 72.1%) hr/day with 3,106 (1,219) step/day. Absolute estimates of sedentary time differed from criterion by 1.2 hr/day (10%) using a 10PM bedtime, 0.4 hr/day (3%) using the hybrid method, and 0.2 hr/day (2%) using the diary only. When normalized to wear time, sedentary time errors were small (10PM: 1.4%; hybrid: 0.6%; diary: 0.4%). Correlations between alternative and criterion estimates of absolute sedentary time were lowest for the 10PM bedtime (r=0.57, p=0.003), then hybrid (r=0.83, p<0.001), then diary (r=0.97, p<0.001), but all were highly correlated after normalizing for wear time (r≥0.95, p<0.001). Bland-Altman plots showed no pattern of error and limits of agreement (hr/day) that decreased from 10PM (-1.1, 3.3), to hybrid (-1.3, 1.8), to diary (-0.8, 0.5). Differences from criterion steps/day were highest using the 10PM method (329, 11%) and similar for the hybrid or diary methods (39, 1%). Steps were highly correlated comparing all alternative methods to criterion (r≥0.96, p<0.001). **CONCLUSIONS:** Using a standard 10PM bedtime resulted in the highest error in sedentary time and steps, though correlations to the criterion were ≥0.95 for all methods after normalizing to wear time. In this population, using participant diaries is preferred to accurately quantify absolute sedentary time, though all methods were acceptable with wear time normalization.

2898   Board #181   June 1 2:00 PM - 3:30 PM
The Relationship between Cell Phone Use, Physical Activity, and Sedentary Behavior in Adults Aged 18-80

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(No relevant relationships reported)

Previous research, using multiple samples of undergraduate college students, suggests cell phone use is primarily a leisure behavior which most often occurs while sitting. This same research has identified a positive relationship between cell phone use and sedentary behavior, but not physical activity. **PURPOSE:** To examine these relationships among individuals older than traditional college students. **METHODS:**

An online survey was completed ($N = 421$; $n = 255$ females, 40 ± 16 years old) which assessed, using validated measures, total cell phone use, situational cell phone use (i.e. is the cell phone being used for leisure or work purposes and while sitting, standing, or during physical activity), sedentary behavior (i.e., sitting time), and physical activity behavior. A tertile split was then performed and participants were placed into the following groups based upon their cell total phone use: *high* ($n = 131$, 474 ± 268 min/d), *moderate* ($n = 138$, 190 ± 36 min/d), or *low* ($n = 152$, 81 ± 33 min/d) users. **RESULTS:** Mean cell phone use for the entire sample was 239 ± 224 min/d. Participants reported that, on average, 61% of their cell phone use was for leisure purposes and 80% of their cell phone use occurs while seated. Linear regression found that cell use was positively associated with sedentary behavior ($\beta = 0.157$, $p = 0.002$), negatively associated with age ($\beta = -0.128$, $p = 0.015$), and not related to physical activity ($\beta = 0.091$, $p = 0.086$) or sex ($\beta = 0.023$, $p = 0.638$). Analysis of variance revealed that the *high* cell phone use group (521 ± 266 min/d sitting) participated in significantly more ($p = 0.006$) sedentary behavior than *low* users (442 ± 214 min/d) with no differences ($p \geq 0.1$) between the *moderate* users (471 ± 253 min/d) and either the *low* or *high* use groups. **CONCLUSION:** Cell phone use in this sample of adults which on average were older than college age was similar to previous studies of college students. Participants reported that cell phones were primarily leisure devices and their use was positively associated with sedentary behavior but not physical activity. Specifically, *high* cell phone users reported 79 min/day or 15% greater sitting than *low* users. These associations were also independent of age and sex within this sample.

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Impact Of Sit-stand Workstation Progressions On Stress, Focus, And Productivity In University Staff Members

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the impact of utilizing sit-stand workstations (Ergotron) throughout the workday on stress, focus, and productivity when following sit-stand progression protocols for 10 weeks. METHODS: Participants (N=60) were randomly assigned to one of three groups. Group 1 and 2 followed a prescribed protocol to progress up to 30 and 20 minutes of standing per hour, respectively. The protocol consisted of reminder emails delivered to participants each hour to reinforce prescribed standing times. Group 3 was instructed to sit and stand according to their preference throughout the day. Stress, focus, and productivity during standing and sitting time were measured using the visual analogue scale (VAS) at the end of each day. Data were analyzed using mixed-designrepeated measures ANOVA with significance set at p < 0.05. RESULTS: For each group, stress was significantly lower and focus and productivity were significantly higher standing compared to sitting (p = 0.01) over the 10 weeks. CONCLUSIONS: The results indicate that there is an increase in focus and productivity, along with reductions in stress, when standing compared to sitting throughout the workday. Furthermore, there was no influence of standing time progression throughout the 10 weeks or total standing time per hour. Future investigations should examine the long-term utilization and compliance of the sit-stand workstations and the potential impact on overall health.

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The Physical And Psychological Effects Of Standing Desks In Office Workers

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(No relevant relationships reported)

The present study demonstrates differences between energy expenditure in typical office workers and whether or not sit-stand desk options are beneficial. PURPOSE: The purpose of the study was to determine differences in energy expenditure between sitting and standing in typically sedentary office workers. A secondary purpose of this study was to determine mindset differences with regards to job boredom, job stress, and job satisfaction. METHODS: Participants (N = 26, 4 males and 22 females) were from two moderately sized communities in the Midwest that had standing desk options available to them. Data was collected using BodyMedia SenseWear armbands for energy expenditure and self-reported Likert-scale surveys for psychological data. Data was collected during four sessions; two sitting sessions where participants were asked to not use their standing desk option, and two standing sessions where participants were allowed to stand as they desired. Data was analyzed using paired-samples t-tests to determine mean differences between energy expenditure and survey data. RESULTS: Results of the *t*-test for energy expenditure indicated the standing condition expended an average of 7.25 kcal more per hour than the sitting condition (t (24) -3.352, p = 0.003). No differences were found between average total survey data

or specific question survey results (all $p > 0.05$). CONCLUSIONS: The results of this study suggest there is a statistically significant increase in energy expenditure when utilizing a standing desk option at the typical office workstation. Participants expressed improvements in mindset, but this difference was not statistically significant. Overall, individuals that participate in standing throughout the day rather than strictly sitting can increase energy expenditure while at their normal workstation, potentially resulting in increased weight loss and decreased negative health risk factors for typically sedentary office workers.

2901   Board #184   June 1 2:00 PM - 3:30 PM

Effects Of Isotemporal Substitution Of Sedentary Time (total And Prolonged Bouts) On Mental Wellbeing

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(No relevant relationships reported)

Sedentary time is ubiquitous and inversely associated with health and wellbeing. Full 24-hour objective monitoring is rare, yet necessary, to understand interrelationships between time spent asleep, sedentary and active and their influences on wellbeing. **PURPOSE**: Our purpose was to use isotemporal substitution to examine the effects of replacing sedentary time (total and prolonged (> 30 min) bouts) with shorter sedentary bouts (< 30 mins), activity, or sleep on mood and stress at baseline and changes in mood/stress over one year. **METHODS**: Healthy young adults (age: 20-35; n=423 baseline; n=270 at one year; 48% women) wore a Sensewear Armband (SWA) 24 hours/day for 10 days and completed the Profile of Mood States (POMS) and the Perceived Stress Scale (PSS) at baseline and one year. Minutes spent sedentary, in light activity or MVPA, and sleeping were assessed with the SWA. Isotemporal substitution was performed separately for replacing one hour of a) total sedentary time and b) time in prolonged bouts with one hour of shorter sedentary bouts, light activity (1.5-3.0 METs), MVPA (> 3.0 METs) or sleep, on mood and stress at baseline and changes across one year. **RESULTS**: At baseline: substituting 60 mins into MVPA from total sedentary time (standardized beta [95% CI]; -.107 [-0.199, -0.014]) or time in prolonged bouts (-0.119 [-0.212, -0.025]) improved mood, as did swapping prolonged for shorter bouts (-0.106 [-0.211, 0.000]). Substituting time in prolonged bouts with sleep decreased current stress (-0.132 [-0.255, -0.009]) and improved mood (-0.136 [-0.257, -0.015]). When predicting changes in wellbeing at one year: substituting total sedentary time with light activity improved the change in mood at one year (-.141 [-0.280, -.002]), while substituting prolonged bouts with light activity non-significantly improved changes in mood (-.138 [-0.282, 0.006]). **CONCLUSIONS**: These results suggest that replacing one hour of sedentary time (especially that accumulated in prolonged bouts) with either more sleep or light activity could be effective for improving current and future mental wellbeing in healthy young adults. Longitudinal studies including objective 24-hour monitoring such as this are instrumental for informing future interventions targeting this set of behaviors.

2902   Board #185   June 1 2:00 PM - 3:30 PM

Racial and Ethnic Differences in Time Spent Sitting - The Booster Break Study

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(No relevant relationships reported)

PURPOSE: To examine the racial and ethnic differences among various types of sedentary behavior (SB) in a sample of sedentary office workers. **METHODS**: Study participants were recruited from five worksites in a large metropolitan city in the United States (N = 149, 67% minority, 83% female) All participants sat for at least 5-hours during a typical workday. SB was measured using a 7-item modified version of the Sedentary Behavior Questionnaire (SBQ) and the two-item sedentary behavior questions assessed in the International Physical Activity Questionnaire. Racial differences were examined with descriptive statistics as regression models. Statistical significance was determined at p < 0.05 with a two-sided test. **RESULTS**: Sedentary behavior ranged from a median of 0 minutes/day for viewing movies or videos to 60 min/day for watching television and riding in or driving a vehicle. Total median time spent sitting during the weekday was 480 min/day, whereas total time spent sitting during the weekend was 270 min/day. Our adjusted models indicated statistically significant racial and ethnic differences for sitting while talking on the phone (p < 0.001), watching television (p = 0.042), riding in or driving a vehicle (p = 0.027), total sitting time during the weekdays (p = 0.008), and weekend (p = 0.012). Median scores were higher among Blacks than Whites for both sitting and

talking on the phone and while watching television (Blacks = 73 and 131, Whites = 26 and 86 min/day). Total time spent sitting on the weekend was higher among Blacks than both Hispanics and Whites (Blacks = 541, Whites = 346, Hispanics = 306 min/day). However, both Blacks and Whites had higher median minutes spent in total sedentary time during the weekday than Hispanics. **CONCLUSION:** According to these data, racial and ethnic differences exist between various types of SB. Healthcare professionals should consider these differences when designing culturally tailored interventions designed to curve sedentary behavior. Supported by NIH Grants K01CA158000, R03NR010291, and CA016672

2903   Board #186   June 1 2:00 PM - 3:30 PM

Changes In Leisure Sedentary Behavior Across Retirement Transition: Finnish Retirement And Aging Study (FIREA)

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(No relevant relationships reported)

Retirement is a major life transition and it may influence health behaviors and time use. **PURPOSE**: To examine changes in leisure sedentary behavior across retirement transition. In addition, we examined which and how pre-retirement characteristics predicted these changes. **METHODS**: The study population consisted of 1,354 participants from the Finnish Retirement and Aging Study (FIREA). Repeated postal survey including questions on sedentary behavior domains (television viewing, computer use at home, sitting in a vehicle and other sitting) were conducted once a year across retirement transition, covering on average three study waves. **RESULTS**: Total sedentary time increased by 67 (95% CI 58-75) minutes/day during retirement transition and continued to increase by 27 minutes/day two years after retirement transition (period*time interaction p<.0001). Of the domain-specific sedentary behaviors, television viewing time increased by 25 (95% CI 21-29) , computer use at home by 19 (95% CI 16-22), and other sitting time by 36 (95% CI 31-41) minutes/day, while time sitting in a vehicle decreased by 6 (95% CI 3-10) minutes/day during retirement transition. Women (69 vs. 50 minutes/day, sex*time interaction p=0.04) and persons who had high occupational sitting time, sleep difficulties, mental disorders or poor self-reported health before retirement were most likely to increase in sedentary behavior during retirement transition. **CONCLUSIONS**: Total leisure-related sedentary time and especially television viewing time increased across retirement transition. As both total sedentary behavior and television viewing are associated with adverse health outcomes and mortality among older adults, more attention should be paid to reducing time spend on sedentary behaviors among recently retired adults. Supported by Academy of Finland Grants 286294 and 294154, Finnish Ministry of Education and Culture and Juho Vainio Foundation.

2904   Board #187   June 1 2:00 PM - 3:30 PM

Objectively-measured And Self-reported Sedentary Behavior And Its Association With Mental Wellbeing In College Students

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(No relevant relationships reported)

Sedentary behavior (SB) is an emerging health risk. While behavior patterns are often established during young adulthood, little is known regarding the accumulation of SB in this population and its association with mental wellbeing.
Purpose: To describe SB patterns in college-aged men and women and to compare objectively-measured SB with self-reported SB and their associations with mental wellbeing.
Methods: Participants were recruited as part of a larger study evaluating feedback mechanisms for lessening SB. Baseline assessments of objectively-measured SB were collected with an inclinometer (activPAL), worn for seven days. Participants subsequently self-reported sedentary time (IPAQ), health-related quality of life (SF-36), and mood (POMS). Descriptive statistics and Pearson's correlation coefficients were used to characterize SB and the cross-sectional relationship between SB and mental wellbeing constructs, including fatigue, pain, anxiety, depression, anger, vigor, and confusion.
Results: Thirty-five participants (age = 19.4 ±1.1 (mean±SD); 64% male) wore the activPAL for 6.9 ± 0.5 days. Per the activPAL, subjects accumulated 602.65 ± 82.4 min/day of sedentary time, with 343.5 ± 77.3 min/day accumulated in bouts of > 30 minutes. They had 48.8 ± 12.8 breaks in SB per day, averaging 5.1 ± 1.4 min/break. Per the IPAQ, SB was significantly lower at 406.59 ± 117.94 min/day (p<0.01). Further, objectively-measured total SB was not significantly correlated with self-reported SB (r= -0.04, p= 0.81), though bouts of SB in > 30 min was (r=0.36, p=0.04). There were no significant differences in objectively-measured SB, number of breaks in

SB, or average break rate by gender or BMI category (p>0.05 for all). SB (objectively-measured or self-reported) was not significantly associated with any of the mental wellbeing outcomes (p>0.05 for all).
Conclusions: College-aged men and women engage in large amounts of SB. The discrepancy between self-report and objective measures suggests they may be unaware of this important health behavior, and may be especially unaware of incidental SB accumulated in shorter bouts. Though SB was unrelated to mental wellbeing in this young healthy population, the development of sedentary habits during young adulthood may be problematic for future health outcomes.

2905   Board #188   June 1 2:00 PM - 3:30 PM

Determinants Of Sedentary Behavior In Adults: Who Is At Risk Of High Sedentary Time?

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(No relevant relationships reported)

Sedentariness is associated with increased risks for cardiovascular diseases, cancer, type 2 diabetes, and mortality. In order to target sedentary behavior efficiently, we need to identify determinants of sedentary behavior.
PURPOSE: To identify subject- and lifestyle-related determinants for the domains of sedentary behavior (transportation, occupation, leisure-time). **METHODS:** Subject characteristics (age, sex, weight, height, marital status, education level, employment, medical history) and lifestyle factors (sleep, smoking, alcohol consumption, physical activity) were collected via an online questionnaire. Sedentary time was assessed using the Sedentary Behavior Questionnaire and estimated for 9 different activities during weekdays and weekend days. Logistic regression calculated odds ratios and 95% confidence intervals (OR [95% CI]) of being sedentary during transportation, occupation and leisure time dichotomized at the 75th percentile (60 minutes/day, 275 minutes/day and 410 minutes/day, respectively). **RESULTS:** This study included 7,648 participants (median age 55, 55% men). Being sedentary during transportation and work was associated with younger age (0.99 per year [0.98-0.99]; 0.97 per year [0.96-0.97], respectively), men (1.97 [1.76-2.20]; 1.58 [1.41-1.78], respectively) and employment (1.68 [1.45-1.93]; 7.07 [5.54-9.03], respectively). Also BMI was associated with sedentary time (1.05 per kg/m^2 [1.04-1.07]) during transportation. Being sedentary during work was linked with a higher education level (5.29 [3.64-7.67]), and inversely related to former smoking (0.71 [0.54-0.93]) and being a cancer survivor (0.73 [0.56-0.96]). In contrast, higher amounts of sedentary time during leisure-time were associated with older age (1.03 per year [1.02-1.03]), unemployment (1.58 [1.38-1.81]), BMI (1.04 per kg/m^2 [1.02-1.06]), being unmarried (1.36 [1.18-1.56]) and worse health status (1.12 per grade [1.03-1.23]). **CONCLUSION:** Several subject and lifestyle-factors relate to a sedentary lifestyle, but characteristics markedly differ between different domains of sedentary time. Domain specific determinants should be included when designing new interventions to reduce sedentary behavior.

2906   Board #189   June 1 2:00 PM - 3:30 PM

Sedentary Time and Cumulative Risk of Preserved and Reduced Ejection Fraction Heart Failure: MESA

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(No relevant relationships reported)

Purpose: Examine the relationship between self-reported sedentary time and cumulative risk of preserved ejection fraction heart failure (HFpEF) and reduced ejection fraction heart failure (HFrEF) using a diverse cohort of U.S. adults 45-84 years of age. **Methods**: Using data from the Multi-Ethnic Study of Atherosclerosis (MESA), we identified 6,814 subjects (52.9% female). All were free of baseline cardiovascular disease. Cox regression was used to calculate the hazard ratio (HR) associated with baseline sedentary time and risk of HFpEF and HFrEF. Weekly self-reported sedentary time was dichotomized based on the 75th percentile (1,890 min/wk). **Results**: During ~11.2 years of follow-up there were 178 first incident HF diagnoses; 74 HFpEF, 69 HFrEF and 35 with unknown EF. In the age adjusted model, sedentary time >1,890 min/wk was a significant predictor of HFpEF (HR 1.75, p=0.03), but not HFrEF (HR 1.36, p=0.24). The relationship with HFpEF remained significant in separate fully adjusted models including body mass index (HR 1.87, p=0.02) or waist circumference (HR 1.86, p=0.02) while the relationship with HFrEF did not reach statistical significance. These models were also adjusted for physical activity (MET·min·wk^{-1}). **Conclusion**: Sedentary time >1,890 min/wk (~4.5 h/d) is an independent predictor of HFpEF, but not HFrEF.

2907   Board #190   June 1 2:00 PM - 3:30 PM

Sitting Is The New Smoking And Teens Report Doing A Lot Of It

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(No relevant relationships reported)

Purpose: Sedentary time has been independently associated with poor chronic disease outcomes in adults, regardless of physical activity level. Thus intervening to decrease sedentary time in adolescents could have important long-term health implications. The aim of this analysis is to assess differences in sedentary time and activities of teens by weight status and sociodemographic factors at baseline of a cluster-randomized, longitudinal study of an intervention for adolescent obesity prevention and management (ACTION PAC). **Methods:** 9th and 10th grade students (n=834) from 8 public high schools in the Southwest completed a physical activity recall during 3 consecutive days (1 weekend day; 2 weekdays) for 30-minute blocks from 5 AM to midnight at baseline. Metabolic equivalents (METs) were assigned based on reported activity and intensity; time blocks with METs ≤ 1.5 were considered sedentary. Electronics-related activities were aggregated as screen-time. Height and weight were collected using standardized methods and sociodemographic information was collected via questionnaire. A multilevel linear regression model was constructed to examine the association of sedentary activities and BMI category (SAS 9.4, PROC MIXED); sex, race/ethnicity, parental education, and household income were assessed as covariates. **Results:** On average, participants were sedentary for 71% of their waking time; 52 participants (6%) reported entire days spent in sedentary activities. Participants in all categories spent most of their sedentary time sitting in class (7.2 blocks/d), followed by screen time (3.7 blocks/d) and car time (2.0 blocks/d). Participants with BMI ≥95th percentile reported more screen time relative to the group with a BMI <85th percentile (4.3 vs. 3.7 blocks/d, p=.048); however, this was attenuated when participant sex was added to the model (p=0.08). Males reported higher mean screen time than females (4.3 vs. 3.2 blocks/d, p<0.0001), with the largest difference in video gaming (1.2 vs 0.2 blocks/d, p<0.0001). **Conclusions:** Teens report large amounts of sedentary time, with no significant differences by weight status. Decreasing sedentary time within the school day and replacing screen time with active endeavors may be an important focus of interventions. Supported by NIH Grant R01HL118734

2908   Board #191   June 1 2:00 PM - 3:30 PM

"Health-enhancing" Breaks From Sitting- Variations By Gender, Age, Adiposity And Diabetes Status

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(No relevant relationships reported)

INTRODUCTION: The most recent American Diabetes Association (ADA) Physical Activity/Exercise position statement included specific guidelines to reduce sitting time and interrupt bouts of sitting at least every 30 minutes with light physical activity. In the experimental evidence underpinning these recommendations, the shortest breaks associated with health enhancement were 5 minutes of standing and 2 minutes of light/moderate ambulation. **PURPOSE:** We quantified the frequency of such health-enhancing breaks (HEBs) from sitting in the free-living environment, and characterized variations by gender, age, adiposity, and diabetes status. **METHODS**: Data were from a subsample of 727 AusDiab study (2011-12) wave 3 participants who wore the activPAL3 device for ≥4 days. A break (any upright event following sitting) was categorized as a HEB if it contained ≥5 minutes upright time (upright HEB) or ≥2 minutes stepping time (ambulatory HEB). Linearized variance estimation corrected for the multistage design and significance was set at p<0.05. **SUMMARY OF RESULTS:** On average (mean ± SD), per day, there were 53.1 ± 14.8 breaks in total, but only 19.7 ± 4.8 HEBs: 18.4 ± 4.5 upright HEBs and 13.6 ± 4.5 ambulatory HEBs, with many HEBs meeting both criteria. Older age, higher BMI and having diabetes were all significantly associated with fewer breaks of all types. After mutual adjustment, these associations remained significant except for the association between total breaks and diabetes, which was heavily attenuated (p=0.573). Women differed significantly from men only in having more upright HEBs; following adjustment, this association was borderline significant (p=0.050). Differences were mostly small-to-moderate (approximately 0.2 to 0.5 SD) with the greatest differences (≥0.5 SD) being for obesity and diabetes status. **DISCUSSION:** These findings in the free-living environment, using accurate accumulation measures, indicate that very few breaks from sitting are HEB; and, that the sociodemographic patterning of HEBs and total breaks were not identical, especially with respect to gender. Notably, while the ADA recommends adults with diabetes break up their sitting time, this population, along with those who were obese, performed the fewest HEBs.

F-60 Free Communication/Poster - **Ergogenic Aids IV - Food, Herbal Supplements and Performance**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2909   Board #192   June 1 3:30 PM - 5:00 PM

The Effects of 6 weeks of Cissus Quadrangularis Supplementation and High Intensity Exercise Training

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(No relevant relationships reported)

Previous studies have shown that supplementation with Cissus Quadrangularis (CQ) can positively alter body composition in sedentary adults. However, it is unknown if this same effect is observed in active adults. **PURPOSE:** The purpose of this study was to determine the effects of 6 wks of supplementation with CQ on body composition and exercise performance in healthy adults enrolled in a crossfit class. **METHODS:** A total of 18 adults (9 males, 9 females, 40.2±8.3 y; mean±SD) completed this study. All subjects had been enrolled in crossfit classes prior to the study. Baseline body composition was assessed by whole body densitometry using air displacement plethysmography, and exercise performance was assessed using a time to completion 1000 m rowing test and a 3 repetition max for the standing press and back squat. Following baseline testing, subjects were randomly assigned in a double-blind manner into one of two groups: 3.2 g/d of CQ; or 3.2 g/d of a maltodextrin placebo (PL). Subjects consumed half of the daily dose in the morning and half in the evening on an empty stomach. All testing was repeated following 6 wks of treatment. Pre to post differences were analyzed using a treatment by time repeated measures ANOVA. **RESULTS:** After 6 wks of treatment, there were no significant differences observed between the CQ or PL group for change in body weight (CQ= -0.2±0.8 kg, PL= -0.07±1.5 kg, p=0.77), fat mass (CQ= -1.1±0.7 kg, PL= -1.0±1.9 kg, p=0.96), fat free mass (CQ= +0.8±0.7 kg, PL= +0.7±1.5 kg, p=0.89), body fat % (CQ= -1.2±0.7 % body fat, PL= -1.1±1.9 % body fat, p=0.94), 3 rep max back squats (CQ= +16.7±11.5 lbs, PL= +16.7±13.2 lbs, p=1.0), 3 rep standing press (CQ= +8.3±6.1 lbs, PL= +3.30±5.6 lbs, p=0.08), or 1000 m rowing test (CQ= -3.0±6.0s, PL= -3.9±9.3s, p=0.81). **CONCLUSION:** Compared to the placebo, 6wk of supplementation with CQ did not alter the body composition or exercise performance adaptations to crossfit training in experienced crossfitters.

2910   Board #193   June 1 3:30 PM - 5:00 PM

The Effects Of Resveratrol-based Polyphenol Supplementation On Indices Of Exercise-induced Muscle Damage

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(No relevant relationships reported)

Exercise-induced muscle damage (EIMD) symptoms may be attenuated through dietary polyphenol consumption by reducing acute inflammation and oxidative stress, protein degradation, and soreness. However, it is unclear if long-term supplementation of a multi-ingredient resveratrol-based polyphenolic compound mitigates EIMD symptoms and facilitates performance recovery. **PURPOSE:** To investigate the effects of a resveratrol-based polyphenol supplement on indices of EIMD. **METHODS:** Male and female subjects completed a muscle damaging exercise protocol consisting of eccentric-loaded resistance exercise (ECRE) followed by four weeks of resveratrol-polyphenol (RES) (n=10) or placebo (CTL) (n=12) supplementation. Perceived soreness, pain threshold and tolerance, range of motion, and muscular performance were measured before and 24 and 48 hours after ECRE. **RESULTS:** CTL demonstrated increased resting soreness at 24 (p=0.02) and 48 hours (p=0.03) post-EIMD compared to baseline while RES reported increased soreness at 24 hours post EIMD and by 48 hours soreness level returned to baseline (p=0.0003). CTL and RES demonstrated increased soreness under muscular tension at 24 (p<0.0005) and 48 hours (p=0.01 and p=0.007, respectively) post-EIMD compared to baseline with no significant interaction. CTL exhibited decreased pain threshold from baseline to 24 hours post-EIMD (p=0.03). CTL also displayed decreased pain tolerance in the vastus intermedius from baseline to 24 hours post-EIMD (p=0.03) and the vastus lateralis from baseline to 24 (p=0.003) and 48 hours (p=0.003). There were no significant interactions for pain threshold or pain tolerance for any test site. In terms of lower-body power, CTL showed a significant decrease in mean (p=0.04) and peak power (p=0.04) from baseline to 24 hours post-EIMD. There were no significant changes from baseline to 48 hours post-EIMD for CTL. RES demonstrated no changes from baseline for power at any post-EIMD time point. **CONCLUSION:** Multi-day

supplementation of a resveratrol-based polyphenolic substance may support the attenuation of soreness and recovery of performance following EIMD, however its effects on skeletal muscle tissue healing and regeneration remains unknown.

2911   Board #194   June 1 3:30 PM - 5:00 PM

Dietary Antioxidants-contained Foods Promote Skeletal Muscle Adaptation And Reduce Fatigue Induced By Resistance Training

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(No relevant relationships reported)

PURPOSE: To investigate the effects of antioxidants-contained foods on muscle adaptation and fatigue induced by resistance training. Here, we focused on three antioxidants which can promote protein synthesis. **METHODS**: Twenty-six healthy men were divided into control (C) and antioxidant (A) groups. All subjects were performed a resistance training program twice a week for 10 weeks. Salmon flake, vegetable juice, and lingonberry jam which contain astaxanthin, β-carotene, and resveratrol, were provided for the A group. Body composition, nutritional intake, maximal voluntary contraction (MVC), oxygen consumption, subjective fatigue, and serum carbonylated protein were measured in pre- and post-intervention. **RESULTS**: Lean body mass was significantly increased in both groups (p < 0.05). Intakes of astaxanthin, β-carotene, and resveratrol were significantly increased in the A group (p < 0.01). Although MVC (kg) of leg extension was significantly higher in post-intervention (C: 26.2 ± 1.7, A: 31.1 ± 2.1) than in pre-intervention (C: 24.2 ± 2.0, A: 25.3 ± 2.4) (C: p = 0.04, A: p= 0.005) in both groups, the degree of change was higher in the A group (C: 2.0 ± 0.8, A: 5.7 ± 1.5) (p = 0.065). Oxygen consumption (ml/kg/min) was significantly higher in post-intervention (3.6 ± 0.1) than in pre-intervention (3.4 ± 0.1) (p = 0.049) in the A group, but not changed in the C group. The degree of subjective fatigue was significantly lower in post-intervention (2.0 ± 0.4) than in pre-intervention (3.1 ± 0.6) (p = 0.028) in the A group, but not changed in the C group. In addition, serum carbonylated protein (nmol/mg) was significantly lower in post-exercise (0.12 ± 0.01) than in pre-exercise (0.15 ± 0.01) (p = 0.026) in post-intervention of the A group only. **CONCLUSIONS**: Intakes of astaxanthin, β-carotene, and resveratrol may promote resistance training-induced muscle adaptation by reducing fatigue and oxidative stress, leading to higher muscle strength.

2912   Board #195   June 1 3:30 PM - 5:00 PM

Effect of New Zealand Blackcurrant Extract on Substrate Oxidation and Cycling Performance in Normobaric Hypoxia

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(No relevant relationships reported)

Blackcurrant is high in anthocyanin content. We have shown enhanced whole-body fat oxidation and increased time trial performance during cycling, in addition to increased femoral artery diameter during an sustained submaximal isometric contraction of the *m.quadriceps* with intake of New Zealand blackcurrant (NZBC) extract in normobaric normoxia (Cook et al., 2015, 2017). The effect of blackcurrant on metabolic and physiological responses and performance during cycling in normobaric hypoxia are not known. **PURPOSE:** To examine the effect of NZBC extract on intensity-dependent physiological and metabolic responses and 16.1-km cycling time trial in trained cyclists in normobaric hypoxia. **METHODS:** The study used a double-blind randomized cross-over design. Eleven healthy men from cycling and triathlon clubs with at least 3 yrs experience and cycling 8-10 hr·wk⁻¹ (age: 38±11 yrs, height: 179±4 cm, body mass: 76±8 kg, $\dot{V}O2max$: 47±5 mL·kg⁻¹·min⁻¹, maximum power: 398±38 W, mean±SD) ingested NZBC extract (600 mg·day⁻¹ containing 220 mg anthocyanins) or placebo (PL) for 7 days (washout 14 days). Participants performed bouts of 10 min at 45, 55 and 65% $\dot{V}O_{2max}$, using indirect calorimetry and blood sampling, followed by a 16.1 km time-trial on a SRM ergometer (SRM International, Germany). Participants were familiarized for the time-trial. All testing took place in a temperature controlled (15°C) normobaric hypoxic chamber set at an altitude of ~2500 m (15% FiO₂) (TIS Services, Medstead, UK) in morning sessions. Data was analysed using paired t-tests. **RESULTS:** At each intensity, NZBC extract had no effect on metabolic and physiological responses (e.g. at 65% $\dot{V}O_{2max}$, heart rate - PL: 133±12, NZBC; 132±12 beats·min⁻¹; fat oxidation - PL: 0.24±0.12, NZBC: 0.20±0.16 g·min⁻¹; carbohydrate oxidation - PL: 2.34±0.42, NZBC: 2.48±0.35 g·min⁻¹; lactate - PL: 1.37±0.45, NZBC: 1.56±0.57 mmol·L⁻¹). No improvements in 16.1 km time-trial performance were observed (PL: 1685±92, NZBC: 1685±99 sec). **CONCLUSION:** Seven day intake of New Zealand blackcurrant extract does not change whole-body fat oxidation and 16.1

km time-trial performance during cycling in normobaric hypoxia. Supplements were provided by Health Currancy Ltd (UK). Blackcurrants New Zealand Inc (NZ) provided funding for conference attendance.

2913   Board #196   June 1 3:30 PM - 5:00 PM

Effects Of Montmorency Tart Cherry (L. Prunus Cerasus) Consumption On Nitric Oxide Biomarkers And Exercise Performance.

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(No relevant relationships reported)

Montmorency tart cherries contain numerous polyphenols that have been shown to improve blood flow and blood pressure. These effects might be linked to increased nitric oxide (NO) synthesis and contribute to improved exercise performance, but this has yet to be investigated. **PURPOSE**: To investigate the effects of supplementation with Montmorency tart cherry juice (MC) on plasma nitrite concentration ($[NO_2]$), a sensitive NO biomarker, vascular function and exercise performance in trained cyclists. **METHODS**: In a randomized, double blind, placebo-controlled, crossover study, 10 physically active males (mean ± SD age; 28 ± 7 years, stature 1.83 ± 0.06 m, body mass 78.0 ± 8.5 kg and VO_{2peak} 59.0 ± 7.0 ml/kg/min) acutely ingested 30 mL of either MC or Placebo (Pla) and completed a 6 min moderate- and severe-intensity cycling bout 1.5 h post ingestion on two occasions for each experimental condition. The severe-intensity cycling test was continued to exhaustion on one occasion and immediately followed by a 60 s all-out sprint on the other occasion. Blood pressure, pulse wave measures, tissue oxygenation index and plasma $[NO_2]$ were assessed pre and 1.5 h post MC and Pla ingestion. **RESULTS**: Time to exhaustion was not different between conditions (P > 0.05), but peak power over the first 20 s (363 ± 42 vs. 330 ± 26 W) and total work completed during the 60 s all-out sprint (21 ± 3 vs. 19 ± 3 kJ) were 10% higher in the MC trial compared to the Pla trial (P < 0.05). Systolic blood pressure was 5 ± 2 mmHg lower 1.5 h post MC supplementation compared to Pla supplementation (P < 0.05). There were no differences in pulse wave measures, plasma nitrite concentration or tissue oxygenation index between the MC and Pla trials (P > 0.05). **CONCLUSIONS**: These results suggest that acute supplementation with MC can lower blood pressure and improve some aspects of exercise performance, specifically end-sprint performance, in trained endurance cyclists. These data reveal a practical, non-pharmacological, dietary intervention that may have implications for enhancing vascular health and exercise performance in trained cyclists.

2914   Board #197   June 1 3:30 PM - 5:00 PM

Effects Of Blackcurrant Extract On Peripheral Blood Flow And Muscular Endurance

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(No relevant relationships reported)

The consumption of blackcurrants has previously been shown to increase blood flow to the hands and eyes in humans at rest via vasodilatory mechanisms attributed to polyphenolics. While an increase in blood flow to the hands at rest may have health related benefits, such as improving resting circulation, it is unclear whether there is a benefit during fatiguing exercise. An increase in blood flow to contracting skeletal muscle during exercise may, in theory, delay the onset of fatigue by improving oxygen and nutrient delivery to the muscle while additionally increasing the rate at which metabolic waste products and biochemical agents of fatigue are removed.**PURPOSE**: To investigate the effects of New Zealand blackcurrant extract on peripheral (forearm) blood flow and muscular performance.
METHODS: Ten healthy males participated in two trials during which they ingested either blackcurrant extract (BC), delivering 1.87 mg anthocyanins/kg bodyweight, or a placebo powder (PP) containing equivalent amounts glucose, fructose and sucrose to BC; treatment allocation was randomly allocated in a balanced fashion and participants were blinded to the treatments. Participants sat at rest and measures of forearm blood flow (FBF), using venous occlusion plethysmography, heart rate (HR), systolic (SBP) and diastolic blood pressure (DBP) were made prior to and every 30 min after treatment ingestion, for 2 h. After 2 h participants completed intermittent isometric handgrip exercise to volitional fatigue. Differences within and between trials for all criterion measures were analysed using two-way repeated measures ANOVA. **RESULTS**: A treatment effect (p = 0.014), time effect (p = 0.05) and a treatment x time interaction (p = 0.005) were observed for FBF. FBF decreased over the 2 h period with PP only (90 min = - 35.8 ± 28.8 %, p =0.047; 120 min = - 39.4 ± 29.1 %, p =0.028), no change was observed with BC. HR, SBP and DBP changed over time

(all p < 0.001) however no difference between treatments was found. The number of repetitions completed during hand grip exercise did not differ between treatments (BC = 73.6 ± 28.8 repetitions vs PP = 77.2 ± 44.5 repetitions, p = 0.68).**CONCLUSIONS**: New Zealand blackcurrant extract maintains peripheral blood flow during a period of prolonged sitting, however this effect does not alter fatiguing hand grip performance.

2915   Board #198   June 1 3:30 PM - 5:00 PM

Effects Of Acute Golden Root Extract (rhodiola Rosea) Supplementation On Anaerobic Exercise Capacity

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(No relevant relationships reported)

PURPOSE: : The purpose of this study was to examine the effects of acute golden root extract (GRE) supplementation on repeated Wingate exercise performance. **METHODS**: College aged female participants (age =19.0 yrs ± 0.63, height= 66.3 in ± 1.8, weight= 152.8 lbs ± 19.9) were recruited for this study. In a within groups counterbalanced study design, participants were supplemented with either 1,500 mg/ day of GRE or placebo (gluten-free cornstarch) for 3 days. Participants also took an additional 500 mg dose of corresponding treatment 30 minutes prior to testing of each trial. During each exercise trial, participants completed 3x 15 second Wingate cycle tests separated by 2 minute recovery periods. Each exercise trial was separated by a 1 week washout period. **RESULTS**: Over the 3x 15 second Wingate cycle tests, mean watts (p= 0.01), mean anaerobic capacity (p=0.025), and total work (p=0.018) were higher in the GRE treatment trial versus placebo. However, mean anaerobic power (p= 0.185), mean peak watts (p= 0.078), and fatigue index (p= 0.186) were unaffected regardless of treatment. **CONCLUSIONS**: This study suggests that acute GRE supplementation improves repeated Wingate performance suggesting a role for GRE as an ergogenic aid.

2916   Board #199   June 1 3:30 PM - 5:00 PM

Nutritional Analysis of Ginger (ZingibreOfficinale) Drink: Potentials for Sport Performance

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(No relevant relationships reported)

PURPOSE:Sport and energy drinks for performance enhancement is a common practice among athletes. These supplements reportedly increases health risks including; dehydration, anxiety, headache, sleep disturbances, caffeine intoxication, withdrawal syndrome, dependence and over working of body systems leading to exploration of alternative traditional herbal supplements like ginger which has both dietary and medicinal values. The purpose of this study is to determine nutritional values of ginger drink and ascertain their potentials for enhancing sport performance. **METHODS**: Experimental research design was adopted to analyse two versions of ginger drinks prepared using ginger rhizomes (Botanical Identification: UIL/001/1083) was obtained from an open market in Ilorin, Nigeria. Ethical clearance was obtained from the University of Ilorin Ethical Review Committee. The ginger rhizomes was used to prepare 2ml/98ml (H2O) and 3ml/97ml (H2O) of ginger concentration. Six samples; (i) 2ml & (ii) 3ml with 1 cube of sugar (1CS) each (iii) 2ml & (iv) 3ml with 2 cubes of sugar (2CS) each (v) 2ml & (vi) 3ml each with no sugar (NS) were prepared and subjected to proximate analysis at the Department of Industrial Chemistry, University of Ilorin, Nigeria. Statistical analysis was descriptive and nutritional components were reported as percentage per 100ml. **RESULTS**: Nutritional values of the ginger drinks were similar; all six samples contained protein, fat, carbohydrate, vitamins and essential minerals; the energyvalue was 168 kj/100ml, which was richer than most energy/sport drinks commonly consumed in Nigeria. These indicated ginger drink might effectively enhance glucose supply for ATP synthesis, delay fatigue, reduce exercise-induced oxidative stress, boost recovery and sport performance. Ginger drink containing 1CS had increased pH/100ml; 3.50% for both 2ml/98ml (H_2O) and 3ml/97ml (H_2O) but ginger drink containing 2CS had the same pH with NS ginger drink; 3.18% for 2ml/98ml (H_2O) and 3.09% for 3ml/97ml (H_2O). **CONCLUSIONS**: Ginger drink is nutritious and might reliably enhance sport performance. Ginger drink with 2CS had less pH implying more potential for sport performance. A follow-up study is ongoing to ascertain the effects of ginger drink on anaerobic and aerobic capacity of athletes.

Abstracts were prepared by the authors and printed as submitted.

FRIDAY, JUNE 1, 2018

2917   Board #200   June 1 3:30 PM - 5:00 PM

The Effect of Curcumin on Inflammation and Exercise Induced Muscle Damage in Healthy Adults

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(No relevant relationships reported)

Curcumin has become a popular nutraceutical product used to decrease inflammation and recently in recovery from exercise. **PURPOSE:** To determine the effect of curcumin on inflammation and exercise induced muscle damage after plyometric exercise. **METHODS:** Participants (n=22; Age: 21.48 ± 1.63 years, Height: 176.37 ± 8.12 cm, Weight: 79.16 ± 11.30 kg) were given either curcumin (500 mg with 95% total curcuminoids) or placebo (maltodextrin) supplements twice daily for 9 days (5 days pre exercise, day of exercise and 3 days post exercise. Participants completed 5 sets of 20 drop jumps on day 6. Blood sampling and recovery tests were assessed at pre-supplementation, 24-hours pre-exercise and 0, 24, 48 and 72-hours post-exercise. Blood markers included creatine kinase (CK) and erythrocyte sedimentation rate (ESR). Muscle damage symptoms were measured via thigh circumference, vertical jump and subjective measurement of pain (VAS) during a squat and a squat jump. **RESULTS:** Both groups experienced symptoms of muscle damage in the 24 hours post exercise with elevated CK (403 ± 390 ul), increased VAS pain scores with squatting (37 ± 30 mm), and pain with squat jump (36 ± 31 mm). Vertical jump also decreased over time in the placebo group (19.8 ± 4.8 inches vs. 21.4 ± 3.2 inches, placebo vs. curcumin; p = 0.01). There was no significant change over time or between groups in thigh circumference. CK was not significantly different between groups despite being ≥200 ul greater 24 hr post exercise in placebo vs. curcumin (528 ± 573 ul vs. 325 ± 178 ul, respectively). ESR was significantly greater immediately post exercise in the placebo vs. curcumin group (6.3 ± 5.6 vs. 3.4 ± 2.6 mm/hr), however these were within the normal range limit for this test. **CONCLUSION:** These data suggest curcumin may aid in pain reduction and potentially inflammation following plyometric exercise. However, future studies need to confirm the efficacy of curcumin for relieving signs and symptoms of exercise-induced muscle damage. Potential targets for future research include dosing protocols and strategies (i.e., daily dosage and required length to provide benefit).

2918   Board #201   June 1 3:30 PM - 5:00 PM

The Effects of Blueberry Supplementation on Exercise-Induced Muscle Damage

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(No relevant relationships reported)

Blueberries have been reported to possess several anti-inflammatory properties. Previous studies examining the anti-inflammatory effect of blueberries on acute inflammation caused by exercise-induced muscle damage are largely inconclusive. This may be due to the dose used in these studies not accounting for an individual's lean mass (LM), the compartment directly involved during exercise, when determining appropriate blueberry dosage. **PURPOSE:** To examine the effect of blueberry supplementation (BB) at a dose relative to LM on delayed onset muscle soreness (DOMS) and recovery. **METHODS:** Fourteen recreationally active women (age: 21±1yr; body fat: 24.8±4.5%) participated in this double blind, matched-pairs study. Participants were matched by LM and randomly assigned to either a BB or a placebo (PLA) group. Leg strength was assessed via one-repetition maximum (1RM) on a leg press. Participants consumed a daily dose of freeze-dried BB powder (1.6g BB/kg$_{LM}$) or a PLA (1.6g PLA/kg$_{LM}$) for 7 days prior to induction of DOMS. Participants completed 6 sets of 10 repetitions at 70% 1RM on the leg press to induce DOMS. Perceived soreness (questionnaire), pressure-pain threshold (dolorimeter), and average power (AP; Biodex™) of the right thigh muscles were assessed immediately before (PRE) and after (POST), 24, 48, and 72h post induction of DOMS. Repeated measures ANOVAs were used for analyses. Significance was set at $p<0.05$. **RESULTS:** There were no group x time interactions for perceived soreness, pressure-pain threshold, and AP, however, significant time effects were observed for these variables. When comparing pre to post 24hr ($p<0.001$), 48hr ($p=0.001$), and 72hr ($p=0.011$) perceived soreness of the thigh muscles significantly increased. Pressure-pain threshold of the thigh muscles decreased significantly from pre to post 24hr ($p=0.023$), 48hr ($p=0.001$), and 72hr ($p=0.024$). Isokinetic leg extension AP decreased from pre to post 24hr (BB: 83±17 to 76±22Nm; PLA: 85±21 to 79±26Nm; $p=0.02$). **CONCLUSION:** Consumption of BB for 7 days prior to DOMS induction on a leg press does not affect rating of perceived soreness, pain threshold, nor attenuate decreases in performance compared to a PLA in recreationally active women.

2919   Board #202   June 1 3:30 PM - 5:00 PM

The Effects Of Rhodiola Rosea Supplementation On Time To Fatigue And Recovery After Exercise In Rats

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(No relevant relationships reported)

Rhodiola rosea is one of the most popular adaptogens claimed to promote physical/cognitive vitality, with ability to reduce the effects of prolonged and minor physical exhaustion that results in fatigue. PURPOSE: To determine the effects of Rhodiola rosea standardized extract supplementation on exercise tolerance and muscular recovery in rats submitted to a 8 weeks swimming training protocol. The study was designed to evaluate the interaction between the Rhodiola rosea supplementation and a physical training program in the variables of the enzymatic adaptations and their gene expressions related to the glycogen resynthesis after exercise. METHODS The study was conducted with 30 rats: Control group (n=10) Exercise group (n=10) and Rhodiola+exercise group (n=10). The training and supplementation protocol consisted in a 8 weeks period. In the Rhodiola+exercise group the animals received 50 mg/kg/day of the product by gavage (intragastric administration). The training protocol consisted in a swimming time of approximately 2h/day 5 days/week. The animals were also submitted to a time to fatigue evaluation test pre and post the 8 weeks program. The analyzed variables were: muscle and hepatic glycogen, gene expression of glycogen synthase and time to fatigue. RESULTS: Post exercise muscular glycogen content was lower in the Rhodiola+Exercise group (0,13±0,01 mg/100mg of tissue) compared with the exercise group (0,64±0,02 mg/100mg of tissue). Post exercise liver glycogen content was also lower in the Rhodiola+Exercise group (0,89±0,01 mg/100mg of tissue) compared with the exercise group (1,77±0,16 mg/100mg of tissue). Gene expression (mRNA) of glycogen synthase was higher in the Rhodiola+Exercise group (1,29±0,43) compared with the exercise group (1,05±0,32). The time to exhaustion was higher in the Rhodiola+Exercise group (93,0±0,34 minutes) compared with the exercise group (71,8±0,43 minutes). CONCLUSION: 8 weeks of Rhodiola rosea supplementation improved the muscle and glycogen mobilization, increasing the time to fatigue. The Rhodiola rosea also increased the gene expression of the glycogen synthase which suggests its benefits on the recovery time after an intense exercise.

2920   Board #203   June 1 3:30 PM - 5:00 PM

Curcuma Longa Extract Reduces Muscle Soreness And Myoglobin Following A Half-marathon: A Double-blind, Placebo-controlled, Randomized

João Felipe Mota[1], Flávia Rasmussen Faria[1], Aline Corado Gomes[1], Kennia Rocha Rezende[1], Gustavo Duarte Pimentel[1], Camila Lemos Pinto[2], Marcelo Saldanha Aoki[3]. *[1]Federal University of Goias, Goiânia, Brazil. [2]University of Alberta, Edmonton, AB, Canada. [3]University of São Paulo, Sao Paulo, Brazil.*
(No relevant relationships reported)

Strenuous exercise result in muscle damage. Oral curcumin appears to reduce pain associated with delayed onset muscle soreness and enhance recovery of muscle performance. **PURPOSE:** The purpose of this study was to examine the chronic effect of curcuma intake after a half-marathon run on indirect markers of muscle damage**. METHODS:** Twenty-eight men completed a double-blind randomized-controlled trial. *Curcuma Longa L.* extract (SG - 1,5g/ day) or placebo (PG - microcrystalline cellulose) was taken twice daily (two capsules during the lunch and one capsule during the dinner) for 4 weeks, then three capsules immediately before the half marathon. Measurements were made at baseline (M0), 20 days after supplementation (M1), immediately before (Pre), after the half marathon (Post), two hours after the half marathon (2 h post), 24 hours after the half marathon (24 h post), and 48 hours after the half marathon (48 h post), comprising: CK, LDH, ALT, AST, myoglobin and muscle soreness. **RESULTS:** SG decreased muscle soreness in palpation of biceps femoris 48-h after half-marathon run (P < 0.05). No difference between groups was observed in ALT, AST, CK, LDH. Myoglobin concentrations were lower after 2 h post competition in SG when compared to PG (62.1 ± 8.26 vs. 107.9 ± 18.5 ng/mL; P < 0.05). **CONCLUSIONS:** Curcuma Longa extract reduces muscle soreness and myoglobin concentration after a half-marathon run. Supported by CNPq Grant 484023/2013-6.

2921   Board #204   June 1 3:30 PM - 5:00 PM

Grain Fermented Beverage Treatment Induces Mitochondrial Biogenesis in C2C12 Myotubes

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(No relevant relationships reported)

PURPOSE: Growing evidences indicate that a part of nutrients, such as amino acids and polyphenols, has an ability to induce mitochondrial biogenesis in skeletal muscle. We have recently developed a new grain fermented beverage (GFB) multiply containing carbohydrates, amino acids, citric acid, grain-derived phenolic acids, and so on. However, although we previously reported that post-exercise GFB intake promotes glycogen supercompensation both in skeletal muscle and liver (Shibaguchi et al. 2017), the influence of this drink on mitochondrial biogenesis in skeletal muscle remain unknown. The aim of this study was to investigate the effects of GFB treatment on mitochondrial biogenesis in skeletal muscle cells.
METHODS: Mouse C2C12 myoblasts were grown in Dulbecco's modified Eagle's medium (DMEM) with 10% fetal bovine serum and differentiated in DMEM with 2% calf serum. After 5 days of differentiation, the myotubes were treated with 3% sterilized water (control), 3% glucose solution (149 g/L), or 3% GFB (149 g/L glucose + fructose) containing DMEM with 2% calf serum for 72 h. Protein expression of mitochondrial-related proteins was analyzed by western blotting.
RESULTS: There were no significant differences in the total protein content in differentiated C2C12 cells among three groups. However, only GFB treatment tended to increase the protein level of COX-IV compared with the control (P = 0.07). A similar trend was also observed in VDAC contents, but not significant (P > 0.10).
CONCLUSIONS: Our results suggested that GFB treatment can induce mitochondrial biogenesis in skeletal muscle cells. Further studies are needed to clarify the mechanisms of these phenomena.

F-61   Free Communication/Poster - **Ergogenic Aids V - Food, Herbal Supplements & Health**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2922   Board #205   June 1 3:30 PM - 5:00 PM

A Comparison of Commercially-Available Echinacea Supplements based off Product Label Information

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(No relevant relationships reported)

Echinacea is one of the most popular herbal supplements among athletes, purportedly for preventing or treating upper respiratory infections. **PURPOSE:** To compare the compositions of commercially available Echinacea supplements based off product label information. **METHODS:** Approximately 250 distinct capsules/tablets and tinctures were identified from online vendors or stores in central Iowa; of these, only 76 capsule/tablet supplements and 17 tinctures provided sufficient product information for comparison (species, type of plant material, extraction method, standardization, and amount). Hierarchical clustering analysis ("phenetics") with Ward's linkage was used to generate dendrograms representing major groups ("clades") of supplements. **RESULTS:** Across the 93 included supplements, the most common species was *E. purpurea* (83%), the most common tissue was aboveground parts (62%), and 20% claimed some form of standardization (most used echinacoside). Twenty percent of supplements combined species, and 22% combined plant material types. Within the capsule/tablet category, 68% used raw plant material (versus extraction). Hierarchical clustering analysis revealed that plant material type explained the largest amount of variation: separate dendrograms for both the capsules/tablet and tincture categories depicted two major clades based on whether the supplement was made from aboveground or belowground parts. **DISCUSSION:** Based on label comparisons, Echinacea supplements differed tremendously in composition. Many studies have indicated that products made from belowground parts and *E. angustifolia* may elicit stronger immunomodulatory outcomes than those from aboveground parts and *E. purpurea*, respectively, suggesting that many current commercially-available supplements may not contain the optimal components. Variation in supplement composition likely explains heterogeneous clinical outcomes in athletes.

2923   Board #206   June 1 3:30 PM - 5:00 PM

Effects of Microencapsulated Diindolylmethane on Resting and Exercise Metabolism in Overweight and Obese College Aged Men

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(No relevant relationships reported)

DIM is present in cruciferous vegetables and further produced after ingestion of crucifers. DIM has been studied for numerous potential health benefits. **PURPOSE:** The present investigation sought to evaluate the effects of DIM on resting and exercise metabolism, fasted glucose, blood lipids and estrogen metabolites after 7 days of supplementation. **METHODS:** The present investigation was a double-blind, cross-over design. Eight overweight college aged males volunteered to participate (Age: 22±2.9yrs; height: 180.9±7.4; BF%: 34.6±5.8). Participants were given DIM (150mg) or placebo twice daily for seven days before returning to the lab, providing blood and urine samples for analysis, undergoing a resting metabolic rate (RMR) assessment and exercising for 20 minutes at a moderate intensity (50% VO2 peak). Prior to crossing over to the other treatment, subjects had a 7 day washout period. **RESULTS:** Paired samples T-test did not reveal differences for total cholesterol (t=0.49, p=032 DIM 149mg/dL±19.2, placebo 161mg/dL±16.7), triglycerides (t=0.29, p=0.38 DIM 137.6mg/dL±31.2, placebo 149mg/dL±19.5), Fasted Glucose (t=0.03, p=0.55 DIM 101.8mg/dL±6.9, placebo 101.6mg/dL±2.9), RMR (t=0.37, p=0.35 DIM 2756.4 kcal/24hr±226.6, placebo 2796.6 kcal/24hr±161.4). Additionally, there were no significant differences found for exercise respiratory exchange ratio (RER), glucose or lactate between treatments (t<0.86, p>0.36). Urine sample were analyzed for 2-hyrdoxyestrone (2OHE1) and 16 α -hydroxyestrone (16α-OH-E1) levels using a commercially available immunoassay. Analysis of results did not reveal differences for 2OHE1 (F=0.23, p=0.63 DIM 4.58 ng/ml±4.28 vs placebo 3.80 ng/ml±3.18) or 16α-OH-E1 (F=0.001, p=0.93 DIM 13.34 ng/ml±14.24 placebo 13.87 ng/ml±12.83). When examined as a ratio 2OHE1/16α-OH-E1 Anova did reveal a significant increase associated with DIM ingestion (F=2.28, p=0.04, ES=0.67). **CONCLUSION:** Based upon the data from the present study supplemental DIM does not appear to alter metabolism at rest or exercise in overweight young men. The higher 2OHE1 to 16-OH-E1 warrants further investigation as this ratio has been associated with positive health outcomes.

2924   Board #207   June 1 3:30 PM - 5:00 PM

Curcumin Supplementation Decreases Homocysteine and Increases HDL in Young, Obese Men

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Reported Relationships: M.S. Campbell: *Contracted Research - Including Principle Investigator; Akay Flavours and Aromatics, Ltd..*

Obesity increases cardiovascular disease risk and is associated with generalized metabolic dysfunction that may contribute to vascular endothelial dysfunction. Curcumin, an active component of the Asian-Indian spice turmeric, is known to improve vascular function in various populations, but the effects of this constituent are largely unknown in young, obese individuals. **PURPOSE:** To determine if 12 weeks of curcumin supplementation in young, apparently-healthy obese men would improve resting serum homocysteine, cholesterol, glucose, and insulin values that would be associated with improvements in endothelial function. **METHODS:** Twenty-two young (26.27 ± 4.18 years), obese (BMI = 33.20 ± 3.42 kg/m²) men were matched based on BMI and randomized into the intervention (curcumin formulated with fenugreek soluble dietary fiber) or placebo (fenugreek soluble fiber only) group for 12 weeks. Pre- and post-intervention blood was collected by venipuncture, and endothelial function was assessed with the Endo-PAT 2000 via the reactive hyperemia index (RHI). Enzyme-linked immunosorbent assays were used to assess homocysteine, high-density lipoprotein (HDL), low-density lipoprotein (LDL)/very low-density lipoprotein (VLDL), glucose, and insulin. A multilevel linear regression model with random effects and an unstructured covariance matrix was employed to analyze treatment effect over the 12-week study with the Kenward and Rogers degrees of freedom method. **RESULTS:** Compared with placebo, the 12-week curcumin intervention reduced homocysteine levels (-26.7 v. +17.6, P = 0.038, group by time interaction) and increased HDL levels (+15.2 v. -17.4, P = 0.047, group by time interaction). The changes from baseline to 12 weeks in low-density lipoprotein (LDL)/very low-density lipoprotein (VLDL), glucose, and insulin were not significantly different between groups (P > 0.05). There was also no significant difference between groups on the change in RHI from baseline to 12 weeks (-0.06 v. -1.18, P = 0.667). **CONCLUSION:** Enhanced bioavailable curcumin may be an effective strategy to improve homocysteine and HDL levels in young apparently-healthy obese men that, in turn, may reduce future CVD risk.

Abstracts were prepared by the authors and printed as submitted.

2925   Board #208   June 1 3:30 PM - 5:00 PM

Bitter Melon Intake Versus Exercise For Postprandial Glucose Among Patients With Type 2 Diabetes

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(No relevant relationships reported)

Although exercise has been shown as effective in lowering postprandial hyperglycemia in patients with type 2 diabetes, alternative approaches for those patients who face substantial barriers to physical activity remain less explored.
PURPOSE: The aim of this study is to compare the effects of bitter melon intake versus exercise on postprandial glucose responses in type 2 diabetic patients who receive hypoglycemic agents. .
METHODS: Using a 2 x 2 randomized cross-over design, a total of 8 patients with type 2 diabetes were randomly assigned to two sequences of treatments, including 1) 100 ml of bitter melon juice administered 15 minutes prior to the 75-g oral glucose load; 2) 30 minutes of moderate-intensity walking performed 15 minutes after the oral glucose load. All participants completed 2-hour oral glucose tolerance test after bitter melon or exercise interventions. Linear mixed models were used to test the effects of treatment, time, and treatment x time interaction on postprandial glucose values after adjustment for covariates. General linear model was used to test incremental area under curve (iAUC) difference between bitter melon and exercise groups after adjustment for covariates.
RESULTS: The baseline glucose levels between bitter melon and waking conditions were similar (6.6 ± 0.9 vs. 6.8 ± 0.7 mmol/L, P=0.57). There were no statistical differences for the mean glucose during the 2-h postprandial period (13.7 ± 2.8 vs. 13.0 ± 2.4 mmol/L, P=.56) and 2-h postprandial glucose iAUC (12.6 ± 4.8 vs. 10.7 ± 3.6 mmol/L·h, P=0.38) between the bitter melon and walking conditions. There was no treatment x time interaction on glucose values (P=0.56). When comparing the glucose levels between the two conditions at each time point, there was also no statistical difference in glucose values at 30 minutes (12.4 ± 2.1 vs 10.5 ± 2.1 mmol/L, P=0.086), at 60 minutes (14.5 ± 2.8 vs 13.6 ± 2.7 mmol/L, P=0.56), 90 minutes (14.7 ± 3.7 vs 14.4 ± 3.3 mmol/L, P=0.88), or 120 minutes (13.5 ± 4.6 vs 13.4 ± 3.9 mmol/L, P=0.95), respectively, between bitter melon and waking conditions.
CONCLUSIONS: Our findings suggest that, among patients with type 2 diabetes, the intake of 100 ml of bitter melon juice can elicit similar postprandial glucose responses, as compared with performing 30 minutes of walking at moderate-intensity.

2926   Board #209   June 1 3:30 PM - 5:00 PM

Curcumin Supplementation Mitigates NASH Development and Progression in Female Wistar Rats

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(No relevant relationships reported)

PURPOSE: Nonalcoholic steatohepatitis (NASH) is independently associated with mortality risk and currently there are no proven pharmacological therapies for treatment. Limited existing evidence suggests that curcumin, a naturally occurring plant polyphenolic compound known to exert anti-inflammatory and antioxidant effects, may have beneficial effects on attenuating NASH development. Here we sought to determine whether curcumin supplementation could be used in both the prevention and treatment of NASH with fibrosis.
METHODS: Female Wistar rats (N=48) were fed a 'western diet' (WD) high in fat (43% kcal) and cholesterol, and administered CC14 injections (0.5 mL/kg) at weeks 1, 2, 4 and 6 to induce a NASH with fibrosis phenotype. Rats were randomized to 4 groups (n=12/group): Fed WD for 8 weeks (WD8), fed WD enriched with curcumin (WD8+C; 0.2% curcumin, BCM-95, Dolcas Biotech), fed WD for 12 weeks (WD12) or fed WD for 8 weeks followed by 4 weeks WD+C (WD12+C).
RESULTS: Dietary curcumin supplementation (WD+8C) significantly attenuated (p<0.05) histological liver inflammation, molecular markers of fibrosis (Col1a1 mRNA) and serum markers of liver injury (AST) compared with WD8. In addition, curcumin supplementation (WD12+C) also partially reversed WD+CCl4 induced NASH, including reduced (p<0.05) hepatocellular inflammation, steatosis and NAFLD Activity Scores (NAS) compared with WD12. Furthermore, 4 weeks of curcumin supplementation also reduced molecular markers of hepatic fibrosis (Col1a1 mRNA) and inflammation (TNF-α, FABP4, SPP1 mRNA), as well as serum measures of macrophage infiltration (CCL5, IL-17a) and liver injury (AST, ALP). These witnessed changes were independent of differences in body mass or adiposity and were not related to changes in markers of hepatic total macrophages/Kupffer cells (F480, CD68).
CONCLUSIONS: Here we report that curcumin supplementation was partially effective at both preventing and also treating NASH in WD+CC14 challenged Wistar rats. These beneficial effects were more prominent in the reversal of NASH with

fibrosis and was particularly effective in attenuating hepatocellular inflammation. Further study is warranted to examine the anti-inflammatory properties of curcumin in the treatment of NASH.

2927   Board #210   June 1 3:30 PM - 5:00 PM

Effects of Aerobic Training and Pomegranate Juice on Oxidative Stress Markers in Women with Type-II Diabetes

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(No relevant relationships reported)

PURPOSE: The aim of this study was to examine the effects of long-term aerobic exercise training and ingesting pomegranate juice on selected plasma oxidative stress markers in middle-aged women with type II diabetes.
METHODS: In a randomized, placebo-controlled design, 33 female participants (age= 52 ± 2 y; stature= 157 ± 6 cm; body mass= 69.9 ± 11.3 kg; body mass index= 27.8 ± 3.29 kg/m²; Control [CON] n=7, supplement [SUP] n=9, aerobic training [AT] n=9, supplement-aerobic training n=8 [SAT]) participated in the study. Primary outcomes were total antioxidant capacity (TAC), superoxide dismutase (SOD), glutathione (GSH), and glutathione peroxidase (GPx) which were measured at baseline and at week 6. All participants were asked to maintain their normal dietary intake during the study period. Participants in both AT and SAT groups were required to follow six weeks of aerobic exercise training program, three sessions a week for at least 45 min per session. Those involved in the SUP and SAT groups had a daily oral ingestion of pomegranate juice (150 ml) for a 6-weeks period [SUP, evening; SAT, an hour after exercise]. The CON group did not receive any intervention. Data were analyzed by GLM and presented as mean (SD).
RESULTS: We observed a significant increase in plasma TAC and GPx only in SAT (p=0.001). There was a significant increase in plasma SOD in the SUP, AT, and SAT, but not in the CON (p=0.001). There was a significant improvement in plasma GSH in the SAT compared to the CON and SUP (0.034).
CONCLUSIONS: Our results indicate that combining aerobic exercise training and pomegranate juice supplementation can have beneficial impact on the antioxidant defense system of the body and reduce oxidative stress in middle-aged women with type-II diabetes.

2928   Board #211   June 1 3:30 PM - 5:00 PM

Allyl Isothiocyanate Enhances Brain Neuronal Plasticity Proteins Via Inhibition Of Inflammation Proteins

Vijaya Juturu[1], Berrak Caglayan[2], Ertugrul Kilic[2], Arman Dalay[2], Mehmet Tuzcu[3], Fusun Erten[3], Mehmet Yalcin Gunal[2], Serdar Altunay[2], Cemal Orhan[3], Kazım Sahin[3]. *[1]OmniActive Health Technologies Inc, Morristown, NJ. [2]Istanbul Medipol University, Istanbul, Turkey. [3]Firat University, Elazig, Turkey.*

Reported Relationships: V. Juturu: *Salary; Employee.*

Background: Oxidative stress caused by the overproduction of reactive oxygen species (ROS) is considered to be responsible for the detrimental effects of traumatic brain injury (TBI), such as disruption of the membrane phospholipid architecture, DNA damage or dysfunction of brain-derived neurotrophic factor (BDNF). The objective of this study was to investigate whether allyl isothiocyanate (AITC) reduce inflammatory mediator levels, serum immunoglobulin G marker for blood-brain barrier and reduces edema and infarction progression in brain.**Purpose:** We hypothesized that treatment of TBI with the antioxidant molecule, allyl isothiocyanate (AITC) in mustard oil, could provide beneficial health outcomes by alleviating the damage caused by ROS in the brain. **Methods:** We induced TBI in male Balb/c mice using a liquid nitrogen-cooled copper probe for 60 seconds and immediately after the cold injury-induced trauma, animals were treated with either vehicle control or AITC (10 mg/kg, ActivAIT). Twenty-four hours after the injury, animals were sacrificed and tissues were collected. The volume of injury which was calculated from the cresyl violet stained coronal brain sections was significantly lower in the AITC group. BBB integrity was evaluated by serum IgG. **Results:** AITC significantly increased protein expressions of brain neuronal plasticity marker proteins; GAP-43, NCAM, Nrf2 and BDNF. Moreover, expressions of inflammation-related proteins; NF-kB, IL1B and IL6 and glial scar marker, GFAP, were significantly reduced in the AITC-treated group, suggesting a protective role of AITC in the neuro-inflammation processes. **Conclusion**: In conclusion, our results demonstrate that the antioxidant molecule AITC when

applied immediately after the TBI in mice, provides beneficial effects on inflammatory processes, while promoting the expressions of plasticity proteins and therefore, could be a candidate molecule for future clinical studies in human patients.

F-62   Free Communication/Poster - **Ergogenic Aids VI - Other**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2929   Board #212   June 1 3:30 PM - 5:00 PM

Carbohydrate Mouth Rinse Improves Peak Treadmill Speed and Time to Exhaustion in Overweight Adults

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(No relevant relationships reported)

Mouth rinsing a carbohydrate solution improves exercise performance in athletes, but whether it benefits exercise performance in overweight adults is unknown. **PURPOSE:** This study determined the effect of carbohydrate mouth rinse on running performance and energy intake in overweight participants. **METHODS:** In a counterbalanced and placebo controlled design, 21 males (Age: 21.0 ± 1.8; BMI: 27.6 ± 1.1) with depleted glycogen stores, completed a graded treadmill exercise test to exhaustion following a 10-s mouth rinse with a solution of either 7.5% carbohydrate (CHO), placebo (PLA), or a no rinse (CON), followed by standardized meal. Anthropometrics, 24-hour energy intake, heart rate (HR), oxygen consumption (VO2), and rating of perceived exertion (RPE) were measured. **RESULTS:** All participants completed the trials. Mean time to exhaustion in seconds per treatment was greater for CHO (1048.7 ± 91.8) versus PLA (1034.4 ± 83.6, p = 0.02), and CON (1012.2 ± 75.7, p = 0.001) ($p\eta^2 = 0.430$). Peak treadmill speed (km/h) was greater for CHO (11.5 ± 0.8) versus PLA (11.3 ± 0.7, p = 0.011), and CON (11.2 ± 0.6, p = 0.003) ($p\eta^2 = 0.354$). Subsequent trial energy intake (Kcal) was lower for CHO (577.5 ± 50.5) versus PLA (622.8 ± 78.3, p < 0.0001), and CON (615.2 ± 69.4, p < 0.0001) ($p\eta^2 = 0.530$). The 24-hour energy intake, HR, VO2 and RPE did not change (P > 0.05). **CONCLUSION:** Carbohydrate mouth rinse improves both running duration and speed in overweight adults with depleted glycogen stores.

2930   Board #213   June 1 3:30 PM - 5:00 PM

Short-term DHEA Intake And Hormonal Responses In Young Recreationally Trained Athletes

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(No relevant relationships reported)

PURPOSE: Dehydroepiandrosterone (DHEA) figures on the World Anti-Doping Agency (WADA) list of prohibited substances in sport because it is assumed that athletes expect a significant increase in testosterone through DHEA administration. The literature on the hormonal effects of DHEA intake nevertheless appears to be very scant in healthy young subjects, especially women. We therefore propose to examine the effects of DHEA on adrenal and gonadal hormones in healthy young male and female recreationally trained volunteers.
METHODS: The study followed a double-blind, randomized-order crossover design. Lean healthy young men (n=10) and women (n=11), with all women using oral contraceptives, were treated daily with 100 mg of DHEA and placebo for 4 weeks. DHEA, DHEA-sulfate (DHEA-S), androstenedione, total testosterone (Tes), free testosterone (fTes), dihydrotestosterone (DHT), SHBG, estrone, and cortisol were measured before, in the middle and at the end of each treatment, as were blood glucose, liver transaminases and lipid status.
RESULTS: As classically reported, the young male volunteers had significantly higher basal Tes, fTes, DHT (p<0.01) concentrations and a significantly lower SHBG concentration (p<0.05) than the young female volunteers before treatment. Women had higher cortisol and cholesterol values (p<0.05) than men. No significant change was observed for the other parameters. In the middle and at the end of DHEA treatment, we observed a significant increase in DHEA, DHEA-S, androstenedione, Tes, fTes, DHT and estrone in both men and women, but the increases in Tes and fTest were more marked in women (p<0.001) than men (p<0.05). No changes were found in the other parameters, irrespective of gender.

CONCLUSION: In young athletes, DHEA administration induces significant blood hormonal changes, some modulated by gender, which can be used as biomarkers of doping.

2931   Board #214   June 1 3:30 PM - 5:00 PM

Neuroprotective Effect of Omega-3 Fatty Acids on Head Trauma in American Football Athletes

K. Michele Kirk[1], David A. Gable[1], Jason D. Stone[1], Anthony J. Anzalone[1], Stephanie M. Turner[1], Andy T. Asko[1], Joel A. Luedke[2], Andrew Jagim[3], Margaret T. Jones, FACSM[4], Jonathan M. Oliver[1]. [1]*Texas Christian University, Fort Worth, TX.* [2]*University of Wisconsin - La Crosse, La Crosse, TX.* [3]*Lindenwood University, St. Charles, MO.* [4]*George Mason University, Fairfax, VA.* (Sponsor: Margaret Jones, FACSM)

(No relevant relationships reported)

Repetitive head impacts sustained over the course of an American football season, even in the absence of a concussion diagnosis, results in a quantifiable pathophysiological response. Further, long-term exposure to repetitive head impacts may lead to neurological impairment, including the development of neurodegenerative disease. Prophylactic treatment with the omega 3 fatty acids (n-3FA) eicosapentaenoic (EPA) and docosahexaenoic (DHA) attenuates the pathophysiological response to head trauma in rodent models. **PURPOSE:** The purpose of this study was to examine the effect of n-3FA supplementation on a blood biomarker of head trauma over the course of an American football season. **METHODS**: Two National Collegiate Athletic Association American football teams volunteered for the study. Thirty-one athletes (n = 31) on one team ingested a highly bioavailable, proprietary formulation (Mindset®), containing n-3FA, including DHA (2,000 mg), EPA (560 mg), and 320mg docosapentaenoic acid (MS- Ω), over the course of an entire season. Thirty-three athletes (n = 33) from the other team served as the control. Neurofilament light (Nf-L), a biomarker of axonal injury, was measured in blood samples obtained prior to the start of the season (T1), at the end of pre-season camp (T2), and over the course of the season (T3 - T6). Standardized magnitude based inference was used to define outcomes of interest. **RESULTS:** Relative to the control group (12.4 ± 5.3 pg•mL⁻¹), MS-Ω very likely attenuated Nf-L measured at the conclusion of Fall camp (8.9 ± 4.5 pg•mL⁻¹) (mean; ×/÷90% confidence limits; 1.5; ×/÷1.2 fold), a period of significant contact. Further, the attenuation relative to placebo was likely maintained at T3 (1.3; ×/÷1.2 fold), T4 (1.3; ×/÷1.2 fold), T5 (1.3; ×/÷1.3 fold), and T6 (1.2; ×/÷1.3 fold) corresponding to sampling time points during the competitive season. **CONCLUSION:** These data indicate that over the course of the season the head trauma sustained by American football athletes does result in a quantifiable pathophysiological response as measured by a biomarker of axonal injury. Further, administration of MS-Ω may impart neuroprotective qualities as evidenced by lower levels of Nf-L.

2932   Board #215   June 1 3:30 PM - 5:00 PM

A Pre-Workout Supplement Does Not Improve 400 M Sprint Running or Bicycle Wingate Test Performance in Recreationally Trained Individuals

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(No relevant relationships reported)

Pre-workout supplements are often consumed as a drink and are purported to delay the onset of fatigue, increase exercise performance, and are marketed to recreational and competitive athletes. Pre-workout supplements typically contain caffeine and other ingredients that are supposed to act as stimulants. However, previous research has been inconclusive on the effects of pre-workout nutritional supplements on exercise performance. **PURPOSE:** The purpose of this project was to evaluate the effects of a commonly used pre-workout supplement on 400 m sprint running and bicycle ergometer Wingate test performance in recreationally trained college age participants. **METHODS**: For the Wingate testing, 60 minutes after consuming a pre-workout supplement or a similarly flavoured placebo eight recreationally trained college aged males engaged in a 30-second bicycle Wingate ergometer test. For the 400 m sprint running, 60 minutes after consuming a pre-workout supplement or a similarly flavoured placebo 16 college aged participants (9 male and 7 female) engaged in two 400 m running sprints on an indoor track with the sprints separated by 10 minutes of passive rest. **RESULTS**: During the Wingate testing there were no differences in peak power (848.85 ± 210.26 W, 866.92 ± 212.99 W), decline in power (48.6 ± 12.2%, 45.0 ± 11.3%), or change in blood lactate concentrations (8.9 ± 5.4 mmol/L, $8.4 \pm$

Abstracts were prepared by the authors and printed as submitted.

4.3 mmol/L) between the placebo and pre-workout, respectively. During the 400 m sprint running, there were no differences in time for the first (78.1 ± 16.1 sec, 80.0 ± 15.0 sec) or second (79.8 ± 13.8 sec, 80.0 ± 14.2 sec) trials for men between the placebo and pre-workout, respectively. During the 400 m sprint running, there were no differences in time for the first (97.3 ± 11.0 sec, 93.9 ± 10.4 sec) or second (96.4 ± 11.5 sec, 95.1 ± 12.4 sec) trials for women between the placebo and pre-workout, respectively. **CONCLUSION**: In spite of containing ~120 mg of caffeine and other purported stimulants, the present data indicate that consuming a common pre-workout supplement does not improve 400 m sprint running or bicycle Wingate test performance, or alter glycolytic metabolism, in recreationally trained individuals. The lack of ergogenic effect could be due to insufficient caffeine content combined with lack of stimulatory effects from the other ingredients.

2933   Board #216   June 1 3:30 PM - 5:00 PM

Acute Effects Of A Multi-ingredient Pre-workout Supplement On 5-km Running Performance In Recreationally-trained Athletes

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(No relevant relationships reported)

PURPOSE: The purpose of the present study was to examine the effects of an acute dose of a multi-ingredient, thermogenic, pre-workout supplement on 5-km running performance and subjective measures of fatigue.
METHODS: Twenty aerobically-trained, college-aged males (n = 10, mean ± SD = 80.8 ± 6.1 kg) and females (n = 10, 64.5 ± 6.6 kg) completed two 5-km running races for time. During the first session, the subjects were randomly assigned to ingest the supplement or placebo 30 minutes prior to running a 5-km run as fast as possible. The supplement contained multiple ingredients including caffeine anhydrous (150 mg), beta alanine (1.6 g), arginine AKG (1.0 g), as well as tyrosine, L-carnitine, green coffee bean extract, and velvet bean extract at unspecified quantities. The placebo was a non-caloric mix that was matched for flavor and consistency. Subjects also completed a 5-point Likert scale (1 = low, 5 = high) questionnaire to determine feelings of fatigue immediately prior to ingesting the substance (baseline), 30 minutes post-ingestion (immediately pre-race), and 5 minutes post-race. For the second session, subjects ingested the opposite substance (supplement or placebo) and underwent the same testing procedures (including time of day) as the first session. Race times were compared between the supplement and placebo conditions using a paired-samples *t*-test. In addition, a two-way ANOVA with repeated measures was used to compare the feelings of fatigue among the conditions (supplement vs. placebo) at the common time points (baseline, pre-race, post-race).
RESULTS: The results indicated there was no significant ($P > 0.05$) difference in 5-km race time between the supplement (23.62 ± 2.08 min) and placebo (23.51 ± 1.97 min) conditions. For the feelings of fatigue, there was no significant condition x time interaction or main effect for condition, but there was a main effect for time. Specifically, the marginal means (collapsed across conditions) for fatigue were significantly ($P < 0.05$) greater post-race (3.3 ± 0.8) than at baseline (2.3 ± 0.7) and pre-race (2.4 ± 0.6).
CONCLUSIONS: The findings of the present investigation indicated that the pre-workout supplement provided no ergogenic effect on 5-km race time or feelings of fatigue when administered on an acute basis in recreationally-active males and females.

2934   Board #217   June 1 3:30 PM - 5:00 PM

Effects of Multi-Ingredient Ergogenic Supplement Consumption on Performance Adaptations to High-Volume Resistance Training

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(No relevant relationships reported)

Consumption of various nutritive supplements in isolation have shown to enhance resistance training (RT) adaptations. What remains unclear is the efficacy by which consumption of a multi-ingredient ergogenic supplement (MIES) comprised of branched-chain amino acids, beta-alanine, creatine, glutamine, and black pepper fruit extract facilitates improvements in skeletal muscle performance during RT. PURPOSE: To investigate the effects of a MIES containing the above ingredients on performance adaptations to high-volume periodized RT. METHODS: Thirty-nine recreationally trained males and females were recruited for this randomized, double-blind, placebo-controlled investigation. Subjects were assigned to either a placebo (PLA) (n=16) or experimental MIES group (MIES) (n=23) in a randomized, counterbalanced manner. All subjects completed a 6-week periodized resistance training program consisting of 3 sessions per week with 48 hours of rest between each session. MIES and PLA consumed one serving of the MIES and placebo, respectively, immediately post-

workout and before sleep on training days, and two servings during rest days. Subjects underwent laboratory assessments for maximum upper and lower body strength and power. A 2 (group) x 2 (time) repeated measures analysis of variance (ANOVA) was used to detect main effects and/or interaction. A Tukey's post hoc test was used for pairwise comparisons. Significance was set at p<0.05. RESULTS: 1RM for each exercise improved pre-post training in both MIES (Back Squat= +26.0%, p<0.001; Bench Press= +20.4%, p<0.001; Deadlift= +26.3%, p<0.001) and PLA (Back Squat= +27.1%, p<0.001; Bench Press= +15.6%, p<0.001; Deadlift= +18.4%, p<0.001), but no group x time interactions were found. There was also a significant improvement pre-post training for all dynamic lower body power output measures in both groups with no significant group x time interaction. There were no between-group differences for average daily training volume each week and across the entire training period. CONCLUSION: Supplementation of the experimental MIES in conjunction with high-volume RT failed to improve RT-induced performance adaptations when compared to a placebo group.

2935   Board #218   June 1 3:30 PM - 5:00 PM

The Effects Of A Multi-ingredient Ergogenic Supplement On Body Composition Following High-volume Resistance Training

Dean Directo, Michael Wong, Adam Osmond, Edward Jo. *Cal Poly Pomona, Pomona, CA.*
(No relevant relationships reported)

In addition to resistance training (RT) methodology, nutrient intake remains a critical factor for the support of skeletal muscle metabolism, performance, and adaptation. Despite the traditional debate regarding the ideal type, timing, and quality of nutrients for recovery and/or performance, the consumption of exogenous substances like branched-chain amino acids (BCAA), beta-alanine, creatine, glutamine and various plant-based compounds, like piperine have previously shown to support performance, recovery, or metabolic adaptations in skeletal muscle. This has largely enabled the use of multi-ingredient ergogenic supplements (MIES) that incorporate a single blend of these substances with the intent of obtaining a synergistic ergogenic effect. What remains unclear is the efficacy by which a MIES blend of such ingredients facilitates the adaptive changes in body composition during a high-volume RT regimen. PURPOSE: To investigate the effects of a proprietary MIES comprised of BCAA, beta-alanine, creatine hydrochloride, glutamine, and black pepper fruit extract on body composition during 6 weeks of high-volume RT. METHODS: Male and female subjects completed a 6 week RT program 3 days a week with 48 hours of rest between each session. EXP (n=16) and Placebo (PLA) (n=23) groups consumed one serving of the experimental MIES or placebo, respectively immediately post-workout and before sleep on training days, and two servings during rest days. Body composition was measured pre- and post-training via Dual Energy X-Ray Absorptiometry. RESULTS: EXP (+1.7 ± 0.3 kg, p<0.001) and PLA (+1.5 ± 0.2 kg, p<0.001) demonstrated an increase in total body mass. EXP demonstrated a greater increase in lean mass than PLA (EXP= 2.1 ± 0.3 kg vs. PLA= 1.1 ± 0.3 kg) (p=0.03). Fat mass was significantly greater in EXP (-0.4 ± 0.2 kg vs. PLA= +0.4 ± 0.2 kg) (p=0.02). EXP exhibited a decrease in body fat percentage (1.2 ± 0.3 % units) (p=0.01) while PLA showed no change. Post-training body fat percentage was lower in EXP than PLA. There were no between-group differences for average daily training volume each week. CONCLUSION: Supplementation of MIES comprised of BCAA, beta-alanine, creatine hydrochloride, glutamine, and black pepper fruit extract may enhance body composition changes during high-volume RT.

2936   Board #219   June 1 3:30 PM - 5:00 PM

Cannabis Use Habits In Relation To Timing Of Physical Activity

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(No relevant relationships reported)

PURPOSE: To describe cannabis use in individuals who use the drug relative to when they participate in physical activity (PA). **METHODS**: Physically active individuals (N=72; males n= 42; females n= 30; average age of 27 years), recruited using the snowball technique, completed a series of self-report questions through Qualtrics designed to describe participants use of cannabis products in relation to their PA. Cannabis use questions were based on the Daily Sessions, Frequency, Age of Onset, and Quantity of Cannabis Use Inventory (DFAQ-CU). **RESULTS:** Respondents reported 417 ± 451 minutes of PA per week, with 74.5% of respondents using cannabis in conjunction with PA at least 1-time per week. Cannabis use was reported in combination with a total of 28 different physical activities. The physical activities most commonly reported included hiking, running, resistance training, yoga, and cycling. Half of participants (51%) reported using cannabis within 1-hour of beginning PA, and 45% reported using most often within 1-hour after finishing PA. Only 4% of respondents reported using cannabis most often during PA. Almost half (47%) of participants that reported using cannabis products before PA were using the *Cannabis Sativa* strain, while 39% of respondents that reported using cannabis

after PA used the *Cannabis Indica* strain. Common perceptions of the effects of cannabis use if used before PA included improved focus, "getting into the zone," pain prevention, and increased pleasure. The most frequent reasons for using cannabis products after PA were to relax, aid in recovery, and stimulate appetite. The majority of participants (69%) reported feeling that cannabis products had a positive effect on their performance. Fewer respondents (29%) felt like there was no effect of cannabis on their performance and only 2% of respondents felt that cannabis use had a negative effect on their PA performance. **CONCLUSION:** Findings from this study showed that cannabis is used before, during and after a wide variety of activities. Participants most often used *Cannabis Sativa* before PA and *Cannabis Indica* after PA. Almost all respondents felt that using cannabis products did not negatively affect their performance.

2937   Board #220   June 1 3:30 PM - 5:00 PM

An Examination of Supplement Use in Volunteer Firefighters

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(No relevant relationships reported)

Firefighter personnel are trained to respond to emergencies and are essential to community safety. Though dietary supplementation use can improve overall health and performance, limited information exists on supplement use among firefighters. Understanding supplement use may aid in health and physical performance. **PURPOSE**: To explore supplement use in volunteer firefighters. **METHODS**: A national sample of 363 volunteer firefighters (aged 18-77, 38.1 ± 12.5 years, 79.3% male, 95% Caucasian) in a wellness program were surveyed on their frequency and reasons for supplement use over the past six months. Questions asked about supplements such as multivitamins/minerals, individual vitamins (e.g. Vitamin C, Vitamin D), individual minerals (calcium, iron), performance enhancers (glutamine, CoQ10), sports bars/gels, and energy drinks. Stata version 15 was used for data analysis. **RESULTS**: Of those reporting supplement use, 78 reported using only one supplement, while 277 reported using multiple supplements. Performance enhancers were used by 31 participants (8.5%) at least twice a week; reasons for consumption included increased physical performance, improved overall health, and to prevent health problems. Multivitamin/mineral supplements were consumed by 132 firefighters (36.4%) at least twice a week; reasons for consumption included improved overall health, prevent health problems, and increase heart health (cholesterol/blood pressure). Sports bars/gels were used by 86 firefighters (23.7%) at least twice a week; reasons for sports included increased physical performance, improved overall health, and to lose weight. Energy drinks were consumed by 124 firefighters (34.2%) at least twice a week; reasons for consumption included increased physical performance, cognitive function, and relaxation/stress/mental health. **CONCLUSIONS**: Overall, most firefighters who reported supplement use did so for improvements in overall health and to prevent health problems. Interestingly, firefighters in this study reported higher overall supplement usage than other tactical athlete populations (i.e, military personnel: 55-61%). Future investigations should examine the usage and effectiveness of performance enhancing supplements on health and occupational performance in firefighters.

2938   Board #221   June 1 3:30 PM - 5:00 PM

Use Of Analgesics For Exercise-associated Pain In Collegiate Athletes

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(No relevant relationships reported)

Pharmacoepidemiological research has reported prevalent use of analgesics in several populations, while experimental research has reported the ability of analgesics to inhibit reparative processes in skeletal muscle. Use could be of particular detriment to athletes. **PURPOSES:** To examine prevalence of use analgesics for exercise-associated pain (EAP), patterns and behaviors associated with use, and predictors of use in a sample of Division I male and female athletes. **METHODS:** A valid and reliable 16-item self-report questionnaire previously used to examine analgesic use in recreationally-active college students was modified to include items pertaining to phase of competitive season, injury status, and number of weekly conditioning sessions (C) and team practice sessions (P). Athletes were verbally invited to participate during training sessions. Analgesic use EAP was the primary outcome variable. Secondary outcome variables included patterns of use (weekly, daily frequencies) and behaviors associated with use (likeliness to follow label instructions), with behavioral items rated on a 5-point Likert scale. Descriptive statistics and frequencies were calculated for all items, and logistic regression was used to evaluate the ability of 3 variables (sex, C, P) to predict use. **RESULTS:** Males (n=28) and females (n=41) across a range of sports participated. The majority (97.1%) were in- or post-season, performing 3.9 ± 1.9 C and

5.5±1.4 P sessions weekly. Twenty-nine percent reported being injured and under care of a health professional. Seventy-four percent (73.9%) reported analgesic use for EAP. Thirty-six percent (36.2%) reported use of a combination of analgesics, and 29% used ibuprofen. Most reported use 2 or 3 days per week (33.3%) and 1 or 2 times per day (62.3%). Thirty-five percent self-determined use, and 31.9% reported a combination of self-determined and directed use. Thirty-four percent (34.7%) reported being *very likely* or *extremely likely* to follow label instructions. No individual variables were revealed as significant predictors of analgesic use (sex, p=0.89; C, p=0.33, P, p=0.16). The omnibus test was also non-significant (p=0.28). **CONCLUSION:** Analgesic use is prevalent in collegiate athletes; however, data seem to indicate conservative use and tendency to follow label instructions.

2939   Board #222   June 1 3:30 PM - 5:00 PM

Specific Bioactive Collagen Peptides in Combination with Resistance Training Improve Body Composition in Untrained Subjects

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(No relevant relationships reported)

It is generally accepted that the combination of resistance exercise and protein supplementation increases fat free mass (FFM) and leads to a reduction in fat mass (FM). However, the question of the optimal type and amount of protein is still under discussion. It was recently demonstrated that bioactive collagen peptide (BCP) intake significantly improves the body composition of sarcopenic men (Zdzieblik et al.(2015) *Br J Nutr*) **PURPOSE** To determine the efficacy of a collagen peptide supplementation in combination with resistance training on the body composition in untrained subjects. **METHODS**
The effect of post-exercise supplementation of specific BCP (BODYBALANCE®) on FFM and FM was tested on 182 untrained women and men aged 46 ± 9 years. The study participants underwent 60 minutes of resistance training three times per week, and were daily treated with 15g BCP or a placebo over a period of 12 weeks. Changes in FFM and FM were measured by DEXA scans and by BIA at the beginning of the study and after 12 weeks. Changes between the study groups in FFM and FM were tested using the unpaired Student's T-test. The studies were conducted with the approval of the Ethics Committee of the Medical Faculty of the University of Freiburg, Germany. All participants gave written informed consent. **RESULTS** The results revealed a significant (p=0.002) increase in FFM after BCP compared to placebo. FFM gain was more than doubled (2.00 ± 0.25 kg) than in individuals who only did the training exercise (0.99 ± 0.19 kg). In addition, FM was significantly (p=0.035) reduced after BCP supplementation by -3.0 ± 0.37 kg compared to placebo (-2.0 ± 0.32 kg). Moreover, study participants who received BCP showed a significant increase in muscle strength of 5.4% compared to placebo treatment. **CONCLUSIONS** Bioactive collagen peptides appear to offer an interesting option for optimized sports nutrition. The results demonstrated that the intake of BCP supports the effect of resistance training, as indicated by a more improved body composition and an increase in muscle strength.

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30 Days of Probiotic Supplementation: The Effect Up On Athletes Immunity After a Marathon Race

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(No relevant relationships reported)

Prolonged strenuous exercise cause an acute increase in leukocytes, including lymphocytes, neutrophils and monocytes. Evidences have suggested that probiotics can enhance athletes' immunity. **PURPOSE:** Investigate the effect of a probiotic supplementation on white blood cells count after a marathon race. **METHODS:** Eight male athletes that participated in a marathon race were randomly assigned to either a probiotic group (PR=4;37.3±5.8 yr,89.2±14.5Kg,time trial 4:04 hrs ±23min) or placebo (PL=4 36.3±8.5 yr,81.8±9.5Kg, time trial 4:53hrs±75min)in a double-blind design. PR was supplemented with sachet containing *Lactobacillus Acidophilus* and *Bifidobacterium Lactis(*10×10^9UFC/d) during 30 days while PL received sachet with maltodextrin(5g/d). It was collected blood samples before the supplementation period (baseline), one day before the marathon (BM), one hour after the race (AR), and 7 days after the marathon(7[th]after)for white blood cells differential count. The data was analyzed using ANOVA with repeated measures and a Bonferroni's *post-hoc*, *p*< 0.05. **RESULTS**: Leukocytes, Neutrophils and Monocytes presented a significant increase AR (**Leu:** PR=13.28±2.63,PL=14.26±4.20mm³; **Neu:**PR=11.20±2.94,PL=12.62±4.27 mm³;

Mono:PR=1.02±0.30,PL=0.95±0.24mm³)when compared to other moments(**Leu:**Baseline: PR=6.47±1.41,PL=5.58±0.56;BM:PR=5.60±0.94, PL=6.01±0.60; 7[th]after:
PR=5.55±0.59, PL=5.57±0.14;
Neu: Baseline:PR=3.13±1.01,PL=3.27±0.72;BM:PR=3.19±0.97,PL=3.66±0.84;7th afterPR=2.89±0.39,PL=3.13±0.30mm³;
Mono: BaselinePR=0.61±0.16,PL=0.52±0.18;BM:PR=0.47±0.03,PL=0.50±0.12;7th after:PR=0.50±0.09,PL=0.48±0.11 mm³)
in both groups with no differences between groups. Regarding lymphocytes cells at the baseline, the probiotic group has presented higher levels when compared to the placebo group (PR=2.53±0.45; PL=1.46±0.21 mm³). In addition, AR, PR has exhibited a significant decrease in the lymphocytes count when compared to the baseline (AR: PR=1.03±0.42 mm³), as well as PL (PL=1.20±0.22 mm³).
CONCLUSION: Thirty days of *Lactobacillus Acidophilus* and *Bifidobacterium Lactis(*10x10⁹ UFC) supplementation have no difference when compared to placebo in leukocytes, neutrophils, monocytes and lymphocytes.
Support by CNPq, CAPES/PROEX.

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Short-Term Medium Chain Triglyceride Consumption Does Not Affect Executive Cognitive Function in Healthy Adults.

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(No relevant relationships reported)

PURPOSE: The present study was conducted to examine the effects of acute medium-chain triglyceride (MCT) consumption on behavioral cognitive function during a task often linked to rapid decision making and reaction time in sport.
METHODS: Thirty recreationally active college students (M=19, F=11) aged 18-25 participated in this study, which consisted of two experimental days, in a double-blind, randomized-order, crossover design. During each laboratory visit, subjects consumed a fruit smoothie, mixed with an MCT supplement, consisting primarily of coconut oil, or a placebo (the same smoothie, without the supplement). Executive cognitive function testing (using a modified Flanker task) was performed two hours later. To prevent any latent effects of the MCT supplement, trials were separated by at least 72 hours. Dependent variables included accuracy and reaction time on the executive cognitive function task.
RESULTS: Paired-sample T-tests were conducted for Flanker task accuracy and reaction time. MCT consumption did not affect response accuracy (M_{MCT}(SD)=91(11)%, M_{CON}=93(8)%; p=0.36) or reaction time (M_{MCT}(SD)=412(60) ms, M_{CON}=417(53)ms; p=0.71). Further separating the data into sub-sections, including the interference scores between congruent and deviant response accuracies (M_{MCT}(SD)=12(13)%, M_{CON}=17(20)%; p=0.22), and the interference scores between congruent and deviant reaction times (M_{MCT}(SD)=-36(37)ms, M_{CON}=-46(39)ms; p=0.29), also did not yield any significant results.
CONCLUSIONS: Acute medium-chain triglyceride (coconut oil) consumption did not appear to benefit or harm executive cognitive function when taken up to two hours before a cognitive trial, beyond the effects associated with carbohydrate supplementation (in the form of a fruit smoothie), especially if consumption did not lead to gastrointestinal distress. This implies that physical activities relying on rapid decision making and reaction time are unlikely to be affected by a single bolus of MCTs. Future research should investigate potential supplementation effects over longer periods of time, or in clinical populations that may benefit from MCT consumption.

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28-Days Hydrogen-Rich Water Supplementation Affects Exercise Capacity in Mid-Age Overweight Women

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(No relevant relationships reported)

Molecular hydrogen (H_2) improves body composition, metabolic profiles and mitochondrial function in overweight women, yet no studies so far evaluated the effectiveness of H_2 for improving exercise capacity in this population.
PURPOSE: To examine the effects of 28-days supplementation with 1 L per day of hydrogen-rich water (HRW) on exercise capacity and quality of life in overweight mid-age women. **METHODS**: Twelve women (age 53.8 ± 13.0 years, BMI 28.8 ± 3.3 kg/m², VO_{2max} 22.3 ± 3.7 ml/kg/min) participated in this randomized, placebo-controlled, cross-over, repeated-measure interventional study. All participants were allocated in a double-blind design to receive two randomly assigned trials: first group received 1 L per day of HRW (supplying ~ 9 ppm of H_2), while the second group received placebo (tap water). Participants were evaluated at baseline, and following 28 days of intervention. The primary endpoint was the change in cardiorespiratory endurance (VO_{2max}) assessed at baseline and at 28 days follow-up. Secondary outcomes included change from baseline to end of treatment in values for work capacity, impact

of weight on quality of life (IWQoL), and hematological biomarkers. Participants were asked to maintain their usual lifestyle, dietary intake and not to use other dietary supplements during the study. **RESULTS:** HRW intervention significantly improved VO_{2max} as compared to placebo at 28-day follow-up (26.2 ± 4.8 ml/kg/min *vs.* 24.2 ± 4.1 ml/kg/min; $P = 0.03$). Differences were found for time to exhaustion and total work completed during an incremental exercise, with HRW resulting in improvement of both variables as compared to placebo ($P < 0.05$). IWQoL scores and hematological markers were not affected by either intervention ($P > 0.05$). **CONCLUSION:** Results indicate that HRW can be used as an alternative hydration formulation to positively affect exercise performance in mid-age overweight women.

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Single versus Split Dose of Iron Optimizes Haemoglobin Mass Gains at 2,106m Altitude

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(No relevant relationships reported)

Purpose: To determine if a split daily 200mg elemental iron dose (2x100mg) is superior to a single daily iron dose (1x200mg) for optimal haemoglobin mass (Hbmass) gains at altitude, while minimizing gastro-intestinal (GI) discomfort. **Methods:** Twenty-six elite male and female runners attended a 3.1±0.3week training camp at 2,106m altitude in Flagstaff, AZ. A two-group design, randomized and stratified to baseline Hbmass, sex and ferritin, was implemented as: 1) split dose of 2 x 100mg daily (AM & PM; SPLIT) vs; 2) single dosing of 1 x 200mg daily (PM only, SINGLE) elemental iron (ferrous fumarate). Two participants were excluded (baseline ferritins <30μ/mL; n=24 for final analysis). Hbmass measures (via the carbon monoxide rebreathing technique) and venepuncture draws were completed upon immediate (± 2 days) arrival and departure of the camp for ferritin, hepcidin and erythroferrone (ERFE) analysis. Validated food frequency (FFQ), GI, menstrual blood loss (MBL) and training questionnaires were implemented throughout the camp. Univariate analysis was used to compare Hbmass outcomes; accounting for the covariates of dietary iron intake, menstrual blood losses and training volume. The alpha-level was set at p<0.05. Data are reported as means ± standard deviation.
Results: Both groups significantly increased Hbmass post-camp, but SINGLE was significantly higher than SPLIT (SINGLE: 867.3±47.9g, SPLIT: 828.9±48.9g, p=0.048). GI scores were worse (greater) in SINGLE for weeks 1 & 2 combined (SINGLE: 18.0±6.7 points, SPLIT: 11.3±6.9 points, p=0.025), however, GI tolerance improved in SINGLE, and the between group difference was no longer apparent by week 3 (p=0.335). ERFE significantly decreased in both groups (~28.5%), however, no between group differences existed (p>0.05). Hepcidin showed a tendency to decline (~33.5%), with no difference between groups (p>0.05). There were no between group differences in FFQ, MBL or average daily training outcomes (p>0.05).
Conclusion: A single nightly 200mg dose of elemental iron (ferrous fumarate) was superior to a split dose for optimizing changes in Hbmass at 2,106m altitude in elite runners over a 3.1±0.3week training camp. Observed differences may be due to a greater acute hepcidin response in the SPLIT group, however, more research is required to explore the mechanism.

2944   Board #227   June 1 3:30 PM - 5:00 PM

Antioxidant Supplementation Attenuates Muscle Performance Adaptations In Young Women: A Randomized Placebo-controlled Trial

Maurílio T. Dutra[1], Sávio Alex[1], Alyson F. Silva[1], Nathalia B. Sales[1], Marco A. Dourado[1], Andrew Fonseca[1], Filipe D. Lima[1], Lee E. Brown, FACSM[2], Martim Bottaro[1]. *¹University of Brasília, Brasília, Brazil. ²California State University at Fullerton, Fullerton, CA.* (Sponsor: Lee E. Brown, FACSM)
(No relevant relationships reported)

Strength training (ST) is widely known to promote acute and chronic adaptations that result in increased muscle performance and hypertrophy. It has been argued that antioxidant supplementation could affect these adaptations by neutralizing oxidative stress. However, chronic interventions analyzing the effects of ST combined with antioxidant vitamins are scarce, and available results are ambiguous. **PURPOSE:** To investigate the effects of ST combined with vitamin C and E supplementation on muscle performance and thickness. **METHODS:** This was a double-blinded placebo-controlled randomized study. Forty-two untrained women (23.8 ± 2.7 years, 58.7 ±

11.0 kg, 1.63 ± 0.1 m) were allocated into three groups: 1) vitamins (VG, *n*=15), 2) placebo (PG, *n*=12), or 3) control (CG, *n*=15). Participants of VG and PG underwent a periodized ST program, twice a week, for 10 weeks. VG supplemented with vitamin C (1g/day) and E (400IU/day) while PG consumed placebo pills. At the beginning and end of the training period, knee extensor peak torque (PT) and total work (TW) were measured on an isokinetic dynamometer and quadriceps *femoris* muscle thickness (MT) was assessed by ultrasound. Mixed factor ANOVA analyzed data. **RESULTS:** A significant group*time interaction for PT (F = 13.4, *P* = .000), TW (F = 6.0, *P* = .005) and MT (F = 4.0, *P* = .03) was observed. Both VG (37.2 ± 5.4 *vs* 40.3 ± 5.6 mm) and PG (39.7 ± 5.2 *vs* 42.5 ± 5.6 mm) increased MT after the intervention (*P* < .05) with no differences between groups. Also, both VG (146.0 ± 29.1 *vs* 170.1 ± 30.3 N.m) and PG (158.9 ± 22.4 *vs* 182.7 ± 23.2) increased PT after training (*P* < .05). However, a significant group effect (F = 5.2, *P* = .01) showed that only PG presented a significant difference *vs* CG (*P* = .01). In addition, both VG (2068.3 ± 401.2 *vs* 2295.5 ± 426.8 J) and PG (2165.1 ± 369.5 *vs* 2480.8 ± 241.3 J) increased TW after the intervention (*P* < .05). However, a significant group effect (F = 5.1, *P* = .01) showed that only PG presented a significant difference *vs* CG (*P* = .01). **CONCLUSION:** Chronic antioxidant supplementation may attenuate muscle performance improvement, but not muscle growth, in untrained young women after 10 weeks of ST.

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Vitamin D Supplementation Improves Health Related Quality of Life in Children with Sickle Cell Disease

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(No relevant relationships reported)

Sickle cell disease has a detrimental impact upon health-related quality of life (HRQL). No study has determined if vitamin D supplementation can improve HRQL in this population using the pediatric Patient-Reported Outcomes Measurement Information System (PROMIS). **PURPOSE**: To assess the impact of vitamin D supplementation on HRQL over a 12-week period in 5- to 17-year-old African American children with (n=21) and without (n=23) type SS sickle cell disease (SCD-SS). **METHODS**: Subjects were randomized to oral daily doses (4000 vs. 7000 IU) of cholecalciferol (vit D$_3$) and evaluated at 6 and 12 weeks for changes in vit D status (serum 25 hydroxyvitamin D (25(OH)D)) and HRQL using PROMIS pediatric short forms. For PROMIS assessment of item response theory-based T-scores (population mean of 50 and SD of 10) in the depressive symptoms, fatigue, and pain domains, a higher T score indicates a worse outcome and in the mobility, peer relationships, and upper-extremity function domains a lower T scores indicate a worse outcome. **RESULTS**: The mean 25(OH)D at baseline was 19.2±7.2 in subjects with SCD-SS and 22.3±9.3 in healthy subjects. After 12 weeks of supplementation, the mean increase in 25(OH)D was 25.6±22.3 ng/mL in subjects with SCD-SS and 20.5±17.5ng/mL in healthy subjects (both P<0.05). In subjects with SCD-SS by 12-wks (n=20), significant (all P<0.05) reductions in pain (54.4 ± 13.3 vs. 48.4 ± 14.8), fatigue (51.7 ± 11.4 vs. 46.4 ± 14.0) and depressive symptoms (43.1 ± 8.1 vs. 39.1 ± 7.3) and improvement in upper-extremity function (45.9 ± 10.9 vs. 51.2 ± 8.7) were observed, with no difference (both P>0.05) in mobility (53.1 ± 6.2 vs. 55.7 ± 5.4) or peer relationships (56.9 ± 7.1 vs. 57.8 ± 11.0). In healthy subjects by 12 weeks, there were no differences (P>0.05) in pain (48.6 ± 8.7 vs. 48.9 ± 7.3), depressive symptoms (41.5 ± 8.2 vs. 39.9 ± 9.4), mobility (57.8 ± 3.3 vs. 57.5 ± 3.7) or peer relationships (56.0 ± 7.3 vs. 56.1 ± 9.2), but significant (both P<0.05) reductions in fatigue (40.3 ± 10.3 vs. 36.3 ± 10.0) and improvement in upper-extremity function (50.6 ± 8.8 vs. 53.2 ± 6.4). **CONCLUSIONS**: Daily high-dose vitamin D supplementation for African American children with and without SCD-SS improved HRQL. Supported by K12 (KL2RR024132), K23 (K23HL114637), (UL1TR000003), CHOP RAG Pilot Grant, GI Research and Education Fund, and Nutrition Center.

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Vitamin D$_3$ Supplementation on Immune Functions and Upper Respiratory Track Infection in Male Taekwondo Athletes

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(No relevant relationships reported)

Vitamin D plays an important role for immune functions. Insufficient serum 25(OH)D concentration during winter season may be associated with increased risk of upper respiratory tract infection (URTI) in athletes. **PURPOSE**: This study was aimed to determine the effects of vitamin D$_3$ supplementation on immune functions and URTI in male taekwondo athletes. **METHODS**: Twenty-five male taekwondo (TKD)

athletes, aged 19-22 years with vitamin D deficiency (25(OH)D; 12.3±2.78 ng/ml), participated in this study. They were randomly assigned to receive 5,000 IU/day of vitamin D$_3$ capsule (N=13) or placebo (N=12) during 4 weeks of winter training. Blood samples were collected two times (pre- and post-tests) to analyze serum 25(OH)D concentration. Saliva samples were collected three times (1st, 2nd, and 4th week) to analyze the salivary immunoglobulin A (SIgA) and lactoferrin concentrations. URTI symptoms were reported daily during 4 weeks of training. Repeated measures ANOVAs were performed and significant level was set at *p*<.05. **RESULTS**: The serum 25(OH)D concentration increased by 255.6% in supplementation group, but this level did not change in placebo group (F=247.50, p<.001). SIgA (F=23.00, *p*<.001) significantly increased in both groups during the study period, but salivary lactoferrin level (F=5.79, p=.011) increased only in placebo group at the 2nd week of training. URTI symptoms significantly decreased only in supplementation group (F=5.456, p=.005) throughout the study. **CONCLUSIONS**: The present study found that high dose of vitamin D$_3$ supplementation (5,000 IU/day) increased the serum 25(OH)D concentration to sufficient level (40.1±6.79 ng/ml), and decreased URTI symptoms during winter training. Our findings suggest that vitamin D$_3$ supplementation during winter training may provide potential benefits for preventing URTI in male taekwondo athletes with vitamin D deficient.

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Impact of a Carbohydrate Mouth Rinse on Muscle and Functional Power in Older Adults.

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(No relevant relationships reported)

People over the age of 70 have decreased muscular power and reduced functional ability. Carbohydrate mouth rinse (MR) has been effective at producing an increase in power-like activities in young healthy athletic populations. **PURPOSE:** The purpose of this study is to assess the effect of a carbohydrate MR on functional measures of power in an older population. **METHODS:** Twelve subjects (5 males, 7 females; Age= 77±3 years) completed 2 experimental sessions under different MR conditions (Placebo (PLAC), 6.4% glucose (CHO)). Subjects completed the timed-up and go (TUG) and hand grip tests immediately after and 10 minutes after application of the MR. During the sit-to-stand phase of the TUG subjects initiated movement with both feet placed on force platforms. **RESULTS:** No differences were found in the TUG as a result of the MR condition immediately (PLAC=9.16±0.34 sec, CHO=9.26±0.33 sec) after or 10 minutes (PLAC=8.98±0.36 sec, CHO=9.11±0.34 sec) after MR. Similar results were found for the hand grip test immediately (PLAC=68.8±5.5 lbs, CHO=68.8±5.7 lbs) after and 10 minutes (PLAC=69.4±5.9 lbs, CHO=73.8±5.8 lbs) after MR. In contrast, impulse (PLAC=352±36 Ns, CHO=409±39 Ns; p=0.01) and power (PLAC=85±9 N-m sec^{-1}, CHO=99±10 N-m sec^{-1}; p=0.02) generated during sit-to-stand were greater immediately after CHO MR as compared to PLAC MR. This result did not persist 10 minutes after MR. **CONCLUSIONS:** CHO MR improved impulse and power during the sit-to-stand phase of the TUG; however, functional performance of the TUG and hand grip was not changed as a result of MR. These results suggest that CHO MR transiently increases muscle power in normal subjects above 70 years of age.

F-63   Free Communication/Poster - **Military Physiology**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2948   Board #231   June 1 3:30 PM - 5:00 PM

Greater Fitness is Associated with Reduced Injury Risk in Specialized Military Men

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(No relevant relationships reported)

Recent literature has shown that cardiorespiratory fitness (CRF) and strength deficits are associated with greater musculoskeletal injury (MSKI) risk. When combined, the Functional Movement Screen (FMS) and lower quarter Y-Balance test (YBT) are powerful indicators of MSKI risk in athletes and military personnel. As the premier combat force for countering explosive hazards, U.S. Navy Explosive Ordnance Disposal (EOD) operators must perform optimally in the most austere environments. To safeguard health and mission success, it is critical to assess factors that influence MSKI risk in this elite group.

PURPOSE: To assess the relationships between measures of fitness and injury risk in EOD operators.
METHODS: Fifty-one active duty men (age 35.6 ± 1.0 yr) were evaluated for body fat percentage (BF%) using dual-energy x-ray absorptiometry, CRF (maximum volume of oxygen uptake [VO_{2max}]), muscular strength (one-repetition max [1-RM] back squat and bench press), and injury risk assessments (FMS, YBT). A quartile split for VO_{2max} established the bottommost, low, high, and topmost VO_{2max} groups. ANOVA and Pearson product-moment correlations were used to evaluate fitness and injury risk associations.
RESULTS: Means ± SE were as follows: BF% = 17.9 ± 0.5, VO_{2max} = 47.0 ± 0.9 ml/kg/min, time on treadmill (TT) = 12.2 ± 0.2 min, time of ventilatory threshold (VT) = 6.2 ± 0.2 min, FMS total score = 15.8 ± 0.3, and YBT left composite (LC) = 99.0 ± 1.0% and right composite (RC) = 98.6 ± 1.0%. Mean FMS scores were different between quartiles (F[3,47] = 5.182, $p < .01$), where the bottommost VO_{2max} group had the lowest scores. YBT was also different between quartiles: LC (F[3,47] = 3.704, $p < .05$) and RC (F[3,47] = 2.899, $p < .05$), where the high VO_{2max} group had the greatest values. Associations with FMS were BF% ($r = −.33, p < .05$), TT ($r = .35, p < .05$), and VT ($r = .30, p < .05$). Correlations with LC and RC were BF% ($r = −.37$ for both, $p < .01$) and TT ($r = .37-.46, p < .01$). No associations with 1-RM were observed.
CONCLUSION: This study is consistent with accruing data that indicate more fit individuals have a lower injury risk. While strength is a critical element of overall fitness, CRF and BF% may better predict MSKI risk. Due to their unique and arduous operational demands, the EOD operator can further reduce injury risk by maintaining peak physical condition.

2949   **Board #232**   **June 1 3:30 PM - 5:00 PM**
Adrenal Stress and Performance during Military Survival Training

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(No relevant relationships reported)

PURPOSE: The purpose of this research study was to evaluate neuroendocrine and physical performance responses in sailors and Marines undergoing U.S. Navy Survival, Evasion, Resistance and Escape (SERE) training.
METHODS: 20 men (Age: 25.3 ± 3.6 years; Height: 178.1 ± 6.1 cm; Weight: 83.7 ± 12.6 kg) took part in the study. Men were further split into high fit (n =10) and low fit (n = 10) subgroups based on physical fitness test scores. Blood samples were obtained at three timepoints (T1: baseline, T2: stress, T3: recovery), and were analyzed for plasma epinephrine, plasma norepinephrine, plasma dopamine, serum cortisol, serum testosterone, and plasma neuropeptide Y. Vertical jump and handgrip tests were performed at T1 and T2.
RESULTS: For the group as a whole (n = 20), stress hormone concentrations were significantly elevated at T2, with a concomitant reduction in testosterone concentrations. NPY concentrations did not increase at T2, but decreased significantly at T3. Subjects maintained performance on the vertical jump and handgrip tests from T1 to T2. Significant between group differences were observed in norepinephrine (high fit: 3530.64 ± 2146.54 pmol•L-1, low fit: 4907.16 ± 3020.85 pmol•L-1) and NPY (high fit: 169.3 ± 85.89 pg•mL-1, low fit: 123.02 ± 88.86 pg•mL-1) responses at recovery (T3).
CONCLUSIONS: This study revealed that despite differential catecholamine and NPY responses during recovery, the SERE training course resulted in significant increases in stress hormone concentrations in all subjects regardless of physical fitness level, with no reductions in physical performance measures.

2950   **Board #233**   **June 1 3:30 PM - 5:00 PM**
Differences between U.S. Army Trainees and Active Duty Soldiers in Performing Physically Demanding Occupational Tasks

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(No relevant relationships reported)

The training implemented during initial entry training (IET) for combat arms trainees (up to 16 weeks) is designed to sufficiently optimize performance of physically demanding occupational tasks. Trainees must be physically capable of performing the tasks within their jobs to the minimal acceptable performance standard, as delineated by U.S. Army Training and Doctrine Command. **PURPOSE**: To compare U.S. Army trainees to active duty soldiers performing physically demanding occupational tasks. **METHODS**: 192 U.S. Army male combat arms trainees (TRs) at the end of their IET and 369 active duty male combat arms soldiers (ADs) both performed the sandbag carry (SBC), casualty drag (CD) and move under direct fire (MUF) tasks. During the

SBC, subjects wore personal protective equipment (PPE; ~32 kg) while lifting and carrying 16 pre-filled 18-kg sandbags a distance of 10m to build a fighting position (4 long x 2 wide x 2 high) as fast as possible (min). For the CD, subjects wore PPE and a weapon while dragging a 123-kg simulated casualty 15m as fast as possible (60-sec time limit). Time was recorded and later calculated as velocity (m·s⁻¹). During MUF subjects wore PPE and a weapon to perform a series of combat rushes covering 100m as fast as possible (min). The MUF course cycled between one prone and two kneeling positions, each 6.6 m apart. Univariate ANCOVA (height and body mass as covariates) were used to compare differences in performances on the three tasks between TRs and ADs. **RESULTS**: 94% of TRs and 99% of ADs performed the three tasks to the minimal acceptable performance standards. ADs performed significantly faster than TRs on SBC (AD: 1.73 ± 0.29 min, TR: 2.09 ± 0.46 min; p<0.01) and CD (AD: 1.14 ± 0.28 m·s⁻¹, TR: 0.80 ± 0.30 m·s⁻¹; p<0.01) with no differences in MUF performance (AD: 2.24 ± 0.15 min, TR: 2.27 ± 0.22 min; p=0.09). **CONCLUSIONS:** Although majority of the TRs met the minimal acceptable performance standards on the three tasks, ADs performed the SBC and CD faster. This could be due to ADs having more experience performing the tasks. While further training occurs at TRs first duty station, TRs may benefit from additional occupational task training during IET. *The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.*

2951   **Board #234**   **June 1 3:30 PM - 5:00 PM**
Effect of a Simulated Tactical Occupation Stressor on Physiological Strain Index and Blood Pressure

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(No relevant relationships reported)

PURPOSE: As a firefighter performs in live-fire suppression, it is critical to understand to the degree their physiological stress is exacerbated by the physical work they are required to conduct to reach a potential victim of an emergency. The purpose of this study was to evaluate physiological strain index (PSI) in response to a simulated firefighting occupation workload.
METHODS: Ten healthy male adults participated in this study. While wearing proper testing attire, participants completed a simulated fire stair climb (SFSC) by completing two consecutive 3-min workloads on a Matrix C7xe ClimbMill (Matrix Fitness USA, Cottage Grove, WI, USA) at a stepping rate of 60 steps/min. The participants completed this protocol under four conditions, with some conditions including the wearing of a 34.04 kg (75 lbs) weighted vest to simulate the wearing of personal protective equipment (PPE) typically worn by a firefighter. Some conditions involved the inclusion of a color-word interference test (CWIT) as a distracting mechanism. PSI was evaluated by continuously monitoring HR and core temperature by using CorTemp® ingestible thermometers and radio receiver (HQ, Inc., Palmetto, FL). PSI was calculated using a previously published and validated equation (Moran et al., 1998). Blood pressure was measured pre-exercise, following initial 3 min workload, and following completion of total workload.
RESULTS: A repeated-measures ANOVA showed that there was a significantly different PSI when comparing conditions ($p = 0.001$). A significantly elevated PSI per min was exhibited during all six minutes of exercise for both the weighted vest and weighted vest + CWIT conditions compared to exercise conditions without the vest. Systolic blood pressure also exhibited a significantly different degree of elevation in the same manner ($p = 0.006$).
CONCLUSIONS: Based on the results of the current study, it appears that the wearing of a weighted vest to simulate PPE significantly elevates PSI above what would be expected by the exercise alone. These findings suggest that firefighters are potentially at a substantial degree of physiological stress from the exercise and weight of gear alone. Further work should be conducted to further evaluate the usefulness of PSI as a means to monitor firefighters during actual or simulated fire suppression.

2952   **Board #235**   **June 1 3:30 PM - 5:00 PM**
Effect of a Simulated Tactical Occupation Stressor on Perceived Exertion and Blood Lactate

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(No relevant relationships reported)

PURPOSE: Findings by Marcora et al. (2009) and Zering et al. (2016) suggest that perceived exertion can be elevated during an exercise bout of a familiar intensity if it is

followed by a task requiring substantial cognitive attention. The purpose of this study was to evaluate rating of perceived exertion (RPE) and markers of physiological stress in response to a simulated firefighting occupation workload.
METHODS: Ten healthy male adults participated in this study. While wearing proper testing attire, participants completed a simulated fire stair climb (SFSC) by completing two consecutive 3-min workloads on a Matrix C7xe ClimbMill (Matrix Fitness USA, Cottage Grove, WI, USA) at a stepping rate of 60 steps/min. The participants completed this protocol under four conditions, with some conditions including the wearing of a 34.04 kg (75 lbs) weighted vest to simulate the wearing of personal protective equipment (PPE) typically worn by a firefighter. Some conditions involved the inclusion of a color-word interference test (CWIT) as a distracting mechanism. RPE was measured each minute during exercise using Borg's 15-point (6 - 20) scale (Borg, 1982; Borg, 1998). Lactate was measured following initial 3 min workload and following completion of total workload.
RESULTS: A repeated-measures ANOVA showed that there was a significantly different RPE when comparing conditions (p < 0.0005). A significantly elevated RPE per min was exhibited during all six minutes of exercise for both the weighted vest and weighted vest + CWIT conditions compared to exercise conditions without the vest. A repeated-measures ANOVA showed that there was a significantly different blood lactate when comparing conditions (p < 0.0005).
CONCLUSIONS: Based on the results of the current study, it appears that the wearing of a weighted vest to simulate PPE significantly elevates RPE above what would be expected by the exercise alone. Blood lactate levels mirrored these results. These findings suggest that firefighters are potentially at a substantial degree of perceived stress from the exercise and weight of gear alone.

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Effect of a Simulated Tactical Occupation Stressor on Immune System Markers of Physiological Stress and Inflammation

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(No relevant relationships reported)

PURPOSE: Walker et al., 2015 reported that increases in immune system markers [interleukin-6 (IL-6), C-reactive protein (CRP)] occur simultaneously with each increase in core temperature. A substantial physiological and psychological disturbance experienced by firefighters could potentially lead to a depression in immune system function. The purpose of this study was to evaluate specific immune system markers in response to a simulated firefighting occupation workload.
METHODS: Ten healthy male adults participated in this study. While wearing proper testing attire, participants completed a simulated fire stair climb (SFSC) by completing two consecutive 3-min workloads on a Matrix C7xe ClimbMill (Matrix Fitness USA, Cottage Grove, WI, USA) at a stepping rate of 60 steps/min. The participants completed this protocol under four conditions, with some conditions including the wearing of a 34.04 kg (75 lbs) weighted vest to simulate the wearing of personal protective equipment (PPE) typically worn by a firefighter. Some conditions involved the inclusion of a color-word interference test (CWIT) as a distracting mechanism. Salivary cortisol (CORT) was measured at baseline, following initial 3 min workload, and following completion of total workload. CRP was evaluated at baseline and one hour following the completion of each workload.
RESULTS: A repeated-measures ANOVA showed that there was a significantly different blood lactate when comparing conditions ($p < 0.0005$). Both Conditions 2 and 4 exhibited a significantly higher BL ($p < 0.05$) than Conditions 1 and 3. There were not shown to be any significant differences ($p > 0.05$) as a result of the SFSC between Conditions 2 and 4 or any differences between Conditions 1 and 3 in regards to BL. Neither CORT ($p = 0.116$) or CRP ($p = 0.700$) was shown to be significantly different across conditions or from baseline.
CONCLUSIONS: Based on the results of the current study, it appears that the wearing of a weighted vest to simulate PPE significantly elevates BL above what would be expected by the exercise alone. This illustrates the significant increase in exercise intensity while wearing the simulated PPE. However, the degree of exercise employed was not enough (with or without the weighted vest) to elicit any substantial changes in inflammatory markers.

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Effect of a Simulated Tactical Occupation Stressor on Reaction Time

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(No relevant relationships reported)

PURPOSE: Further work needs to be conducted on the effects exercise or physical exertion has on the body in regards to reaction time (RT). This becomes especially important to occupations who must complete a strenuous physiological workload while making potential life-and-death decisions that require a quick response. The purpose of this study was to evaluate RT in response to a simulated firefighting occupation workload.
METHODS: Ten healthy male adults participated in this study. While wearing proper testing attire, participants completed a simulated fire stair climb (SFSC) by completing two consecutive 3-min workloads on a Matrix C7xe ClimbMill (Matrix Fitness USA, Cottage Grove, WI, USA) at a stepping rate of 60 steps/min. The participants completed this protocol under four conditions, with some conditions including the wearing of a 34.04 kg (75 lbs) weighted vest to simulate the wearing of personal protective equipment (PPE) typically worn by a firefighter. RT was evaluated by employing a color-word interference test (CWIT) to evaluate how quickly the participant could react to distracting or incorrect visual stimuli to provide a response. The ability to answer quickly as well as accurately was assessed during the CWIT.
RESULTS: A repeated-measures ANOVA showed that there was a significantly different overall RT ($p = 0.001$) during the SFSC while wearing the weighted vest being significantly worse than baseline ($p = 0.016$). This difference was mirrored in RT during correct responses ($p = 0.025$) exhibiting a slowed RT while wearing the weighted vest ($p = 0.106$). CWIT accuracy ($p = 0.159$) or RT during incorrect responses ($p = 0.630$) was not shown to be significantly different from baseline.
CONCLUSIONS: Based on the results of the current study, it appears that the wearing of a weighted vest to simulate PPE significantly impairs RT. These findings suggest that the decision-making ability of tactical-style occupations could be hampered in response to such a workload-induced physiological stress, exposing themselves and potential victims they are attempting to help to further harm.

2955   Board #238   June 1 3:30 PM - 5:00 PM

Heart Rate Reserve: An Objective Measure of Soldiers' Physical Exertion During Field Operations

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(No relevant relationships reported)

Physiological monitoring can be accomplished in a military field environment using wearable technologies, but information is limited on physical exertion measures that are most useful for military applications, such as mission planning and protective equipment evaluations.
PURPOSE: Determine sensitivity of percentage heart rate reserve (%HRR) to variations in carried load using experimenter- and self-paced military tasks.
METHODS: 38 Army male soldiers [M (SD): Age = 24.2 (4.1); Wt. = 80.7 kg (12.5); Ht. = 1.76 m (.07); $\dot{V}O_{2Peak}$ = 50.3 ml/kg/min (5.4)] volunteered for a 6-session study conducted under an IRB-approved protocol. Wearing a heart rate monitor, they executed 3 trials (1 trial/session) of an experimenter-paced, 4.83-km foot march (FM) at a 4.83 km·h^{-1} speed and 3 trials (1 trial/session) of a self-paced, maximum effort run of an obstacle course (OC) carrying a different military load (randomized) on each trial (FM: 8.8, 47.2, 50.7 kg; OC: 8.8, 28.1, 31.5 kg). Maximum heart rate (MHR) was obtained in the final 20 s of $\dot{V}O_{2Peak}$ testing. Resting HR (RHR) was recorded in the final 20 s of a 5-min period of sitting prior to trial initiation. The highest HR in a trial (MHR$_{trial}$) was also identified. %HRR was calculated as [(MHR$_{trial}$ – RHR)/(MHR – RHR)] x 100. Separate repeated measures ANOVAs (Subjects x Load) were applied to FM and OC %HRR and completion time.
RESULTS: On the FM, completion time was not significantly affected by load, $F(1.15, 42.6) = 2.68$, $p =.105$, $\eta p^2 = .067$, [M (SD) in min: 59.68 (1.06), 59.37 (1.08), 60.52 (3.74) for loads 1-3], but %HRR increased significantly with each load increase, $F(1.66, 61.44) = 112.17$, $p < .001$, $\eta p^2 = .752$ [M (SD) in %: 54.15 (10.45), 76.15 (11.53), 82.32 (8.10) for loads 1-3]. On the OC, completion time increased significantly with each load increase, $F(2, 74) = 132.25$, $p < .001$, $\eta p^2 = .781$ [M (SD) in min: 4.34 (0.61), 5.58 (1.05), 6.23 (1.11) for loads 1, 2, & 3], but %HRR did not show a significant load effect, $F(1.51, 55.95) = 1.03$, $p = .347$, $\eta p^2 = .027$ [M (SD) in %: 91.02 (5.23), 91.97 (5.13), 91.18 (6.02) for loads 1-3].

Abstracts were prepared by the authors and printed as submitted.

CONCLUSIONS: %HRR distinguished among external loads carried on an experimenter-paced task (FM). %HRR did not vary with load on a self-paced maximal effort task (OC) but, in conjunction with completion times, %HRR provided critical data on soldiers' physical exertion.

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Effect of Long-term Elite Military Training and Operations on Hormonal Profile

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(No relevant relationships reported)

Chronic exposure to multifactorial stress, such as that endured by elite military operators, may lead to overtraining syndrome and negatively impact hormonal regulation. In acute settings (<6 mos), military training has been shown to lead to hormonal dysfunction; however, less is known about the consequences of long-term military training. **PURPOSE:** The purpose of this study was to determine the chronic effects of military operations and training on the hormone profile of elite military operators. **METHODS:** Active-duty elite US military operators (n = 65, age = 29.8 ± 1.0 yrs, height = 178.4 ± 0.7 cm, weight = 85.1 ± 2.0 kg) concomitantly engaged in rigorous physical training were recruited to participate in the study. Basal plasma concentrations of luteinizing hormone (LH), total testosterone (TT), free testosterone (FT), sex-hormone binding globulin (SHBG), cortisol, thyroid stimulating hormone (TSH), triiodothyronine (T3), and thyroxine (T4) were obtained between 0600-1000 hrs. Data were analyzed for correlations and compared against normative reference values; all data are presented as mean ± SE. **RESULTS:** Mean LH, TT, FT, SHBG, cortisol, TSH, T3, and T4 for all subjects were: 3.4 ± 0.2 IU $\cdot$ L^{-1}, 13.5 ± 0.9 nmol $\cdot$ L^{-1}, 28.2 ± 1.2 pmol $\cdot$ L^{-1}, 94.2 ± 6.4 nmol $\cdot$ L^{-1}, 441.3 ± 26.4 nmol $\cdot$ L^{-1}, 3.5 ± 0.7 mIU $\cdot$ L^{-1}, 150 ± 9.0 ng $\cdot$ dL^{-1}, and 7.8 ± 0.2 µg $\cdot$ dL^{-1}, respectively. There was a significant positive correlation between TT and cortisol ($R^2 = 0.07$; $y = 0.0093x + 9.4364$; $P < 0.05$). In addition, 43% of the participants (n = 28) had TT below age-based normative reference ranges. Those with lower than normal TT (8.2 ± 0.3 vs. 17.6 ± 1.3 nmol$\cdot$L^{-1}; $P < 0.01$), also had lower FT (24.4 ± 1.9 vs. 31.1 ± 1.4 pmol $\cdot$ L^{-1}, $P < 0.01$), cortisol (367.4 ± 39.1 vs 497.2 ± 33.2 nmol$\cdot$ L^{-1}; $P < 0.05$) and T3 (121.1 ± 5.4 vs. 164.0 ± 14.3 ng $\cdot$ dL^{-1}; $P < 0.01$). **CONCLUSION:** These results indicate that military operations and training may place a large burden on the operators and depress or alter the hypothalamic pituitary, adrenal, gonadal and thyroid axes. Further research need be conducted to determine what, if any, consequences these differences may cause.

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Psychological Hardiness And Success On The Occupational Physical Assessment Test In Army Combat Arms Recruits

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(No relevant relationships reported)

In January 2017, the U.S. Army employed the Occupational Physical Assessment Test (OPAT) to determine the physical readiness of recruits (RCs) prior to initial entry training (IET). The OPAT consists of the standing long jump (SLJ), seated power throw (SPT), strength deadlift (SDL), and interval aerobic run (IAR). Recruits who meet the top OPAT level (i.e., black) qualify for heavy physically demanding jobs, such as combat arms (i.e., infantry, artillery, etc). Psychological readiness, measured by hardiness, has been shown to predict recruit success. **PURPOSE**: To examine the relationship between psychological hardiness and physical readiness (OPAT) in combat arms RCs. **METHODS:** Within the first week of IET, 945 U.S. Army male combat arms RCs performed the OPAT and completed the Dispositional Resilience Scale - Military (DRS-II-M) questionnaire, a validated 24-item, 5-point Likert scale (1 = definitely false to 5 = definitely true) measure. DRS-II-M provides three positive (control, commitment and challenge) and three negative (alienation, powerlessness and rigidity) hardiness dimensions. RCs were divided into two groups; those who achieved the OPAT black level (n=636) (SLJ $\geq$ 160 cm, seated power throw $\geq$ 450 cm, SDL $\geq$ 160 lb, and IAR $\geq$ 43 shuttles) versus those who did not (n=309). Two-tailed independent sample t-tests were used to compare hardiness across groups. **RESULTS:** RCs achieving black level scored significantly higher than those who did not on positive hardiness dimensions summed averages (SA) (12.65 ± 1.29 vs 12.43 ± 1.47; p = 0.015) and significantly lower on negative hardiness SA (6.35 ± 1.39 vs 6.63 ± 1.43; p = 0.004). Within the individual measure dimensions, black-level RCs scored higher on challenge (4.15 ± 0.58 vs 4.05 ± 0.62; p = 0.013) and control (4.35 ± 0.47 vs 4.25 ± 0.51; p = 0.003) averaged factors (AF) of positive hardiness and lower on alienation (1.53 ± 0.68 vs 1.63 ± 0.69; p = 0.033) and powerlessness (1.57 ± 0.62 vs 1.70 ± 0.66; p = 0.003) AF of negative hardiness. **CONCLUSIONS:** RCs who score high on the OPAT also have increased hardiness suggesting they will be successful in meeting the

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psychological and physical demands of combat arms jobs. *The views expressed in this abstract are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.*

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Evaluation Of Occupational Heat Strain Under Dry And Humid Conditions With Equivalent WBGT

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(No relevant relationships reported)

PURPOSE
American Conference of Governmental Industrial Hygienist's (ACGIH) Threshold Limit Value (TLV), based on Wet Bulb Globe Temperature (WBGT), is a commonly used tool to prevent occupational heat stress (core body temperature (Tc) elevation within +1°C or $\leq$ 38 °C). This study examined the hypothesis that a level of heat stress would be equivalent to different combinations of ambient temperature and relative humidity should it be matched to the equivalent in terms of WBGT.
METHODS
All subjects provided informed consent approved by the NIOSH IRB. Eight healthy men (Age: 23±2 yrs.) wearing a cotton work coverall with a hardhat and work gloves underwent four cycles of an intermittent work-rest (15 min each, total 2 hours) under two ambient conditions characterized as either dry (45.5°C, 15% RH) (DRY) or humid (31°C, 84% RH) (HUM), but both equivalent to 30°C WBGT. The work was performed via a cycling exercise at a fixed rate of 350 watts metabolic heat production while the rest was given as sitting on a chair and removing gloves and headgear, with hydration *ad lib*. Tc, skin temperature (Tsk), Thermal sensation (TS), and Rating of Perceived Exertion (RPE) were measured during exercise.
RESULTS
Measurement of Tc, TS, and RPE were not significantly different between DRY and HUM conditions. There was also no difference in Tc elevation (DRY: 0.8±0.4°C, HUM: 0.7±0.3°C) within the upper limit of TLV. However, Tsk was significantly higher in DRY condition than HUM during exercise (p≤0.05). The average amount of water intake was not significantly different between DRY (1187.5±258.8 ml) and HUMID (901.5±323.6 ml) throughout trials (P>0.05).

		Baseline	1st Exercise	2nd Exercise	3rd Exercise	4th Exercise
Tc (°C)	DRY	37.0 ± 0.4	37.0 ± 0.3	37.2 ± 0.2	37.4 ± 0.3	37.7 ± 0.3
	HUM	36.9 ± 0.4	37.1 ± 0.4	37.2 ± 0.4	37.4 ± 0.4	37.7 ± 0.4
Tsk (°C)	DRY	34.5 ± 0.7	36.1 ± 0.3	36.4 ± 0.4	36.3 ± 0.6	36.3 ± 0.7
	HUM	33.9 ± 0.5	35.3 ± 0.3	35.4 ± 0.5	35.3 ± 0.5	35.2 ± 0.5
TS	DRY	7.1 ± 0.2	9.2 ± 0.6	9.8 ± 0.7	9.8 ± 0.5	10.0 ± 0.8
	HUM	7.4 ± 0.5	9.1 ± 0.7	9.4 ± 0.9	9.6 ± 0.9	9.6 ± 0.9
RPE	DRY	6.1 ± 0.4	9.4 ± 1.2	10.1 ± 1.5	10.4 ± 1.8	10.5 ± 1.7
	HUM	6.1 ± 0.4	9.3 ± 1.3	10.1 ± 1.7	10.1 ± 1.8	9.9 ± 1.6

CONCLUSION
These data demonstrated that a level of heat stress is similar under different ambient temperature and RH when matched the same in WBGT. However, it is speculated that a prolonged working time (e.g. 4 to 8 hour work shift) would likely surpass the upper limit of ACGIH's TLV.

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Combat Exposure Blunts Sympathetic Response to Acute Exercise Stress in Explosive Ordnance Disposal Personnel

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(No relevant relationships reported)

Electrodermal activity (EDA) is a valid proxy of sympathetic nervous system activity during exercise and thus possesses the translational potential for studying the effects of acute and chronic stress. **PURPOSE**: To evaluate the effect of combat exposure (CE) on the EDA response to acute exercise stress in chronically stressed military men. **METHODS:** Thirty-six healthy military men (mean age: 37.0±6.9 yr) completed a graded exercise test to assess maximal oxygen consumption (VO$_{2max}$). EDA was recorded at baseline and during exercise (25, 50, 75, 100% VO$_{2max}$) and recovery. A tertile split of CE levels established three exposure groups: low CE (n=12), medium CE (n=12), and high CE (n=12). A 3 (group) × 6 (stage) repeated-measures analysis of variance evaluated EDA changes across stages of exercise, as well as between CE

levels. **RESULTS:** Baseline EDA values for high, medium, and low CE did not differ ($p>0.05$). From 25% to 100% VO_{2max}, mean percent changes in EDA from baseline were +85.2 to +121.6%, with a subsequent decline in seated recovery (+105.8%) ($p<0.001$, $\eta_p^2 =0.28$). An interaction between CE and exercise workload was observed ($p=0.022$, $\eta_p^2 =0.13$). Specifically, low CE displayed a steep linear increase in EDA from 25% to 100% VO_{2max}, followed by a steady decrease into recovery. In contrast, the high CE EDA response was blunted, with a peak occurring at 75% VO_{2max}, after which it declined through 100% VO_{2max}. The medium CE EDA response mirrored low CE until 75% VO_{2max} and then declined through seated recovery. **CONCLUSION:** Dose-dependent effects of CE were demonstrated on EDA response to exercise stress. The low-CE pattern is consistent with the literature characterizing healthy plasma catecholamine responses during exercise stress, as well as with our prior research illustrating EDA responses in aerobically fit individuals. High-CE individuals, by contrast, exhibit a less adaptive response. Collectively, these findings imply that CE disrupts the sympathetic response to acute exercise stress.

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Factors Impacting Field March Performance of U.S. Service Academy Cadets

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(No relevant relationships reported)

Field march performance (FMP) is an important skill of ground combat forces. Aerobic ability, "GRIT", overall strength & perhaps lean body mass are important factors influencing FMP. **PURPOSE:** Investigate factors impacting FMP in a military school selection process of U.S. Service Academy cadets. **METHODS:** 230 relatively fit subjects participated in a one-day military school selection tryout culminating with an ~8.5 mile FMP carrying ~35-lb load on terrain including several elevation changes each of at least ~500 feet. Specific multiple regression & frequency distribution analysis involved investigating the factors influencing the top & bottom 10% FMP (n = 46) of the larger sample. **RESULTS:** Analysis revealed that service academy career run time was the most potent factor impacting FMP; multiple R = .79, adjusted R^2 = .62. Threshold measures appear present; 12:30 or faster 2MR (13 vs 0 subjects) and 2:38 or faster on an indoor obstacle course test (IOCT; 15 vs 2 subjects) reside in the Top 10% fastest FMP group. Body mass (adjusted R^2 = -.02) and pull-ups (adjusted R^2 = .02; a questionable surrogate for strength) did not impact FMP. Descriptive data:

Group n = ()	HT in	BM lbs	PU Reps	SU Reps	Pullups Reps	2MR Secs	2MR-YR Secs	APFT Pts	APFT-YR Pts	FMP Min	IOCT Day Secs	IOCT-YR Secs
ALL (230)	71 (2.8)	180 (22.6)	74.1 (12.1)	69.5 (11.5)	11.2 (4.2)	821.4 (60.1)	793 (51.9)	270.6 (31.0)	316 (32)	122.5 (14)	216.4 (30.7)	NA*
Top 10% FMP (23)	70.6 (2.7)	178.6 (20.6)	74.4 (11.1)	75.5 (9.0)	12.0 (4.1)	781.2 (47.3)	752 (42.1)	290.8 (26.4)	335 (29.4)	100.9 (5.1)	199.7 (26.5)	156.3 (14.4)
Bottom 10% FMP (23)	70.6 (2.3)	177.6 (15.9)	65.5 (8.3)	62.0 (9.1)	8.7 (3.2)	879.2 (64.9)	841.1 (48.7)	241.3 (24.1)	291.5 (25.1)	149.7 (8.8)	241.6 (36.4)	181 (15.6)

*Data unavailable, institutional data reveals mean IOCT time of ~180 secs.
DISCUSSION: With 35-lb load, body mass & pull-ups did not influence FMP, whereas aerobic ability was the most potent factor. A postulated "GRIT" factor, attaining a performance badge on the IOCT (<2:38 min:sec); although a high incidence of success attainment (15/23 top 10% vs 2/23 bottom 10%), did not increase the variance in a two-factor regression model. **CONCLUSIONS:** In the present study, more robust strength measures were unfortunately not attained and future research should examine these and other physiological parameters. For soldiers desiring success on an 8.5 mile FMP with a 35-lb load, achieving & maintaining a career 2MR of at least 12:30 appears to enhance FMP and lead to a more enhanced physical profile related to military school selection criteria.

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Change in Measures of Moral Function Following Acute Bouts of Marine Corps Martial Arts Training

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(No relevant relationships reported)

The Marine Corps Martial Arts Program (MCMAP) is designed to be delivered in an environment characterized by periods of intense physical activity and psychological stress. The purpose of the program is to prepare Marines for the stress and complex ethical decisions encountered in the modern-day battlefield. However, how multifactorial stressors effect ethical decision-making processes is not well understood. **PURPOSE:** To quantify changes in ethical decision-making following MCMAP training. **METHODS:** Fifty-five, active duty, newly enlisted U.S. Marines (Males: n =

37; age = 19 ± 1 yr; height = 176 ± 7 cm; mass = 74 ± 7 kg; Females: n = 18; age = 20 ± 2 yr; height = 164 ± 6 cm; mass = 61 ± 6 kg) volunteered for this investigation. Nine cohorts were recruited over a 2-year period with each cohort observed 3 times with 3 weeks between each visit. Serial blood samples for cortisol, norepinephrine (NE), and epinephrine (EPI) were collected before training and during the recovery period (Immediate Post IP), 15, 30, 45 and 60min). Endocrine measures were quantified using summary measures and analyzed with RMANOVAs. To quantify moral function, the Moral Functioning Continuum (MFC) was adapted from the Continuum of Injurious Acts. The MFC represents a hierarchy from less severe to more severe aggressive actions. The subjects responded on a continuum as to whether they consider acts in hypothetical situations as legitimate or appropriate with scores assessed before training, IP, 30, and 60 min. Moral function variables were analyzed using a multilevel regression models. **RESULTS:** There were no significant differences observed for the summary or baseline endocrine measures. Moral Intention exhibited an acute response to training with significantly impaired decision making observed immediately post training. Moreover, both Moral Intention and Moral Judgment worsened over the visits suggesting a chronic impairment related to time in training. **CONCLUSION:** We have identified a functional change in ethical decision-making following acute bouts of MCMAP. We would suggest future work not only examine the transient changes in decision making in response to an acute stressor, but also examine how time in service changes the individuals ethical decision-making process.

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Prediction of Lower Extremity Musculoskeletal Injuries for Naval Special Warfare Operators: A Machine Learning Approach

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(No relevant relationships reported)

Lower extremity (LE) musculoskeletal injuries (MSI) are a common and costly occurrence in US NAVY Sea, Air, and Land (SEALs) Operators. Understanding the risk factors associated with LE MSI is an important step in designing injury prevention programs. **PURPOSE:** To develop a robust mathematical model to predict LE MSI in SEAL Operators. **METHODS:** 285 subjects (age: 26 ± 5 yrs, height: 179 ± 7 cm, weight: 85 ± 9 kg) participated in testing, including: LE muscular strength and flexibility; balance; body composition; anaerobic power/capacity; and aerobic capacity (VO2max). Medical charts were reviewed for LE MSI 365 days following laboratory testing. The correlated variable sets were identified using Hierarchical Clustering Analysis (HCA). Important features then were selected from the clusters and modeled with regression trees wherein output (predictions) were interpreted as the probability of injury for each individual. To classify observations, a decision threshold was defined that minimized the false positive rate (FPR) conditional on a true positive rate (TPR) of approximately 90% whenever all available variables were utilized. Individuals with predicted probabilities above this threshold were classified as injured. Variables selected in the final models were chosen in a forward fashion, with individual predictors that reduced the FPR without significantly lowering the TPR added to the model. The procedure stopped when no remaining predictor variables were able to produce a model that outperformed the current iteration. **RESULTS:** LE MSI rate was 13/285 or 4.5%. Each cluster of feature sets from HCA consisted of variables mostly from the same laboratory test category. The final regression tree model contained knee flexion and left knee extension strength (normalized to body weight), fat-free mass (kg), and hamstring flexibility, as the best predictors (TPR of 92.3% and FPR of 2.9%). **CONCLUSION:** Knee strength, fat-free mass, and hamstring flexibility were important risk factors identified in the machine learning algorithm that accurately classified SEAL Operators with LE MSKI. Alternative high prediction models also can be created using this modeling framework on different variable sets. **Supported by ONR N00014-11-1-0929**

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Abdominal Circumference Measurements in a US Navy Active Duty Population

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(No relevant relationships reported)

Abdominal obesity is a major risk factor for multiple diseases including Type II diabetes, hypertension, heart disease, and stroke. One of the quickest and most economical means of measuring abdominal obesity is abdominal circumference (AC). There are four sites most commonly measured for AC; iliac crest (IC), mid-abdominal (between IC and lowest rib), umbilicus (UMB), and the smallest region of the waist. Circumference at the IC is the current site used by the US Navy for those sailors who

do not pass height and weight standards. However, use of a more easily defined site, such as the UMB, may improve reliability, especially on sailors whose IC may be difficult to palpate.

Purpose: The purpose of this study was to determine if obtaining circumference at the UMB is a valid measure for AC in the US Navy active duty population.

Method: UMB and IC circumference measurements were taken on 115 subjects, (79 male and 36 female), using a retractable tape measure on the skin. Trained researchers took measurements at end of expiration with the tape parallel to the floor while ensuring tape tension did not cause indentation of the skin. Three measurements were taken at both sites per individual by the same researcher. Averages were calculated and used for analysis.

Results: Mean circumference for males was 35.3 ± 3.8 inches at UMB and 35.7 ± 3.6 inches at IC. Mean circumference for females was 33.8 ± 4.1 inches at UMB and 35.3 ± 3.8 inches at IC. There was a high correlation between UMB and IC measurements ($r^2 = .981$ and $.966$ for males and females, respectively). For intra-rater reliability, interclass correlation coefficients (ICC) for the three measurements for males were ICC = .996 at both UMB and IC. For females correlations were ICC = .992 at UMB and .986 at IC.

Conclusion: High correlation between sites suggests UMB can be a valid substitute for IC when measuring AC. The high ICC for both sites supports reproducibility of AC measures at these sites. The ease of locating the UMB eliminates the need to palpate correct IC measurement site. Based on these results, use of the UMB as the Navy standard to obtain an AC measurement may be preferable as it can be less intrusive and more easily located.

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Evaluation of The US Navy's Physiological Heat Exposure Limits during Deployment in The Persian Gulf

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(No relevant relationships reported)

The U.S. Navy uses Physiological Heat Exposure Limits (PHEL curves) to reduce heat stress casualties aboard naval vessels. The PHEL curves, established in the 1960s, have not been examined over several decades of advancements in shipboard technology. PHEL curves ranging from I to VI (low to high metabolic work), are assigned to each job which, in combination with ambient workspace conditions, determine allowable stay times in a particular workspace. Due to advancements in shipboard design, it is probable that the metabolic rate while performing certain shipboard duties has changed, which could reduce the accuracy of current PHEL assignments.

PURPOSE: To compare predicted and measured metabolic rates of scullery personnel aboard an aircraft carrier deployed in the Persian Gulf.

METHODS: Eight military personnel (age: 22 ± 2 yrs, ht: 165 ± 6 cm, wt: 71.8 ± 11.9 kg) assigned to shipboard scullery work (designated PHEL V) had their metabolic rate predicted based on established PHEL guidance. They then performed routine scullery work for the duration of their shift while measurements of oxygen consumption (VO_2), heart rate (HR), and core temperature (T_{core}) were collected for 3-4 hours. Measurements were collected again during a second shift to determine consistency of metabolic rates. Predicted and measured VO_2 recordings, converted to watts (W), were then compared to determine accuracy of existing PHEL curve assignments.

RESULTS: VO_2 measurements between the first and second shifts were not different (229 ± 33 vs 225 ± 31 W; p =.72), suggesting that duties performed were consistent. However, the predicted metabolic rates of the current PHEL assignments were significantly higher than those actually measured (240 ± 22 vs 227 ± 28 W; p = .03). Mean T_{core} of scullery personnel during both shifts was $37.4 \pm 0.2°C$, with the highest T_{core} recorded at 38.3°C. Mean HR was 96 ± 12 bpm, equivalent to $49 \pm 6\%$ of age-adjusted maxHR.

CONCLUSION: Findings from this limited data set identify a discrepancy between current PHEL curve assignments and measured metabolic rates in scullery personnel, likely resulting from task automation. Further work on this issue is warranted, as discrepancies between predicted and actual work rates could alter workspace allowable stay times and reduce the frequency of required workspace heat stress monitoring.

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Fitness and Body Composition Characteristics of Special Weapons and Tactics Team Members of Law Enforcement

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(No relevant relationships reported)

The job demands of members in Special Weapons and Tactics (SWAT) teams of law enforcement agencies involve heavy exertion, yet it remains uncertain whether this special population has adequate fitness levels to sustain high intensity work efforts. **PURPOSE:** To examine the fitness and body composition characteristics of SWAT members. **METHODS:** Fourteen healthy men (mean $\pm$ SD; age = 33.1 ± 5.7 y, height = 180.7 ± 5.4 cm, mass = 90.6 ± 10.0 kg) from SWAT teams of local law enforcement agencies completed five health-related fitness assessments. These included 1) a total body dual-energy x-ray absorptiometry (DEXA) scan to determine lean body mass (LBM), fat mass (FM), bone mass (BM), percent body fat (%body fat), bone mineral density (BMD), and a BMD T-score; 2) a one-repetition maximum (1RM) test of upper body strength on a bench press; 3) a graded exercise test on a treadmill to measure maximum oxygen uptake (VO_{2max}); 4) a YMCA submaximal bench press test to measure upper body muscular endurance; and 5) the Canadian trunk forward flexion test to measure hamstring flexibility. **RESULTS:** Participants had an LBM of 70.1 ± 7.2 kg, FM of 17.2 ± 5.5 kg, BM of 3.7 ± 0.6 kg, %body fat of $18.7 \pm 4.7\%$, a BMD of 1.3 ± 0.1 g·cm^{-2}, and a T-Score for BMD of 1.06 ± 1.15. Absolute and relative 1RM on the bench press were 120.9 ± 14.5 kg and 1.35 ± 0.22 kg·kg^{-1}, respectively. VO_{2max} was 47.9 ± 5.5 ml·kg^{-1}·min^{-1}. Participants completed 52 ± 15 repetitions on the YMCA submaximal bench press test. Distance reached on the Canadian trunk forward flexion test was 30.7 ± 5.7 cm. **CONCLUSION:** According to ACSM normative data for 30-39-year-old males, participants' body fat percentage is classified as fair. According to normative data from the World Health Organization, this population displayed a higher-than-average BMD T-score compared to other 30-year-old men. Participants demonstrated very good to excellent levels of cardiorespiratory fitness, muscular strength, muscular endurance, and flexibility, suggesting their fitness levels are appropriate for the vigorous exertions involved in this occupation. This information is beneficial for fitness professionals who train the tactical population. Partially Supported by NIGMS Training Grant GM083883

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Body Composition Indices to Classify Activity Level in Air Force Men and Women

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(No relevant relationships reported)

The search continues for a simple, accurate means of classifying the best body build and/or composition of active duty military personal. Various branches of the military consider body composition assessment an integral part of determining combat readiness. Heretofore, branches of the military have relied on a tape measure test to estimate body fat (%fat), which has not proven entirely successful. Recent interest has increased in body composition ratios to discern proportions of muscle and fat to identify personnel with greater military-task performance potential. **PURPOSE:** To evaluate the ability of selected body composition ratios to differentiate among activity level groups of active duty Air Force personnel. **METHODS:** Air Force men (n = 604) and women (n = 343) were evaluated for body composition using air displacement plethysmography (BodPod®, Life Measurement) to identify fat mass (FM), fat-free mass (FFM) and %fat. Participants were stratified into 4 age groups, determined by decade, with individuals <20 yrs (n = 13) combined with the 20-29 yr-old group and into 4 activity groups (sedentary, low active, active, and very active). Height and weight were used to calculate BMI = kg/m^2. Fat-free mass index (FFMI) and fat mass index (FMI) were determined by evaluating each component relative to height (m^2). Body type was estimated from the ratio of FFMI:FMI. **RESULTS:** An activity category x age group (4×4) MANOVA was performed on each sex. In men, BMI, FMI, and %fat were significantly different (p<0.001) among activity groups and age groups, with no significant interactions. In women, BMI, FMI, and %fat were significantly different (p<0.007) among activity groups. Among age groups, FFMI, %fat, and body type were significantly different. No interactions were significant. Discriminant analysis identified FM as the best discriminator of activity group in each sex, but the success rate of each category was <10%. **CONCLUSION:** Body composition indices do not appear to offer a simple solution to identifying military

personnel with the proper proportion of FFM to FM commensurate with active duty status in either sex. Additional research may need to concentrate on the relationship between body composition indices and physical performance tasks.

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Morphological Characteristics Associated with Successful and Non-Successful Performance on Occupationally Specific, Operationally Relevant Physical Tasks

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(No relevant relationships reported)

The US Air Force has expanded its research and development efforts of occupationally specific, operationally relevant (OSOR) physical fitness tests and standards. Knowledge of factors affecting success on OSOR physical tasks can provide valuable information for selection, training and operations. **PURPOSE**: We compared the morphological characteristics associated with success and non-success on operational physical tasks to inform targeted selection processes and training programs for physically demanding career fields. **METHODS**: A bona fide occupational requirements physical demand analysis was conducted for six Battlefield Airmen career fields. Analysis identified operationally-required critical physical tasks, which provided the basis for developing physical task simulations (PTSs). Career field senior leaders and experience operators reviewed PTS data to determine an operationally relevant minimum effective time (MET) for task success. Measures of morphology (stature, body mass, body mass index, and fat-free mass, fat mass, and relative body fat from both bioelectric impedance and skinfolds) and performance on 14 PTSs were recorded ($n = 171$, 62 female; age, 28.5 ± 5.6 yrs). Performance was successful if the subject both completed the PTS and met the MET. **RESULTS**: Successful performers were significantly different than non-successful performers for all morphological characteristics measured (stature 176.7 cm - 167.8 cm, body mass 82.3 kg - 70.8 kg, body mass index 26.3 kg/m2 - 25.1 kg/m2, fat-free mass 69.6 kg - 55.2 kg, fat mass 12.7 kg - 15.7 kg, and relative body fat 15.2% - 22.2%) across nearly all PTSs. Number of PTSs significance ($p < .01$) reached equals: stature 14 of 14 PTSs, body mass 13, body mass index 10, fat-free mass 14, fat mass 10, and relative body fat 11. **CONCLUSION**: The study showed that significant differences in morphology exist between US Airmen who successfully complete and those that do not complete operational physical tasks inherent to physically demanding military occupations such as USAF Battlefield Airmen.

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Validity of Critical Velocity Regression Equation to Estimate Weighted Sprint Performance

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(No relevant relationships reported)

The maximal aerobic steady-state has been estimated for running using the critical velocity (CV) concept. The CV metric has been associated with occupational and combat-specific performance measures. Tactical professionals are often burdened with load carriage that takes the form of duty gear, equipment, weapons, body armor, and protective gear. Thus, a model of high-intensity interval training (HIIT) prescribed using the CV concept to specifically increase CV would be of considerable use for improving tactical performance. **PURPOSE:** We investigated the validity of a recently developed equation for predicting sprinting times of various tactical loads based upon performance of a running 3-min all-out exercise test (3MT). **METHODS:** 13 recreationally trained participants completed the running 3MT to determine CV and finite running capacity for running velocities exceeding CV (D'). Two subsequent counterbalanced loaded sprints of 800 and 1000 m distances with 20 and 15% of their body mass, respectively, were evaluated. Estimated times (t, sec) for running 800 and 1000 m with a tactical load was derived using t = $(D - D')$/CV, where the CV was adjusted for added load using the following regression equation: original CV + (-0.0638 x %load) + 0.6982, D was 800 or 1000 m, and whole percentage load was ~15 or 20% of the participant's body mass. **RESULTS:** From the 3MT, CV (3.80 $\pm$ 0.5 m/s^{-1}) and D' (200 ± 49.88 m) values were determined. The typical error of predicting actual time for the 800 and 1000 m loaded sprints was 5.6 and 10.1 s, with corresponding ICCs of 0.95 and 0.87, and coefficient of variations of 2.9 and 4.3%. The regression model (188.7 ± 25.4 s) underestimated actual (195.2 ± 22.4 s) sprint times for the 800 m distance with ~20% load carriage (t = 2.96, p = 0.01). Similarly, estimated (229.5 ± 27.1 s) underestimated actual (244.9 ± 24.2 s) sprint times for the 1000 m distance with ~15% load carriage (t = 3.95, p < 0.01). The effect size differences between estimate and actual sprint times were small (0.27) and moderate (0.60) for 800 and 1000 m, respectively. **CONCLUSION**: The adjustment to CV

through the regression equation yields small to moderate overestimates of maximal loaded sprint times for distances of 800 and 1000 m. Whether such errors remain pervasive for prescribing HIIT is unclear and is a research problem worth exploring.

F-64   Free Communication/Poster - Occupational/ Firefighter Physiology

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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Effects of Wrist Cooling on Recovery from Exercise-Induced Heat Stress with Firefighting Personal Protective Equipment

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(No relevant relationships reported)

Enhancing recovery from firefighting is paramount due to the high cardiovascular strain associated with firefighting compounded by the encapsulating personal protective equipment (PPE), which can result in severe fatigue and/or cardiac incidents. Recent work suggests that wrist cooling via DhamaSPORT^{tm} band might enhance recovery from live firefighting, but work in a controlled setting with measures of core temperature is needed. **PURPOSE:** To determine the effects of the DhamaSPORT^{tm} cooling band on recovery from Exercise-Induced Heat Stress associated with wearing PPE. **METHODS:** In 11 male participants (23 ± 5 years old, 176 ± 4 cm tall, 84 ± 12 kg mass, BMI 27 ± 3 kg/m^2) we measured heart rate (HR), core temperature (T_{CO}), thermal sensation (TS), and rating of perceived exertion (RPE) during 30 min of walking exercise (3 mi/hr, 5% grade) in full PPE and SCBA (~20kg), and in a single blind, counterbalanced, crossover design, we assessed the recovery from exercise with a DhamaSPORT^{tm} cooling band placed on their wrist but only activated during one trial (control vs. cool). Pre-exercise, and at recovery, heart rate variability (HRV; log transformed root mean square of successive differences; LnRMSSD) and fatigue (visual analog scale; VAS) were recorded. **RESULTS:** At rest no differences were observed between trials for HR, HRV, VAS, TS, or T_{CO}. During exercise, HR (145 ± 22 vs. 148 ± 19 bpm), T_{CO} (37.8 ± 0.3 vs. 37.8 ± 0.3 °C), TS (6.4 ± 0.8 vs. 6.5 ± 0.4), or RPE (4.9 ± 1 vs. 5.0 ± 1) were not different between trials (all, $p > 0.05$, control vs. cool). Time to 50% recovery (46 ± 41 vs. 43 ± 41 sec) and time to complete recovery (519 ± 275 vs. 624 ± 289 sec) and were not significantly different with the band active (both, $p > 0.05$, control vs. cool). During recovery, there was no significant differences in T_{CO} or HR ($p > 0.05$). At recovery, T_{CO} (37.6 ± 0.3 vs. 37.8 ± 0.3°C, $p = 0.07$), HR (70 ± 10 vs. 75 ± 11 bpm, $p = 0.06$), and fatigue VAS (2.9 ± 2.0 vs. 2.5 ± 2.5, $p = 0.08$) tended to be lower, while HRV (LnRMSSD; 4.1 ± 0.9 vs. 4.2 ± 0.6), and TS (3.7 ± 0.8 vs. 3.8 ± 0.8) were relatively similar with the band active ($p > 0.05$, control vs. cool). **CONCLUSION**: Use of the DhamaSPORT^{tm} cooling band after exercise-induced heat stress might enhance recovery of core temperature, fatigue, and HR, without notable impact on heart rate variability or thermal sensation. Supported by: DhamaUSA.

2970   Board #253   June 1 3:30 PM - 5:00 PM

Longitudinal Changes in Dynamic Balance Ability Among Firefighter Recruits: A Multivariate Analysis Perspective

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(No relevant relationships reported)

Research has demonstrated a link between dynamic balance ability, assessed via the star excursion balance test (SEBT), and musculoskeletal injury (MSKI) risk. Previous research also suggests that changes in health and fitness occur among firefighter recruits as they progress from their training academy to active-duty service. However, similar longitudinal changes in dynamic balance ability have yet to be examined. **PURPOSE:** To observe longitudinal changes in dynamic balance ability among firefighter recruits. **METHODS:** 27 male firefighter recruits enrolled in the same training academy volunteered to participate in the current study (mean $\pm$ SD, age = 29.9 ± 4.1 yrs; height = 179.8 ± 4.6 cm; body mass = 87.2 ± 9.7 kg). SEBT data were collected at the beginning (W1) and end (W14) of their firefighter training academy, as well as at the end of their probationary period (W38). SEBT reach distances were normalized to limb length and averaged between right and left reaches in the anterior (SEBT$_{ANT}$), posterolateral (SEBT$_{PL}$), posteromedial (SEBT$_{PM}$) directions. α = 0.05 determined statistical significance for all analyses. **RESULTS:** An omnibus RM MANOVA revealed a significant and large effect of time on dynamic balance ability ($F_{6,100} = 13.463$, $\Lambda = 0.306$, $\eta^2_p = 0.447$, $P < 0.001$). Results of the *post hoc* RM

ANOVAs demonstrated significant main effects of time on $SEBT_{ANT}$ ($F_{2,52}$ = 29.280, $P < 0.001$), $SEBT_{PL}$ ($F_{2,52}$ = 12.856, $P < 0.001$), and $SEBT_{PM}$ ($F_{2,39.754}$ = 4.460, P = 0.026) reaches. Follow-up pairwise comparisons further revealed that from W1 to W14, $SEBT_{PL}$ and $SEBT_{PM}$ significantly increased, while a significant change was not observed in $SEBT_{ANT}$. From W14 to W38, significant decreases were observed in all three SEBT reach directions. From W1 to W38, a significant decrease was observed in $SEBT_{ANT}$, but no significant changes were observed in the $SEBT_{PL}$ and $SEBT_{PM}$. **CONCLUSIONS:** Results indicate that this firefighter recruit training academy yielded significant improvements in dynamic balance ability, particularly in $SEBT_{PL}$ and $SEBT_{PM}$ reach directions. However, these adaptations were lost before recruits finished their probationary period. Job challenges may influence the capability for new firefighters to maintain the improvements in dynamic balance ability gained during their recruit training academy, increasing their MSKI risk.

2971   Board #254   June 1 3:30 PM - 5:00 PM

Physical Activity Intensity Of Brazilian Militar Firefighters During A 24h On-duty Period

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(No relevant relationships reported)

Firefighters' job activities expose firefighters to multiple physical stressors. In Brasilia Fire Department wildland firefighters are a specialized group that perform primarily wildland fire suppression and other tasks, such as recues. **PURPOSE**: To evaluate the physical activity (PA) intensity of wildland firefighters during a routine 24-hour on-duty period. **METHODS**: We evaluated 26 wildland firefighters, aged 34.6±6 years, with BMI 25.3±2.9 kg/m² and VO_{2max} of 45.9±3.9 mL(kg.min)$^{-1}$. Each participant wore an Polar® heart rate (HR) transmitter with an ActiGraph accelerometer for HR data storage during a 24-hour period. Maximum HR (MHR) was estimated by Tanaka formula. PA intensity was defined in HR zones: very heavy (≥ 94% of MHR); heavy (77% - 93% of MHR); moderate (64% - 76% of MHR) and light (≤ 63% of MHR). Absolute and relative time spent in each zone were compared between those who participated or not on at least one episode of wildland fire suppression (Mann-Whitney test). Volunteers reported main duties on a written log. **RESULTS:** 17 participants (65.3%) accumulated at least 30min/day of moderate to vigorous physical activity (MVPA). 50% of the volunteers responded to wildland fires and classified those activities as light (31%) or moderate intensity (69%). Absolut and relative time in each HR zone were similar between those who responded or not to wildland fires (p>0.05). 21 (81%) reached the HR of heavy intensity and 12 (46%) the very heavy one. Table 1 shows descriptive data.

Table 1: median (min - max) time of HR in different physical activity intensities (n = 26).

	Absolute (min)	Relative (%)
Light	1083.8 (562.5 - 1315.0)	95.5 (86.9 - 99.9)
Moderate	23.9 (3.3 - 140.6)	2.3 (0.3 - 11.1)
Heavy	15.7 (0.0 - 65.8)	1.3 (0.0 - 5.6)
Very heavy	0.0 (0.0 - 35.0)	0.0 (0.0 - 4.5)
Wear time	1180.5 (639.0 - 1323.0)	

Conclusion: Firefighters spent most of their time in light activities, including sedentary and resting periods. However, >80% of the volunteers interspersed the light activities with periods of MVPA. No firefighter reported any heavy demand during the monitored days. New studies including firefighters' activities during huge wildland fires are needed.

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Firefighting Influences Cognitive Performance: The Heart of the Matter

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(No relevant relationships reported)

Firefighters (FFs) work in hazardous, volatile environments with considerable physical and mental demands that might influence cognitive performance. The nature and extent of such influence requires examination. PURPOSE: Determine the influence of a night-burn FF drill on new-recruit FFs' perceptual sensations (thermal, respiratory, effort), physical workload (heart rate; HR), and cognitive performance (modified Flanker task), while identifying individual risk factors. METHODS: New-recruit, male FFs (N=28; 24.96 ± 4.2 yrs) participated in a live-fire night-burn drill (48:54±03:46 mins) as part of a 6-wk training program. This involved emergency response, fire attack, and search and rescue. Aerobic fitness was estimated from 1.5-mi run time. Cognitive behavioral performance on a modified Flanker task and perceptual states (thermal sensation, RPE, respiratory distress, feelings, felt arousal, fatigue, anxiety) of each FF were measured on a separate baseline day, as well as pre- and post-firefighting (Post-0, End). HR was continuously recorded throughout. RESULTS: After accounting for baseline, M HR during drill predicted variance in post-task affect (state anxiety: 24.5%, P= 0.01); TS: 18.1%, P= 0.025; FS: 14.6%, P= 0.046); VAS nervousness: 17.4%, P= 0.028). M HR during drill also predicted cognitive performance Post-0 for Flanker Accuracy on all trials (16.8%, P= 0.033). FS change from Pre to Post-0 also explained Accuracy for all trials (14.4%, P= 0.047). 1.5-mi run time predicted variance in Post-0 Flanker SD for all trials (20.2%, P= 0.016). VAS fatigue change from Pre to Post-0 also explained Flanker SD (16.5%, P= 0.032). CONCLUSIONS: Simple, on-line tracking of HR may be able to help incident commanders recognize FFs who, indicated by greater relative HR during emergency response, may have diminished decision-making capacity on the fireground. Other factors (e.g., trait anxiety, dispositional resilience) may influence physical effort put forth in an emergency scenario and may put certain FFs at higher risk for making errors. Future research should determine trainability of such factors in order to enhance performance and, ultimately, safety for FFs. Manifestation of such changes in cognitive performance, in terms of decision making during a live-fire emergency, needs further investigation.

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Firefighting Exercises, Heat Stress, And The Cardiovascular System In Recovery

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(No relevant relationships reported)

Sudden cardiac death is a common cause of mortality in the firefighting (FF) community. This population has many lifestyle and health risk factors that contribute to cardiovascular disease development; therefore, it is necessary to focus on cardiovascular variables and heat stress in this population. **PURPOSE:** To examine multiple cardiovascular variables in a firefighting cohort during recovery from firefighting exercises to investigate the relationships between recovery time and heat stress as well as body temperatures and indices of arterial stiffness. **METHODS:** A 20-minute exercise bout consisting of aerobic and resistance exercise was performed by 15 healthy career firefighters (age=32.0±7.2 y; ht=1.8±0.1 m; wt=92.7±18.4 kg; VO_{2max} = 40.8±6.5 ml kg^{-1} min^{-1}) while wearing personal protective equipment (PPE). Two conditions were studied: HOT=40°C, 30% humidity; CON=16°C, 78% humidity). Electrocardiography, arterial stiffness, HR, blood pressure, core (T_c), skin (T_{sk}), and temperature gradient (T_{grad}) measurements were obtained pre, during, and 5,10,20,40,60 min post-exercise. Subjects sat for a 60-min recovery while measurements were taken. A repeated measures MANOVA was used to test for differences between the conditions and over time. **RESULTS:** HR was not different at rest between conditions (p=0.577). HOT HR was higher than CON at 5 and 10 min into recovery (p= 0.003, p=0.009). HOT HR was higher than pre (70±14bpm) throughout recovery (80±12bpm;p<0.05). Aortic Augmentation Index (AIx) showed a time effect at 5, 20 min of recovery (p=0.019, p=0.005). Subendocardial Viability Ratio (myocardial perfusion) did not change in either condition over time. The T_{grad} showed a time effect with CON T_{grad} lower than pre throughout exercise and HOT T_{grad} lower than pre throughout exercise and 5 min into recovery (p<0.05). **CONCLUSION:** The increased HR and convergence of T_c and T_{sk} seen in this short bout of exercise and in one stage of recovery with relatively mild heat stress suggest a need for further investigation in this population and PPE. Specifically, it is necessary to relate body temperature and arterial

stiffness as cardiovascular risk factors while performing multiple bouts of exercise with shorter recovery times in higher environmental temperatures while wearing PPE to better simulate live FF.

2974   Board #257   June 1 3:30 PM - 5:00 PM

Effectiveness Of Cold, Wet Towels As A Cooling Modality For Fireground Rehab

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(No relevant relationships reported)

Firefighters experience a rise in body temperature during exertion. The use of active cooling modalities during fireground rehab is necessary to lower elevated core body temperatures in order to avoid heat stress related incidents. The use of cold, wet towels placed around the head and neck are listed as an effective cooling modality in the NFPA standard in spite of limited evidence of effectiveness. **PURPOSE**: We tested the hypothesis that the thermal transfer of cold, wet towels placed around the head and neck would be ineffective at promoting recovery of core body temperature when compared to forearm immersion in 10°C water.
METHODS: Fourteen healthy subjects (6 female) aged 22.1 ± 1.6 y completed two separate experimental trials counterbalanced for cooling modalities of cold, wet towels (CT) and forearm immersion (FI). Subjects wore full firefighter turnout gear while completing two rounds of a firefighting-based exercise circuit in 40°C and 60% relative humidity. Five minutes following exercise completion, subjects were cooled for 30 min with the assigned modality in the hot, humid environment. Heart rate, core body temperature, blood pressure, and perceptual scales were recorded at various time points from baseline through the completion of active cooling.
RESULTS: Heart rate (CT: -6.54 ± 6.86 bpm, FI: -28.36 ± 10.37 bpm, p< 0.01) and core temperature (CT: -0.05 ± 0.17 °C, FI: -0.60 ± 0.50 °C, p<0.01) decreased more during FI. At the end of the cooling period, ratings of perceived recovery (p<0.05), thermal sensation (p<0.01), thermal comfort (p<0.01), and sweating sensation (p<0.01) improved for both cooling modalities but favored forearm immersion.
CONCLUSIONS: Cold, wet towels placed around the head and neck following exertional heat stress did not provide adequate recovery of heart rate or core temperature in a hot humid setting.

2975   Board #258   June 1 3:30 PM - 5:00 PM

The Effect of Personal Protective Equipment on Firefighter Occupational Performance

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(No relevant relationships reported)

PURPOSE: To determine the effect of load carriage (LC) and the self-contained breathing apparatus (SCBA) on occupational performance of structural firefighters. METHODS: Twenty-one professional male structural firefighter recruits (Age: 28.6 ± 4.3 yr; Height:178.6 ± 7.2 cm; Body mass: 94.1 ± 15.4 kg; Body fat: 17.8 ± 8.4%) participated in the study. Occupational physical ability was assessed by time to complete a simulated fire ground test (SFGT). The SFGT was composed of a stair climb, charged hose drag, equipment carry, ladder raise, forcible entry, search, and victim rescue. Subjects performed 2 familiarization trials and 3 trials of a SFGT in different conditions: physical training clothes only (PT), wearing turnout gear and an SCBA (but not breathing through the SCBA (LC)), and wearing turnout gear and breathing through the SCBA (SCBA). RPE was also measured. Heart rate, blood lactate, and perceived exertion were assessed during the SFGT. Repeated measures ANOVAs were used to identify differences among trials. To describe within group changes, relative difference scores were calculated as follows: % difference = (([experimental trial outcome – PT outcome] / PT outcome) x 100). RESULTS: The SCBA trial took 44.5 ± 15.5% longer (345.9 ± 43.7s; p<.001) and the LC trial took 38.3 ± 12.6% longer (331.2 ± 39.3s; p<.001) than the PT trial (241.0 ± 33.3s). The SCBA trial took longer than the LC trial (p = .046). Heart rate and lactate measures were not different between trials. RPE was higher in the SCBA trial (6.7 ± 1.7) and LC (6.3 ± 1.5) compared to the PT trial (4.6 ± 1.8; p<.001). CONCLUSION: Load carriage and the respirator elicit a large decrement in occupational performance. Performance in PT clothes is not an accurate depiction of performance in load carriage. Firefighters and practitioners must identify safe and effective training strategies to prepare firefighters for the occupational demands of load carriage and respirator use.

2976   Board #259   June 1 3:30 PM - 5:00 PM

The Influence Of Wildland Fire Operations On Adipose Tissue, Skeletal Muscle And Lipids

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(No relevant relationships reported)

Wildland fire suppression requires extended work shifts in arduous settings that may include high ambient temperatures, altitude or compromised air quality. The physiological demands of the job have been well characterized with total energy expenditure (EE) often exceeding 5,000 kcal/day. **PURPOSE:** The purpose of this study was to evaluate changes in cross-sectional area of the muscles of the upper thigh (XT), body composition, and blood lipids over a 5-month fire season. **METHODS:** Wildland firefighters (N=27, 25 M, 2 F, 27±1 years, N=15 hotshots, N=12 type II crew) were recruited from the Fairbanks, AK area prior to the 2017 fire season. Total and regional lean tissue mass (LTM) and fat mass (FM) were quantified from dual x-ray absorptiometry (DXA), while XT was calculated from magnetic resonance imaging (MRI). Pre- and post-season ≥3-hour fasted blood samples were collected for measures of total cholesterol (CHOL), high (HDL) and low-density lipoproteins (LDL). Results were analyzed using paired t-tests, presented as means±SEM and considered significant at p<0.05. **RESULTS:** The 27 participants averaged a total of 63±10 days on wildfire assignments. There was an increase in total body mass (78.5±2.5 kg and 79.7±2.4 kg) and body mass index (23.9±0.5 and 24.5±0.5) from pre- to post season, respectively; (N=27). There was also an increase in total FM (12.4±1.9 kg and 13.9±1.0 kg), arm FM (1.4±0.1 kg and 1.5±0.1 kg), leg FM (4.1±0.4 kg and 4.7±0.3 kg), and visceral FM (318±47 g and 419±48 g) from pre- to post-season, respectively; (N=27). Total LTM, arm LTM, and leg LTM (N=27), were unchanged. MRI analysis revealed no changes in XT over the fire season (N=27). Of the 27 participants that completed DXA and MRI scans, 18 completed blood sampling. There was an increase in CHOL (160±8 and 176±8) and LDL (83±6 and 96±9 mg/dL) from pre- to post-season, respectively (N=18). HDL remained unchanged. **CONCLUSION:** Increased FM and blood lipids may reflect the occupational consequences of seasonal wildland fire operations. Despite previously reported high levels of EE in this cohort, these concomitant alterations in adipose tissue and blood lipids may indicate the detrimental influence of dietary and/or environmental factors.

2977   Board #260   June 1 3:30 PM - 5:00 PM

Prediction Of Heat Strain Using Trunk Posture While Wearing Personal Protective Clothing: A Pilot Study

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(No relevant relationships reported)

PURPOSE: Many occupations, such as firefighting and emergency healthcare response, require the use of personal protective equipment (PPE) in hot and humid environments. Increased core body temperature (Tco) and muscular fatigue from hyperthermia may result in alteration to the biomechanics of walking, which can be measured to estimate the level of heat strain. The purpose of this study was to determine if trunk posture is related to hyperthermia while walking on a treadmill with PPE. **METHODS**: Five healthy men walked on a treadmill in three conditions while wearing healthcare worker (HCW) PPE (1: 30 minutes walking at 3.0 mph and 0% grade, 20°C and 50% relative humidity (RH); 2: 30 minutes walking at 3.0 mph and 0% grade, 27.5°C and 60% RH; and 3: 30 minutes walking at 3.0 mph and 0% grade, 32.5°C and 70% RH). Trunk posture [degrees of trunk flexion (+) or extension (-)], Tco, and heart rate (HR) were measured continuously throughout exercise. **RESULTS**: Average end exercise Tco for all conditions was 37.3±0.6°C. Trunk posture (0.52±5.6) displayed a significant positive relationship with age (22±3 years) (r = 0.29) and Tco (r = 0.21) along with the control variable HR (126.1±28.4 beats/min) (r = 0.41). Trunk posture was significantly negative related to BMI (25.1±2.4 kg/m²) (r = -0.28) and height (178.7±7.2 cm) (r=-0.28). Generalized Estimating Equations revealed that Tco was significantly and positively related to trunk posture while controlling for the other covariates (B = 6.47, p <0.001). Age was shown to moderate the relationship between Tco and trunk posture (Tco * age, B = 3.34, p <0.001). **CONCLUSIONS**: A significantly positive relationship was found between Tco and the magnitude of trunk flexion in hyperthermia. This relationship was shown to be moderated by age. Trunk posture measurement may be useful in predicting fall potential and magnitude of heat strain in individuals wearing PPE while exercising or working in hot and humid environments.

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Comparison between Six Hours of Continuous Walking to Six Hours of Intermittent Walking

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(No relevant relationships reported)

INTRODUCTION: Studies have shown that employee productivity and satisfaction decline with number of hours worked [1,2]. However, most of these studies looked at sedentary career fields when many careers require long hours of standing and/or walking.
PURPOSE: The purpose of this study was to determine if repeated breaks from walking has an effect on productivity and satisfaction.
METHODS: 23 healthy adults (11 males, 12 females) mean age of 22.5 ± 3.4 years volunteered to participate in the study. Participants were split into two groups. Continuous walkers, (n=11) who walked around a standard 400 outdoor meter track at a self-selected pace for 6 hours with one 10 minute break at 3 hours. Intermittent walkers (n=12), who walked for 50 minutes followed by a 10 minute break, repeated 6 times. Heart rate (HR), Blood pressure (BP), laps, and feeling scale were analyzed at Pre-walking, Midpoint, and Post walking. Dependent variables were analyzed utilizing a 2 (group) x 3 (time) ANOVA with repeated measures on time. Significance was accepted at the p<0.05 level.
RESULTS: Continuous group walked significantly more laps total and more laps per hour (mean 58.8 ± 5.93 vs. 46.9 ± 4.21 mean total laps, $p < 0.01$). However, there was no difference in number of laps per relative hours walked (9.8 ± 0.98 vs. 9.4 ± 0.84 laps/hr, $p = 0.894$). Although a decline in feeling scale from hour one to hour 6 was observed, it was not similar for both groups (Continuous p=0.039, Intermittent p=0.032). No significant differences were observed between groups in HR, Systolic BP or Diastolic BP.
CONCLUSIONS: Individuals walked the furthest distance when walking continuously. Six hours may not be enough time to see a significant decline in walking performance measures. The test environment may have been more enjoyable than a usual work environment.

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Pilot Project: Energy Expenditure Comparison of Active Dance Video Games Pauses in Work Place

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(No relevant relationships reported)

Health programs incorporating physical activity components in office space work environments are encouraged to reduce sedentary/sitting down time that has recently been shown to be detrimental to employee health. **PURPOSE**: The aim of this pilot project is to compare energy expenditure of three methods to play dance active video games to reduce employee sedentary time and explore the possibilities and limitations to using this video game type as part of an employee based health program. **METHODS**: A total of 8 desk based worker participants (men, 26 ± 5 years) were recruited to perform 3 types of active video game dances using original instructions and a modification to allow individuals with limitations to play. The 3 dances were Party Rock Anthem, Land of 1000 Dances, and No limit (JustDance, Ubisoft, Montreal). The modifications were to play with a motion capture device (Kinect, Microsoft, USA), with a controller device (PSMove, Sony, Jp), and with a controller device in a sitting position (PSMove, Sony, Jp).The energy expenditure was measured by oxygen uptake using a portable metabolic analyser (K4b2, Cosmed, It) and the heart rate by a heart rate monitor (v800, Polar, Fi). **RESULTS**: The group average METS with Kinect vs PS vs sitting position during the Party Rock Anthem was 6.3 ± 0.8, 5.5 ± 1.2, and 3.0 ± 0.8 METS (p<0.001). The group average METS on Kinect vs PS vs sitting position during Land of 1000 Dances was 7.4 ± 1.6, 6.1 ± 1.4, and 3.6 ± 1.4 METS (p<0.001). Finally, the group average METS on Kinect vs PS vs sitting position during No limit was 6.8 ± 1.3, 5.8 ± 1.3, and 3.5 ± 1.1 METS (p<0.001)**. CONCLUSIONS**: Knowing that now these games are available using only a cell phone as a controller and a simple computer with internet, it seems feasible to use these video games to reach the minimum ACSM guidelines in a health program for an office company, even when modified for physically limited employees. However, a significant difference between the different types of play and individual needs must be considered in a workplace health program. Furthermore, additional research needs to be done to measure the impact of implementing physical active work breaks on personnel fitness changes and retention.

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An Analysis of the Physical Demands of National Ambulance Resilience Unit (NARU) Roles

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(No relevant relationships reported)

PURPOSE: The National Ambulance Resilience Unit (NARU) works on behalf of each National Health Service (NHS) Ambulance Trust in England to strengthen national resilience and improve patient outcome in challenging pre-hospital scenarios. NARU personnel are trained to deal with hazardous or difficult situations and mass casualty incidents. The aim of this study was to quantify the physically demanding tasks undertaken by NARU personnel. METHODS: The study was completed in two phases. In Phase 1, 10 subject matter experts from a range of NHS Ambulance Trusts participated in a two-day researcher led workshop to define the most physically demanding tasks performed by NARU personnel. In Phase 2, 34 participants (29 men and 5 women, stature 1.77 ± 0.08 m, body mass 84 ± 14 kg, estimated VO_{2max} 39 ± 7 mL·kg^{-1}·min^{-1}) performed scenarios of the tasks defined in Phase 1, with measurements of heart rate, speed of movement, load carried, and weights and forces of objects moved. Data are expressed as mean ± standard deviation. RESULTS: Eleven criterion tasks were defined in Phase 1: Swift Water Rescue, Re-board Boat, Unload Vehicle and Set-up Decontamination Unit, Clinical Decontamination (CD), Movement in Gas Tight Suits, Marauding Terrorist Firearms Attack (MTFA) , Over Ground Rescue, Unload Incidence Response Unit Vehicle, Above Ground Rescue, Over Rubble Rescue, and Subterranean Rescue. The shortest tasks were the Swift Water Rescue and Re-board Boat at ~1 min, with resultant heart rates of 76 ± 10 and 61 ± 14 %HR$_{max}$, respectively. The longest tasks were the CD and MTFA (~120 min) resulting in heart rates of 65 ± 11 and 73 ± 11 %HR$_{max}$, respectively. The greatest forces exerted were during equipment lifting and carrying (e.g. 167 kg by 6 people) and dragging of casualties (e.g. single person 88 kg casualty and stretcher drag). CONCLUSION: All five components of fitness (aerobic endurance, anaerobic endurance, muscular strength, muscular endurance and mobility) are required to successfully perform the criterion tasks undertaken by NARU personnel. These data can be used to inform interventions to enhance physical performance and develop physical employment standards for specialist ambulance responders. ACKNOWLEDGEMENT - This work was conducted in collaboration with the National Ambulance Resilience Unit in the United Kingdom.

F-65　Free Communication/Poster - **Medical Issues**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2981　Board #264　June 1 2:00 PM - 3:30 PM

Vitamin D Status in Elite South African (SA) Rugby Union Players: A Pilot Study

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(No relevant relationships reported)

Evidence suggests that poor vitamin D status (VIT-D) has negative implications for the health, well-being and performance of athletes. To date, little is known about athletes from the Southern Hemisphere. **PURPOSE:** i) To assess vitamin D levels in elite SA Rugby Union players (RU); and ii) to ascertain whether a relationship exists between vitamin D status and seasonal climatic variation, dietary intake or skin type. **METHODS:** In this longitudinal observational study, a cohort of elite RU players were screened to determine factors related to their VIT-D status including: i) serum 25-hydroxyvitamin D [25(OH) D], ii) comprehensive dietary analysis and iii) a Fitzpatrick skin type classification questionnaire (evaluating genetic predisposition, reaction to sun exposure and tanning habits). Initially, forty-one players completed the summer assessment, whereas only 17 were available for follow-up 6 months later during the winter. **RESULTS:** The mean s-[25(OH)D] was 62.0 ± 22.4 ng/mL^{-1} (95% CI: 50.5, 73.5) for the summer period, while at time point 2 the mean s-[25(OH)D] was 38.4 ± 11.2 ng/mL^{-1} (95% CI: 32.6, 44.2). Analysis of paired data revealed that 88% (2/17) of players displayed adequate s-[25(OH)D] during summer with the remaining 12% (2/17) of cases showing signs of insufficiency. During winter, 82% (14/17) had adequate s-[25(OH)D] while 6% (1/17) and 12% (2/17) of players displayed concentrations indicative of insufficiency and deficiency. No association was found between reported dietary intake and s-[25(OH)D]. A negative correlation (p=0.05) was found for summer s-[25(OH)D] and the Fitzpatrick skin type score. **CONCLUSIONS:**

Both VIT-D insufficiency and deficiency were low in SA RU athletes. Seasonal differences in VIT-D and skin score were demonstrated, likely due to changes in the length of sunlight exposure that effects endogenous VIT-D production.

2982   Board #265   June 1 3:30 PM - 5:00 PM

Effects of Training Camp on Hematological Variables in Athletes with Sickle Cell Trait

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(No relevant relationships reported)

PURPOSE: To explore the hematological differences in African-American athletes with sickle cell trait (SCT) and healthy controls (CON) before preseason camp and the changes that occur after preseason training. METHODS: Sixteen (n=8 SCT; n=8 position matched, CON) NCAA Division 1 athletes (12 football, 2 each women's soccer and volleyball) had blood drawn before and after preseason camp and analyzed for Hb electrophoresis (Hb-A, Hb-A2, Hb-S, and Hb-F), complete blood count with differential, chemistry panel 26, and prothrombin time, activity and international normalized ratio (INR). RESULTS: Baseline total Hb was similar between SCT and CON (mean±SD; 14.2±1.3 vs. 14.1±0.9g/dL, resp; P=0.87), but as expected, Hb-A was lower and Hb-A2 and Hb-S were higher in SCT than CON (P<0.001 for all). Baseline neutrophils were higher (4.43±1.29 vs. 3.28±0.93cellsx10^3/mL, P<0.005) and lymphocytes tended to be lower (1.56±0.45 vs. 1.99±0.39cellsx10^3/mL; P=0.09) amongst SCT compared to CON, respectively. Baseline amylase (99.4±25.4 vs. 72.9±18.8u/L; P=0.03), uric acid (6.8±1.7 vs. 5.5±0.8mg/dL; P=0.08), and creatinine (1.2±0.2 vs. 1.0±0.2mg/dL; P=0.07) were higher in SCT compared to CON. All Hb measures in SCT were similar after camp compared to baseline (P>0.33 for all). Baseline and position adjusted change in neutrophils were similar between SCT and CON (mean, 95%CI; -0.09, -2.06 to 1.89 vs. 0.36, -1.61 to 2.34cellsx10^3/mL, resp; P=0.77). Similarly, the adjusted change in lymphocytes was not different between SCT and CON (0.53, 0.01 to 1.05 vs. 0.15, -0.37 to 0.67, resp; P=0.40), however, total lymphocyte counts increased in SCT over time (P<0.05). Creatinine responses differed between SCT and CON (-0.05, -0.12 to 0.02 vs. 0.05, -0.03 to 0.12; P=0.05) and potassium decreased a greater extent in SCT (-0.44, -0.6 to -0.3 vs. -0.2, -0.3 to -0.1; P=0.05) after camp. CONCLUSION: Despite major hematological differences due to SCT, very few changes occur during the exhaustive, preseason camp at sea level. *Funded in part by the Robert and Patricia Hines Endowed Professorship in Kinesiology, LSU, and unrestricted funding provided in part by a gift to the Tiger Athletic Foundation.*

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Body Composition Changes in Male Collegiate Lacrosse Players from Preseason to Post Season

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(No relevant relationships reported)

Body composition changes differ in all sports due to specific training. In the off season most teams participate in strength training programs, however during the competitive season, training is often replaced with team sport training. Lacrosse players in previous studies showed better performance with decreased body fat percentage and increased lean body mass. However, its common during the competitive season to show an increased expenditure with more frequent practices and no adaptation to diet, which can lead to a decrease in lean body mass (LBM) along with rapid body fat percent loss in the competitive season. These changes can increase chances of injury, decrease performance, and slow recovery.
Purpose: To examine body composition changes in male collegiate lacrosse players from preseason to post season
Methods: We examined 18 male NCAA Division II collegiate lacrosse players (age 19.6±1.72) pre -competitive season, and post -season (January and May). Subjects completed a body composition assessment using dual-energy X-ray absorptiometry.
Results: Using descriptive statistics and a 2 way t-test, there was a decrease in overall total mass of 8.7 lbs. (179.9±33.2 vs 171.2±28.2, *p*=0.42). Body fat % decreased by 2.5% (21.1±7.6 vs. 18.6±6.7, *p*=0.58). Lean body mass increased by 1.5 lbs. (133.9±16.44 vs. 135.3±15.3).

Conclusion: Although these results were not significant, there was a decrease in % body fat and a minimal increase in lean body mass from pre to post season in Division II male lacrosse players. These changes do not demonstrate negative energy balance throughout the competitive season as previous research suggests.

2984   Board #267   June 1 3:30 PM - 5:00 PM

Stress Urinary Incontinence in Female Powerlifting: A Survey

John Petrizzo, Rori Alter-Petrizzo, John Wygand, FACSM, Robert M. Otto, FACSM. *Adelphi University, Garden City, NY.* (Sponsor: John Wygand, FACSM)

(No relevant relationships reported)

Stress urinary incontinence (SUI), usually defined as involuntary leakage from the urethra, synchronous with exertion/effort, or on sneezing or coughing with an incidence rate of 4-35% in the general population has an unknown incidence with female powerlifters. **PURPOSE:** The purpose of this anonymous online survey was to identify trends related to SUI in female powerlifters who do not otherwise have risk factors for or symptoms of SUI in their daily lives. **METHODS:** Female powerlifters between the ages of 18-35 who have successfully been competing for at least two years on a National level or higher, are nulligravida, and have no history of SUI symptoms with ADLs, as well as no history of kidney disease, bladder disease, diabetes mellitus, pelvic floor, bladder, or rectal prolapse were eligible to participate. Solicitation scripts were posted on both USA Powerlifting and the United States Powerlifting Association's Facebook pages. 51 competitive female powerlifters completed the survey (ht. 162.6 ± 7.0 cm, body mass 71.4 ± 13.7 kg, waist 77.2 ± 8.3 cm, and hip 100.3 ± 10.0 cm). **RESULTS:** 74.5% (38) of participants indicated that they have experienced SUI while training the power lifts. Only 7.8% (4) who reported suffering from SUI while lifting indicated that they spoke to their doctors about the condition. 35.3% (18) indicated that they had not tried anything to help them manage their symptoms. 68.6% (35) indicated that they experience SUI while performing the deadlift while 49% (25) reported experiencing SUI while performing the squat. No participants reported experiencing SUI while performing the bench press. Additionally, 31.4% (16) reported experiencing symptoms while performing sets of 2-3 reps while 21.6% (11) subjects reported experiencing symptoms only while performing singles. 56.9% (29) reported that their symptoms were worse while wearing a weightlifting belt. Finally, 35.3% (18) reported that their symptoms of SUI while lifting causes them distress or anxiety. **CONCLUSION:** SUI is a significant issue for female powerlifters that may cause distress and anxiety when training and competing. SUI is more prevalent during heavy lower body lifting and may be made worse when wearing a weightlifting belt. This information can be useful to coaches and lifters when trying to manage the symptoms of SUI.

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Differential Sweat And Urine Electrolyte Reponses In Collegiate Football Players With Sickle Cell Trait

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(No relevant relationships reported)

Purpose: To determine the effects of sickle cell trait (SCT) on hydration status and body temperature regulation in collegiate football players during 17 days of pre-season training.
Methods: Twelve players were recruited to two groups: 6 with the SCT and 6 position-matched control players (CON). Body weight was measured and urine collected pre- and post-practice to examine urine color, specific gravity (USG), and electrolytes (Na^+, K^+, and Cl^-). Sweat was collected using gauze covered by a waterproof patch on the lower back. Each player ingested a core temperature pill 4-6 hours prior to practice. Ambient and black globe temperatures and humidity were collected pre-and post-training to assess wet-blub globe temperature (WBGT).
Results: Mean WBGT was 28.6±3.1°C (24.1-33.5°F). Average weight loss was -1.1±1.0kg (mean±SE). Weight loss, maximal core temp and heat storage (change in core temperature per hour) were similar in CON and SCT (P>0.05). However, SCT had significantly higher sweat sodium and chloride levels (Na^+: 60.79±7.18 mmol/L; Cl^-: 51.57±6.49 mmol/L) compared to CON (Na^+: 47.54±7.17mmol/L; Cl^-: 40.53±6.48 mmol/L; P<0.001 for both). CON had higher post-training USG (1.028±0.007) than SCT (1.018±0.007; P<0.001). Urine electrolytes were significantly higher for CON than SCT in all pre and post measurements (Pre Na^+:164.06±8.74 mmol/L vs. 100.31±9.10 mmol/L; Pre-K^+: 52.84±4.43 mmol/L vs. 36.50±4.59 mmol/L; Pre-Cl^-: 151.36±8.50 mmol/L vs. 87.61±8.80 mmol/L and Post-Na^+:118.47±8.79 mmol/L vs. 70.26±9.07 mmol/L; Post-K^+: 62.74±4.61 mmol/L vs. 35.48±4.73 mmol/L, Post-

Abstracts were prepared by the authors and printed as submitted.

Cl⁻: 99.06±5.14 mmol/L vs. 51.78±5.59 mmol/L, respectively; P<0.001 for all).
Conclusions: Sweat electrolyte levels were higher in the SCT group whereas urine electrolytes and USG were higher in CON for all measures. Future research should investigate whether the dissimilarities in sweat and urine electrolytes in SCT are meaningful and result in altered sodium or fluid balance concerns.
Funded in part by the Robert and Patricia Hines Endowed Professorship in Kinesiology, LSU, and unrestricted funding provided in part by a gift to the Tiger Athletic Foundation.

2986   Board #269   June 1 3:30 PM - 5:00 PM

Cardiometabolic Changes During The Hormonal Transition Of A Male-to-female Athlete: A Case Study

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(No relevant relationships reported)

PURPOSE: To assess the cardiovascular changes during estrogen treatment for gender reassignment in an aerobically trained, male-to-female transgender athlete.
METHODS:Subject is a biologically male distance runner (age 27) that initiated gender reassignment. Social male-to-female transition was completed prior to testing. The following assessments were performed: anthropometry, DXA (dual energy x-ray absorptiometry) scan (1st, 3rd, and 4th visit only), resting echocardiogram, treadmill-based VO2peak, resting carotid-femoral pulse wave velocity (cf-PWV), resting peripheral/central blood pressures and augmentation index (normalized at heart rate of 75 bpm; AIX@75). Baseline assessments were made during two separate visits completed prior to estrogen treatment (visits were averaged). Subsequent assessments were made at 2 and 6 weeks following the initiation of the estrogen treatment (10 mg estradiol valerate s.c. once per week).
RESULTS:

	Baseline	2 weeks	6 weeks
BMI	18.5	19.8	19.6
Total body fat	18.80%	21.80%	22.50%
Visceral body fat	143 g	274 g	230 g
Absolute VO$_2$	3.3	3.3	2.9
Relative VO$_2$	58.7	55.8	50.3
SBP	118	111	109
DBP	73	71	65
cSBP	106	99	96
cDBP	74	71	65
cf-PWV	6.7	6.2	6.2
AiX@75	4.75	-13	-6

RHR: Resting heart rate; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; cSBP: Central systolic blood pressure; cDBP: central diastolic blood pressure; cf-PWV: carotid femoral pulse wave velocity; Aix@75: Augmentation index normalized at a heart rate of 75

	Baseline	2 Weeks	6 weeks
EF (%)	58.74	60.66	62.29
SV (ml)	87.36	90.34	89.96
LVESV (ml)	61.14	58.58	54.45
LVEDV (ml)	148.73	148.92	147.92
LVSD (cm)	3.36	3.37	3.35
LVDD (cm)	5.3	5.31	5.33

EF: Ejection fraction; SV: Stroke volume; LVESV: Left Ventricular End Systolic Volume; LVEDV: Left Ventricular End Diastolic Volume; LVSD: Left Ventricular systolic diameter;LVDD: Left Ventricular diastolic diameter.**CONCLUSIONS**: : Body composition and cardiorespiratory physiology are altered during the immediate weeks of male-to-female estrogen therapy

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Low Energy Availability Associated With Lower BMD And Bone Stress Injury Site In Female Athletes

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(No relevant relationships reported)

Low energy availability (LEA) is a risk factor for impaired bone health and bone stress injury (BSI). Additionally, those with BSI at trabecular-rich bone sites are at higher risk for low BMD vs. those with BSI at only cortical-rich sites.
PURPOSE: To evaluate the association of LEA with BMD and site of BSI in female athletes.
METHODS: 1000 female athletes (ages 15-30 years) presenting to a sports medicine clinic completed a 400+ question survey covering topics related to relative energy deficiency in sport (RED-S), including female athlete triad risk factors and athletic activity. Comprehensive chart review was completed to identify athletes with history of BSI and available dual energy x-ray absorptiometry (DXA). LEA was defined as meeting ≥ 1 criterion: self-reported history of eating disorder/disordered eating (ED/DE), high score on the Brief Eating Disorder in Athletes Questionnaire (BEDA-Q), and/or high score on the Eating Disorder Screen for Primary Care (ESP). Athletes with BSI of the pelvis, femoral neck, sacrum, and/or calcaneus were categorized into the trabecular-rich BSI group; all others were categorized into the cortical-rich BSI group. Associations between EA status, BSI location, and DXA were assessed by chi-squared or t-test analysis (p<0.05).
RESULTS: Of the 1000 patients surveyed, 126 had a history of both BSI and available DXA. Of these patients, 53.2% had LEA. Patients with LEA had lower BMD Z-scores than those with normal EA at the lumbar spine (-0.92±1.06 vs. -0.49±0.98, p=0.022), total hip (-0.27±0.75 vs. 0.29±0.77, p=0.009), and femoral neck (-0.34±0.87 vs. 0.23±0.97, p=0.028). Patients with ≥ 1 trabecular BSI accounted for 21.4% of the sample. In the trabecular-rich BSI group, 70.4% had LEA, while 48.5% of those in the cortical-rich group had LEA (p=0.043). Additionally, those with trabecular-rich BSI had lower BMD than the cortical-rich BSI group at the lumbar spine (-1.19±1.10 vs. -0.58±0.99, p=0.015), but not at other sites assessed by DXA.
CONCLUSIONS: Our findings support the well-established relationship between LEA and impaired BMD. We also found that trabecular-rich BSI is associated with low EA and independently associated with low BMD. Therefore, trabecular BSI may serve as a clinical indicator for further bone health evaluation and assessment for LEA, including ED/DE.

2988   Board #271   June 1 3:30 PM - 5:00 PM

Reflected Ultraviolet Radiation Exposure in Athletes

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(No relevant relationships reported)

Abstract
Background: Ultraviolet (UV) radiation harms skin causing deadly skin cancer, however many athletes fail to use sun safe practices. No studies have examined the potential threat of a "second sun" created by UV radiation reflected off different outdoor playing surfaces.
Aim: This study hypothesized that athletic surfaces would reflect UV radiation and that this UV radiation would be greatest at lower heights and from smooth light-colored surfaces.
Methods: To evaluate this hypothesis, UVA and UVB radiation and reflected UV radiation were measured with UV dosimeters on different outdoor playing surfaces at various heights.
Results: All surfaces reflected UVA radiation (0.4 - 8% of direct UVA exposure), while only the smooth and light-colored playing surfaces (clay court, light asphalt, and concrete) reflected any UVB radiation (5 - 8%) and only at the lowest measured height. The amount of reflected UVA radiation did not change across heights comparable to typical human stature, but varied between surfaces. Light-colored and/or smooth playing surfaces including concrete, infield dirt, and clay and green courts reflected the most UVA radiation. The lightest-colored and smoothest surface, the spectator stands, reflected by far the most UV radiation, with 22 times the rate of UVA reflection of the least reflective surface, brown turf.
Conclusion: Reflected UV radiation threatens outdoor athletes and spectators. Tennis players, infield baseball and softball players, those who play on concrete surfaces, and coaches and others in the stands are at greatest risk and should be particularly vigilant with sun safety.

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Differences In Return To Play Guidelines Using Red-s Cat And Triad Risk Assessment Guidelines For Female Athletes

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(No relevant relationships reported)

The International Olympic Committee (IOC) proposed the term Relative Energy Deficiency in Sport (RED-S) to describe the health and performance consequences beyond the well-established Female Athlete Triad (Triad). Both the IOC and the Triad Coalition have developed return-to-play (RTP) criteria to guide clinical decision making on clearance for participation in sports based on health assessment. **PURPOSE**: To determine the agreement between the RED-S Clinical Assessment Tool (RED-S CAT) and Triad risk assessment criteria (Triad-RA) for sports participation clearance levels for female athletes. **METHODS**: 1000 female athletes (ages 15-30 years) presenting to a sports medicine clinic completed a comprehensive, 400+ question survey covering topics related to RED-S, including Triad risk factors, and sports participation. Clearance level/risk assessment for each athlete was assigned according to each syndrome's model as low (green light), moderate (yellow light), or high risk (red light). Clearance level by each model was compared within each athlete. **RESULTS**: Using the RED-S CAT, 26.6% of athletes were green light (full clearance), 29.7% were yellow light (provisional/limited clearance), and 43.7% were red light (fully restricted). Using the Triad-RA, 30.2% of athletes were low risk, 61.9% were moderate risk, and 7.9% were high risk. Overall the models agreed that 86% of the athletes were at elevated risk (moderate or high). The most discordance occurred for athletes deemed to be at high risk by RED-S CAT, but moderate risk by Triad-RA; these athletes accounted for 37.3% of all subjects. The Triad-RA cleared 8.8% of the sample for full participation that the RED-S CAT categorized as elevated risk; the RED-S CAT cleared 5.2% of the sample for full participation that the Triad-RA categorized as elevated risk. **CONCLUSIONS**: Most female athletes surveyed met elevated risk categories using both RED-S CAT and Triad-RA. The RTP criteria for both syndromes should be further refined for use in primary care settings as part of pre-participation examinations to appropriately categorize athletes needing further medical care and potential restriction from sport.

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Game Day Glucose Values For A High School Soccer Player With Type 1 Diabetes: A Case Study

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(No relevant relationships reported)

Sport and exercise can improve cardiovascular health for someone with type 1 diabetes mellitus (T1DM), but it must be performed safely. Blood glucose control in adolescent athletes can be challenging, especially on the day of competition. Because of the hormonal response to stress of a game, blood glucose will be altered even if exerting a similar amount of energy. PURPOSE: The purpose of this case study was to examine average daily glucose for a period of 72- hours starting on and following a non-gameday (NGD) compared with a game day (GD) for a high school soccer player with type 1 diabetes. METHODS: Data from a 15 year old male athlete with T1DM was used for this case study. The athlete wore an accelerometer on his upper left arm during the same time period in which his continuous glucose monitor (CGM) and insulin pump was being observed. Average daily blood glucose from the athlete's CGM was obtained over a 72-hour period on NGD and GD following consent. RESULTS: Paired samples t-tests showed no difference in daily energy expenditure at either time points. Average insulin on GD was slightly higher compared to NGD (36.2 ± 1.48 vs. 28.26 ± 9.85) but did not reach significance. Average daily glucose over the NGD was significantly lower (p < 0.01) compared to GD (128.27 ± 32.72 mg/dL vs. 167.74 ± 58.32 mg/dL). This was confirmed by comparing 3 additional GD with 3 NGD (167 ± 9.62 mg/dL vs. 130 ± 5.71 mg/dL). On the day of competition, the CGM recorded a high of 308mg/dL and a low of 49mg/dL within 24 hours following the game, compared to a high of 227mg/dL and a low of 72mg/dL for the NGD. CONCLUSION: CGM averages displayed competition and post recovery glucose values that were significantly higher compared to those of NGD. The results suggest that hormonal stimuli from competition and the recovery associated with participation in competitive sports can influence glucose fluctuations in athletes with T1DM. This was confirmed by additional analysis that included values from 3 other GD CGM readings.

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Impact Of Seasonal Change In Body Composition On Hemoglobin Levels Among Long Distance Runners.

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(No relevant relationships reported)

PURPOSE: Long distance runners pursue leanness to improve performance. Losing fat mass is achieved by chronic negative energy balance, and it would increase the risk of developing anemia. The purpose of this study was to assess the association between change in %fat and decreases in hemoglobin (Hb) and ferritin levels among long distance runners. **METHODS**: A cohort of 40 Japanese competitive male runners of the same university team was analyzed retrospectively. Blood test and body composition analysis (DXA) were performed twice a year: pre-season in March and peak-season in August. The least significant change in %fat was calculated (LSC: 0.11) and the subjects were dichotomized into 2 groups: change in %fat from pre- to peak-seasons within +/- LSC (constant: CNT, n=14), and change in %fat exceeded LSC (decrease: DCR, n=26). No runners increased %fat. Body compositions were compared by paired t-test between pre- and peak-seasons for each group. Changes of Hb and ferritin were analyzed by 2-way repeated measures ANOVA between CNT and DCR. P<0.05 was considered statistically significant. Written informed consent was obtained from each runner. **RESULTS**: Only fat mass (FM) and %fat were significantly different between CNT and DCR in pre-season (3.4 vs. 4.4 kg and 6.3 vs. 8.1 %, respectively); other variables (age, lean soft tissue mass [LM], Hb, and ferritin) were not (20.3 vs. 19.9 y/o, 51.2 vs. 50.1 kg, 14.9 vs. 15.3 g/dl, and 43.3 vs. 60.7 ng/ml, respectively). Total running mileage (March - July) was not significantly different between CNT and DCR (3193 vs. 3171 km). FM, LM and %fat significantly decreased from pre- to peak-seasons in DCR (3.4 kg, 50.6 kg, and 5.9 %, respectively in peak-season); but not in CNT (3.6 kg, 51.4 kg, and 6.2 %, respectively). Two-way repeated measures ANOVA showed that there was a significant main effect of the seasonal phase of training on Hb (CNT: 14.9 to 14.3 g/dl, DCR: 15.3 to 14.4 g/dl) and ferritin (CNT: 43.3 to 32.9 ng/ml, DCR: 60.7 to 48.5 ng/ml). No significant interaction effect was observed between the seasonal phase of training and the change in %fat. **CONCLUSIONS**: Hb and ferritin significantly decreased from pre- to peak-seasons with or without decrease in %fat among lean runners. It is recommended to conduct blood test periodically for recognition of developing anemia which would impair performance.

2992   Board #275   June 1 3:30 PM - 5:00 PM

Hormonal Responses after Exercise-induced Muscle Damage in Healthy Humans

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(No relevant relationships reported)

Mechanically overloaded muscle and its subsequent damage are strong stimuli for eliciting acute hormonal changes, and muscle adaptation following exercise-induced muscle damage may involve complex hormonal responses before the completion of muscle regeneration. **PURPOSE**: This study investigated systemic responses of thyroid-stimulating hormone (TSH), free thyroxine (fT4) and prolactin (PRL) for several days after eccentric exercise-induced muscle damage in humans. **METHODS**: Nine healthy men (age 25.7 ± 1.7 years, height 180.4 ± 1.7 cm, body mass 77.2 ± 2.7 kg, body mass index 23.7 ± 0.6) performed 50 maximal eccentric muscle actions using the knee extensor muscles of both legs on an isokinetic dynamometer. Blood samples were withdrawn before and at 6, 48 and 120 hrs post-exercise, and serum levels of TSH, fT4) and PRL were measured by ELISA using commercially available kits. Myoglobin (Mb) concentration and lactate dehydrogenase (LDH) activity were also evaluated as indirect markers of muscle damage. One-way ANOVA was used for statistics. **RESULTS**: Significant alterations in Mb and LDH were observed over time after eccentric exercise (p<0.05-0.001). Serum fT4 levels exhibited a gradual increase reaching statistical significance at 48 and 120 hrs following the muscle damaging exercise (1.20±0.05 ng/dl, 1.29±0.04 ng/dl, and 1.26±0.05 ng/dl, at 6, 48 and 120 hours after exercise, respectively, compared to 1.13±0.02 ng/dl at baseline; mean±SE, p<0.05). Both PRL and TSH showed also a gradual increase up to 33% at 48 hrs and 120 hrs post exercise, respectively, however they failed to reach statistical significance due to a large variability shown between the subjects' responses (PRL: 23.4±3.1 ng/ml, 28.1±4.7 ng/ml, 30.2±4.1 ng/ml and 25.7±4.6 ng/ml; TSH: 1.09±0.14 μIU/ml, 1.27±0.15 μIU/ml, 1.17±0.20 μIU/ml, and 1.33±0.17 μIU/ml, at baseline, 6, 48 and 120 hours post-exercise, respectively, mean±SE, p>0.05). **CONCLUSION**: The late elevated levels of TSH and PRL, and particularly of fT4, during the recovery period after muscle damage may suggest functional interactions between those

hormones and muscle regeneration. Further studies are needed to characterize the mechanisms by which those hormonal responses are triggered and regulated at the systemic level during recovery after exercise-induced muscle damage.

F-66 Free Communication/Poster - **Clinical Exercise Physiology of Cancer and Exercise**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2993   Board #276   June 1 3:30 PM - 5:00 PM

Physical Functioning in Older Breast Cancer Survivors: A 12-Month Randomized-Controlled Trial with 6-month Follow Up.

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(No relevant relationships reported)

The largest age group of breast cancer survivors (BCS) in the U.S. is comprised of women ages 65+, who are susceptible to age-related decrements in physical function accelerated by cancer treatment toxicities. Though exercise is known to reverse age-related functional limitations, older BCS may be heterogeneous in baseline functioning which may affect the efficacy of exercise to reverse functional declines. **PURPOSE:** Determine the efficacy of each aerobic and resistance training to improve physical function in older BCS, considering baseline physical functioning. **METHODS:** Older, early-stage, BCS (mean age=72), who underwent chemo- or radio-therapy in the previous 2 years were randomized to 12 months of supervised, group aerobic (AER) or resistance (RES) training or control (CON) flexibility exercise, followed by 6 months of home-based training. Physical function was assessed by the Physical Performance Battery (PPB), 5x chair stand time (sec), maximum bench and leg press (kg), and 4-meter usual walk speed (m/sec) tests and self-reported lower-body function with the Late-Life Function and Disability Instrument (LLFDI). A linear mixed effects model was used to assess function after 12 and 18 months on the full sample and only in BCS with PPB scores ≥9. **RESULTS:** 114 BCS were enrolled and randomized to AER (n=37), RES (n=39), or CON (n=38). Within the full sample there was a significant improvement in bench press strength at 12 months (p=0.03) and PPB at 18 months in RES vs CON. After removing participants with low baseline physical functioning (n=79), the following additional significant differences were found between: 1) RES (αmean=2.72±1.7) and CON (αmean=-3.06±2.0) for self-report physical function at both 12 (p=0.04) and 18 months (p=0.005), 2) AER (αmean=0.4±0.0) and CON (αmean=-0.03±0.0) at 12-months for average walk speed and, 3) AER (αmean=0.32±0.3) and RES (αmean=0.50±0.2) at 18 months, for chair time (p=0.05). **CONCLUSIONS:** Although AE and RT are efficacious in improving physical function in older BCS across a range of baseline physical functioning, broader improvements may only be possible among women with better functioning and thus capable of achieving a greater dose of exercise. Older BCS may need to be stratified into groups based on their initial functioning, then matched to appropriate training.

2994   Board #277   June 1 3:30 PM - 5:00 PM

The Relationship Between Six Minute Walk Distance And Dyspnea Symptoms Among Preoperative Lung Cancer Patients

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(No relevant relationships reported)

Background and Objective: The purpose of this study was to examine the relationship between preoperative 6MWD and symptoms, quality of life in patients who underwent lung resection for primary lung cancer.
Material and Methods: Patients of cohort included were those scheduled to undergo lung cancer surgery, at participating hospitals in the Seoul of South Korea. In total, 364 persons(mean age, 61.51yr) attended from March 2016 to September 2017. Exclusion criteria of a cohorts of lung cancer study included ECOG PS >1 and neoadjuvant therapy, Multiple cancer, recurrent lung cancer. Patients planned for lung cancer surgery filled out a questionnaire and perform before surgery. Cardiorespiratory fitness (CRF) was assessed six minute walk distance using the 6-minute walk test (6MWT). The symptoms was assessed using the mMRC and CAT questionnaires. The quality of life was assessed using the EORTC Quality of Life, Core30 and lung cancer 30 questionnaires. Data from were summarized according to the 6MWT recorded (lower and higher) estimated using 6MWD (cut-point 450m).

Results: Lung cancer patients with low 6MWD (<450m) were more likely to have dyspnea than those with high 6MWD(>450m).
mMRC and CAT score were -0.256 (95% CI -0.387, -0.125), -2.427(95% CI -3.751, -1.104).
Quality of life were general health score 10.456 (95% CI -5.030, 15.882), fatigue score -8.891 (95% CI -14.618, -3.165).
Conclusions: Preoperative 6MWD was significantly associated with preoperative symptoms and QoL in patients who underwent lung resection for malignancies
Key words: Lung cancer, Cardiorespiratory fitness, symptoms

Different of dyspnea and QoL by 6MWD before surgery			
	mMRC score	CAT score	General Health_QoL
6MWD <450m	0.53 (0.52-0.54)	8.10 (7.88-8.30)	58.53 (58.02-59.04)
6MWD >450m	0.24 (0.24-0.25)	5.43 (5.32-5.55)	67.41 (67.14-67.70)

2995   Board #278   June 1 3:30 PM - 5:00 PM

Cognition Improves In Cancer Survivors After A Multi-dimensional Cancer Rehabilitation Program

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(No relevant relationships reported)

Cancer Related Cognitive Impairment (CRCI), or "chemo-brain," has become a recognized problem for cancer survivors;, however, limited evidence exists about concerning interventions that may improve cognition for cancer this population. survivors. Symptoms include: short-term memory loss, decreased concentration, mental "fogginess" and fatigue. These symptoms may contribute to a decrease in quality of life. **PURPOSE:** To measure the effectiveness of a multi-dimensional cancer survivor rehabilitation program on cognition as well as physical and psycho-social functioning. **METHODS:** Sixty-two post-treatment cancer survivors, (7 men, 55 women, 35-77 years) were subjects in a one group, pre-post, quasi-experimental design. Subjects were cleared for exercise prior to participation. The program consisted of two, 90 minute sessions pera week for 12 weeks. Each meeting was divided into 3 sections: an educational activity, cardiovascular endurance training, and a strength and flexibility session. A subset of this group (n= 22) participated in brain exercise games once pera week for 15 minutes. Dependent measures included: the Montreal Cognitive Assessment (MoCA), the General Practitioner assessment of Cognition (GPCOG), aerobic capacity, body fat %, lower body flexibility, handgrip strength, quality of life, Schwartz fatigue scale, and the LASA scale (fatigue, anxiety, confusion, depression, energy and anger). **RESULTS:** The following measures showed statistically significant (p < .05) improvements:. GPCOG increased 6.6%**,** aerobic capacity increased 20.7%, body fat decreased by 1.9%, lower body flexibility improved 14.3%, handgrip strength increased 11.6%. Quality of life increased 10.4%. Fatigue measured by the Schwartz scale decreased 18.5%, LASA scale results: fatigue decreased 36.7%, depression decreased 49.2%, confusion decreased 42.7%, energy increased 23.8%, anger decreased 40.8%, anxiety decreased 30.7%. MoCA increased 4.3% and approached significance (p= .056). **CONCLUSION:** The combination of tools acquired in the cancer rehabilitation program proved effective in improving cognition and reducing symptoms often seen in post-treatment cancer survivors. The mechanism for cognitive improvement cannot be ascertained from the design of this study but may hold promise for future studies.

2996   Board #279   June 1 3:30 PM - 5:00 PM

Skeletal Muscle Blood Flow, Oxygen Extraction and Consumption in Women Receiving Chemotherapy for Breast Cancer

Amy A. Kirkham, David Ian Paterson, Edith Pituskin, Justin Grenier, Esther Yang, Richard B. Thompson. *University of Alberta, Edmonton, AB, Canada.*
(No relevant relationships reported)

PURPOSE: Cardiac muscle injury is a well-recognized side effect of anthracycline chemotherapy and trastuzumab therapy for breast cancer. Preclinical studies have identified parallels in cell damage response and dysfunction between cardiac and skeletal muscle. However, assessment of the effect of treatment on skeletal muscle in patients has been limited to muscle strength.
METHODS: Early stage breast cancer patients receiving chemotherapy including anthracyclines or trastuzumab enrolled into a RCT of a multi-disciplinary team intervention versus usual care. Patients underwent a MRI scan before the first and after the third chemotherapy treatment. A maximal incremental single leg plantar flexion test was performed followed by 15 min of rest. A 4-min steady state test was

then performed at 60% of peak power. Beginning at end-exercise, time-resolved blood flow (popliteal vein, phase contrast MRI) and venous oxygen saturation (S_vO_2, susceptometry-based oximetry using deoxyhemoglobin as an intrinsic contrast agent) were measured with custom methods. These values were used to calculate lower leg VO_2 using the Fick equation with [hemoglobin] (hb) extracted from clinical records and S_aO_2 measured via pulse oximetry.
RESULTS: Twelve patients have completed both scans. Preliminary analyses were of change over time with both groups combined. Peak power did not change (15.7 ± 3.0 to 16.6 ± 3.8 W, p=0.227). After treatment, oxygen carrying capacity of the blood (hb*1.34*S_aO_2) was significantly decreased (median change = -17%, p=0.004) due to reduced hemoglobin (13.5 ± 13 to 11.2 ± 13 g/dL). Exercise blood flow increased (438 ± 119 to 633 ± 167 mL/min, median change=44%; p<0.001) out of proportion to this reduction. S_aO_2 and S_vO_2 did not change appreciably (~98% and 60%, respectively). As a result there was a small but non-significant increase in leg VO_2 (30 ± 9 to 35 ± 13 mL/min, median change = 16%, p=0.165). Exercise mean arterial pressure decreased and heart rate increased after treatment (p=0.007, p=0.017).
CONCLUSIONS: Our preliminary findings indicate that chemotherapy for breast cancer does not reduce oxygen extraction with isolated muscle exercise. Local blood flow increases partly in response to reduced oxygen-carrying capacity of the blood, but mechanisms for the remaining hyperemia response are unknown.

2997   Board #280   June 1 3:30 PM - 5:00 PM
Assessing Body Composition With Dual-energy X-ray Absorptiometry And Bio-electrical Impedance In Breast Cancer Survivors

Kyuwan Lee, Nathalie Sami, Christina Dieli-Conwright, FACSM. *U of Southern California, Los Angeles, CA.* (Sponsor: Christina Dieli-Conwright, FACSM)
(No relevant relationships reported)

PURPOSE: As obesity is recognized as a risk factor for breast cancer recurrence, the assessment of body composition is vital in breast cancer survivors (BCS) to guide appropriate weight management interventions. Dual-energy X-ray absorptiometry (DXA) is a highly valid and accurate method for assessing body composition, however, the use of DXA is limited due to availability and high cost. Bio-electrical impedance analysis (BIA) is an alternative method to estimate body composition due to safety, low cost, and ease of use. The purpose of this study was to verify whether DXA and BIA yield similar results for body composition including: body fat percentage (BFP), lean body mass (LBM) and fat mass (FM) in BCS. We further examined whether our results differed by BMI category.
METHODS: BCS (Stage I-III) who had completed cancer-related treatment within the previous 6 months were included in this study. BFP, LBM and FM were estimated using BIA (InBody 520) and followed immediately by DXA (GE Lunar Prodigy). Testing was performed between 7:00-11:00 AM following a minimum 4-hour fast. BMI categories used were based on the World Health Organization: normal (18.0-24.99 kg/m²), overweight (25.0-29.9 kg/m²), obese (30.0-34.99 kg/m²), and severely obese (>35.0 kg/m²). Agreement between the devices was assessed by Bland-Altman analysis.
RESULTS: Our study population included a total of 89 BCS (52.7±10.4 yr), primarily Hispanic (63.6%), with BMI of 29.2±5.6 kg/m². There was no agreement between the two devices in assessments of BFP (DXA: 44.2±6.2 vs BIA: 40.4±7.8%), LBM (DXA: 39.1±7.6 vs BIA: 42.9±5.9kg) and FM (DXA: 32.4±10.8 vs BIA: 30.6±11.0kg). DXA provided significantly higher estimates of BFP and FM, with a lower estimate of LBM compared to BIA (P<0.001). These findings held true among BCS in the normal (n=28), overweight (n=21), and obese group (n=23). However, there was agreement between the two devices on FM (DXA: 48.7±7.2 vs BIA: 47.9±5.7kg) in severely obese BCS (n=17; P=0.102).
CONCLUSIONS: BIA may underestimate BFP and FM and overestimate LBM, compared to DXA in BCS. However, BIA and DXA provide similar FM in severely obese BCS, suggesting that BIA can be alternative to estimate FM. Future studies are warranted to assess the utilization of these 2 devices in a larger cohort of BCS across BMI categories.

2998   Board #281   June 1 3:30 PM - 5:00 PM
Muscle Strength and Fasting Insulin Levels Following a Combined Exercise Intervention in Breast Cancer Survivors

Nathalie Sami, Kaylie Zapanta, Kyuwan Lee, Christina Dieli-Conwright, FACSM. *University of Southern California, Los Angeles, CA.*
(No relevant relationships reported)

PURPOSE: Breast cancer treatments may lead to elevated fasting insulin levels and gains in fat mass causing insulin resistance in skeletal muscle and subsequent reductions in muscle strength (MST). Exercise is a non-pharmacologic strategy to improve elevated insulin and reduced MST. In particular, combined aerobic and resistance exercise (CE) reduces insulin levels and improves MST, and has been shown to be superior to resistance or aerobic exercise alone at reducing insulin resistance in patients with type 2 diabetes. The purpose of this study was to determine whether fasting insulin levels and muscle strength (MST) can be improved following a 16-week supervised CE intervention in overweight and obese breast cancer survivors (BCS).
METHODS: Sedentary, overweight/obese (BMI >25 kg/m²) BCS (Stage I-III) were randomized to the Control (CON) or the Exercise (EX) groups. EX underwent supervised CE sessions 3 times per week for 16 weeks. CON was asked to maintain their current level of activity. Fasting serum insulin was measured using enzyme-linked immunoabsorbent assays. MST was assessed from 10-RM (repetition maximum) tests of the leg extension (LE) and chest press (CP) to estimate 1-RM values. Repeated measures ANOVA was used to examine the effects of exercise on MST and insulin. Pearson's correlations were performed to examine the association between MST changes for each exercise and insulin.
RESULTS: At baseline, EX (n=48) and CON (n=46) did not differ by age (53.0 ± 10.4 yr), insulin (35.2 ± 15.4 pmol/L), or BMI (33.5 ± 5.5 kg/m²). Post-intervention, insulin was significantly reduced (-13.5 ± 3.1%) and all MST measures (35.9 ± 6.7%) significantly increased in EX compared to CON (*P*<0.01). Significant correlations were found between reduced insulin and improved MST for LE (r=-0.67, p=0.001) and CP (r=-0.81, p=0.01) in EX.
CONCLUSION: A 16-week supervised CE intervention is an effective approach to reduce insulin, and increase MST, and reductions in insulin are associated with improved muscle strength in BCS. Collectively, this supports the utilization of aerobic and resistance exercise as vital components of cancer rehabilitation following completion of cancer treatment.

F-67   Basic Science World Congress/Poster - **Skeletal Muscle II**

Friday, June 1, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

2999   Board #282   June 1 3:30 PM - 5:00 PM
Sex Differences In Objectively Measured Physical Activity Among Individuals With ACL Reconstruction

Christopher Kuenze[1], Lisa Cadmus-Bertram[2], Karin Pfeiffer, FACSM[1], Caroline Lisee, FACSM[1], Stephanie Trigsted[3], Dane Cook[2], David Bell[2]. *[1]Michigan State University, East Lansing, MI. [2]University of Wisconsin - Madison, Madison, WI. [3]High Point University, High Point, NC.* (Sponsor: Karin Pfeiffer, FACSM)
(No relevant relationships reported)

Females are more likely to experience poor knee-related outcomes and are less likely to return to pre-injury levels of return to sport following ACLR as compared to males of the same age and pre-injury activity level. Evidence has shown that young adults with ACLR participate in significantly less moderate-to-vigorous physical activity (MVPA) as compared to healthy matched. However, it is not clear if an individual's sex is a factor in their determining the likelihood of engagement in healthy levels of MVPA following ACLR. **Purpose:** To examine the effects of sex and ACLR status on the volume of MVPA in which an individual engages as well as the likelihood that an individual will meet national guidelines for weekly MVPA. **Methods:** 31 individuals with a history of ACLR (Sex = 22F/9M, Age = 20.3 ± 1.7 years, BMI = 23.3 ± 2.8kg/m², Time since surgery = 28.2 ± 17.1mo) and 32 healthy individuals (Sex = 22F/10M, Age = 20.8 ± 1.6 years, BMI = 23.3 ± 30kg/m²) enrolled in this study. Objective MVPA in Freedson bouts (min/wk) were assessed with an ActiGraph GT3X-BT accelerometer worn on an elastic belt at the hip over a period of 7 days with a minimum of 4 days of wear with ≥10 hours per day. Wear time (min/day) was validated using recommendations of Choi et al. Between group (ACLR, Healthy) and sex (M/F) differences in MVPA in Freedson bouts were investigated using a 2 (group) x 2 (sex) ANOVA. Fischer's exact test was utilized to assess the sex-based difference in meeting national MVPA recommendations (MVPA > 150 min/wk) among individuals with ACLR. **Results:** Overall, individuals with ACLR (MVPA = 114±95 min/week) participated in less MVPA in Freedson Bouts per week as compared to healthy individuals (MVPA = 212±138 min/wk, *p* = 0.002). Females (MVPA = 184±133min/wk) were more active than males (MVPA = 116±102 min/wk, *p* = 0.02). There was no meaningful interaction between group and sex (*p* = 0.06) but females with ACLR (72.0%) were more likely to meet MVPA guidelines when compared to males (36.3%, *p* = 0.05). **Conclusion:** Individuals with ACLR participate in less MVPA than those with no history of knee injury which is consistent with previous findings. While no interaction was present between sex and history of ACLR, females with ACLR were more likely to meeting MVPA guidelines which may have implications for long term health risks associated with ACLR.

3000   Board #283   June 1 3:30 PM - 5:00 PM

Road Bicycle Saddle Shape Preference and its Potential Determinants

Sewan Kim[1], James E. Peterman[1], Todd M. Carver[2], Garrett Y.D. Getter[2], William C. Byrnes, FACSM[1]. [1]University Colorado Boulder, Boulder, CO. [2]Specialized Bicycle Components, Boulder, CO. (Sponsor: William Byrnes, FACSM)

(No relevant relationships reported)

The saddle is an integral part of riding a bicycle, however research examining determinants of cycling saddle preference/comfort is limited. **PURPOSE:** To determine if trained cyclists can differentiate between road bicycle saddle shapes and whether preferences are related to anatomy and/or cycling position variables. **METHODS:** Cyclists riding 5-12 hr/wk and training for a cycling event participated (21 M and 21 F). Pelvic anatomy (composition plus ischial tuberosity width) and overall body composition were determined by DXA. Cycling position variables were determined using 3D motion capture. Subjects then completed 3 separate saddle evaluations using identical cycling shorts while riding 3 differently shaped saddles (flat, convex widthwise and concave lengthwise). The 1st and 3rd evaluations were identical and occurred in the lab on an ergometer adjusted to the subject's personal cycling position. In a blinded, randomized design, subjects rode each saddle twice for 5 min. A 6-item visual analog comfort questionnaire (0-100 with 100 being extreme comfort) was completed after each bout. For evaluation 2, subjects rode each saddle for 1 wk on their road bike while maintaining normal riding hours with comfort assessed at the end of each week. Upon study completion, subjects chose a preferred saddle, which was collected independent of comfort ratings. **RESULTS:** For evaluations 1 and 3, comfort ratings were not different between saddles or across evaluation sessions. With prolonged testing, significant (p<0.05) differences were observed for overall comfort for convex vs. concave (72.5 ± 18.0 and 61.2 ± 17.9) and flat vs. concave (70.7 ± 19.1 and 61.2 ± 17.9). Evaluation 2 comfort ratings matched preferred saddle choice, but did not improve subjects' ability to differentiate saddles during evaluation 3. No relationships were observed between saddle comfort and any anatomy or cycling position variables. **CONCLUSION:** Trained cyclists in an acute, blinded setting cannot differentiate saddle shapes even when accustomed to the saddle. With longer exposure, cyclists can differentiate saddle shapes and demonstrate a preference that aligns with comfort ratings. However, no relationship was found between measured variables and saddle preference/comfort.

Supported by Specialized Bicycle Components.

3001   Board #284   June 1 3:30 PM - 5:00 PM

Associations of Intracortical Facilitation and Inhibition of the Soleus with Popliteal Venous Flow

Masafumi Terada, Keisuke Senoo, Kaede Kaneda, Syunsuke Nonoyama, Tadao Isaka. *Ritsumeikan Universtiy, Kusatsu, Japan.*

(No relevant relationships reported)

Associations of Intracortical Facilitation and Inhibition of the Soleus with Popliteal Venous Flow

Masafumi Terada, Keisuke Senoo, Kaede Kaneda, Syunya Nonoyama, Tadao Isaka. Ritsumeikan University, Shiga, Japan

The soleus muscle is functionally important to maintain venous return and consequently cardiac output by compressing underlying veins in order to increase blood flow back to the heart. Previous literature has reported that soleus dysfunction may contribute reduced venous retune. Soleus dysfunction have been attributed to altered intracortical excitability within the central nervous system. However, there is little investigation that has examined associations of intracortical facilitation and inhibition of the soleus with venous flow in the popliteal vein. Determining these associations may help to establish neurophysiological mechanisms that cause altered venous return. **PURPOSE:** Determine if intracortical facilitation and inhibition of the soleus are associated with popliteal venous flow. **METHODS:** Ten participants (8M, 2F; 20.3 ± 0.9yrs; 165.0 ± 7.6cm; 61.0 ± 5.4kg) were enrolled in this current study. Paired-pulse transcranial magnetic stimulation was used to assess intracortical facilitation (ICF) and short-interval intracortical inhibition (SICI) in the soleus muscle. Blood flow velocities in the popliteal vein were measured using Dropper ultrasound in a standing position and immediately after five repetitions of maximum voluntary isometric contraction (MVIC) strength of the plantar flexors. Peak velocity and time-averaged maximum velocity (TAMAX) were assessed. Pearson Product Moment Correlations were used to examine associations of ICF and SICI in the soleus with measures of blood flow velocity in the popliteal vein. Significance was set a priori at p<0.05. **RESULTS:** TAMAX immediately after MVIC was moderately correlated with ICF (r=0.63, p=0.03) and SICI (r=0.59, p=0.04). **CONCLUSION:** These findings indicate the potential for associations of intracortical facilitation and inhibition of the soleus with blood flow velocities in the popliteal vein. Further study with a large sample size is needed to examine these associations in specific pathological condition in order to determine the effects of clinical dysfunctions on venous return.

3002   Board #285   June 1 3:30 PM - 5:00 PM

Agreement Of Heart Rate Monitoring With A Smartwatch In Persons Using Wheelchairs

Daniel Moreno, Evan Glasheen, Antoniette Domingo, Brian Panaligan, Jochen Kressler. *San Diego State University, San Diego, CA.*

(No relevant relationships reported)

Purpose: To validate heart rate (HR) from a fitness smartwatch (SW) designed to measure values in wheelchair users against standard heart rate monitoring. Valid HR tracking will be useful tool for monitoring exercise intensities for wheelchair users. **Methods**: 5 wheelchair users (age=50.0 (5.6)), and 3 able-bodied (age=25.3(3.2)) participants completed several tasks; wheelchair treadmill propulsion at 30, 45, and 60 strokes per minute (spm), arm cycle ergometry (ACE) at 45, 60, and 80 revolutions per minute (rpm), and ACE VO2max test at 50rpm with wattage(W) increments of 15/20(female/male) per 3min stage until failure. Participants wore the SW on their dominant hand, and a heart rate monitor strap around their chest. Average steady state HRs from SW and HR strap were compared by Bland-Altman analysis.**Results**: Combined resting HRs from the SW were 78(11) beats per minute (bpm). HR strap recorded 78(11)bpm for resting HR. Bland-Altman analysis showed high agreement between SW and HR strap (mean difference= -.04 bpm, limits of agreement (LoA) ±6 bpm). Mean absolute percent error (MAPE) for resting state was 2.5%. Reported average HRs by SW for treadmill task at 30, 45, and 60spm were 54(44), 76(48) and 62(54) bpm, respectively. HR strap measurement were 76(12), 102(25), and 110 (14) bpm. Poor agreement was seen for the treadmill task at 30spm (-49(-171-73)), 45spm (-25(-116-66)), and 60srpm (-48(-160-65)), with MAPEs of 42.2%, 27.6% and 43.9%, respectively. For ACE, average HRs reported by SW at 45, 60, and 80rpm were 89(12), 88(38), and 101(47)bpm. HR strap measurements were 85(12), 90(18), and 91(15)bpm. Mean differences (LoA) were 5(-74-83), -2(-79-76), and 9(-93-112), with MAPEs of 30.6%, 31.3%, and 43.3%, respectively. Average HRs reported by SW for stages 1, 2, 3, 4 and 5 of ACE VO2max were 82(9), 91(42), 113(112), 85(67) and 41(82)bpm, respectively. HR strap measurements were 83(10), 95(6), 115(7), 143(12), and 169(4)bpm. Good agreement was seen at first three stages -.4(-7-6), 2.2%, -4(-88-79) 21.2%, and -2(-16-12) 3.1%. Agreement declined at higher stages 4 and 5, with -58(-207-92) 38.5% and -128(-283-28) 76.3%, respectively.**Conclusion**: SW shows good validity at measuring HR at rest and only at lower frequencies/stages of ACE based exercises. The SW was poor at tracking HR for the treadmill tasks.

3003   Board #286   June 1 3:30 PM - 5:00 PM

Maturation Related Change in Neuromuscular Component of Force Production in Trained and Untrained Girls

rana fayazmilani, Aynaz Pourmotahari. *Shahid Beheshti University, Tehran, Iran, Islamic Republic of.*

(No relevant relationships reported)

Maturation-Related Change in Neuromuscular Component of Force Production in Trained and Untrained Girls

Rana Fayazmilani*[1], Aynaz Pourmotahari[2]
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Abstract
Purpose: the main purpose of the present study was to investigate the maturation-related change in neuromuscular components of force production in gymnasts and untrained girls during the maximal voluntary isometric contraction (MVC). **Method**: 60 girls, in two groups of gymnasts and untrained were divided into the three subgroups of preadolescents, adolescents, and adults according to Tanner's scale. All aspects of study were explained and clarified to all subjects. Then, informed consent forms were completed by subjects (in the child's group by their parents). After familiarity and initial measurements, each subject performed three maximal voluntary isometric contractions (MVC) of the knee extensor at five different angles to determine the optimal angle of force production. The rate of force development (RFD) was calculated using the torque data. The EMG signal of the rectus femoris muscle was recorded during the MVC test to measure voluntary activation (RMS). **Results**: The normalization of torque based on body weight eliminated the difference in force between the age groups. These results were similarly observed in the level of RMS and RFD. However, there was a significant difference between the gymnasts and the untrained groups in all variables. **Conclusion**: It seems that the differences in body size are more likely to justify absolute force differences than the neural factors. This is partly supported by the results of RMS and the RFD.
Keywords: Preadolescents, Electromyography (EMG), Rate of Force Development (RFD), Maximum Voluntary contraction (MVC)

Footnotes
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3004　　　Board #287　　　　　June 1 3:30 PM - 5:00 PM

Effects Of High Intensity Interval& Eccentric Training On Irisin And Myostatin Levels In Rats

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kharazmi university, tehran, Iran, Islamic Republic of.
(No relevant relationships reported)

Some myokines such as irisin and myostatin have considerable effects on energy metabolism in addition to the musculoskeletal system. **PURPOSE:** Our aim was to investigate the effects of 9 weeks different training methods on circulating irisin and myostatin.**METHODS**: For this purpose, 20 Sprague Dawley rats with the weight range of (130±30gr) were divided into three groups: control (n=7), high intensity interval training (n=6), and eccentric training (n=7). They were held in the dark: light of 12:12. 48 hours after the last exercise session, protein measurement was performed using enzyme-linked immunosorbent assays (ELISA) test. **RESULTS:** Serum myostatin and irisin levels increased significantly following eccentric but they decreased following high intensity interval training. **CONCLUSIONS**:Despite these differences both myokines indicated significant relationship following 9 weeks of eccentric and high intensity interval training. Given the markedly increase in circulating myokines after eccentric training sessions these data suggest that eccentric training is probably more effective to stimulate skeletal muscle metabolic regulation.

SATURDAY, JUNE 2, 2018

G-19   Thematic Poster - **Aging/Lifecycle**

Saturday, June 2, 2018, 9:00 AM - 11:00 AM
Room: CC-Mezzanine M100C

3059   **Chair:** Steven K. Malin, FACSM. *University of Virginia, Charlottesville, VA.*

(No relevant relationships reported)

3060   Board #1   June 2 9:00 AM - 11:00 AM

Changes In Vitamin D Status Before And After Nordic Summer In Overweight Middle-aged Participants

Petra Lundström, Maria J. Eriksson, Kenneth Caidahl, Anette Rickenlund. *Karolinska Institutet, Stockholm, Sweden.*

(No relevant relationships reported)

Background: Sun exposure is the main source to synthesize vitamin D. Obesity, type II diabetes mellitus, and living at high altitude are risk factors for low vitamin D status. Seasonal variations in affected populations are unknown. **Purpose:** We investigated the effect of sun exposure during a summer season on vitamin D status in Sweden, and its association with fat mass and deranged carbohydrate metabolism. **Methods:** One hundred sixty-one subjects (91 women and 70 men), with a mean age of 60 ± 5 years with body mass index ≥ 25 kg/m^2, with or without deranged carbohydrate metabolism were studied. The participants were divided into groups based on an oral glucose tolerance test. Glucose tolerance was classified as normal (NGT) ≤ 8.9 mmol·L, impaired glucose tolerance ≥ 8.9-12.1 mmol·L or T2DM ≥ 12.2 mmol·L. Blood samples, body composition, and food questionnaires were taken before and after a summer season with a second year follow-up.
Results: Eighty-five percent of participants showed low to deficient levels of vitamin D before summer (55.1 ± 21.5 nmol·L^{-1}). After summer the level increased significantly to 66.4 nmol·L^{-1}, ($P<0.01$) but remained below the recommended value (≥ 75 nmol·L^{-1}) in 65% of the subjects. Similar low vitamin D levels were found in a follow-up substudy. Before summer, we did not find any interactions between vitamin D, carbohydrate metabolism, or gender. There were no significant differences in the mean value of vitamin D before and after the second summer compared with the first. Before summer, Vitamin D in women with NGT correlated with fat mass (% and kg) ($r = -0.34$ -0.43, $P = 0.01$). There was no correlation between vitamin D levels and the intake of fatty fish.
Conclusion: In most of this overweight/obese population, sun exposure at high latitudes had a beneficial but often insufficient effect on circulating vitamin D levels compared with those currently recommended.

3061   Board #2   June 2 9:00 AM - 11:00 AM

Continuous Glucose Monitoring in Older Adults: Impact of Aerobic Exercise and Metformin on Glucose Variability

Oscar D. Safairad[1], Hayden M. Schoenberg[2], Jaime L. Laurin[2], Benjamin F. Miller, FACSM[2], Karyn L. Hamilton, FACSM[2], Adam R. Konopka[1]. *[1]University of Illinois at Urbana-Champaign, Urbana, IL. [2]Colorado State University, Fort Collins, CO.* (Sponsor: Karyn L. Hamilton, FACSM)

(No relevant relationships reported)

A greater magnitude and frequency of glucose fluctuations within or between days is defined as impaired glucose variability (GV) and is a risk factor for Type 2 Diabetes. Glycated hemoglobin (HbA1c) is the standard approach to provide an index of long-term GV (~3 months). Continuous glucose monitoring (CGM) has emerged as a tool to measure glucose every 5 minutes to ascertain short-term GV. **PURPOSE:** Identify if GV is impaired in older, non-diabetic individuals and determine the influence of aerobic exercise with or without metformin on GV in older adults. **METHODS:** CGM was used to measure cumulative GV over 7-10 days in young ($n=5$, 28yr, 23kg/m^2) and older ($n=17$, 64yr, 32kg/m^2) adults. In a double blinded fashion, older adults were randomized to consume placebo ($n=9$) or Metformin ($n=8$) during 12-weeks of aerobic exercise training (AET). Participants were provided a standardized beverage (300 kcal) after each exercise. CGM was also implemented during and after the 12-week intervention. Cumulative mean glucose, indices of intra-day (continuous overall net glycemic action (CONGA$_{4h}$)) and inter-day (mean of daily differences (MODD), average daily risk range (ADRR)) GV were calculated by EasyGV software. Mean glucose was also determined every 24-hr after AET. **RESULTS:** Older adults have greater (P<0.05) mean glucose (6.3 ± 0.7 vs. 5.3 ± 0.3), CONGA$_{4h}$ (5.2 ± 0.4 vs. 4.4 ± 0.3), MODD (1.2 ± 0.4 vs. 0.9 ± 0.1), and ADRR (7.4 ± 4.8 vs. 2.6 ± 1.2) versus young. Compared to baseline, cumulative mean glucose and ADRR were lower (P<0.05) during AET in older adults on placebo (Mean, 6.2 ± 0.6 vs 5.5 ± 1.0; ADRR, 6.9 ± 3.3 vs 4.8 ± 1.7) or metformin (Mean, 6.3 ± 0.7 vs 5.5 ± 0.7; ADRR, 8.2 ± 6.3 vs 5.5 ± 2.0). When taking metformin, CONGA$_{4h}$ was also lower during AET (5.2 ± 0.4 vs 4.9 ± 0.3). Cumulative GV was not different after AET in either group. However, in

the metformin group, 24-hr mean glucose was decreased (P<0.05) 1 day after AET and gradually increased the next 7 days (P≤0.06 Days 5-7 vs. Day 1) back to baseline. **CONCLUSION:** In older adults, cumulative mean glucose and GV were decreased toward young values during AET. While improvements in cumulative GV dissipated after AET, the addition of metformin to exercise may delay the return of 24-hr glucose to baseline values. These data highlight the need for regular exercise to sustain improvements in GV in older adults.

3062   Board #3   June 2 9:00 AM - 11:00 AM

Effect of Moderate Intensity Exercise Dose on Lipoprotein Concentrations and Particle Size in Older Women

Ryan R. Porter, J. Larry Durstine, FACSM, Charity B. Breneman, Xuewen Wang. *University of South Carolina, Columbia, SC.* (Sponsor: J. Larry Durstine, FACSM)

(No relevant relationships reported)

Lipoprotein concentrations are well established biological markers associated with cardiovascular disease (CVD) risk. Recent research has placed great importance on the function of different lipoprotein subfractions (medium and small VLDL; small and large LDL; small, medium and large HDL). Current literature supports exercise as being protective by affecting lipoprotein particle size and concentration, whereas little research has been conducted to determine the effects of exercise dose on these outcomes.
PURPOSE: To determine if exercise dose has an effect on VLDL, LDL, and HDL particle size and concentrations in older sedentary women after 16 weeks of moderate-intensity aerobic exercise.
METHODS: Sixty-five women (age = 64.7 ± 4.2 years) were randomized into higher-dose (n = 30) and lower-dose (n = 35) exercise groups. Supervised treadmill walking sessions lasted approximately 35 or 55 minutes, 3 times per week, for lower-dose and higher-dose groups, respectively. All exercise was completed at an intensity of 50-55% of heart rate reserve. Fasting plasma samples were collected before and after exercise intervention. Plasma lipoprotein particle concentrations and average sizes were determined by nuclear magnetic resonance spectroscopy.
RESULTS: Exercise, in the entire sample, lowered total HDL and small VLDL particle concentration (1.5 ± 3.6 µmol/L and 4.2 ± 16.4 nmol/L; p<0.01 and p<0.05, respectively), and increased mean HDL particle size (0.1 ± 0.3 nm; p<0.01). When analyzed by exercise groups, the lower-dose group displayed a decrease in total HDL particle concentration (1.9 ± 3.1 µmol/L; p=0.001), while the higher-dose group displayed an increase in mean LDL particle size (0.3 ± 0.5 nm; p<0.05). Both exercise higher-dose and lower-dose treatments were found to significantly increase mean HDL particle size (0.1 ± 0.2 nm and 0.1 ± 0.3 nm, respectively; p<0.05) with no significant difference between groups.
CONCLUSIONS: The results from this study support that exercise in sedentary older women decreased CVD risk. Though the HDL particle concentration decreased in the lower-dose group, maintenance of HDL particle concentration in the higher-dose group along with the increase in mean HDL and LDL size are characteristics associated with lower CVD risk. Supported by NIH Grant R00AG031297

3063   Board #4   June 2 9:00 AM - 11:00 AM

Resistance Exercise and Low Dose Protein Ingestion Augments Anabolic Signaling Mechanisms In Older Women

Susannah E. Scaroni[1], Sarah K. Skinner, 61801[1], Joseph W. Beals[1], Stephan van Vliet[1], Elizabeth Poozhikunnel[1], Ralf Jager[2], Martin Purpura[2], Jonathan Oliver[3], Scott Paluska, FACSM[1], Nicholas A. Burd[1]. *[1]University of Illinois at Urbana-Champaign, Urbana, IL. [2]Increnovo LLC, Milwaukee, WI. [3]Texas Christian University, Fort Worth, TX.* (Sponsor: Scott Paluska, FACSM)

(No relevant relationships reported)

Resistance exercise enhances skeletal muscle anabolic signaling responses to the ingestion of sub-optimal amounts of protein in young men. However, the effectiveness of resistance exercise to potentiate the phosphorylation of the mechanistic target of rapamycin (mTORC1) to the ingestion of minimal amount of protein in aging women has not been well characterized. **PURPOSE:** We compared the phosphorylated-state of mTORC1 before and after ingestion of ~14 g whey protein or water at rest and after resistance exercise in middle-aged and older women. **METHODS:** 10 women (59 ± 2 y; BMI: 25 ± 1 kg/m^2; LBM: 46 ± 2 kg) performed a bout of unilateral leg extension exercise (3 sets × 12 repetitions at 60% estimated 1RM) prior to ingesting whey protein (0.3g/kg LBM; WHEY, $n=5$) or water (WATER $n=5$). Blood and skeletal muscle biopsies were used to measure plasma amino acids and insulin concentrations and phosphorylation of mTORC1 at Ser2448 at 2 and 4 h of the postprandial phase in both exercise (EX) and non-exercised (CON) legs. **RESULTS:** Plasma branched chain amino acid concentrations were increased from basal (2.5-fold) in WHEY ($P<0.05$), but not in WATER condition ($P>0.05$). Plasma insulin concentrations increased after WHEY (2.3 ± 0.8 fold change from basal, $P=0.02$), but not after WATER ingestion (1.0

± 0.1 fold-change, P=0.45). WHEY ingestion increased mTORC1 phosphorylation at 2 h (3.4±0.6 and 1.7±0.3 fold-change in EX and CON, respectively $P<0.05$). There were no changes in mTORC1 phosphorylation after WATER ingestion at any time point ($P>0.05$). **CONCLUSION:** Our data demonstrated that consuming a minimal amount of protein immediately after resistance exercise resulted in a greater, but transient, phosphorylation of anabolic signaling mechanisms involved in protein translation over that induced by feeding or resistance exercise alone.

3064   Board #5   June 2 9:00 AM - 11:00 AM

Calorie Restriction Promotes Constant Physical Activity Levels Throughout Total Lifetime of Female Mice

Jorge Z. Granados[1], Ayland C. Letsinger[1], Heather L. Vellers[1], Victor A. Garcia[1], Jeremiah D. Velasco[1], Edward C. Nagle[1], Layla C. Perez[1], Madison Spier[2], Isabel Lambertz[2], Robin Fuchs-Young[2], J. Timothy Lightfoot, FACSM[1]. *[1]Texas A&M University, College Station, TX. [2]Texas A&M University Health Science Center, College Station, TX.* (Sponsor: J. Timothy Lightfoot, FACSM)

(No relevant relationships reported)

BACKGROUND: Physical inactivity contributes to incidence of diseases and decreased life expectancy. Previous data has shown that chronic overfeeding via high fat high sugar diet (HFHS) reduces voluntary wheel running (WR) activity in mice. **PURPOSE:** Determine the effects of a 12% calorie restriction diet (DR) vs. an *ad-lib* HFHS diet on physical activity (PA) levels (distance, duration, speed) throughout total lifetime in female SENCAR mice. **METHODS:** SENCAR mice were bred and offspring were weaned at 3 weeks of age onto a HFHS (20% protein, 45% fat, 24% sucrose + 10% fructose water), an *ad-lib* standard chow (CONT; 20% protein, 10% fat, 57% cornstarch), or a DR (12% kcal restriction, 20% protein, 10% fat, 57% cornstarch). At 4 weeks of age, female mice were housed in pairs and two plastic running wheels were mounted inside each cage. WR distance (km/day) and duration (min/day) were recorded and used to calculate average speed (m/min) via a mounted computer system. Repeated measures ANOVA determined the effect of diet on WR activity relative to varying percentages of total lifetime (15%, 25%, 50%, 75%, and 100%). **RESULTS:** 116 female mice [HFHS (n=42), DR (n=55), CNTL (n=19)] were analyzed. Both *ad lib* HFHS and *ad lib* CONT diets significantly decreased distance, duration, and speed after 25% of the total lifespan. All PA variables remained unchanged for the DR mice with the only significant reduction occurring in duration between 75% (221 ± 98min/day) to 100% (188 ± 79min/day) of total lifetime. Additionally, correlations of determination were observed for body weight vs HFHS (.44), DR (.04), and CONT (.34) diets. **CONCLUSIONS:** DR mice maintained activity levels across their lifespans as compared to *ad lib* CONT and *ad lib* HFHS mice whose activities decreased over their lifespan. These findings substantiate our previous data and propose that minimal calorie restriction may serve a novel intervention to prevent physical inactivity across the lifespan.

3065   Board #6   June 2 9:00 AM - 11:00 AM

Leucine-Enriched Protein Supplementation Does Not Augment Muscle Mass and Strength Gains During Resistance-Type Exercise Training in Older Males

Andrew M. Holwerda, Maarten Overkamp, Kevin J.M. Paulussen, Joey S.J. Smeets, Annemie P. Gijsen, Joy P.B. Goessens, Lex B. Verdijk, Luc J.C. van Loon. *Maastricht University Medical Centre+, Maastricht, Netherlands.* (Sponsor: Professor Janice L. Thompson, PhD, FACSM)

(No relevant relationships reported)

Purpose: The proposed benefits of protein supplementation on the skeletal muscle adaptive response to resistance-type exercise training remain unclear. Protein ingestion after exercise and prior to sleep have been shown to augment muscle protein synthesis during recovery from exercise. However, it remains to be established whether dietary protein ingestion after exercise and before sleep augments muscle mass and strength gains during resistance-type exercise training in older individuals. **Methods:** Forty-one healthy older males (70±1 y) completed 12 weeks of whole-body resistance-type exercise training (3 sessions·week^{-1}) and were randomly assigned to ingest either protein (20 g whey plus 1 g leucine; n= 21) or an energy-matched placebo (n= 20) after exercise and each night prior to sleep. Maximal strength was assessed by one-repetition maximum (1RM) testing before and after training. Muscle hypertrophy was assessed at the whole-body (dual-energy X-ray absorptiometry), upper leg (computed tomography scan), and muscle fiber (biopsy) levels. Muscle protein synthesis during week 12 of training was assessed by providing deuterated water (^{2}H$_2$O) and collecting muscle biopsies. **Results:** Leg extension 1RM increased in both groups (placebo: 88±3 to 104±4 kg, protein: 85±3 to 102±4 kg; $P<0.001$), with no differences detected between groups ($P>0.05$). Appendicular lean mass (placebo: 26.7±0.7 to 27.7±0.7 kg, protein: 26.0±0.5 to 26.6±0.5 kg; $P<0.001$) and quadriceps cross sectional area

(placebo: 67.8±1.7 to 73.5±2.0 cm^2, protein: 68.3±1.4 to 72.3±1.4 cm^2; $P<0.001$) increased in both groups, with no differences detected between groups ($P>0.05$). Muscle fiber hypertrophy occurred in type II (placebo: 5486±418 to 6492±429 μm^2, protein: 5367±301 to 6259±391 μm^2; $P<0.001$), but not in type I fibers (placebo: 6059±364 to 6600±269 μm^2, protein: 5935±246 to 6171±305 μm^2; $P>0.05$), with no differences detected between groups ($P>0.05$). Muscle protein synthesis rates were 1.62±0.06 and 1.57±0.05 %·d^{-1} in the placebo and protein groups, respectively, with no differences detected between groups ($P>0.05$). **Conclusion:** Leucine-enriched protein supplementation after exercise and before sleep does not augment skeletal muscle mass or strength gains after resistance-type exercise training in older males.

3066   Board #7   June 2 9:00 AM - 11:00 AM

Muscle Protein Synthetic Responses After Low-dose Protein Ingestion and Resistance Exercise In Older Women

Sarah K. Skinner[1], Joseph W. Beals[1], Stephan van Vliet[1], Justin T. Parel[1], Elizabeth Poozhikunnel[1], Alexander V. Ulanov[1], Lucas Li[1], Ralf Jager[2], Martin Purpura[2], Scott A. Paluska, FACSM[1], Jonathan Oliver[3], Nicholas A. Burd[1]. *[1]University of Illinois at Urbana-Champaign, Urbana, IL. [2]Increnovo LLC, Milwaukee, WI. [3]Texas Christian University, Fort Worth, TX.* (Sponsor: Scott Paluska, FACSM)

(No relevant relationships reported)

Resistance exercise enhances the anabolic sensitivity of myofibrillar protein synthesis rates (MPS) to the ingestion of a moderate amount of protein in young and older men. However, the effectiveness of resistance exercise to potentiate postprandial MPS after the ingestion of minimal dose of protein in aging women has not been well characterized. **PURPOSE:** We compared changes in MPS to ingestion of ~14 g whey protein or water at rest and after resistance exercise in middle-aged and older women. **METHODS:** 10 women (59±2 y; BMI: 25±1 kg/m^2; LBM: 46±2 kg) performed a bout of unilateral leg extension exercise (3 sets × 12 repetitions at 60% estimated 1RM) prior to ingesting whey protein (0.3g/kg LBM; WHEY, n=5) or water (WATER n=5). Primed continuous infusions of L-[$ring$-^{13}C$_6$]phenylalanine, blood, and skeletal muscle biopsies were used to measure MPS over 4 h postprandial phase in both exercise (EX) and non-exercised (CON) legs. **RESULTS:** Plasma essential amino acid concentrations were increased from basal (2.5-fold) in WHEY group ($P<0.05$), but not in WATER group ($P>0.05$). EX significantly increased MPS above basal in both WHEY (5-fold) and WATER (2.3-fold) groups over the 4-hour postprandial period ($P<0.05$). MPS were not significantly increased above basal rates in the CON leg throughout the postprandial period in either condition (P=0.104). No group differences in MPS were observed between the WHEY or WATER groups in either the EX or CON legs ($P>0.05$). **CONCLUSION:** A moderate volume of resistance exercise significantly increased MPS in aging women. However, the ingestion of a low dose of whey protein immediately after resistance exercise did not potentiate the MPS response when compared to ingesting water. Therefore, more targeted anabolic strategies are warranted to maximize the MPS response to feeding and exercise in older women.

G-20   Thematic Poster - **Altitude/Hypoxia: Training and Performance**

Saturday, June 2, 2018, 9:00 AM - 11:00 AM
Room: CC-Lower level L100C

3067   **Chair:** Roy Salgado. *USARIEM, Natick, MA.*

(No relevant relationships reported)

3068   Board #1   June 2 9:00 AM - 11:00 AM

Impact Of Altitude On Sample Size Estimations For Exercise Performance:Implications For Research

Roy Salgado, Samuel Cheuvront, FACSM, Upendra Bhattarai, Robert Kenefick, FACSM. *US Army Research Institute of Environmental Medicine, Natick, MA.*

(No relevant relationships reported)

Adequate sample size is needed to detect a meaningful change in an outcome variable in response to an experimental intervention (e.g. dietary supplements). **Purpose:** To calculate and compare the sample size needed to detect a significant and meaningful improvement (5 - 20%) in exercise performance using different modes (i.e. cycling and running) of exercise at 3500 and 4300 m altitude for test selection. **Methods:** A total of 62 sea level (SL) residents (58 men and 4 women; mean ± SD; 24 ± 5 yrs, 176.0 ± 7.6 cm, 78.4 ± 11.4 kg; 49.3 ± 6.4 ml·kg^{-1}·min^{-1} VO2peak) completed either a: 1) 720kj cycle time trial (TT) at 3500 m (n = 6), or at 4300 m (n = 17); 2) a 5000/6000W cycle TT at 4300 m (n = 13); 3) a 11.2 km treadmill TT at 3500 m (n=11); or 4) a 3.2 km TT at 4300 m (n = 15) at SL and within two days upon arrival to altitude. Sample size

(n) was calculated as: n = 16*CV (%)/Δ perf (%), where CV (%) = typical error (sec)/ mean TT perf (sec) and Δ perf (%) = 5, 10, and 20% improvement in performance to be detected. **Results:** Table 1 provides sample size estimations needed to detect a change in cycling and running performance of 5, 10, and 20% at 3500 and 4300 m of altitude. **Conclusion:** The findings indicate that performance measured using running as a mode of exercise when compared to cycling requires a smaller sample size to detect a significant and meaningful change.

Disclaimer: The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the Department of Defense.

Figure 1a. Average self-selected gait velocities for total hip arthroplasty patients (THA) and healthy control (CTRL) groups across data collection time-points. * p < 0.05 for difference between groups. For THA group only, † p < 0.05 for difference compared to pre-surgery, ◊ p < 0.05 for difference compared to 3 weeks post-surgery, Y p < 0.05 for difference compared to 6 weeks post-surgery.
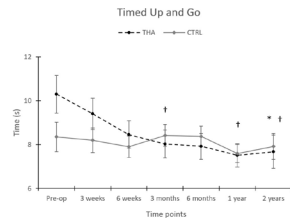
Figure 1b. Average Timed Up and Go completion times for total hip arthroplasty patients (THA) and healthy control (CTRL) groups across data collection time-points. For THA group only, * p < 0.05 for difference compared to pre-surgery, † p < 0.05 for difference compared to 3 weeks post-surgery.

3069   Board #2   Jun. 2 9:00 AM - 11:00 AM

Ischemic Preconditioning and Cycling Time Trial Performance in Hypoxia

Chad C. Wiggins, Keren Constantini, Timothy D. Mickleborough, Robert F. Chapman, FACSM. *Indiana University, Bloomington, IN.* (Sponsor: Robert F. Chapman, FACSM)

(No relevant relationships reported)

Ischemic preconditioning (IPC) of the legs prior to exercise has been shown as a novel approach to improve performance in a number of different exercise modes in normoxia. Very little has been done potential mechanisms behind the performance improvements in well-trained subjects, and less has been done examining the influence of these mechanisms during exercise in hypoxia. **PURPOSE:** To determine if IPC is an effective intervention for improving 5km cycle time trial (TT) performance in both normoxia and hypoxia. **METHODS:** Thirteen men (age= 24 ± 4 years, $\dot{V}O_2$max= 63.1 ± 5.1 ml·kg⁻¹·min⁻¹) completed four randomized trials of each combination of hypoxia ($F_IO_2 = 0.16$) or normoxia with a resting pre-exercise IPC protocol (4 x 5min at 220mmHg) or SHAM (4 x 5min at 20mmHg) procedure. Following the IPC/SHAM protocol subjects completed two constant load bouts and a 5km time trial on a cycling ergometer. Breath-by-breath $\dot{V}O_2$, oxyhemoglonin saturation, and skeletal muscle oxygenation/extraction (measured via near-infrared spectroscopy) were continuously monitored throughout the trials. **RESULTS:** IPC significantly improved 5km TT time in normoxia by 0.9 ± 1.7% compared to SHAM (IPC: 491.2 ± 33.7s vs. SHAM: 495.9 ± 34.5s, P < 0.05). IPC did not alter 5km TT performance times in hypoxia. Muscle oxygenation, extraction, and tissue saturation did not differ between treatments or inspirates (P > 0.05). **CONCLUSION:** IPC improves 5km cycling TT performance in normoxia only. Muscle oxygenation was unchanged suggesting that highly trained subjects choose power output based on a set level of muscular oxygenation regardless of the fraction of inspired oxygen or treatment with IPC.

3070   Board #3   June 2 9:00 AM - 11:00 AM

Muscle Oxygenation & Systemic Metabolic Responses during Maximal Sprint Exercise in Hypoxia among Athletes

Nobukazu Kasai, Yuka Motomura, Akiho Ikutomo, Kazushige Goto. *Ritsumeikan University, Kusatsu, Japan.* (Sponsor: Robert Kraemer, FACSM)

(No relevant relationships reported)

The influence of maximal sprint exercise in moderate hypoxia on muscle oxygenation and systemic metabolic responses has not been fully elucidated. **PURPOSE:** The purpose of the present study was to determine the effects of maximal sprint exercise in moderate hypoxia on muscle oxygenation, systemic oxygen uptake and power output among competitive athletes. **METHODS:** Seven sprinters (height; 176.1 ± 2.2 cm, body weight; 67.8 ± 3.4 kg, BMI; 22.6 ± 0.7 kg/m²) participated. They performed two trials under either hypoxic (HYP, F_IO_2: 14.5%, a simulated altitude of 3000m) or normoxic (NOR, F_IO_2: 20.9%) conditions in a randomized, with a single-blind and crossover design. The exercise in each trial consisted of three consecutive sets of 20-s maximal sprints with a 5 min rest period between sets. Time-course changes in percutaneous oxygen saturation (SpO_2,

power output during exercise, blood lactate, glucose concentrations, and muscle oxygenation [oxy-hemoglobin (Hb), deoxy-Hb, total-Hb], and respiratory variables were evaluated.

RESULTS: A significant main effect of number of set was observed for mean power output during exercise ($P<0.01$). However, no significant interaction (trial × number of set, $P=0.76$) or main effect of trial ($P=0.66$) for mean power output was observed. There were significant main effects of trial ($P<0.01$) and time ($P<0.01$) for blood lactate concentration, and post-exercise blood lactate concentrations were significantly higher in the HYP (22.8 ± 0.6 mmol/L) than in the NOR (20.0 ± 0.7 mmol/L, $P<0.05$). Both trials showed significant increases in deoxy-Hb and total-Hb during the exercise (main effect of time, $P<0.01$). However, deoxy-Hb and total-Hb tended to be higher in the HYP during the latter sets of sprint. Accumulated VO_2 during exercise was significantly lower in the HYP (1419 ± 76 ml) than in the NOR (1973 ± 120 ml, $P<0.01$), whereas accumulated VCO_2 was not significantly different between the trials (main effect of trial, $P=0.65$).

CONCLUSION: No apparent difference in muscle oxygenation kinetics during maximal sprint exercise was found between hypoxic and normoxic conditions. However, exercise-induced elevations of muscle deoxygenation (deoxy-Hb) tended to be augmented under hypoxic condition.

3071   Board #4   June 2 9:00 AM - 11:00 AM

Cardiac Function and SMO_2 During HIIT at Altitude and Sea Level with Oxygen Contrast Training

Frank Wojan[1], Craig Broeder, FACSM[1], Peter Chomentowski[1], Anthony Deldin[2]. *[1]Northern Illinois University, DeKalb, IL. [2]Loyola University, Chicago, IL.* (Sponsor: Craig Broder, Ph.D., FNAASO, FACSM)

(No relevant relationships reported)

PURPOSE: This study investigated how high-intensity interval training (HIIT) at altitude (ALT) versus sea level (SL) with and without supplemental oxygen recovery (SRO2) affected cardiac function and skeletal muscle %O2 saturation (SMO2). **METHODS:** Eight cyclists aged 42.4 ± 7.7 (HT: 68.9 ± 4.6; WT: 177.9 ± 26.6; Body Fat: 19.3% ± 7.5%; VO2 max L/min 4.38 ± 1.01) performed a baseline cycling VO2max test and four treatment trials (TRA - ALTHIIT/SRO2; TRB - SLHIIT/ SLrecovery; TRC - ALTHIIT/SLrecovery; TRD - steady-state (SS) cycling). Each HIIT work period (n=3) was 75s with 120s recovery at 75% and 50% of VO2max, respectively. For TRD, subjects cycled at a workload equal to the mean O2 uptake equal of TRB (Control-Trial). O2 uptake was measured using a breath X breath metabolic cart for VO2 max and TRB. Cardiac function (HR, Cardiac Output (Q), Stroke Volume (SV)) was assessed using impedance cardiography. SMO2 was measured in the vastus-intermedius quadricep muscles using Moxy NIR devices. Data was analyzed using a w/in repeated measures design (Treatment (4) X 3 HIIT/ Recovery Periods). **RESULTS:** Despite identical workloads, HR was significantly lower during SS cycling compared to the HIIT trials by 7.6% (SS: 118.0 ± 3.4; Mean HIIT TR HRs: 127.0 ± 3.7, p=0.002). ALTHIIT/SRO2 (TRA: 141.8 ± 9.2) showed a lower SV by 8.4% compared to the ALTHIIT/SLrecovery trial (TRC: 154.3 ± 9.2). Q was significantly lower during the HIITw/SRO2 (TRA:17.7 ± 1.1) compared to SLHIIT/SLrecovery & ALTHIIT/SLrecovery (TRB: 19.8 ± 1.1; TRC:19.8 ± 1.1) by 12% (P=0.04). SMO2 data showed a trend for ALTHIIT/SRO2 & SS cycling to have higher SMO2 values compared to the both HIIT trials without SRO2 (p=0.09). During recovery, ALTHIIT/SRO2 showed improved HR recovery 5.2% (p=0.01), increased SMO2 re-saturation rate 12.6% (p=0.01), and lowered Q 11.9% (p=0.01) compared to the altitude-sea level recovery trial. **CONCLUSION:** These results suggested that supplemental O2 recovery lowered cardiac demand (Q) at the same HIIT workload by maintaining HIIT SMO2 better by enhancing the overall recovery process. Supported by a grant from LiveO2 and Exercising Nutritionally, LLC

3072   Board #5   June 2 9:00 AM - 11:00 AM

Effects Of HIIT Training While Using A Breathing-restrictive Mask Compared To Increased Environmental Altitude

Bryanne N. Bellovary[1], Kelli E. King[1], Tony P. Nuñez[2], James J. McCormick[1], Andrew D. Wells[1], Kelsey C. Bourbeau[1], Zachary J. Fennel[1], Zidong Li[1], Kelly E. Johnson[3], Terence Moriarty[1], Christine Mermier[1]. *[1]University of New Mexico, Albuquerque, NM. [2]Metropolitan State University of Denver, Denver, CO. [3]University of Saint Mary, Leavenworth, KS.* (Sponsor: Dr. Ann L. Gibson, FACSM)

(No relevant relationships reported)

Purpose: To determine whether six weeks of high intensity interval training (HIIT) while wearing a breathing-restrictive mask (mask) (model 2.0, Training Mask LLC, Cadillac, MI) set to simulate 2550 m improves VO_2max and submaximal VO_2 compared with training in hypobaric hypoxia (2550 m) and control conditions (1550 m). **Methods:** Thirty participants volunteered and were consented and randomized into a mask (M) (n = 10; 5 men), altitude (A) (n = 10; 6 men), or control (C) (n =

10; 4 men) group. Participants maintained their normal routine. Pre- and post-testing included a VO_2max on a cycle ergometer with continuous metabolic gas analysis allowing submaximal power outputs (PO) measures of economy. All participants completed POs of 100, 125, and 150W as they exercised to VO_2max. Ventilatory threshold 2 (VT2) was determined graphically using metabolic equivalents. Participants cycled on an ergometer 2x/week for 30 min/session for six weeks. Sessions included a 5-min warm-up and cool-down with 20 min of HIIT (30s at 100% peak power output (PPO) of preVO_2max, 90s active recovery at 25W, 10 bouts). Repeated measures ANOVA and one-way ANOVA determined statistical significance for training changes and percent change, respectively ($p < 0.05$). **Results:** All groups significantly improved PPO by 8.3-13.0% (M: $F_{(1,9)} = 17.28$, A: $F_{(1,9)} = 7.45$, C: $F_{(1,9)} = 11.96$, $p < 0.05$). The M group improved PO at VT2 by 13.8% ($p = 0.009$). There was a nonsignificant improvement (8.3%) in PO at VT2 for the A group ($p = 0.054$). However, no significant differences occurred between groups for PPO and PO at VT2 ($p = 0.481$ and 0.250, respectively). The M group was significantly less economical (higher VO_2) at 125W before and after training compared with the C group ($p = 0.003$). However, percent change in submaximal VO_2 at 100, 125, and 150W were not different between groups ($p = 0.907$, 0.743, and 0.985, respectively). Percent improvements in VO_2max were not different between groups (C = 3.6%; M = 2.6%; A = 6.5%; $p = 0.623$). **Conclusion:** Since all groups demonstrated similar HIIT adaptations, using the mask or training in hypobaric hypoxia may not be needed for training adaptations. The protocol followed a live low, train high altitude model which typically lacks training improvements compared with a live high, train low altitude model.

3073   Board #6   June 2 9:00 AM - 11:00 AM

Muscle Oxygenation During Repeated Double-poling Sprint Exercise Under Hypoxic Condition

Keiichi Yamaguchi, Nobukazu Kasai, Daichi Sumi, Haruka Yatsutani, Kazushige Goto. *Ritsumeikan University, Kusatsu, Japan.* (Sponsor: Robert R Kraemer, FACSM)

(No relevant relationships reported)

PURPOSE: To compare acute physiological responses to repeated double-poling sprint exercise between normoxic condition and hypoxic condition.
METHODS: Eight male athletes (19.8 ± 1.0 yrs, 174.9 ± 6.5 cm, 71.1 ± 5.8 kg) completed repeated exercise (double-poling exercise) under either hypoxic (HYP, FiO_2: 14.5 %) or normoxic condition (NOR, FiO_2: 20.9 %). The exercise consisted of 9×20 s maximal sprint exercise (40 s or 5 min rest periods between sprints). Power output, muscle oxygenation of triceps brachii muscles (evaluated by near infrared spectroscopy; NIRS), arterial oxygen saturation (SpO_2) and respiratory variables were continuously monitored throughout exercise. Changes in blood lactate and glucose concentrations were also determined.
RESULTS: SpO_2 during exercise remained significantly lower in HYP ($P < 0.05$). Mean power output during exercise did not differ significantly between HYP and NOR. No significant difference between the trials was observed for blood lactate and glucose concentrations. Both trials showed significant increases in deoxygenated hemoglobin (deoxy-Hb) (241.7 ± 46.9 % in HYP vs. 175.8 ± 27.2 % in NOR) and total hemoglobin (total-Hb) (138.0 ± 18.1 % in HYP vs. 112.1 ± 6.7 % in NOR) for triceps brachii muscle, but the exercise-induced elevations of these variables were significantly greater in HYP ($P < 0.05$). During exercise, systemic oxygen uptake was significantly lower in HYP (2126 $\pm$ 108 ml/kg/min) than in NOR (2531 $\pm$ 74 ml/kg/min) ($P < 0.05$).
CONCLUSIONS: Exercise-induced elevation of total-Hb was profound during repeated double-poling sprint exercise in hypoxia, suggesting augmented blood volume (blood perfusion) in working muscles. In addition, power output during exercise was not affected by hypoxia, although systemic oxygen uptake was significantly lower.

3074   Board #7   June 2 9:00 AM - 11:00 AM

High-intensity Interval Training In Hypoxic Condition Accelerate The Anerobic Glycolytic System

Marie Oriishi[1], Hayato Ohnuma[2], Masahiro Hagiwara[3], Ryo Yamanaka[4], Toshiyuki Ohya[5], Kazunori Asaba[6], Takashi Kawahara[2], Yasuhiro Suzuki[2]. *[1]Tsukuba University, Ibaraki, Japan. [2]Japan Institute of Sports Sciences, Tokyo, Japan. [3]Japan Olympic Committee, Tokyo, Japan. [4]Teikyoheisei University, Chiba, Japan. [5]Chukyo University, Aichi, Japan. [6]Yamanashi Gakuin University, Yamanashi, Japan.*

(No relevant relationships reported)

We previously demonstrated that 7 days of intermittent hypoxic training improved performance in the maximal anaerobic running test (MART) (ACSM 2015). It is expected that the high-intensity interval training (HIT) in hypoxic condition is one of the key of performance enhancement method. However, the differences of physiological response during HIT between in hypoxia and in normoxia is not clear. **PURPOSE**: The purpose of the present study was to compare the physiological response during HIT in hypoxic condition with normoxic condition in well-trained 400m or 800m runners.**METHODS**: Thirty-five well-trained university female 400m or 800m runners were assigned to either hypoxic group (n=18) or normoxic group (n=17). The hypoxic group completed 5 sets of 30 seconds maximal effort pedaling in a normobaric hypoxic room (FIO2=14.4%; 3000m). The rest periods between each sets were 4 minutes. The normoxic group completed the same exercise in ambient normobaric normoxia (60m). Mean power and peak power of each sets were recorded. Blood lactate concentration (La) was measured 1 minute after each sets of pedaling. **RESULTS**: No significant differences with hypoxic and normoxic group were found in mean power of each sets (hypoxic group: 464.7 $\pm$ 56.2, 396.4 $\pm$ 39.0, 324.7 $\pm$ 31.6, 286.2 $\pm$ 28.2, 245.7 $\pm$ 24.5, normoxic group: 455.5 $\pm$ 61.5, 396.9 $\pm$ 43.0, 339.0 $\pm$ 31.6, 293.2 $\pm$ 29.8, 249.1 $\pm$ 25.6 W). No significant differences between hypoxic and normoxic group were found in peak power of each sets (hypoxic group: 577.0 $\pm$ 77.2, 509.7 $\pm$ 55.1, 407.0 $\pm$ 46.6, 345.8 $\pm$ 41.9, 287.6 $\pm$ 30.6, normoxic group: 553.3 $\pm$ 85.4, 493.2 $\pm$ 61.6, 412.1 $\pm$ 45.3, 344.9 $\pm$ 41.0, 287.5 $\pm$ 34.0 W). La values from hypoxic group were significantly higher than normoxic group after every sets of pedaling ($p < 0.01$, 1st set: 16.5 $\pm$ 2.5 vs. 13.3 $\pm$ 2.1, 2nd set: 19.9 $\pm$ 2.5 vs. 16.7 $\pm$ 2.0, 3rd set: 21.7 $\pm$ 2.5 vs. 17.5 $\pm$ 1.9, 4th set: 21.1 $\pm$ 2.4 vs. 17.6 $\pm$ 1.9, 5th set: 21.2 $\pm$ 2.2 vs. 17.9 $\pm$ 1.7 mmol/l).**CONCLUSIONS**: The power produced during high-intensity interval training is not affected by hypoxic condition. However, energy production through anaerobic glycolytic system seems to accelerate in hypoxic condition.

G-21   Thematic Poster - **Bone Quality in Athletes and Special Populations**

Saturday, June 2, 2018, 9:00 AM - 11:00 AM
Room: CC-Lower level L100E

3075   **Chair:** George A. Kelley, FACSM. *West Virginia University, Morgantown, WV.*

(No relevant relationships reported)

3076   Board #1   June 2 9:00 AM - 11:00 AM

Changes in Bone Mineral Density of Middle and Long Distance Runners Across an Indoor Season

Ronald Otterstetter, FACSM[1], Jordan T. Olson[1], Marissa N. Baranauskas[2], Brian Miller[1], Michelle M. Boltz[1], Laura Richardson[1], Matthew Juravich[1]. *[1]The University of Akron, Akron, OH. [2]Indiana University, Bloomington, IN.*

(No relevant relationships reported)

INTRODUCTION: Bone mineral density (BMD) is an important aspect of bone health in endurance runners. Musculoskeletal overuse injuries to the bone, such as stress reactions and stress fractures, are of major concern to endurance runners and coaches because of the debilitating nature they have on training and performance. A greater understanding of BMD in these athletes can lead to a reduction in stress injuries to bone. PURPOSE: To determine changes in total and segmental BMD over the course of an indoor track season between sexes and between middle and long distance event groups. METHODS: Volunteers from a collegiate track team (N=21; men=13/women=8; Age= 20.3 +/- 1.1 yrs.) were recruited. Dual x-ray absorptiometry (DEXA) was used to measure BMD before and after the 8-week indoor track and field season. Runners were classified as long or middle distance based on their current and past training history. Total and segmental BMD data were collected from DEXA output. A 2x2 factorial design using an ANCOVA procedure, adjusting for the pre-season BMD, was used to identify differences by sex and distance. RESULTS: Significant differences ($p<0.001$) were observed in leg BMD by sex (Men= 1.54 ± 0.12 g/cm²; Women= 1.34 ± 0.04 g/cm²) with an adjusted mean difference of 0.176 g/cm². The men had an increase in their leg BMD, while women did not change over the length of the season. No other significant differences were found in total body BMD or any segmental BMD measures when comparing event classification or sex. CONCLUSION: The findings provide support for BMD awareness with runners to facilitate mechanisms for reduced injuries. For the current study, the stress placed on the bones of the runners over the span of an indoor track and field season was enough to maintain and even elicit favorable changes in leg segmental BMD. Training volume and intensity were not factors in BMD changes across a track season. Additional investigation on differences among sex is warranted for healthy endurance athletes.

3077   Board #2   June 2 9:00 AM - 11:00 AM

Bone Mineral Density in Master Olympic Weightlifters

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(No relevant relationships reported)

Research has demonstrated the effects of resistance training on bone mineral density (BMD). Olympic style weightlifting, unlike traditional resistance training, uses

the entire body to conduct higher load lifts at higher velocities and lower training volumes. Little research has been done in looking at the Olympic style weightlifting and the impact it can impose on the body. Whether this mode of training results in similar BMD adaptations is unknown, particularly in middle and older age adults. **PURPOSE**: To determine the influence of age and sex on BMD in Masters Olympic Weightlifters when body mass index, weightlifting experience and strength were controlled. **METHODS**: Men (n = 27) and women (n= 24) competitors from the 2017 National Masters Championship (age: 35 to 76 years) volunteered for BMD (g/cm^2) measurement using a dual energy X-ray absorptiometry (DXA) for the following sites: spine (L1-L4), femoral neck, radius and total body. For each site, separate regression models were developed using age, sex, body mass index (BMI), experience level (years of competitive lifting), and strength (meet clean and jerk performance to body mass ratio). **RESULTS**: The set of independent variables were statistically significant predictors of BMD for the radius (P<.001, R$^2_{adj}$=.50), femoral neck (P=.009, R$^2_{adj}$=.25) and total body (P=.001, R$^2_{adj}$=.36). The model for the spine was not statistically significant (P=.056, R$^2_{adj}$=.15). BMI and strength, individually, were significant predictors of radial BMD while BMI was a significant predictor for total body BMD. Neither sex nor age were significant predictors of BMD for any of the four sites. **CONCLUSIONS**: Previous studies have noted that with aging, BMD declines, especially in women post-menopause. Our study revealed that there were no sex differences, nor was age or weight lifting experience significant predictors for BMD at the four sites considered. One interpretation of these results is that the Olympic style weight training may reduce age and sex related declines in BMD. Future research will compare BMD between age and sex matched runners and sedentary individuals to determine the accuracy of this interpretation.

3078   Board #3   June 2 9:00 AM - 11:00 AM
Effect Of Symmetric Weight Training On Imbalanced Humerus Bone Mineral Density Of Arms In Baseball Pitchers

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(No relevant relationships reported)

Background: Mechanical stress is known as a strong stimulus for bone growth. **Purpose**: To examine effect of bilateral balanced weight training on the disparity in bone mineral density (BMD) between dominant and non-dominant arm of baseball players. **Methods**: Baseball players (N = 25, aged 18-22 y) participated in this study after baseline measurement under overnight fasted condition. Participants received either high protein (36% protein, 6.8 kcal per kg) or low protein (12% protein, 6.8 kcal per kg) supplementations immediately after each resistance workout, 3 days a week, for 12 weeks. Three days after the last exercise-training bout, BMD were assessed by dual-energy x-ray absorptiometry (DEXA). **Results**: The baseline data show an unequivocal greater humerus bone mineral density in the dominant arm compared to contralateral non-dominant arm (~20% greater) for all baseball players without exception. However, none other locations had significant asymmetry in BMD between limbs. Weight training significantly increased humerus bone BMD (main effect), but mildly decreased total body BMD. Resistance training increased BMD in humerus bone of dominant arm and decreased whole-body BMD. No interactive effect of training and diet on BMD was found. **Conclusion**: Weight training leads to bone mineral redistribution between arm and leg, but the difference of humerus bone between both arms cannot be altered.
Keyword: BMD, resistance exercise, weight training

3079   Board #4   June 2 9:00 AM - 11:00 AM
A 9-month Jumping Intervention to Improve Bone Acquisition in Adolescent Male Athletes: The PRO-BONE Study

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(No relevant relationships reported)

Participation in different loading sports during growth can have different effects on bone status and development. However, there is no evidence how to improve bone acquisition in adolescent athletes involved in weight-bearing and non-weight bearing sports. **PURPOSE**: To investigate for first time the effect of a 9-month jumping intervention programme on bone mass, geometry and microarchitecture in adolescent males participating in weight-bearing (soccer, SOC) and non-weight bearing (swimming, SWI & cycling, CYC) sports. **METHODS**: 93 adolescent males (13-15 years) were included. Sport groups were randomised to intervention and sport (INT-SWI=19, INT-SOC=15, INT-CYC=14) or sport only (CON-SWI=18, CON-SOC =15, CON-CYC=12). The intervention comprised a progressive jumping programme of 3 levels (3 months each) using weighted vests (Level 1= 20 jumps, 0 kg, 3 sets/day, 3

times/week; Level 2= 20 jumps, 2 kg, 4 sets/day, 3 times/week; Level 3= 20 jumps, 5 kg, 4 sets/day, 4 times/week). Dual-energy x-ray absorptiometry (DXA) assessed bone mineral content (BMC), hip structural analysis (HSA) assessed cross-sectional area (CSA), cross-sectional moment of inertia (CSMI) and section modulus, trabecular bone score (TBS) assessed bone microarchitecture and quantitative ultrasound assessed bone stiffness before and after the intervention. One-way analysis of covariance compared the bone gains after controlling for pre-intervention bone, change in lean mass and post maturity status. Significance was set at p<0.05. **RESULTS**: INT-CYC gained significantly (p<0.05) higher total body less head BMC (5.0 %), lumbar spine BMC (4.6 %), femoral neck BMC (9.8 %) and bone stiffness (12.3 %) than CON-CYC. INT-CYC gained significantly higher CSA (11.0 %), CSMI (10.1 %) and TBS (4.4 %) outcomes than CON-CYC. INT-SWI gained significantly (p<0.05) higher femoral neck BMC (6.0 %), legs BMC (4.2 %) and bone stiffness (12.7 %) than CON-SWI. INT-SWI gained significantly (p<0.05) higher CSMI outcomes (10.9 %) than CON-SWI. There were no significant (p>0.05) differences between INT-SOC and CON-SOC for any bone outcomes (0.9-3.9 %). **CONCLUSIONS**: The present 9-month jumping intervention improved bone outcomes in non-weight bearing sports, such as swimming and cycling, but not in a weight-bearing sport, such as soccer.

3080   Board #5   June 2 9:00 AM - 11:00 AM
Calcium, PTH, And CTX Responses to Treadmill Walking During Different Thermal Environments in Older Adults

Sarah J. Wherry, Christine M. Swanson, Pamela Wolfe, Rebecca S. Boxer, Rpbert S. Schwartz, Wendy M. Kohrt, FACSM. *University of Colorado Anschutz Medical Campus, Aurora, CO.* (Sponsor: Wendy Kohrt, FACSM)
(No relevant relationships reported)

Serum ionized calcium (iCa) decreases and parathyroid hormone (PTH) and c-terminal telopeptides of type I collagen (CTX; marker of bone resorption) increase during endurance exercise in younger and older adults. Evidence from equine models suggests this may be due to dermal calcium loss. **PURPOSE:** To determine if exercise in a warm environment exaggerates the decrease in iCa and increases in PTH and CTX compared to a cool environment. **METHODS:** Women (n=5) and men (n=7) aged 61-78 years performed two identical 1-hour treadmill walking bouts under warm (~28°C) and cool (~21°C) conditions at ~75% of maximal heart rate iCa, PTH, and CTX were measured every 15 minutes starting 15 minutes before and continuing for 60 minutes after exercise. Sweat calcium loss was estimated from sweat volume and sweat calcium concentration. Changes in iCa, PTH, and CTX were adjusted for plasma volume shifts. Between and within group differences were evaluated using maximum likelihood estimation in a repeated measures model. **RESULTS:** There was no difference in sweat calcium loss between thermal conditions. iCa decreased similarly during exercise in both conditions (W: -0.16, 95% CI: -0.28, -0.08 mg/dL; C: -0.16, 95% CI: -0.24, -0.04 mg/dL). After adjusting for plasma volume shifts, change in iCa$_{ADJ}$ was significant only for the warm condition (-0.24, 95% CI: -0.44, -0.04 mg/dL), but there was no difference between conditions. PTH increased similarly during exercise in both conditions (W: 16.4, 95% CI: 6.2, 26.5 pg/mL; C: 17.3, 95% CI: 8.1, 26.4 pg/mL). Adjusting for plasma volume shifts did not change the results. CTX increased similarly in both conditions (W: 0.08, 95% CI: 0.05, 0.11 ng/mL; C: 0.08, 95% CI: 0.01, 0.16 ng/mL), and adjusting for plasma volume shifts did not change the results. There were no differences between conditions for any outcome, even after adjusting for plasma volume shifts. **CONCLUSION:** Differing thermal conditions do not appear to be a major factor in the decrease in iCa and the increases in PTH and CTX observed during exercise in older adults. This may be due to the low sweat calcium loss during both conditions or small temperature difference. Future studies should determine if there are sex- or age-related differences that modify the relationship between sweat calcium loss and the activation of bone resorption during exercise.

3081   Board #6   June 2 9:00 AM - 11:00 AM
Bone Density Measurements in an Elite Population of Older Weightlifters

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(No relevant relationships reported)

In the aging population, low bone mineral density (BMD) is a prevalent health concern, ranging from the milder condition of osteopenia, to the more severe osteoporosis. Resistance training, particularly with heavy resistance that loads the axial skeleton is often prescribed as an intervention to increase BMD. Training for the sport of Olympic Weightlifting requires consistently exposing the axial skeleton to high loads and thus could lead to elevated BMD. **PURPOSE:** The purpose of this study was to measure total body and lumbar spine BMD in Olympic Weightlifters competing in the Masters National Championships. **METHODS:** 26 men (age: 49.8 ± 11.6 years; height: 172.9 ± 7.3 cm; weight: 85.0 ± 13.1 kg) and 21 women (age: 47.1 ± 9.3 years;

height: 158.9 ± 29.6 cm; weight: 67.8 ± 13.7 kg) competing in the 2016 Masters National Championships for Olympic Weightlifting were invited to the laboratory to undertake dual-energy x-ray absorptiometry (DXA) scans, including total body (TB) and posterior-anterior (PA) spine. A median split for age was performed, separating younger men (YM) (age: 41.2 ± 5.2 years) from older men (OM) (age: 60.4 ± 6.8 years) and younger women (YW) (age: 39.4 years) from older women (OW) (age: 53.7 ± 6.6 years). Independent T-tests were performed to compare age group within sex differences and also to compare sex within age group. **RESULTS:** Overall mean Z-score was not different between men and women for TB (men: 1.5 ± 1.5 vs. women: 2.1 ± 1.1) or PA spine (men: 1.2 ± 1.9 vs. women: 2.0 ± 1.5). Furthermore there were no significant differences between YM and OM for TB (YM: 1.6 ± 1.4 vs. OM: 1.4 ± 1.7) or PA spine (YM: 1.4 ± 2.0 vs. OM: 1.0 ± 1.8), or YW and OW for TB (YW: 2.3 ± 1.1 vs. OW: 1.7 ± 1.2) or PA spine (YW: 2.4 ± 1.1 vs. OW: 1.4 ± 1.8). Comparably, there were no significant differences between YM and YW, nor OM and OW in either TB or PA spine Z-scores. **CONCLUSIONS:** These data demonstrate that both men and women, including younger and older populations, all equally benefit from long-term, heavy resistance exercise that loads the axial spine when performed at the elite level. Based on these high Z-scores, it appears that this benefit is substantial and could be an effective intervention at developing bone density in populations with osteopenia or osteoporosis.

3082 Board #7   June 2 9:00 AM - 11:00 AM

Relationships between Circulating MicroRNAs, Bone Mineral Density and Muscle Function in Postmenopausal Women

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(No relevant relationships reported)

MicroRNAs (miRNAs, miRs) are short, non-coding RNA molecules that regulate gene expression at posttranscriptional level. Recent research has indicated that some miRNAs, such as miR-21 and miR-23a, target on genes of osteogenesis (Lian et al. 2012) and/or muscle atrophy (Wada et al. 2011). In the process of aging, there are progressive declines in bone mineral density (BMD) and muscle function, which potentially may be regulated by these miRNAs. **PURPOSE:** To examine the relationships between specific circulating miRNAs and bone density and muscle function in older postmenopausal women. **METHODS:** Seventy-five postmenopausal women aged 60 to 85 years old participated in this study. Body composition and areal BMD (aBMD) were measured by DXA. Volumetric BMD (vBMD) and bone strength were measured by pQCT. Grip strength was assessed by the digital grip strength dynamometer, whereas gait speed was assessed using the 4-meter path. Muscle power was assessed through countermovement jumps on the jump mat. Serum levels of miRNAs (miR-21, -23a, -24, -100, -125b) were analyzed using real-time PCR. **RESULTS:** MiR-21 was significantly negatively correlated with left trochanter BMC (r = -0.252, p = 0.048), right trochanter BMC (r = -0.294, p = 0.020), and cortical vBMD at tibia 38% site (r = -0.253, p = 0.047). There also was a trend for a significant correlation between miR-21 and lumbar spine aBMD (r = -0.249, p = 0.051). MiR-125b was significantly positively correlated with jump velocity (r = 0.263, p = 0.05) and relative jump power (r = 0.294, p = 0.028). **CONCLUSION**: Our results suggest that a higher expression level of circulating miR-21 is associated with decreased BMD in relatively healthy postmenopausal women, whereas a higher expression level of circulating miR-125b is associated with a greater jump power. Future investigations are needed to further explore circulating miRNAs in osteoporotic or fragile older adults.

3083 Board #8   June 2 9:00 AM - 11:00 AM

Bone Mineral Density In Older Adults With T2DM After Exercise Training: Results From Hart-D

Matthew C. Scott[1], Neil M. Johannsen[1], Damon L. Swift[2], Conrad P. Earnest, FACSM[3], Timothy S. Church[4]. [1]*Louisiana State University, Baton Rouge, LA.* [2]*Eastern Carolina University, Greenville, NC.* [3]*Texas A&M, College Station, TX.* [4]*Pennington Biomedical Research Center, Baton Rouge, LA.* (Sponsor: Conrad P. Earnest, FACSM)
(No relevant relationships reported)

PURPOSE: To examine the effects of 9-months of exercise training on whole body and regional bone mineral density (BMD) in individuals with type II diabetes mellitus (T2DM). **METHODS:** Participants (N=191, men=71; age =57±8.y; BMI=34.4±5.8kg/m²; whole body BMD=1.19±0.13g/cm²; VO_{2peak}=19.5±4.4ml/kg/min;mean±SD) from the HART-D study (NCT00458133) were randomized to aerobic (AER), resistance (RES), combined training (COMB) or a non-exercise control (CON). Compliant participants (>70% of sessions) with complete baseline and follow-up data for BMD (lumbar, thoracic, pelvis, and leg derived from whole body scans by DXA), peak oxygen uptake (VO_{2peak}), isokinetic leg strength (peak torque at 60 deg/s), and anthropometry were included in this ancillary analysis. Associations between baseline BMD values (lumbar, thoracic, pelvis, leg and whole body BMD) were compared with age, sex, and baseline measures for VO_{2peak}, isometric strength, and T2DM duration. Changes over 9-months were analyzed for group effects after adjusting for baseline. Changes in BMD were compared with age, sex, and changes in VO_{2peak} and muscle strength. **RESULTS:** Baseline associations showed that age was inversely related to pelvis BMD (p=0.006, r=-0.20) and females had significantly lower thoracic, lumbar, and whole body BMD (p<0.001). VO_{2peak} was correlated to leg (p<0.001, r=0.31) and whole body (p=0.02, r=0.17) BMD, and isokinetic leg strength was correlated to thoracic (p<0.001, r=0.26), pelvic (p<0.001, r=0.28), leg (p<0.001, r=0.46), and whole body (p<0.01, r=0.34) BMD. All groups increased whole body BMD with exercise training (P<0.05); however, no group effects were found for BMD changes after 9-months (p>0.10). Changes in pelvic BMD were found to be higher in females (p=0.04) than males and changes in VO_{2peak} were inversely correlated with changes in thoracic BMD (p=.04, r=-.15). No significant effects were observed. **CONCLUSION:** Sex, aerobic fitness, and muscle strength had similar relationships with BMD in individuals with T2DM as typically found in the normal adult population. However, group changes after 9-months of exercise training, while increased, were not different from the changes in CON. *Funding provided by the National Institutes of Health, R01-DK068298.*

G-22 Thematic Poster - **Exercise and Sport Psychology- Applications of Technology**

Saturday, June 2, 2018, 9:00 AM - 11:00 AM
Room: CC-Lower level L100F

3084 **Chair:** Chris Pitsikoulis. *Aurora University, Aurora, IL.*
(No relevant relationships reported)

3085 Board #1   June 2 9:00 AM - 11:00 AM

The Effect of Treadmill Walking, Smartphone Use and School Work on Positive and Negative Affective States in College Students

Jacob E. Barkley, Andrew Lepp, Ashlyn Grose. *Kent State University, Kent, OH.* (Sponsor: Ellen Glickman, FACSM)
(No relevant relationships reported)

Excessive internet-connected, cellular telephone (smartphone) use is associated with greater anxiety and lower quality of life in college students. However, the acute effect of a bout of smartphone use on positive and negative affect and how this may differ from other, common activities (i.e., low-intensity exercise, school work) in college students, has not been studied.
PURPOSE: To compare the effects of separate bouts of smartphone use, treadmill walking, and school work on positive and negative affect in college students.
METHODS: Forty one college students (n = 25 female, 21.7 ± 2.0 years old) completed four, 30-minute conditions (control, treadmill walking, smartphone, school work), on separate days, in a controlled, laboratory environment: 1) Control, participants were seated on a chair in a quiet room. 2) Walking, participants walked at 3.1 mph on a treadmill. 3) Smartphone, participants utilized their smartphones to interact with their personal social-media accounts (e.g., Facebook, Twitter). 4) School work, participants completed self-selected school work (e.g., studying). Participants completed the positive and negative affect scale pre- and post-condition.
RESULTS: Analyses of variance revealed a significant (F = 22.3, p < 0.001) condition by time interaction for positive affect which significantly increased (t = 4.2, p < 0.001) from pre- to post-condition during walking (21.8 ± 8.4 pre, 27.4 ± 9.9 post), did not change (t = 1.2, p = 0.24) during school work (21.8 ± 7.7 pre, 23.0 ± 8.2 post) and significantly (t ≥ 3.7, p ≤ 0.001) decreased during both the smartphone (21.5 ± 8.1 pre, 17.2 ± 6.7 post) and control (19.8 ± 7.8 pre, 14.9 ± 5.8 post) conditions. There was also a significant (F = 15.6, p = 0.05) condition by time interaction for negative affect which significantly decreased (t = 2.3, p = 0.03) from pre- to post-condition during school work (13.4 ± 4.4 pre, 12.4 ± 4.1 post) and did not significantly change (t ≤ 1.6, p ≥ 0.11) for the remaining conditions (control: 12.5 ± 3.5 pre, 13.7 ± 4.1 post; walking: 12.3 ± 3.7 pre, 11.8 ± 2.7 post; smartphone: 12.5 ± 3.3 pre, 12.4 ± 2.6 post).
CONCLUSION: Walking on a treadmill increased positive affect and school work decreased negative affect in college students. Conversely, a bout of smartphone use significantly decreased positive affect and did not reduce negative affect.

3086　Board #2　June 2 9:00 AM - 11:00 AM

Physical Activity And Tablet-based Stem Learning: Effects On Children'S Executive Function In Low-income Childcare

April Bowling, Chris Marcella, Sarah Boucher, Katherine Donnelly, Samantha Durand, Jacqueline Ochoa, Kevin Finn, FACSM. *Merrimack College, North Andover, MA.* (Sponsor: Kevin Finn, FACSM)

(No relevant relationships reported)

Low-income children are at disproportionate risk of low physical activity (PA) and school achievement. Exercise has been shown to positively affect executive function (EF) in children, and may act to prime the brain for learning. Likewise, tablet-based learning applications are an engaging educational modality that can be employed in diverse settings. However, little research exists in real world settings, particularly regarding the robustness of EF improvements after engagement with electronic learning technologies. **PURPOSE:** To investigate changes in children's EF pre-/post-PA, versus pre-/post-PA incorporating a tablet-based STEM learning platform in a real-world low-income childcare setting. **METHODS:** Children (n=19, ages 7-10) attending a YMCA summer childcare program serving low-income families participated in a control condition (40 minutes of quiet reading), and two, 40 minute PA sessions, one immediately followed by 5-10 minutes of a tablet-based science, technology, engineering, and math (STEM) lesson (PA+tablet). PA sessions utilized aerobically-oriented games led by trained staff. Pedometers were used to measure children's total steps during PA. EF was measured and pre- and post- all three conditions. Children were randomly assigned to condition order. Relationships between condition and Stroop score changes were assessed using multi-level mixed effects linear regression, controlling for condition order, test administrator, child age and gender. **RESULTS:** Children averaged 954.5 steps per PA session (SD±751.8). Relative to the control condition, participation in PA was associated with a 0.73 point improvement in Stroop score; that improvement was not significant (p=0.71). However, participation in PA+tablet resulted in a 3.5 point deterioration in Stroop score relative to the control condition (p=0.08). **CONCLUSION:** In a real world setting serving children at risk of low-physical activity and scholastic achievement, PA may prime children for learning by improving EF, but improvements do not appear to be sustained after engagement in tablet-based STEM learning.

3087　Board #3　June 2 9:00 AM - 11:00 AM

Chronic Systemic Inflammation Moderates the Relationship Between Adiposity and Behavioral and Neuroelectric Indices of Attention

Grace M. Niemiro[1], Anne M. Walk[1], Caitlyn G. Edwards[1], Melisa A. Bailey[1], Sarah K. Skinner[1], Michael De Lisio[2], Nicholas A. Burd[1], Hannah D. Holscher[1], Naiman Khan[1]. [1]*University Of Illinois at Urbana - Champaign, Urbana, IL.* [2]*University Of Ottawa, Ottawa, ON, Canada.*

(No relevant relationships reported)

PURPOSE: Two-thirds of the US population today is living with overweight or obesity, signifying a serious public health concern. One co-morbidity of obesity is chronic inflammation, which contributes to cardiovascular and metabolic disease, and is often indicated by elevated plasma C-reactive protein (CRP) concentrations. Further, adiposity has been linked to decrements in selective aspects of cognitive function. However, the potential interactive effects of adiposity and inflammation on cognitive function are limited. This study aimed to examine the relationships among plasma CRP concentrations, cognitive function, and adiposity. **METHODS**: 36 adults (25-45 years) underwent a fasted venous blood draw for measurement of CRP and a dual x-ray absorptiometry (DXA) scan for quantification of whole body adiposity. Cognitive function was assessed using a two-stimulus visual oddball paradigm while underlying event-related brain potentials were recorded. Specifically, the latency of the P3 waveform in a central-parietal region of interest (ROI) was used to index attentional resource allocation and information processing speed, respectively. **RESULTS**: According to bivariate correlations, plasma CRP was positively associated with whole body percent fat (r=0.55, p<0.001). Whole body percent fat and CRP were negatively correlated with target accuracy (r=-0.28, p=0.048; r=-0.44, p=0.003; respectively). Whole body percent fat was correlated with lower peak latency difference (target peak latency - non-target peak latency) in the ROI (r=-0.38, p=0.01), signifying poorer modulation in cognitive processing speed. Yet, adjustment of plasma CRP using partial correlations revealed that the relationship between adiposity and target accuracy (r=-0.13, p=0.23), and P3 peak latency difference (r=-0.24, p=0.09) was mitigated (All, P >0.05). **CONCLUSIONS**: The cross-sectional relationship between adiposity and cognitive function was moderated by the extent of systemic inflammation in overweight and obese adults. Future studies are needed to determine whether reducing chronic systemic inflammation via exercise and nutritional manipulations prevents the negative implications of adiposity for cognitive function.

3088　Board #4　June 2 9:00 AM - 11:00 AM

Adults' Smartphone Use Predicts Being an Active Couch Potato

Andrew Lepp[1], Jacob E. Barkley[1], Curtis Fennell[2]. [1]*Kent State University, Kent, OH.* [2]*University of Montevallo, Montebalo, AL.* (Sponsor: Ellen Glickman, FACSM)

(No relevant relationships reported)

Physical activity is typically negatively associated with sedentary behavior. However, individuals who exercise regularly but allocate large amounts of time to sedentary behavior are an exception to this relationship and known as "active couch potatoes" (ACP). The ACP is of concern as the negative health effects of sedentary behavior appear to be independent of the benefits of physical activity. Previously published research found a positive relationship between smartphone use and sedentary behavior but no relationship between smartphone use and physical activity. Therefore, being a high smartphone user may predict being an ACP (i.e., being highly sedentary yet sufficiently physically active). This idea was previously explored with a correlational study using a sample of college students. In that study, smartphone use was associated with being an ACP. However, this relationship has not been tested in adults beyond college age. Furthermore, previous research did not include the most commonly studied predictor of sedentary behavior - TV viewing. **PURPOSE:** To test whether adults' smartphone use, TV viewing, sex and age predicts being an ACP. **METHODS:** A sample of 423 adults ($n = 277$ female, 40 ± 16 years old) completed surveys assessing physical activity and sedentary behavior. Daily smartphone use and TV viewing were also assessed. Participants were coded as an ACP (or not) based off scores from the physical activity and sedentary behavior surveys. A binary logistic regression was used to test whether smartphone use, TV viewing, sex and age were predictors of being an ACP. **RESULTS**: The binary logistic regression model was statistically significant, $\chi 2 = 50.96$, $p < 0.001$ ($df = 4$). Sex and TV watching were not significant predictors of being an ACP (Wald ≤ 1.148, $p \geq 0.284$). Age and smartphone use were significant predictors of being an ACP (Wald ≥ 6.545, $p \leq 0.011$). Results revealed an inverse relationship between age and the likelihood of being an ACP, and a positive relationship between smartphone use and the likelihood of being an ACP. **CONCLUSIONS**: Similar to college students, increased smartphone use predicted being an ACP in adults beyond college age. Because TV viewing was not a predictor, greater attention should be given to understanding the relationship between smartphone use and the health compromising ACP lifestyle.

3089　Board #5　June 2 9:00 AM - 11:00 AM

Factors Related to Accelerometer-determined Patterns of Physical Activity in Adults: The Houston Train Study

Erin E. Dooley[1], Deborah Salvo[1], Kelley Pettee Gabriel, FACSM[1], Ashleigh M. Johnson[1], Casey P. Durand[2], Gregory Knell[2], Samantha J. Kreis[1], Ipek N. Sener[3], Harold W. Kohl, III, FACSM[1]. [1]*The University of Texas Health Science Center at Houston (UTHealth) School of Public Health in Austin, Austin, TX.* [2]*The University of Texas Health Science Center at Houston (UTHealth) School of Public Health in Houston, Houston, TX.* [3]*Texas A&M Transportation Institute, Texas A&M University System, Austin, TX.*

(No relevant relationships reported)

Meeting U.S. Physical Activity (PA) Guidelines has health benefits. Yet, little is known about factors related to changes in PA over time, particularly among minority populations. **PURPOSE:** To examine sociodemographic, PA preferences (for walk and bike), and health factors related to accelerometer-derived patterns of 1-year PA change in the Houston Travel Related Activity in Neighborhoods (TRAIN) Study, a majority-minority cohort. **METHODS:** Participants wore an ActiGraph wGT3X-BT monitor and completed self-report surveys at baseline and follow-up. Valid wear time was defined as ≥ 4 days, ≥ 10 hrs/day. PA was stratified by meeting Guidelines using total MVPA defined by Freedson. Four PA patterns were defined: (i) maintain high activity above Guidelines, (ii) increased to meet Guidelines, (iii) decreased from meet to not meet Guidelines, and (iv) maintained low activity. Multinomial logistic regression was used to examine associations between studied factors and each PA pattern, with the 'maintain high' group as referent. **RESULTS:** Complete data were available for 153 adults (19% maintained high activity, 8.5% increased, 13% decreased, 59.5% maintained low activity). Controlling for all variables, males (OR = 0.3, 95% CI = 0.1, 0.9) had lower odds of being in the 'maintain low' group. Blacks (vs. whites, OR = 18.8, 95% CI = 2.6, 275.0), those liking biking (vs. strongly liking, OR = 4.6, 95% CI = 1.3, 15.6), and older participants (vs. younger, on continuous scale, OR = 1.1, 95% CI = 1.0, 1.1) had higher odds of being in the 'maintain low' group. Factors directly associated with being in the 'increased' group were being black (vs. white, OR = 17.9, 95% CI = 1.3, 120.9), strong dislike for biking (vs. strongly liking OR = 25.2, 95% CI = 1.6, 401.3), and having

more chronic diseases (vs. less, on continuous scale, 95% CI = 1.5, 11.7). Having low educational attainment (vs. high, OR = 0.04, 95% CI = 0.0, 0.9) was inversely associated with being in the 'increased' group. No studied factors were significantly associated with being in the 'decreased' group.

CONCLUSION: PA patterns are dynamic and suggest that sociodemographic, PA preferences, and health factors relate to change patterns over time. Future studies should examine the role of these factors over longer follow-up periods, and consider these factors when designing interventions.

3090　Board #6　　　　　　　June 2 9:00 AM - 11:00 AM

Computerized Forecast Modeling to Predict Energy Intake: Perceptions of Adopting New Technology

Marissa Baranauskas, Judith A. Juvancic-Heltzel, Laura Richardson, Shiva Sastry. *The University of Akron, Akron, OH.* (Sponsor: Ronald Otterstetter, FACSM)

(No relevant relationships reported)

Alarming trends in obesity precipitate the examination of current weight-management strategies used by exercise professionals (EPs). Unaddressed energy balances negatively affect the efficacy of weight-management interventions. However, the scope of practice of EPs limits their ability to address energy imbalances through observation of trends in dietary intake. Common methods, such as the 24-hr dietary recall, tend to underestimate energy intake (EI) especially in overweight and obese populations, and are associated with poor adherence. Furthermore, traditional dietary recall methods assess past EI without considering how future EI patterns change over time. Therefore, the development of new technologies to accurately facilitate EPs in addressing EI imbalances, and improve the effectiveness of weight-management interventions is warranted.

PURPOSE: To investigate perceptions of a new technology designed to track EI via computerized forecast modeling. METHODS: Evaluating perspectives towards technology can be difficult using traditional Likert scale surveys. Q Methodology provides an avenue to systematically study subjectivity by using factor analysis and correlation to assess agreement and variances of views. Participants (N = 11, 2 males, 9 females; 47 ± 17 yrs.; BMI 26± 5 kg·m-1) sorted 44 statements from "most like my view" to "most unlike my view." The Q sort consisted of statements associated with the Transtheoretical Model of behavior change, barriers, and the adoption of a new technology to track EI. RESULTS: Factor analysis revealed two factors of participants' views: compliant dieters and dedicated exercisers. CONCLUSION: Two converging views emerged surrounding the adoption of a new technology designed to track nutritional intake. Consensus between factors provides tangible evidence of technology apprehension. Overall, the analysis identifies how facets of a diverse population will perceive a novel technology designed to track EI, and provides insight into how distinct barriers can be overcome to enhance adoption. Conducting preliminary research regarding perceptions of technology adoption can enhance the development and marketability of an EI forecasting system.

3091　Board #7　　　　　　　June 2 9:00 AM - 11:00 AM

Effects of Physical Activity Trackers and Motivational Interviewing on Mood in Chronic Low Back Pain

Maria Perez, Laura D. Ellingson, Jeni E. Lansing, Kathryn J. Southard, Jacob D. Meyer, Gregory J. Welk, FACSM. *Iowa State University, Ames, IA.* (Sponsor: Gregory J. Welk, FACSM)

(No relevant relationships reported)

Annually, ~23% of individuals suffer from chronic low back pain (CLBP). Physical activity (PA) is a recommended treatment and increasing PA also improves mood-related symptoms, which are prevalent in those with CLBP. However, effective strategies to increase PA and their effects on mood in CLBP are unknown. **PURPOSE:** We examined the effects of using an activity tracker (AT) alone or in combination with motivational interviewing (MI) on PA and mood in CLBP. **METHODS:** Fifty-one adults with CLBP (51% women; mean age 44 ± 10.6) were randomized to receive either: an AT (AT, n = 18), an AT with three sessions of MI (MI, n = 17) or were placed in a wait-list control group (WL, n = 16) for 12 weeks. Changes steps/day (activPAL) and mood (Profile of Mood States [POMS]) over the intervention were evaluated with Group X Time repeated measures ANOVA and effect sizes (Cohen's d). Correlation coefficients (Pearson's r) assessed relationships between changes in PA and changes in mood. **RESULTS:** There were non-significant (p > 0.05) increases in steps/day for intervention groups (MI: $1,019 \pm 2,665$; AT: $897 \pm 2,468$) and a small decrease for WL (-182 ± 2,434). POMS Total Mood Disturbance (TMD) improved across all groups (p = 0.001). Groups were not significantly different for either outcome (p > 0.05); however, larger effect sizes were observed for intervention groups for PA (MI d = 0.30; AT: d = 0.28; WL: d = 0.06) and TMD (MI: d = 0.42; AT: d = 0.48; WL: d = 0.28). When examining POMS subscales, significant improvements were observed across groups for Depression (p = 0.023) and Fatigue (p < 0.020). For Vigor, there was a significant Group X Time interaction (p = 0.011). Vigor improved for AT (d = 1.02) and MI (d = 0.52) and decreased for WL (d = 0.46). Across groups, change in PA

was significantly and positively associated with change in Vigor (r = 0.32; p = 0.022). When examining groups individually, the association remained significant for the MI group only (r = 0.62; p = 0.006).

CONCLUSION: Results suggest that AT alone and with MI may be effective for improving PA and vigor in CLBP. Future research is needed to determine the intervention components that are most effective for increasing PA and to elucidate possible mechanisms underlying the beneficial effects of changes in PA for patients with CLBP.

3092　Board #8　　　　　　　June 2 9:00 AM - 11:00 AM

Behavior Change Theory Taxonomy Analysis of Smartphone Apps for Fitness, Nutrition, and Weight Loss

Joy Furlipa, Kimberly Reich. *High Point University, High Point, NC.*

(No relevant relationships reported)

A majority of Americans do not meet physical activity or nutrition guidelines for health. Convenient interventions to support healthy behaviors may be beneficial. Smartphone use has become ubiquitous, with apps that are an integral part of life for many. The health and fitness category of apps is robust and growing, but the potential for these apps to affect health behavior change is poorly understood. **PURPOSE**: To evaluate top-ranked fitness, nutrition, and weight-loss smartphone apps for incorporation of evidence-based behavior change strategies. **METHODS**: Two investigators coded descriptions of the 150 top-ranked "free" apps in the health and fitness category of the US iOS app store for evidence of health behavior change strategies using the Behavior Change Technique (BCT) Taxonomy (v1). Prevalence of taxonomy items were calculated and Pearson correlations were estimated for the relationship between BCTs per app and customer ranking, as well as for the relationship between BCTs per app and app store ranking. Significance was set at p < 0.05. **RESULTS**: 71 app descriptions were identified as fitness, nutrition, and/or weight-loss focused. Of those, 45.1% incorporated goals and planning; 57.7% incorporated feedback and monitoring; 56.8% incorporated social support; 29.6% incorporated comparison of behavior; 29.6% incorporated shaping knowledge; 22.5% incorporated associations; 11.6% incorporated reward and threat; 9.9% incorporated antecedents; and 5.6% incorporated natural consequence. Only 17 of the 93 techniques in the BCT taxonomy were utilized across all coded apps. There was a trend towards a weak negative correlation between number of BCTs per app and app store ranking (r = -0.22, p = 0.06) and no significant correlation between number of BCTs and customer rating (r = -0.02, p = 0.87). 45.1% of the "free" apps offered a premium version, in addition, and 11.3% required a paid subscription after download. **CONCLUSIONS**: Goal planning, monitoring, feedback, and social support were the most common strategies found in the popular fitness, weight-loss, and nutrition apps, though more must be learned about their effectiveness. Furthermore, there is potential to incorporate a greater variety of health behavior change techniques.

G-23　Thematic Poster - **Jumping and Landing**

Saturday, June 2, 2018, 9:00 AM - 11:00 AM
Room: CC-Lower level L100H

3093　　**Chair:** Robin Queen, FACSM. *Virginia Tech, Blacksburg, VA.*

(No relevant relationships reported)

3094　Board #1　　　　　　　June 2 9:00 AM - 11:00 AM

Association Of Flexibility And Jump Landing Kinematics On The Recovery Of Lower Body Power And Strength Following Exhaustive Exercise

Thomas Kopec[1], Mark Richardson[2], Phillip Bishop[3], Lizzie Hibberd[2], James Leeper[2], Bailey Welborn[2], Mike Esco, FACSM[2]. *[1]Samford University, Birmingham, AL. [2]University of Alabama, Tuscaloosa, AL. [3]Liberty University, Lynchburg, VA.* (Sponsor: Mike Esco, FACSM)

(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the relationship between knee flexion range of motion (ROM) and jump landing kinematics evaluated via the landing error scoring system (LESS) and the change in performance variables following an exhaustive bout of exercise. **METHODS:** Participants were measured for ROM and LESS, and then completed performance tests consisting of vertical jump (VJ), and isometric quadriceps strength assessment (ISO). Next, participants completed an exhaustive bout of exercise, and upon termination, performance variables were reassessed. Participants returned for follow-up testing at 24-, 48-, and 72-hours.

Abstracts were prepared by the authors and printed as submitted.

RESULTS: ROM was significantly correlated with the changes in VJ (ΔVJ_{24}, r = .65) and the changes in ISO (ΔISO_{24}, r = .75) at 24-hours after baseline, and ROM was also significantly correlated with the change in VJ (ΔVJ_{48}, r = .66) and the change in ISO (ΔISO_{48}, r = .79) at 48-hours follow-up, but not at 72. LESS scores were significantly correlated with ΔISO_{24} (r = .67), as well as ΔISO_{48} (r = .62), respectively, but not at 72. **CONCLUSIONS:** These findings indicate that higher levels of flexibility resulted in better mitigation of the decreases to VJ and ISO following the exhaustive bout of exercise at both 24- and 48-hours post-exhaustive exercise, but not at 72. A possible explanation for the association between higher LESS scores (poorer mechanics) and faster return of ISO towards baseline may be that those with poorer LESS scores exerted less effort during the exhaustive exercise bout and therefore did not manifest a high level of muscle damage. However, this was not supported by the non-significant relationships between LESS and the number of repetitions participants completed (r = .27); or LESS and RPE following exercise (r = -.27). The reason for these finding remains unclear. Clinicians can use ROM before training to predict the recovery of lower extremity power and strength following intense physical activity.

Pearson partial correlation coefficients		
	ROM (control LESS)	LESS (control ROM)
VJ	.27	.57
ISO	-.38	-.03
ΔVJ_{IP}	.31	.37
ΔISO_{IP}	.50	.41
ΔVJ_{24}	.65*	.44
ΔISO_{24}	.75*	.62*
ΔVJ_{48}	.66*	.37
ΔISO_{48}	.79*	.62*
ΔVJ_{72}	.43	.18
ΔISO_{72}	.45	.44

3095   Board #2   June 2 9:00 AM - 11:00 AM

Countermovement Jump Kinetics and Performance Changes from 1st to 4th year in Division I Collegiate Athletes

Demitra R. Philosophos, Jennifer L. Sanfilippo, Mikel R. Stiffler-Joachim, Bryan C. Heiderscheit, Daniel G. Cobian. *University of Wisconsin-Madison, Madison, WI.*
(No relevant relationships reported)

The countermovement jump (CMJ) is a common test of athletic ability. Kinetic analysis indicates phase-specific CMJ ground reaction rate of force development (RFD) and rate of force unloading (RFU) are associated with jump performance. Collegiate athletes complete strength and conditioning regimens to maximize athletic ability and sports performance, but it is unclear what elements of the CMJ moderate these performance improvements.
PURPOSE: To evaluate the changes in CMJ ground reaction force-time curve eccentric (ECC) and concentric (CONC) phase variables between the 1st and 4th year of participation in Division I collegiate athletics, and determine if and how these adaptations relate to changes in jump performance.
METHODS: 79 healthy NCAA Division I athletes (60 males) participating in football, soccer, basketball, hockey, and wrestling performed maximal CMJs on force plates (800 Hz) as part of standard yearly preseason evaluations. ECC and CONC phase force-time curve variables were computed, and Wilcoxon Signed-Ranks tests were used to evaluate changes in variables of interest between 1st and 4th year CMJ performance. Spearman's correlation was used to evaluate associations between CMJ height and force-time curve variable differences.
RESULTS: Jump height increased significantly (p < .001) from 1st to 4th year (38.3 ± 9.5 cm to 40.1 ± 9.1 cm), along with early phase (0-50%) ECC RFD (44.1 ± 37.6 N/s/kg to 55.1 ± 35.1 N/s/kg). Improved jump height was significantly associated with increased peak ECC RFD (rs = .274, p = .015), late phase (50-100%) ECC RFD (rs = .308, p = .006), and peak CONC RFU (rs = -.383, p < .001). Across the cohort, the force-time curve variable most strongly associated with CMJ height was peak CONC RFU (rs = -.560, p < .001).
CONCLUSIONS: Improved CMJ performance is associated with increased ground reaction force ECC RFD and CONC RFU from 1st to 4th year of participation in Division I collegiate athletics. Our results suggest that CMJ height may be maximized by training to enhance the rate of unloading through rapid generation of hip, knee, and ankle extensor torque in combination with utilization of stored elastic energy.

3096   Board #3   June 2 9:00 AM - 11:00 AM

Reliability And Between-limb Symmetry Of Joint Kinetics And Kinematics During A Countermovement Jump

Bryan C. Heiderscheit, Mikel R. Stiffler-Joachim, Jennifer L. Sanfilippo, Daniel G. Cobian. *University of Wisconsin-Madison, Madison, WI.*
(No relevant relationships reported)

Investigations of lower extremity movement biomechanics in injured populations are often designed with the assumption that limb symmetry and reliability across measurement intervals are inherent. However, the between-limb variation and long term reliability of lower extremity kinetics and kinematics in healthy comparison groups is unknown.
PURPOSE: To evaluate the test-retest reliability and between-limb symmetry of hip, knee, and ankle joint kinetics and kinematics of the countermovement jump (CMJ) in healthy Division I collegiate athletes.
METHODS: 22 Division I collegiate cross country athletes (13 females, age 19.7 ± 1.1, BMI 20.8 ± 2.2) performed maximal CMJs as part of preseason evaluations in 2 consecutive years. Whole body kinematics and ground reaction forces were recorded bilaterally. Eccentric (ECC), concentric (CONC), and landing (LAND) phase sagittal plane hip, knee, and ankle joint angles, moments, and powers were computed. Between session reliability was assessed with intraclass correlation coefficients (ICC). To evaluate limb symmetry, median between-limb differences were expressed as a percentage of the median absolute values of each variable.
RESULTS: Most variables demonstrated fair to good reliability (.4 < ICC <.75). CONC phase hip, knee, and ankle joint moment impulses (ICCs 0.69 - 0.73), peak powers (ICCs 0.75 - 0.82), and LAND phase peak angles (ICCs 0.70 - 0.71), excursions (ICCs 0.70 - 0.82), and peak powers (ICCs 0.66 - 0.72) demonstrated the greatest consistency. Rate of hip, knee, and ankle joint moments during the ECC (ICCs 0.37 - 0.56) and CONC phases (ICCs 0.37 - 0.58) were less reliable. Between-limb variation in hip and knee joint peak angles throughout all CMJ phases was < 5% of absolute values. LAND moments, impulses, powers, and work demonstrated substantially greater between-limb asymmetry (14 - 46% of absolute values) than CONC phase variables (6 - 12%).
CONCLUSIONS: CMJ CONC phase hip, knee, and ankle joint impulses and powers have the greatest limb symmetry and reliability across intervals in healthy collegiate athletes. Sports medicine clinicians and scientists should be aware of the expected between-limb asymmetry and variation across testing intervals when assessing CMJ biomechanics in injured populations or attempting to evaluate the effects of intervention.

3097   Board #4   June 2 9:00 AM - 11:00 AM

Biomechanical Risk Factors For Recurrent Ankle Sprains During Landing/Cutting In Ankle Instability Patients: 6-month Follow-up

S. Jun Son, Dustin Bruening, Brent Feland, Matthew Seeley, Ty Hopkins, FACSM. *Brigham Young University, Provo, UT.* (Sponsor: J. Ty Hopkins, FACSM)
(No relevant relationships reported)

Altered movement patterns have consistently been observed in chronic ankle instability (CAI) patients during landing and cutting tasks. Altered foot placement along with changes in joint moments have been identified as risk factors for ankle sprains. However, to examine a causal effect between biomechanical factors and risk of ankle injury, research should be conducted in a prospective design.
PURPOSE: To identify biomechanical risk factors related to recurrent ankle sprains during jump landing/cutting in CAI patients at a 6-month follow-up.
METHODS: 91 of 100 CAI patients completed a 6-month follow-up survey, and 13 CAI patients (7M, 6F, 22 ± 2 yrs, 174 ± 11 cm, 75 ± 15 kg, 84 ± 5% FAAM-ADL, 65 ± 12% FAAM-Sports, 5.8 ± 3 sprains) reported recurrent sprains within 6 months, and 78 CAI patients (39M, 39F, 22 ± 2 yrs, 174 ± 11 cm, 74 ± 14 kg, 85 ± 6% FAAM-ADL, 69 ± 10% FAAM-Sports, 3.3 ± 2 sprains) did not have recurrent injury after the initial data collection where subjects performed 10 jumps consisting of a maximal vertical jump-landing and cutting at 90°. Functional linear models were used to detect between-group differences. If 95% confidence intervals did not cross zero, differences were significant.
RESULTS: Figure 1 shows that CAI patients who suffered ankle sprains within 6 months showed several biomechanical differences including (i) more plantarflexion, less knee flexion and more knee abduction angles, and (ii) increases in plantarflexion, inversion, knee extension, knee abduction and hip abduction moments over various portions of stance relative to those who did not have recurrent injury.
CONCLUSIONS: CAI patients who suffered recurrent sprains within 6 months demonstrated altered foot placement (4° more plantarflexion) along with more inversion moment and altered frontal knee and hip biomechanics. Moreover, these patients reported a greater number of previous ankle sprains (5.8 sprains) relative to those who did not have reinjury at a 6-month follow-up (3.3 sprains).

Figure 1. Grand ensembles for lower extremity joint angles and internal moments in the sagittal and frontal planes during a jump landing/cutting task between CAI patients who experienced recurrent ankl sprains within 6 months and CAI patients who did not have recurrent sprain injury at a 6-month follow-up. 0% of stance indicates inital foot contact, 50% of stance indicates peak ankle dorsiflexion and knee flexion, and 100% of stance indicates toe-off during the task. When 95% confidence intervals (shaded area) did not cross the zero (horizontal red line), between-group differences were significant. Abbreviations: DF, dorsiflexion; PF, plantarflexion; Add, adduction; Abd, abduction.

3098　　　**Board #5**　　　　　　June 2 9:00 AM - 11:00 AM

The Biomechanical Pattern Of Multidirectional Single-leg Landing In Professional Dancers And Non-dancers

Ana M. Azevedo[1], Raul Oliveira[1], Joao R. Vaz[2], Nelson Cortes[3]. [1]University of Lisbon, Lisbon, Portugal. [2]University of Nebraska at Omaha, Omaha, NE. [3]George Mason University, Manassas, VA.
(No relevant relationships reported)

Professional dancers (PD) have a high injury rate (42% to 97%) with more than 50% occurring in the lower extremity (LE). PD are required to perform repetitive multidirectional single-leg landings. Therefore, it is important to investigate the landing biomechanical strategies in various jump directions between PD and non-dancers (ND).
PURPOSE: To compare LE biomechanics during multidirectional single-leg landings between PD and ND.
METHODS: 15 PD (27±7years, 1.69±0.1m, 57.8±9.3kg), and 15 ND (25±5 years, 1.69±0.1m, 66±10.2kg) conducted single-leg jumps in three directions (diagonal-DJ, frontal-FJ, and lateral-LJ) followed by a vertical jump. The second landing was used for analysis. Dominant LE biomechanical data was collected using a motion capture system (200Hz) and a force plate (1000Hz). Visual3D was used for data processing. LE joint angles (°) of the hip (HF), knee (KF), ankle, and foot; internal joint moments (Nm/Kgm); and ground reaction force (BW) were calculated at: initial contact (IC), peak knee flexion (PKF), and peak vertical ground reaction force (vGRF). Repeated measures ANOVAs were conducted (p<0.05).
RESULTS: A main effect was found for direction (p<0.05). LJ (2.9±0.5) had the lowest vGRF compared to FJ (3.1±0.6) and DJ (3.3±0.7). HF at PKF was lower in the FJ direction (32±12), compared to LJ (39±11) and to DJ (39±10). A main effect for group was attained (p<0.05). Particularly, PD (2.9±0.5) had lower vGRF than ND (3.3±0.7). At IC, PD had lower HF (19.3±4.7), KF (-3.1±3.5), and 1st metatarsophalangeal extension (MTPE: -9.9±7.0), and higher hindfoot-tibia (-32.7±4.5), and forefoot-tibia (-49.1±6.1) plantarflexion (PF) than ND (HF: 25.2±6.6, KF: -13.6±4.1, MTPE: -4.8±7.5, hindfoot-tibia: -23.8±6.8, forefoot-tibia: -30±12.5). Lastly, at IC, PD had a lower knee abductor moment (.12±.16) than ND (-.01±.14). Yet, at vGRF, PD had a higher knee adductor moment (-.51±.3) than ND (-.41±.2). No other difference was found (p>0.05).
CONCLUSION: This study demonstrated that PD had an extended landing pattern compared with ND. Despite the extended landing posture at IC, PD showed a lower vGRF, suggesting that a higher PF angle of the ankle may improve energy absorption and dissipate landing forces. Further research should investigate the role of PDs' ankle range of motion and shock absorption in landings.

3099　　　**Board #6**　　　　　　June 2 9:00 AM - 11:00 AM

The Relationship Between Vertical Ground Reaction Force And Audio Characteristics During A Single-Leg Landing

Caroline Lisee, Thomas Birchmeier, Arthur Yan, Brent Geers, Kaitlin O'Hagan, Caitlin Davis, Christopher Kuenze. Michigan State University, East Lansing, MI.
(No relevant relationships reported)

Landing kinetic are associated with injury risk and altered after injury, but are difficult to assess clinically. Relationships between soundwave characteristics and kinetics have only been reported during bilateral tasks. Preliminary evidence may support the use of sound as a clinically feasible technique of landing kinetic evaluation. **Purpose:** To assess the relationship between kinetics(peak vertical ground reaction force (vGRF), linear loading rate (LR), instantaneous LR) and soundwave characteristics(peak audio amplitude, audio frequency) during a single leg landing task. **Methods:** Physically active participants (15 males/11 females, age=24.81±3.6 years, height=176±9.05 cm, mass=74.86±14.4 kg) with no injuries in the past 3 months completed 5 single leg landings per limb onto a force plate while soundwave characteristics were recorded with a microphone. Means and standard deviations were calculated for all landings of each limb and considered independent outcomes for a total of 52 landings. Loading time was defined from initial contact to peak vGRF. Linear and instantaneous LR were defined as the slope during loading time and peak slope during the middle 60% of loading time respectively. Audio frequency was calculated from the onset of sound to peak audio amplitude defined as the largest peak to peak amplitude of sound. Outliers were detected through the Grubb's Outlier Test and 1 data point was removed from each of the peak amplitude and audio frequency datasets for a final sample of 51 limbs. Spearman's *rho* correlations were used to assess relationships between soundwave and kinetics due to non-normally distributed data. **Results:** Peak audio amplitude was moderately correlated with non-normalized vGRF(rho=0.356, p=0.010), normalized vGRF(rho=0.486, p=0.001), linear LR(rho=0.500, p=0.001), and instantaneous LR(rho=0.368, p=0.009). Audio frequency was moderately correlated with instantaneous LR(rho=-0.394, p=0.005). **Conclusion:** Peak audio amplitude may be more useful for assessing normalized vGRF and linear LR, but audio frequency may be more useful for instantaneous LR assessment. Evidence of soundwave and kinetic relationships support continued refinement of soundwave measurement techniques especially in feedback based interventions and for use in previously injured populations.

3100　　　**Board #7**　　　　　　June 2 9:00 AM - 11:00 AM

Limited Dorsiflexion Range of Motion Alters Joint Kinematics during Landing/Cutting in Chronic Ankle Instability Patients

Kaitland Garner, S. Jun Son, Dustin Bruening, Brent Feland, Matthew Seeley, Ty Hopkins, FACSM. Brigham Young Univerrsity, Provo, UT. (Sponsor: J. Ty Hopkins, FACSM)
(No relevant relationships reported)

Limited dorsiflexion range of motion (DFROM) has consistently been demonstrated in chronic ankle instability (CAI) patients. Further, reduced DFROM appears to increase the risk factor for ankle sprains. However, DFROM seems to vary between CAI patients, which could result in altered movement patterns and risk of injury.
PURPOSE: To examine lower extremity joint angles during a jump landing/cutting task within a CAI population categorized by DFROM.
METHODS: 100 CAI subjects were classified into 3 subgroups based on DFROM, measured by the weight-bearing lunge test: a Hypo (14M, 10F; ≤ 39°; 35±2.5°, 23±2 yrs, 176±13 cm, 80±13 kg), Normal (25M, 32F; 40-50°; 46±2.6°, 21±2 yrs, 174±7 cm, 72±14 kg), or Hyper DFROM group (11M, 8F; ≥ 51°; 54±3°, 22±2 yrs, 175±11 cm, 74±14 kg). Subjects performed 5 jumps consisting of a maximal vertical forward jump-landing plus a side-cut at 90°. Functional linear models were used to detect between-group differences. If 95% confidence intervals did not cross zero, differences were significant.
RESULTS: Figure 1 shows that CAI subjects with Hypo DFROM had up to 4° less DFROM and 2.5° less knee flexion, relative to Normal and Hyper DFROM groups, during the jump landing/cutting task, and increased hip flexion (2.5°) during initial landing compared to the Normal DFROM group.
CONCLUSIONS: Static DFROM on the weight-bearing lunge test influences sagittal-plane joint kinematics in the lower extremity during jump landing/cutting. CAI subjects with Hypo DFROM show decreases in DFROM and knee flexion, but these limitations did not increase hip flexion during most of stance (a small increase during initial landing relative to the Normal DFROM group). This stiffer landing/cutting movement pattern could increase impact loading of the lower extremity and may increase the risk of ankle reinjury.
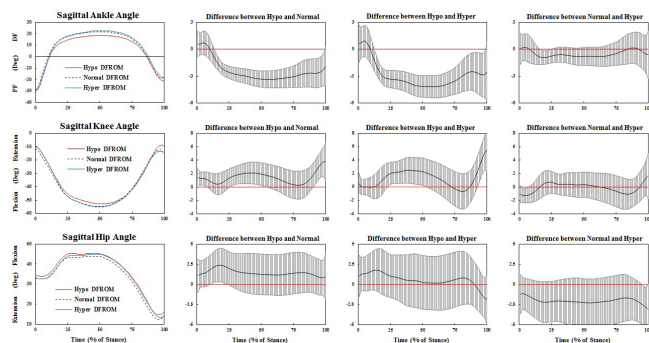
Figure 1. Grand ensembles for sagittal-plane joint angles in the lower extremity during a jump landing/cutting task between the Hypo, Normal, and Hyper DFROM groups. 0% of stance indicates initial foot contact, 50% of stance indicates peak ankle dorsiflexion and knee flexion, and 100% of stance indicates toe-off during the task. When 95% confidence intervals (shaded area) did not cross the zero (horizontal red line), between-group differences were significant.

G-24   Free Communication/Slide - **New Strategies to Increase Physical Activity in Youth**

Saturday, June 2, 2018, 9:00 AM - 11:00 AM
Room: CC-Mezzanine M100D

3101   **Chair:** John R. Sirard, FACSM. *University of Massachusetts Amherst, Amherst, MA.*

(No relevant relationships reported)

3102   June 2 9:00 AM - 9:15 AM

Effects of a School-Based Physical Activity Intervention on Cardiometabolic Health Five Years After Cessation

Geir K. Resaland[1], John Bartholomew, FACSM[2], Lars Bo Andersen[1], Sigmund A. Anderssen[3], Eivind Aadland[1]. *[1]Western Norway University of Applied Sciences, Sogndal, Norway. [2]The University of Texas at Austin, Austin, TX. [3]Norwegian School of Sport Sciences, Oslo, Norway.* (Sponsor: John Bartholomew, FACSM)

(No relevant relationships reported)

While there have been several school-based physical activity (PA) interventions targeting improvement in cardiovascular disease (CVD) risk factors, including cardiorespiratory fitness (CRF), few have assessed the long-term effect on a cardiometabolic health composite score. PURPOSE: To determine the effect of a two-year school-based PA intervention on CVD risk five years after cessation. Methods: We recruited two elementary schools, assigned to intervention (n=125 children) or control (n=134 children). The intervention school offered 210 min/week more PA than the control school over two consecutive years (4th and 5th grades) during 2004-2007. A follow-up assessment was conducted 5-y post intervention (10th grade) during 2011-2012 where 180-210 (73-85%) children provided valid data. Primary outcomes were several CVD risk factors: triglyceride (TG), total to high-density lipoprotein cholesterol ratio (TC:HDL ratio), insulin resistance (HOMA), systolic blood pressure (SBP), waist circumference (WC), and (CRF measured as) peak oxygen uptake (VO2peak). These variables were analyzed individually and as a composite score through linear mixed models, including random intercepts for children. Results: Analyses revealed significant effects of the intervention five years after cessation for HDL (ES=.22), diastolic BP (ES=.48), VO2peak (ml/kg/min) (ES=.29), and the composite risk score (ES=.38). These effects were similar to the immediate results following the intervention. In contrast, while TC:HDL ratio initially decreased post intervention (ES=.27), this decrease was not maintained at 5-y follow-up (ES=.09), whereas WC was initially unchanged post intervention (ES=.02), but decreased at 5-y follow-up (ES=.44). Conclusion: These data reveal that the significant effects of a two-year school-based PA intervention remained in effect for CVD risk factors five years after cessation of the intervention. As cardiometabolic health can be maintained long-term after school-based PA, this paper demonstrates the sustainability and potential of schools in the primary prevention of future CVD risk in children.

3103   June 2 9:15 AM - 9:30 AM

Effects of Integrating Physical Activity into Early Education Learning Standards on Preschoolers' Physical Activity Levels

Sofiya Alhassan, FACSM, Christine St. Laurent, Sarah Burkart, Cory J. Greever, Matthew Ahmadi. *University of Massachusetts, Amherst, Amherst, MA.*

(No relevant relationships reported)

Preschool centers are ideally situated to intervene on preschoolers' health behaviors such as physical activity (PA), diet, and sleep (PADS). In order for health behavior interventions to be sustainable within the preschool center, the intervention needs to be implemented by classroom teachers. Unfortunately, teachers are constrained by demands such as meeting early childhood education learning standards (state mandated policies). It is possible that integrating health behavior lessons and activities into learning standard could improve teachers' compliance with health behavior interventions. **PURPOSE:** To examine the impact of integrating health behavior interventions into learning standards on preschoolers' PA, diet and sleep behavior. **METHODS:** This was a parallel group pilot randomized control study. Data were collected in Spring 2016 and analyzed in Fall 2016. Two preschool centers were randomized to either the PADS (children, n = 60) or the control (CON; children, n = 54) group. The PADS intervention consisted of a PA, diet, and sleep curriculum and activities embedded into Massachusetts early education learning standards and was implemented for four days/week for 12 weeks. PADS also had a parent component, which was delivered online. CON preschool participated in their usual activity. PA was assessed using accelerometers for seven days per week. Diet and sleep variables were assessed using a parent report surveys. Outcome variables were assessed at baseline, 6-weeks, and 12-weeks. **RESULTS:** After adjusting for baseline differences, significant group by visit interaction were observed for during preschool-day percent of time spent in moderate-to-vigorous PA (PADS; baseline = 7.7% ± 3.6, 12-week = 11.7 ± 3.8; CON, baseline = 10.7% ± 3.7, 12-week = 10.9% ± 3.5; p = 0.03) and sedentary time (PADS; baseline = 83.6% ± 5.8, 12-week = 77.2% ± 6.4; CON; baseline = 79.1% ± 5.4, 12-week = 78.4% ± 5.5; p = 0.05). At 6-week, significant improvement (p = 0.02) was observed in percent of time spent in total daily vigorous activity for the PADS compared to the CON group. **CONCLUSION:** This pilot study provides preliminary evidence that integrating health behaviors into learning standards are feasible and potentially an effective way for increasing preschoolers PA level but not effective in changing either diet or sleep behaviors.

3104   June 2 9:30 AM - 9:45 AM

Fueling Learning Through Exercise (FLEX) - Long-term Impact Of School-based Programs On Children's Moderate-to-Vigorous Physical Activity

Jennifer M. Sacheck, FACSM[1], Sarah Amin[1], Stephanie Anzman-Frasca[2], Virginia Chomitz[2], Kenneth Chui[1], Paula Duquesnay[1], Miriam Nelson, FACSM[3], Catherine Wright[1], Christina Economos[1]. *[1]Tufts University, Boston, MA. [2]University of Buffalo, Buffalo, NY. [3]University of New Hampshire, Durham, NH.*

(No relevant relationships reported)

Purpose: Schoolchildren do not meet current recommendations for school-time and daily moderate-to-vigorous physical activity (MVPA), which is further exacerbated by a steady decline in MVPA over the elementary school years. Our objective was to evaluate the impact of two innovative school-based PA programs, *100 Mile Club®* and *Just Move/NYP™,* on school-time (sMVPA) and total daily MVPA among lower-income schoolchildren.
Methods: Elementary schools (n=18) were randomized to *100 Mile Club* (walk/run program), *Just Move* (active classroom breaks), or control. Teachers/champions were trained to implement programming for 3rd and 4th grade students. Consented children were measured at baseline (pre-intervention), mid-point (6 months), and end-point (18 months). MVPA was measured via 7-day accelerometry (Actigraph GTX3+). Height/weight were measured to assess weight status. Demographics were collected by parent report. Mixed effects linear regression models were used to examine the impact of program on sMVPA and total daily MVPA adjusting for school-level clustering, sex, grade, BMI status, free/reduced-price lunch eligibility (FRPL), wear-time, and average daily temperature.
Results: 982 children (8.7 ± 0.7 years; 44% male; 64% non-white; 40% overweight/obese; 55% FRPL; 38% *100 Mile Club*, 32% *Just Move,* 31% control) had valid accelerometer wear-time (≥3 days, ≥10 hr/day) over the three time points. At baseline, 8.4% (18.3 ± 8.6 min/day) and 19.8% (44.9 ± 20.1 min/day) fulfilled the 30-min sMVPA and 60-min total daily MVPA recommendations, respectively. There was a significant program effect on sMVPA (p = 0.002), but not for daily MVPA (p = 0.47). Pair-wise comparisons suggest that this difference was driven by a decrease in sMVPA in control schools from mid- to end-point (Bonferroni p = 0.004; -2.3 min, 95%CI -4.3,

-0.4); while sMVPA in both intervention groups remained stable over the 18-month intervention period (*100 Mile Club*: 18.1, 18.9, 18.4 min/day; *Just Move*: 17.6, 16.8, 17.5 min/day).

Conclusion: Two very different school-based PA programs appeared to be effective in preventing the decline in sMVPA that is typically seen with increasing grade level. Multiple opportunities for PA during school hours are needed to move the needle on children meeting sMVPA recommendations.

Funding provided by NIH-NICHD.

3105　June 2 9:45 AM - 10:00 AM

Effect of the Kiddie Cats on the Move Intervention On Preschoolers' Physical Activity

Connie Tompkins, Lori E. Meyer, Erin K. Shoulberg, Caroline Martin, Marissa Dennis, Allison Krasner, Betsy Hoza. *University of Vermont, Burlington, VT.*

(No relevant relationships reported)

Young children spend a significant amount of time in structured preschool settings; however, the majority of this time is spent in sedentary behaviors. Given that obesity, physical activity (PA), and sedentary behaviors track throughout development, interventions aimed at increasing PA opportunities for young children in the preschool setting may be critical in establishing healthy trajectories for young children. **PURPOSE:** To examine PA in preschool-aged children during school days when a PA curriculum was administered as compared to non-intervention days. **METHODS:** A pilot PA curriculum, *Kiddie CATs on the Move*, was implemented in local preschools over 23-weeks, 2-3 times per week by classroom teachers and college students enrolled in a service-learning course. Physical activity was objectively measured by accelerometry during the preschool day at 3 intervention timepoints. A total of 32 children (M_{age} = 3.91±0.6, 12 males, 20 females) who had at least 2 days of valid data on both intervention days and non-intervention days were included in the analyses. Minutes per hour (min/hr) of moderate-to-vigorous (MVPA), total PA (light + MVPA), and sedentary as well as percentage of time spent in each were calculated. Paired-samples t-test was used to compare intervention vs. non-intervention days. **RESULTS:** Children engaged in significantly more total PA (min/hr) on days when the PA curriculum was administered vs. non-intervention days (17.2±3.5 vs. 16.0±3.5, p<0.001) and significantly more min/hr in MVPA (9.5±2.7 vs. 8.5±2.9, p<0.001). On intervention days, children spent significantly less time in sedentary behavior compared to days without the intervention (71.3% vs. 73.4%, p<0.001). **CONCLUSIONS:** The current findings suggest the *Kiddie CATs on the Move* curriculum significantly increased the amount of time preschoolers engaged in PA (total and MVPA) throughout their school day. This teacher- and student-led intervention in the preschool setting may represent a viable approach to increase PA and aid in the establishment of healthy behaviors in young children.

3106　June 2 10:00 AM - 10:15 AM

Physical Fitness Changes are Independent of Adiposity in an Afterschool Translational Health Program

Carolina Velasquez, Emily W. Flanagan, Kara Bolon, Arlette C. Perry, FACSM. *University of Miami, Coral Gables, FL.*

(No relevant relationships reported)

Background: As obesity rates continue to rise in children and adolescents, physical fitness (PF) levels are reported to decrease. Given the fact that low PF levels are associated with adverse medical conditions and fewer schools require physical education, improving PF levels has been the target of many afterschool programs. However, not all afterschool programs have been successful in improving PF levels in minority children. In adults, improvements in aerobic fitness (AF) are observed concomitantly with decreases in adiposity. However, less is known about this relationship in children, particularly minority children. **Purpose**: The present study was done to determine whether a translational health in nutrition and kinesiology (THINK) program focusing on education, clinical activities, and free play can improve PF independent of adiposity. **Methods**: A total of 73 participants (35 Latino, 31 Black, and 7 White) 8-12-years enrolled in a YMCA afterschool program. All participants were randomly assigned to THINK or control (CON) programs. Muscular strength (MS) was assessed using grip dynamometer and AF was assessed using the NIH *two-minute walk test* as part of their PF evaluation. Adiposity was measured using skinfold thickness of the triceps (TRI) and subscapular (SS). Means and standard errors were evaluated for all dependent variables in both THINK and CON groups. An analysis of covariance was performed to determine differences between groups over time after adjustment for pretest scores. **Results:** Significant differences were found in MS between THINK and CON even after for controlling for SS (THINK x̄=14.641 ±1.724; CON x̄=6.554 ± 2.391; p=.010) and TRI (THINK x̄=14.771±1.767; CON x̄= 6.425±2.496; p=.013). Significant differences were also observed between THINK and CON in AF after controlling for SS (THINK x̄=39.952±10.738, CON x̄=-7.125±14.681; p=.016) and TRI (THINK x̄=41.352±11.130, CON x̄=-9.630±15.60; p=.016). **Conclusion**: A translational health program such as the THINK which

targets exercise physiology knowledge, clinical experiences, and structured free play can improve PF measures independent of adiposity levels in predominantly minority children participating in an afterschool setting.

3107　June 2 10:15 AM - 10:30 AM

Impact of Social Support on Changes in Physical Activity among Children Participating in School-based Programs

Sarah A. Amin, Kenneth Chui, Paula J. Duquesnay, Catherine M. Wright, Virginia R. Chomitz, Christina D. Economos, Jennifer M. Sacheck, FACSM. *Tufts University, Boston, MA.*

(No relevant relationships reported)

PURPOSE: Teacher and peer social support (SS) enhances children's physical activity (PA) engagement and represents an important consideration for implementing school-based PA interventions. We aimed to assess changes in school PA social support (S-SS) among children participating in school-based PA programming and examine if changes in moderate-to-vigorous PA (MVPA) differed by S-SS level.
METHODS: Eighteen MA schools from lower-income districts were enrolled in the *FLEX* study and randomized to control, *100 Mile Club®* (walking/running club), or *Just Move/NYP™* (active classroom breaks). Demographic data were collected by parent report. Third and fourth grade children were recruited and measured for height/weight and 7-day accelerometry (Actigraph GT3X+). SS for PA was self-reported and a S-SS score (6 items) was median split into low and high categories. For each program group, the association between low vs. high S-SS and changes in MVPA from baseline (pre-intervention) to 6 months were examined using mixed effects models adjusting for sex, grade, race, BMI category, free/reduced price lunch eligibility (FRPL), mean temperature, and school-level clustering.
RESULTS: 747 children (8.7±0.7 years, 43% male, 64% non-white, 56% FRPL, 40% overweight/obese) had valid accelerometer wear-time (≥3 days, ≥10 hrs/day) and 20% (45.6±19.3 min/day) met the 60-min total daily MVPA recommendations at baseline. There were modest changes in high S-SS from baseline to 6 months for children participating in Just Move (4% increase), 100 Mile Club (7% increase), and control (7% decrease) (p>0.05). The interaction between S-SS and time point was not significant for the control or 100 Mile Club group (p>0.05). In Just Move, there was an interaction between time point and S-SS (p=0.02). Pairwise comparisons indicated no difference in MVPA for children reporting low vs. high S-SS at baseline (p>0.05). However, at 6 months, Just Move children with high S-SS had 3.8 min (95% CI: 0.69-6.91) more MVPA than those with low S-SS (p=0.016; Bonferroni adjusted p=0.09).
CONCLUSIONS: Children participating in active classroom breaks who reported high S-SS had increased MVPA compared to those reporting lower support. Future work should consider how to effectively support and sustain S-SS to encourage school-wide improvements in PA behaviors.

3108　June 2 10:30 AM - 10:45 AM

Changes In Ability, Confidence, And Motivation Among Children In A Novel School-based Physical Literacy Intervention

Erin Hennessy[1], Daniel P. Hatfield[1], Kenneth Chui[2], Stephanie Herrick[3], Christine Odalen[3], Teri West[3], Rachel Pratt[3], Catherine Wright[1], Jennifer Sacheck, FACSM[1]. *[1]Tufts University Friedman School of Nutrition Science and Policy, Boston, MA. [2]Tufts University School of Medicine, Boston, MA. [3]New York Road Runners, New York, NY.* (Sponsor: Jennifer Sacheck, FACSM)

(No relevant relationships reported)

Programs that increase children's physical literacy (PL), defined as the *ability*, *confidence*, and *motivation* to be physically active for life, hold promise for helping children achieve physical activity recommendations, yet few studies have tested PL interventions. **PURPOSE:** To fill this gap, we conducted a pilot evaluation of a PL-based intervention in the school setting. **METHODS:** Three New York City elementary schools were recruited. The intervention included twice-weekly lessons during regularly scheduled 3rd/4th grade PE classes over 10 weeks between Feb-Jun 2017. Twenty lessons were selected from a bank of 400 activities designed to build running, locomotion, and balance skills through age-appropriate play and games. Lessons were linked to SHAPE America PE standards and involved a warm up activity, skill-based activity, games focused on the skill, and a cool down activity. *Ability* was measured by direct observation (eight tasks from the PL Assessment for Youth (PLAY*fun*) tools). Each task was graded on a four-point rubric (0-100), categorized as: Initial (0-25), Emerging (26-50), Competent (51-75) and Proficient (76-100). *Confidence* and *motivation* were measured by child-reported surveys; demographics were collected via parent-reported surveys. Height/weight were measured; body-mass index z-scores computed. Paired sample t-tests tested change in PLAY*fun* scores, reported as mean (SD). **RESULTS:** Baseline (T1) and post-intervention (T2) data were collected on n=45 children. Most children were 9.4 (0.5) years old (n=28), female (n=24), either Non-Hispanic Black or Hispanic (n=40), and of a healthy weight (n=30). Children improved in two running tasks: run there/back (T2:

50.4, T1: 45.2, Δ5.1 (11.7, p lt 0.01) and run/jump/land (T2: 42.8, T1:37.5, Δ5.3 (16.3), p=0.03); one locomotor task: crossovers (T2:27.0 T1:22.3 Δ4.8 (13.4), p=0.02); and the balance task: backward balance walk (T2:32.9 T1:29.2, Δ3.7 (10.8), p=0.02). Self-reported confidence and motivation were high (>4 on 5-point scales) at baseline with no change observed at post. **CONCLUSION:** Children participating in a PL-based program focused on running, locomotion, and balance may demonstrate improvements in PL domains, particularly motor skills. This study was funded by NYRR.

3109 June 2 10:45 AM - 11:00 AM

Physical Activity and Screen Time Recommendation Compliance in Preschoolers

Sarah Burkart, Christine W. St. Laurent, Sofiya Alhassan, FACSM. *University of Massachusetts Amherst, Amherst, MA.* (Sponsor: Sofiya Alhassan, FACSM)
(No relevant relationships reported)

Low physical activity (PA) and increased screen time (ST) is problematic for preschool-age children (2.9-5 years), and is attributed to childhood overweight/obesity. Due to this, several organizations have provided recommendations surrounding these behaviors. However, few studies have examined the compliance rates of preschoolers based on the recently released PA and ST recommendations (≥15 minutes of PA/hour and ≤60 min/day). **PURPOSE:** To assess preschool-age children's compliance with PA and screen time recommendations and identify variables contributing to compliance. **METHODS:** Baseline data from preschoolers (n=52, 50% male, age = 3.7±0.8 years, BMI % = 50.2±26.5) in two preschool centers participating in the Preschool Activity, Diet, and Sleep pilot study was utilized for this analysis. PA was measured with an Actigraph GT3X accelerometer worn on the lower back of children for seven consecutive days. PA data were reduced using Pate et al. cut points, and compliance was assessed for school-day (≥15 min/hour) and total day (≥180 min) recommendations. ST and parent variables were assessed with self-report validated questionnaires. Appropriate descriptive statistics were calculated for all variables. Logistic regression was used to determine differences in compliance based on gender, ST, school-day PA, parent PA, and parent PA knowledge. **RESULTS:** Children engaged in 11.3±3.6 min/hour of PA and 102.6±79.6 min/day of ST. The percentage of preschoolers meeting school-day recommendations and total day recommendations were 17.1% and 26.5%, respectively. Approximately 35.9% of preschoolers met ST recommendations. There were no gender differences in PA (*p*=0.052) or ST (*p*=0.91) compliance. Additionally, only school-day PA significantly contributed to the likelihood of meeting total day recommendations (OR=1.05, 95% CI=1.002, 1.104). **CONCLUSION:** Preschoolers' compliance with PA and ST recommendations was low in this sample. Additionally, only school-day PA was a significant predictor of meeting daily PA recommendations. No significant predictors were identified for ST compliance. Practical intervention strategies are needed to increase PA and reduce ST in preschoolers, specifically in the preschool environment.

G-25 Clinical Case Slide - **Arm**

Saturday, June 2, 2018, 9:00 AM - 10:40 AM
Room: CC-200E

3110 **Chair:** Jim Macintyre, FACSM. *Center for Orthopedic and Rehabilitation Excellence, West Jordan, UT.*

(No relevant relationships reported)

3111 **Discussant:** William J. Moreau, FACSM. *US Olympic Committee, Colorado Springs, CO.*

(No relevant relationships reported)

3112 **Discussant:** Wayne Elton Derman. *Stellenbosch University, Cape Town, South Africa.*

(No relevant relationships reported)

3113 June 2 9:00 AM - 9:20 AM

Left Anterior Arm Pain in a 79 year old Female Pilates Method Strength Trainer

Brittany J. Moore[1], Elena J. Jelsing[2], Jonathon T. Finnoff, FACSM[3]. *[1]Mayo Clinic, Rochester, MN. [2]Mayo Clinic, Minneapolis, MN. [3]Mayo Clinic College of Medicine and Science, Rochester, MN.* (Sponsor: Jonathan T. Finnoff, FACSM)
(No relevant relationships reported)

HISTORY: A 79 year old female presented to sports clinic with 2 weeks left anterior elbow pain that developed following a Pilates class. She described a pulling type of discomfort in the left antecubital region worse with elbow extension and improved with rest. She noted associated swelling in the region over the same period. She denied history of bruising, trauma, or obvious injury to the arm during the class. She exercised regularly with Pilates method and denied engaging in any novel activities prior to pain onset. She denied changes in strength or sensation. She had cochlear implants which were not MRI compatible.
PHYSICAL EXAMINATION: There was fullness about the left anterior distal arm to antecubital fossa which was tender and hard on palpation. The left biceps tendon was palpable in the antecubital fossa but less prominent than the contralateral side. She had a left elbow extension lag of 15 degrees; elbow flexion and forearm prono-supination range and strength were symmetric. She was neurovascularly intact.
DIFFERENTIAL DIAGNOSIS: 1. Distal biceps tendon tear 2. Distal biceps muscle tear 3. Brachialis muscle tear 4. Deep venous thrombosis 5. Sarcoma
TEST AND RESULTS: Elbow anterior-posterior & lateral radiographs: Normal. Elbow anterior musculoskeletal ultrasound: Lateral portion of brachialis muscle had heterogeneous echogenicity, large areas of hypoechogenicity in between fibers and discontinuity of proximal fibers with the distal insertion. Medial half of brachialis muscle had intact fibers. Remainder of exam was normal including brachialis tendon insertion, biceps muscle and tendon, vasculature, and nerves.
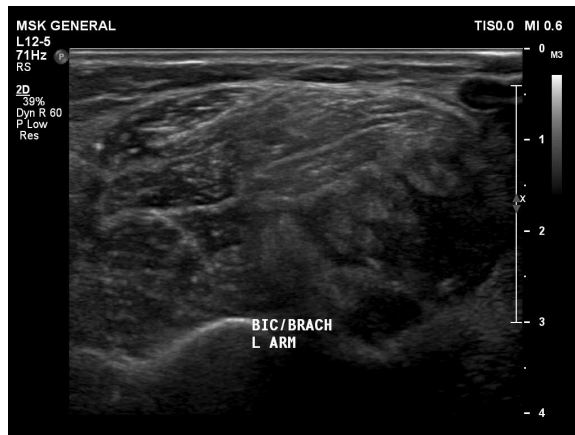
FINAL WORKING DIAGNOSIS: High grade partial thickness tear of the distal lateral brachialis muscle
TREATMENT AND OUTCOMES: She was managed with compression sleeve and initiation of physical therapy for range of motion with later progression to elbow flexor strengthening. Three months post injury she was at normal baseline for motion and activity.

3114   June 2 9:20 AM - 9:40 AM
Left Arm Pain and Numbness-Recreational Athlete

Paul A. Krebs, Clinton Hartz. *The Ohio State University, Columbus, OH.* (Sponsor: James Borchers, MD, MPH, FACSM)
(No relevant relationships reported)

History: A 41 year old right hand dominant female presented with left arm pain and numbness of 6 months duration with progressive worsening. Symptoms started in the distal posterior medial aspect of her arm and radiated to the 4th and 5th fingers of the hand. The pain was worse with lifting, swimming, biking, and tennis, forcing her to stop her normal athletic activities. She also noticed swelling in the distal aspect of the arm where the pain originated and a palpable bump. She denied history of trauma, clicking, locking, or instability.

Physical Exam: Neck exam showed full painless range of motion, no tenderness, and a negative Spurling test. Shoulder exam showed full strength and range of motion. Her left elbow had full range of motion with pain, no instability or crepitus. She had soft tissue tenderness and swelling in the distal arm medially with palpable nodules just proximal to the medial epicondyle. Cozen's, Speed's, and Yergason's tests were negative. She had 5/5 strength and full range of motion of her left hand. Neurologic exam showed decreased sensation in the ulnar nerve distribution. Capillary refill and radial pulses were intact.

Differential Diagnosis:
1. Cubital Tunnel Syndrome
2. Ulnar Neuropathy Secondary to Mass Effect
3. Fracture/Stress Fracture
4. Cervical Radiculopathy
5. Thoracic Outlet Syndrome

Tests and Results:
XR Humerus: No soft tissue swelling or acute osseous abnormality
Limited Diagnostic Ultrasound: 4 hypervascular nodules adjacent to ulnar nerve, likely lymph nodes

Final Working Diagnosis:
Ulnar neuropathy secondary to mass effect, lymphadenopathy, need to rule out malignancy.

Treatment and Outcomes:
1. MRI Left Humerus: abnormal enlarged lymph nodes. Mass effect evident along the ulnar nerve.
2. Referred to Hematology Oncology.
3. Biopsy: grade 1 follicular lymphoma.
4. PET scan: hypermetabolic lymphadenopathy above and below the diaphragm, uptake in the spleen and liver, consistent with a Stage III lymphoma.
5. Bendamustine/Rituximab (BR) was started because of its response rate and lower side effect profile compared to other chemotherapies.
6. Patient has undergone 2 cycles of BR with good response, including near resolution of her humeral disease.
7. She is restarting activities as tolerated. The expectation is that her ulnar neuropathy will improve with remission of her lymphoma.

3115   June 2 9:40 AM - 10:00 AM
Bilateral Wings

Nina Yaftali. *Rush, Chicago, IL.*
(No relevant relationships reported)

HPI:
19 year-old right hand dominant male high school recreational basketball player who presents with chief complaint of bilateral shoulder pain for one year. About one and half years ago patient was training in the gym when he did a heavy overhead press and heard an audible pop in his shoulders. He complained of a dull, achy posterior shoulder pain and mild winging of both his scapula. He stopped exercising, and went to see an orthopedist who recommended physical therapy. He was diagnosed with weak shoulders and rotator cuff tendonitis with a prescription of rotator cuff and scapular strengthening exercises. After one year of physical therapy, he notes no improvement.

PHYSICAL EXAM:
Alert, oriented Caucasian male. Bilateral scapular winging more prominent on right compared to left. Atrophy of periscapular region more prominent on left.
Full active range of motion bilaterally.
4+/5 strength in abduction, forward flexion, and external rotation bilaterally. Negative belly press or lift off sign bilaterally
Neck flexion and bilateral deltoids 4+/5 strength bilaterally
Rhomboids 2/5 strength bilaterally
5/5 biceps and triceps strength bilaterally
Positive O'Brien's and Hawkins on right.
Normal reflexes and sensation bilaterally.
Increased lumbar lordosis with ambulation

DIFFERENTIAL DIAGNOSIS:
1. Long thoracic nerve neuropathy
2. Axillary nerve neuropathy
3. Myotonic Dystrophy

4. Limb Girdle Muscle Dystrophy

TEST AND RESULTS:
MRI right shoulder: Minimal tendinosis of the supraspinatus and subscapularis tendon.
MRI left shoulder: Mild tendinosis of subscapularis tendon.
EMG: Myopathic process with chronic features affecting the right upper extremity and periscapular region.
Genetic test: FSHD1 confirmed

FINAL WORKING DIAGNOSIS:
Facioscapulohumeral muscle dystrophy

TREATMENT AND OUTCOMES:
Patient was prescribed physical and occupational therapy for stretching, and range-of-motion exercise. It is recommended he no longer do heavy weightlifting, just low intensity aerobic exercise. His pain is controlled with NSAIDS currently, as no other drug shows any clear benefit. He received a baseline pulmonary function test, and dilated retinal exam. Patient is doing well overall. The shoulder surgeon is evaluating him for possible scapular fixation if his range of motion worsens.

3116   June 2 10:00 AM - 10:20 AM
Shoulder Weakness- Football

Daniel Sisk, Mindy Loveless. *University of Washington, Seattle, WA.*
(No relevant relationships reported)

HISTORY: A 17-year-old high school football player sustained a left shoulder injury while tackling an opposing player to the ground. He had pain in the left shoulder that increased the following day with radiation into the neck. He was evaluated by orthopedics 5 days post-injury. Initial X-rays of the cervical spine and left shoulder were unremarkable and subsequent left shoulder MRI 12 days post-injury was also unremarkable. Over the next few weeks the pain resolved but weakness in the shoulder persisted. He was then referred to our clinic for further evaluation approximately 3 months post-injury with ongoing shoulder weakness. He denied paresthesias.

PHYSICAL EXAMINATION:
Weakness was isolated to left shoulder external rotation and abduction. Shoulder flexion, extension and internal rotation were intact. Inspection showed atrophy of left supraspinatus and infraspinatus. Full pain free ROM of neck. Sensation and reflexes were intact in upper extremities.

DIFFERENTIAL DIAGNOSIS:
1. Suprascapular nerve injury
2. Rotator cuff tear
3. Cervical radiculopathy
4. Brachial plexus injury

TEST AND RESULTS: Diagnostic US of left shoulder: Increased echogenicity of left supraspinatus and infraspinatus
EMG/NCS: Increased insertional activity, 1+ fibs, 2+ sharps, increased phasicity and decreased recruitment in supraspinatus and infraspinatus. Membrane instability in deltoid and teres minor. No other abnormalities.
Repeat MRI of left shoulder: Atrophy of supraspinatus and infraspinatus. No mass or anatomic abnormality

FINAL WORKING DIAGNOSIS:
Left suprascapular nerve injury

TREATMENT AND OUTCOMES:
1. Referral to surgery resulted in nerve transfer surgery from spinal accessory nerve to suprascapular nerve
2. One month post-op little to no return of external rotation with mild weakness in left shoulder shrug as expected course post-operatively
3. Returned to football one month after surgery with recommendation to avoid positions requiring tackling

3117   June 2 10:20 AM - 10:40 AM

Forearm Pain- Diving

Dorcas Copa, Jaime Aparicio. *Memorial Hermann Ironman, Houston, TX.*

(No relevant relationships reported)

Forearm Pain-Diving

D. Copa, Jaime Aparicio, Memorial Hermann Ironman, Houston, TX

E-mail: Dorcas.copa@memorialhermann.org

HISTORY: A 22 year old International and NCAA Division I female diver developed medial forearm pain during the Spring of 2017 experienced only during the pike position of her dive. The pain initially was during the activity only but progressed to pain after the activity had ended.

PHYSICAL EXAM:

The examination of the athlete was done in the athletic training room by a physical therapist. Subjectively, questions about female athlete triad indicated inconsistent menstrual cycle. However, she did consume adequate calories including foods with calcium and protein. Further questioning about hormone levels and nutrition indicated she had been found to have low levels of vitamin D in previous blood tests as well as very low estrogen. The athlete reported having to take estrogen supplements in the past.

The physical exam revealed normal active range of motion bilaterally, normal sensation, reflexes, and strength. Vascular system was noted to be intact. Upper limb nerve tension was tested, resulting in negative findings. Pin point pain with palpation along the ulna in two places, one approximately middle of the ulna and the other approximately 2 inches from the proximal radioulnar joint, reproduced her pain. Applied manual force at each end of the ulna over a fulcrum also reproduced her pain suggesting an osseous pathology so imaging was suggested by the physical therapist and ordered by the orthopedic surgical fellow.

DIFFERENTIAL DIAGNOSIS:

1. Ulnar Stress Reaction
2. Periostitis
3. Bone Contusion

TESTS AND RESULTS: Plain Radiographs demonstrate bowing of the ulna

WORKING DIAGNOSIS:

The final diagnosis was bowing of the ulna with a stress reaction.

TREATMENT AND OUTCOMES:

1. Increase core strength in pike position in create a "tighter" pike throughout the pike position during dive.
2. Scapulothoracic strengthening to offload the forearm during the dive.
3. Diving Technique
4. Vitamin D supplements and nutrition counseling.

G-34   Free Communication/Poster - **High Intensity Interval Training**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3132   Board #1   June 2 8:00 AM - 9:30 AM

Sports Related Fitness Evaluation and High Intensity Interval Training in Table Tennis Players

Pei-Fan Wang, Mei-Hua Tu, Li-Lan Fu. *National Taiwan Sport University, Taoyuan, Taiwan.*

(No relevant relationships reported)

PURPOSE: To investigate the effect of 8 weeks high intensity interval training (HIIT) in elite table tennis players.

METHODS: Twenty four elite table tennis player (age: 19.52 ± 1.21 yrs; playing experience: 11.17 ± 1.56 yrs) participated in this study and were allocated into HIIT exercise group (n = 12, TG) and control group (n = 12, CG). All subjects were assessed by graded exercise test (GXT), sub-maximal exercise test (SBT), and table tennis specific fitness test (TTSFT) before and after the intervention. The TG group received HIIT protocol 3 times/week for 8 weeks period. Control group maintained the regular training programs. Participants were asked to perform a running test to fatigue before and after the experiment intervention to measure VO_2max, exercise duration, VT, HRmax and RPE. All subjects completed two 6-min bouts of moderate-intensity (MIE) and severe-intensity (SIE) running incremental exercise test. TTSFT was executed using a mechanical table tennis ball thrower to control the exercise intensity. Each participant forehand topspin three position rally table tennis trials at frequency of 60 balls/min till exhaustion. The Polar heart rate monitor was used to record HR and exercise duration.

RESULTS: After HIIT, TG significantly improve VO_2max (53.19 ± 6.11 vs. 56.73 ± 4.39 ml/kg/min, $p < .05$), time to voluntary exhaust (14.14 ± 1.17 vs. 14.93 ± 0.73 min, $p < .05$), and LACpost (pre 9.99 ± 2.35 vs. post 11.07 ± 2.02 mmol/L, $p < .05$) of GXT

test, and better than CG (post 50.04 ± 6.40 ml/kg/min; 13.70 ± 1.64 min; LACpost 8.96 ± 1.23 mmol/L) ($p < .05$). The variables of CG showed no significant difference. TG significantly increase SIE velocity, VO2max (55.01 ± 4.76 vs. 58.05 ± 4.88 ml/kg/min, $p < .05$) and LACpost (pre 11.72 ± 1.89 vs. post 12.50 ± 1.51 mmol/L, $p < .05$) of SBT, and better than CG ($p < .05$). However, there were no significant difference in MIE test between TG and CG ($p > .05$). TG (pre 371.36 ± 112.97 vs. post 475.71 ± 165.62 sec, $p < .05$) showed significantly improvement in TTSFT compare to CG (pre 361.20 ± 79.18 vs. post 334.80 ± 128.00 sec, $p > .05$).

CONCLUSIONS: Eight weeks HIIT could effectively improve aerobic capacity, specific fitness and exercise performance of table tennis players. Incorporation of a suitable training program into the training routine might be important to improve the exercise perforamcne.

3133   Board #2   June 2 8:00 AM - 9:30 AM

Biomarkers of Inflammation and Angiogenesis Following Short Vs. Long Bouts of High-Intensity Training

Chad D. Markert[1], Khala N. Clemons[1], Emily E. Bechke[2], Cassie M. Williamson[2], Michael J. McKenzie, FACSM[1], Brian M. Kliszczewicz[2]. [1]*Winston Salem State University, Winston Salem, NC.* [2]*Kennesaw State University, Kennesaw, GA.*

(No relevant relationships reported)

Effects of varying types of high-intensity training (HIT) on the appearance and time course of circulating biomarkers have not been adequately characterized. **Purpose**: The purpose of this study was to examine the effects of HIT on biomarkers of inflammation and angiogenesis, over time, in HIT bouts of varying duration (short bout, 5 min, and long bout, 15 min). **Methods**: Ten males, 18-45 years old, who had participated in CrossFit for at least 6 months, were recruited from local affiliates. The participants completed a total of 3 lab visits [Visit 1: collection of descriptive data; the next 2 visits were randomized between the short bout and long bout]. All subjects completed the same exercises. Blood was drawn pre and post-exercise, and 1 hour, 3 hours, and 6 hours post-exercise, centrifuged, and plasma frozen for analysis. A multiplex assay (Millipore MagPix) was used to determine concentrations of the biomarkers of interest [interleukin 6 (IL-6), interleukin 10 (IL-10), tumor necrosis factor alpha (TNF-alpha), and vascular endothelial growth factor (VEGF)]. **Results**: The short bout produced results similar to those of the long bout. Repeated measures ANOVA revealed no trial-dependent differences ($p \leq 0.05$) in any of the biomarkers. Both temporal responses and concentrations were similar in the short and long bout. **Conclusions**: The biomarkers IL-6, IL-10, TNF-alpha, and VEGF all follow a similar pattern of peaking post-exercise, and returning to baseline within 6 hours, regardless of the duration of the HIT. A practical implication is that a 5 min bout of HIT may be just as effective as a 15 min bout in terms of eliciting certain specific physiologic responses. Supported by WSSU Office of Student Research, Honors Student Research Grant (K.N.C.).

3134   Board #3   June 2 8:00 AM - 9:30 AM

Effect of Reducing Sprint Duration in A REHIT Protocol on Changes in VO$_2$max and Mood

Preeyaphorn Songsorn[1], Gulbin Nalçakan[2], Richard Metcalfe[3], Niels Vollaard[1]. [1]*University of Stirling, Stirling, United Kingdom.* [2]*University of Ege, İzmir, Turkey.* [3]*Ulster University, Belfast, United Kingdom.*

(No relevant relationships reported)

Sprint interval training (SIT) is associated with health benefits, but 'classic' SIT (6x30-s 'all-out' cycle sprints) requires high motivation and is associated with negative affective responses and high levels of perceived exertion. In order to make SIT more suitable for sedentary individuals, the number of sprints and sprint duration have previously been reduced to develop a reduced-exertion high-intensity interval training (REHIT) protocol consisting of 2x20-s 'all-out' cycle sprints within a 10-min session. This genuinely time-efficient protocol remains effective at improving aerobic capacity (VO_2max). It is unknown if further reducing the sprint duration in the REHIT protocol affects improvements in $\dot{V}O_2max$ or changes in mood. **PURPOSE**: To examine the effect of reducing sprint duration from 20-s to 10-s in a REHIT protocol on changes in $\dot{V}O_2max$ and psychological perceptions. **METHODS**: Thirty-five healthy untrained subjects (mean±SD age: 22±3 y; BMI: 25±5 kg·m^{-2}; $\dot{V}O_2max$: 37±8 mL·kg^{-1}·min^{-1}) were randomised into groups performing two 10-s sprints (REHIT10; n=18) or 2x20-s sprints (REHIT20; n=17), within a 10-min session performed 3 times a week for 6 weeks. $\dot{V}O_2max$ was examined before and after training. Rating of perceived exertion (RPE), psychological perceptions (BRUMS, PANAS and acceptability of HIT) were evaluated during training sessions. **RESULTS**: The increase in $\dot{V}O_2max$ was significantly greater in REHIT20 (2.77±0.75 vs. 3.04±0.75 L·min^{-1}, +10%) compared to REHIT10 (2.58±0.57 vs. 2.67±0.61 L·min^{-1}, +4%; time x group interaction effect: $p<0.05$). There were no significant differences between REHIT10 and REHIT20 in mean RPE (REHIT10: 13.6±0.4, REHIT20:14.5±0.4), changes in mood status, or affective responses. **CONCLUSIONS**: Reducing REHIT sprint duration from 20-s to

10-s attenuates improvements in V̇O$_2$max, and does not result in more desired affective responses. Our findings support the use of the original REHIT protocol consisting of 2x20-s sprints.

3135   Board #4   June 2 8:00 AM - 9:30 AM

Chlorella Intake Further Enhances Anaerobic And Aerobic Capacities Increased By High Intensity Intermittent Training

Shumpei Fujie[1], Natsuki Hasegawa[1], Naoki Horii[1], Moe Oshiden[1], Katsunori Tsuji[1], YuZhong Xu[1], Toru Mizoguchi[2], Eri Okumura[2], Izumi Tabata, FACSM[1], Motoyuki Iemitsu[1]. [1]Ritsumeikan University, Kusatsu, Japan. [2]Sun Chlorella Corp., Kyoto, Japan. (Sponsor: Izumi Tabata, FACSM)
(No relevant relationships reported)

High intensity intermittent training (HIIT) enhances anaerobic and aerobic capacities. Our recent study have demonstrated in animal study that the 6-week combination of chlorella intake and HIIT further elevated glycolytic and oxidative phosphorylation as ATP supply in skeletal muscle as compared with chlorella alone and HIIT alone, resulting in enhancement of anaerobic and aerobic exercise capacities. However, the combined effects of chlorella intake and HIIT on anaerobic and aerobic capacities in human remain unclear. PURPOSE: The aim of this study was to investigate whether the combination of chlorella intake and HIIT further enhanced anaerobic and aerobic capacities as compared with HIIT alone in human. METHODS: Twelve healthy young male subjects (21 ± 1 years) were participated in this study. Subjects completed 3-week of exhaustive HIIT, consisting of 6-7 bouts of 20-second cycling on a leg ergometer at an intensity of 170% maximal oxygen uptake (VO2max) with a 10-second rest between each bout, 3 days/week. They orally took chlorella or placebo (10 tablets) after the breakfast and dinner between the 3-week in a double-blind, randomized, crossover design with 4 weeks between each intervention. We measured VO2max as an indicator of aerobic capacity and maximal oxygen deficit (MOD) as an indicator of anaerobic capacity. RESULTS: After each HIIT intervention, VO2max was significantly increased in both chlorella and placebo groups (P<0.05). However, the amount of change in VO2max after the intervention was significantly higher in chlorella intake than placebo intake (P<0.05). After each HIIT intervention, MOD was significantly increased in both chlorella and placebo groups (P<0.05). However, the amount of change in MOD after the intervention was significantly higher in chlorella intake than placebo intake (P<0.05). CONCLUSIONS: These results suggest that the combination of chlorella intake and HIIT may further enhance anaerobic and aerobic capacities in human.
Supported by Grants-in-Aid for Scientific Research (#17H02183, #16K13059, M. Iemitsu)

3136   Board #5   June 2 8:00 AM - 9:30 AM

Effect Of A Short-term Hiit Program On Systemic Brain-derived Neurotrophic Factor In Healthy Males

Iván Rentería[1], Patricia C. García-Suárez[1], David O. Martínez-Corona[1], Luis M. Gómez-Miranda[2], Alberto Jiménez-Maldonado[1]. [1]Universidad Autónoma de Baja California, Ensenada, Baja California, Mexico. [2]Universidad Autónoma de Baja California, Tijuana, Baja California, Mexico.
(No relevant relationships reported)

Effect of a Short-Term HIIT Program on Systemic Brain-Derived Neurotrophic Factor in Healthy Males

Iván Rentería[1], Patricia C. García-Suárez[1], David O. Martínez-Corona[2], Luis M. Gómez-Miranda[1], Alberto Jiménez-Maldonado[1]
[1]Facultad de Deportes. Universidad Autónoma de Baja California, México.
[2]Escuela de Ciencias de la Salud. Universidad Autónoma de Baja California Campus Ensenada, México.

The brain-derived neurotrophic factor (BDNF) is a member of the neurotrophin family of growth factors. Several stimuli, such as physical exercise have the potential to increase BDNF production. Ambiguous findings regarding the exercise intensity that elicits changes in systemic BDNF levels have been reported in the literature. PURPOSE: To determine the effects of short-term high intensity-interval training (HIIT) on systemic BDNF levels in healthy males. METHODS: Eleven healthy young males (Age = 22.8 ± 2.3 yr.; body weight (BW) = 77.8 ± 11.9 kg; height = 173.4 ± 5.2 cm; BMI = 25.8 ± 3.3 kg/m²) participated in the study. A graded maximal exercise test (GXT) was used to determine the maximal aerobic power (MAP) required to design the exercise intensities. The short-term HIIT protocol consisted of cycle ergometer exercise 3 times/week for 4-weeks. Paired t-test was used to compare anthropometrics and cardiovascular variables, MAP and systemic BDNF levels before and after short-term HIIT. RESULTS: Short-term HIIT did not change significantly the systemic BDNF levels (Pre-HIIT = 18.8 ± 1.6 ng/mL vs. Post-HIIT = 19.2 ± 2.2 ng/mL, p = 0.6495). Similarly, the BW and BMI were not modify by HIIT. Contrary, the hearth rate recovery was improved after the HIIT program (Pre-HIIT=159.5 ± 11.9 vs Post-

HIIT = 148.1 ± 13.6, p= 0.04). **CONCLUSION**: The short-term HIIT protocol used in this study was unable to elicit significant changes on systemic BDNF levels in healthy males. The physiological mechanisms explaining this finding are currently under scrutiny. On the other hand, the same protocol improved the heart rate recovery in healthy men. These data suggest different response of the Central Nerve System and Peripheral Nerve System to the same exercise modality.

3137   Board #6   June 2 8:00 AM - 9:30 AM

Effects of High Intensity Interval Training on Anaerobic Performance & Aerobic Power on Male Basketball Players

Seyed reza Seyedi. *Wuhan sport university, Wuhan, China.*
(No relevant relationships reported)

PURPOSE: High Intensity interval training (HIIT) has become an increasingly popular form of exercise due to its greater effects on exercise capacity and short time requirement. The purpose of this study was to compare two models of HIIT 15s and 30s training on anaerobic peak power, anaerobic average power, anaerobic power drop, time to peak power and aerobic power.
METHODS: Fourteen male basketball players (age: 22.4 ± 2.1 years, weight: 74.5 ± 6.7kg and height: 182 ± 7.3cm) participated in the study. Participants were healthy and active players of a collegiate varsity team, who were randomly assigned to 15s HIIT group and 30s HIIT group. After baseline metabolic, anthropometric, and fitness measurements, both groups performed HIIT three times a week for a period of six weeks. The training of the 30s HIIT group consisted of a total of 18 sessions of 4 to 8 repeats of 30-second sprint cycling at 95%of heart rate with 1-minute active rest between each repetition on an electromagnetically controlled cycle ergometer. The 15s HIIT group trained using the same frequency of workouts per week with 4 to 8 repetition, and applied 15s sprint cycling at 95%of heart rate with 1-minute interval between each repetition on the electromagnetically controlled cycle ergometer. For both groups, before and after the six-week long training anaerobic performance was measured by means of 30 second Wingate cycling ergometer test and aerobic power was measured by means of cycling. Peak power, average power, time to peak, drop of power and aerobic power data were collected and analyzed. Independent t test and paired t test were employed to examine the differences (p < .05) between groups, respectively.
RESULTS: The 15s HIIT group had significantly greater improvements on peak power (0.704±0.601), and average power (0.748±0.347) than the 30s HIIT group did on peak power (-0.260±1.06), and average power (-0.395±0.831). Meanwhile, the 30s HIIT group had significantly greater values on drop power (3.394±2.318), time to peak (1.66±1.10), and aerobic power (3.142±2.544) than the 15s HIIT group did on drop power (-0.484±1.621), time to peak (1.110±0.981), and aerobic power (4.142±3.132).
CONCLUSIONS: It is concluded that the 15s HIIT model may result in greater effects on anaerobic power (peak and average powers) and the 30s HIIT model may yield great aerobic power.

3138   Board #7   June 2 8:00 AM - 9:30 AM

The Effects Of A Three-week Hiit Program On Physiological And Physical Performance Parameters

Linghao Kong[1], Qingwei Jin[2], Susan Sotir[1], Vincent Paolone, FACSM[1], Jeff Gagnon[1], Samuel Headley, FACSM[1]. [1]Springfield College, Springfield, MA. [2]Tianjin University of Sports, Tianjin, China. (Sponsor: Samuel Headley, FACSM)
(No relevant relationships reported)

High Intensity Interval Training (HIIT) has been demonstrated to have a positive effect on a number of physiological variables in several clinical populations. However, little work has been done on this topic in China. **PURPOSE:** To investigate the effects of a 3-week HIIT program on physiological and physical performance parameters (blood pressure, time to exhaustion, peak heart rate, lactate threshold, and O$_{2peak}$) among three different Chinese groups. **METHODS:** Thirty males were categorized by current health status (blood pressure, O$_{2peak}$, and frequency of exercise per week): to healthy active group (n = 10; age = 21.9±2.8, height = 176.5 ± 4.8, weight = 71.8 ± 9.3, percentage of body fat = 13.0 ± 6.12), healthy inactive group (n = 10; age = 20.9 ± 1.85, height = 172.8 ± 4.4, weight = 69.1 ± 10.5, percentage of body fat = 18.35 ± 7.0), or prehypertensive group (n = 10; age = 22.1 ± 2.0, height = 176.3 ± 7.4, weight = 71.8 ± 12.8, percentage of body fat = 20.47). Baseline testing included body fat estimation, blood pressure measurement, and a O$_{2peak}$ test conducted on a treadmill. Subjects completed a 3-week, 3 sessions per week intervention. Each session included a warm-up (5 min), 10 HIIT cycles (60 sec high intensity at 90% O$_{2peak}$ and 60 sec active recovery at 45% O$_{2peak}$, 20 min), and a cool-down (5 min). Post intervention assessments repeated the baseline measures. Six 2 (Time) x 3 (Group) mixed factorial ANOVAs were performed to determine if differences existed in the dependent variables. **RESULTS:** No significant interaction was found for any dependent variables. Significant main effects were identified for systolic blood pressure (120.1±8.3 to 116.8±7.2 mmHg, $p < 0.001$) diastolic blood pressure (72.3±6.7 to 69.5±5.5 mmHg, $p < 0.001$), time to exhaustion (16.0 ± 3.2 to 18.0 ± 2.5

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min, $p<0.001$), O_{2peak} (42.2 ± 6.8 to 45.5 ± 6.2 ml·kg^{-1}·min^{-1}, $p < 0.001$), and lactate threshold (67.1 ± 12.8 to 79.6 ± 11.0 %, $p < 0.001$) over time. Systolic blood pressure and diastolic blood pressure decreased, time to exhaustion, O_{2peak}, and lactate threshold increased, regardless of groups. No significant main effect was found for peak heart rate (183.7 ± 8.8 vs. 184.3 ± 8.8, $p > 0.05$). **CONCLUSION:** A 3-week HIIT program lowered resting systolic and diastolic blood pressure, while increasing time to exhaustion, lactate threshold, and O_{2peak} for all three groups included.

3139   Board #8   June 2 8:00 AM - 9:30 AM

Acute Physiological Responses During Steady State and High Intensity Interval Training in Inactive Men

Toni LaSala, Jordan L. Cola, Racine R. Emmons, Michael A. Figueroa, Francis Frabasile. *William Paterson University, Wayne, NJ.* (Sponsor: Gordon Schmidt, FACSM)

(No relevant relationships reported)

Abstract

High Intensity Interval Training (HIIT) has become an increasingly popular mode of exercise, especially with those with the perception of a lack of time. These intervals have been shown to decrease the time spent being active while simultaneously providing similar results to steady-state training to elicit the cardiovascular adaptations. **Purpose:** To investigate the changes between steady-state training and HIIT training on respiratory exchange ratio (RER), peak oxygen consumption (VO$_{2peak}$), heart rate (HR) and rate of perceived exertion (RPE) in recreationally trained, college-aged participants. **Methods:** Thirteen men 21 to 27 years old (M= 23.31, SD ± .07) were recruited for the study. Subjects participated two sessions and were randomly assigned to two groups: Steady-State (SS) or High Intensity Interval Training (HIIT) training on a treadmill. SS training consisted of a 3-minute warm-up at 2.0 mph with a 0% grade followed by the Balke Protocol. HIIT protocol consisting a 5-minute warm-up at 3 mph at 0% grade, followed by maximum effort sprints for 30 seconds followed by a 30 second active recovery with sprint intervals beginning at 4.5mph increasing by .5mph after recovery interval. **Results:** There was a significant difference in RER between groups (t (12) = 2.30, $p <$.05, $d = $.55). However, no significant differences in VO$_2$ (t (12) = -1.06, $p =$.31, $d=$.36) and HR (t (12) = -.812, $p = $.43, $d =$.26) were identified using a paired samples t-test, between treadmill conditions (SS, HIIT). Furthermore, there were no significant differences (z = -1.51, $p = $.13, $r = $.54) in RPE after conducting a Wilcoxon matched pairs signed-rank test. The results suggest that training at higher intensities for a shorter period of time yielded similar results to training at lower intensities for a longer duration. **Conclusion:** HIIT training allows for increased cardiovascular health in a time efficient manner, which can accommodate various schedules.

3140   Board #9   June 2 8:00 AM - 9:30 AM

Testosterone and Cortisol Responses after Short-term High-intensity Interval Exercise Training in Healthy Humans

Giorgos Paradisis, Anastassios Philippou, Popi Stavrinou, Gregory Bogdanis, Maria Maridaki. *National and Kapodistrian University of Athens, Athens, Greece.*

(No relevant relationships reported)

High intensity interval training (HIIT) has recently gained popularity as an effective stimulus for eliciting adaptations in various aspects of physical fitness. Those adaptations may also involve complex hormonal changes, however less is known about the hormonal responses to this type of exercise training. **PURPOSE**: This study investigated the changes in serum levels of the competitive (anabolic vs catabolic) hormones testosterone (TESTO) and cortisol (CORT) caused by a 3-week HIIT regimen in healthy humans. **METHODS:** Eight physically active males (age: 24.3 ± 1.4 y, body mass: 77.9 ± 2.9 kg, height: 179 ± 1 cm, body fat: 9.7 ± 1.3%) performed three HIIT sessions/week over 3 weeks. Each session included four to six 30-s bouts of high-intensity cycling separated by 4 min of recovery. Blood samples were withdrawn before and at 0.5, 24 and 48 hrs post-exercise. Serum levels of TESTO and CORT were measured by ELISA using commercially available kits. Two-way ANOVA was used for statistics. **RESULTS:** Before training, acute exercise significantly elevated CORT levels by 120.5% (p<0.05) at 0.5 hrs post exercise (357.3±54.7 ng/ml, 137.4±16.8 ng/ml and 179.9±28.5 ng/ml, at 0.5, 24 and 48 hrs after exercise, respectively, compared to 194.9±29.0 ng/ml at baseline; mean±SE). Training reduced the CORT levels both at baseline (122.1 ng/ml) and post exercise (231.9±35.0 ng/ml, 78.7±6.3 ng/ml and 78.7±8.2 ng/ml, at 0.5, 24 and 48 hrs after exercise, respectively) compared to the pre-training levels (p<0.05-0.01); however post-training CORT levels remained significantly elevated at 0.5 hrs post exercise (p<0.01). Circulating levels of TESTO did not change significantly over time, neither before nor after the 3-week HIIT regimen (p>0.05). Interestingly, however, after training the TESTO/CORT ratio increased at 48 hrs post exercise (p<0.05) and was significantly higher at 24 and 48 hrs post exercise compared to the corresponding pre-training time points (65.0% vs 35.9% and 85.3% vs 67.1%, at 24 and 48 hrs, respectively; p<0.05). **CONCLUSION:** Our findings suggest that HIIT triggers beneficial responses of CORT and TESTO/

CORT ratio, which may reflect a specific drive towards anti-catabolic and/or regulatory adaptations to exercise-induced stress. More studies are needed to further characterize the hormonal responses to HIIT in humans.

3141   Board #10   June 2 8:00 AM - 9:30 AM

Physiological Effects of Increasing Battling Rope Weight During 6 weeks of High Intensity Interval Training

Derek PD Bornath, Kevin J. Milne, Kenji A. Kenno. *University of WIndsor, Windsor, ON, Canada.*

(No relevant relationships reported)

Acute battling rope (BR) high intensity interval training (HIIT) increases oxygen consumption, and 4 weeks of BR HIIT has reported significant increases in female upper body maximal oxygen consumption (MVO$_2$), and skeletal muscle endurance. **PURPOSE:** To determine if increasing BR weight during 6 wks of HIIT increases upper body MVO$_2$ and upper body skeletal muscle strength, endurance and power. **METHODS:** 18 recreationally active men and 15 women (23±2y) performed 10 BR HIIT sets, 30s work: 60s rest, 3x/week, for 6 wks. For the first 3 weeks, women used 40 ft, 1.5", 20lb BR and men used 50 ft, 1.5", 25lb BR, after which BR weight was increased by 10lb using a heavier rope for another 3 wks in both groups. Upper body MVO$_2$ (arm ergometer) and skeletal muscle performance (isometric shoulder [shld] flexion/extension, dynamic shoulder power, maximum sit-ups and push-ups) was assessed at baseline, and after 3 and 6 wks. **RESULTS:** During BR HIIT male and female heart rates were >85% of predicted maximums, and peak HIIT blood lactates (BLa) reached 10.79 and 8.33 mmol/L, respectively. See table below for MVO$_2$ and skeletal muscle performance adaptations after 3 and 6 wks of BR HIIT.

		baseline	3 wks	6 wks
upper body MVO2 (ml/kg/min)	male	36.5±5	39.9±7[a]	43.9±7[bc]
	female	31.5±5	34.3±5[a]	38.8±5[bc]
isometric shld flexion (lb)	male	93±18	96±16[a]	99±18[bc]
	female	45±9	50±9[a]	53±10[bc]
isometric shld extension (lb)	male	47.1±7	48.8±7	49.6±6[c]
	female	23.2±5	25.4±4[a]	25.3±4.7[c]
dynamic shld power (N)	male	3904±528	4274±523[a]	4597±536
	female	2883±372	3264±465[a]	3425±451[bc]
situps (#)	male	44.9±15	50.4±15[a]	55±15[bc]
	female	43.7±17	50.3±20[a]	55.7±24[bc]
pushups (#)	male	41.6±17	45.9±16[a]	48.8±18[bc]
	female	27.4±9	32.3±10[a]	37.1±11[bc]

a=baseline vs. 3 wks p<.05, b=3 vs 6 wk p<.05, c=baseline vs 6 wks p<.05
CONCLUSION: 3 wks of BR HIIT can significantly increase upper body MVO$_2$ and skeletal muscle strength, endurance and power in male and female university students. Increasing BR weight plus 3 more wks of BR HIIT produced additional significant improvements in MVO$_2$ and skeletal muscle performance, suggesting progressive overload training principles can be applied to BR training.

3142   Board #11   June 2 8:00 AM - 9:30 AM

Hormonal Responses after Short-term High-intensity Interval Exercise Training in Healthy Humans

Maria Maridaki[1], Roxane Tenta[2], Popi Stavrinou[1], Gregory Bogdanis[1], Anastassios Philippou[1]. *[1]National and Kapodistrian University of Athens, Athens, Greece. [2], School of Health Science and Education, Harokopio University, Greece, Athens, Greece.*

(No relevant relationships reported)

High intensity interval training (HIIT) elicits multiple physiological adaptations which may involve complex hormonal changes, as HIIT is characterized by high physiological demands and stress, and might disturb the levels of hormones associated with energy expenditure and exercise-induced stress. PURPOSE: This study investigated the changes in serum levels of thyrotropin (TSH), free thyroxine (fT4) and prolactin (PRL) caused by a 3-week HIIT regimen in healthy humans. METHODS: Eight physically active males (age: 24.3 ± 1.4 yrs, body mass: 77.9 ± 2.9 kg, height: 179 ± 1 cm, body fat: 9.7 ± 1.3%) performed three HIIT sessions/week over 3 weeks. Each session included four to six 30-s bouts of high-intensity cycling separated by 4 min of recovery. Blood samples were withdrawn before and at 0.5,

24 and 48 hrs post-exercise. Serum levels of TSH, fT4 and PRL were measured by ELISA using commercially available kits. Two-way ANOVA was used for statistics and data are presented as mean±SE. RESULTS: TSH levels peaked at 0.5 hr post exercise, both before (3.41 ± 0.44, 4.85 ± 1.54, 3.14 ± 0.283, and 2.91 ± 0.31 μIU/ml, at baseline, 0.5, 24 and 48 hrs post-exercise, respectively) and after the 3-week HIIT regimen (2.55 ± 0.34, 4.14 ± 0.70, 2.44 ± 0.22, and 2.37 ± 0.49 μIU/ml, at baseline, 0.5, 24 and 48 hrs post-exercise, respectively). FT4 levels peaked 24 hrs post exercise, both before (2.66 ± 0.17, 2.71 ± 0.09, 2.99 ± 0.22, and 2.61 ± 0.04 ng/dl, at baseline, 0.5, 24 and 48 hrs post-exercise, respectively) and after the 3-week HIIT regimen (2.70 ± 0.17, 2.90 ± 0.17, 3.16 ± 0.12, and 2.77 ± 0.07 ng/dl, at baseline, 0.5, 24 and 48 hrs post-exercise, respectively). PRL levels peaked at 0.5 hrs post exercise, both before (38.80 ± 9.90, 66.0 ± 16.32, 27.86 ± 4.40, and 20.14 ± 7.90 ng/ml, at baseline, 0.5, 24 and 48 hrs post-exercise, respectively) and after the 3-week HIIT regimen (25.32 ± 4.81, 55.0 ± 9.39, 24.03 ± 2.50, and 20.76 ± 4.76 ng/ml, at baseline, 0.5, 24 and 48 hrs post-exercise, respectively), reaching statistical significance compared to baseline only after the 3-week regimen (p<0.01). CONCLUSION: Our findings suggest that HIIT triggers mild acute hormonal changes, particularly of PRL, which may reflect regulatory responses to exercise-induced stress; however more studies are needed to further characterize the hormonal responses to HIIT in humans.

3143   Board #12   June 2 8:00 AM - 9:30 AM

The Physical and Psychological Effects of Tactical High-Intensity and Jiu-Jitsu Training on Law Enforcement Officers

Charlie Shervheim, Nick Powell, Maxwell Rasmussen, Jennifer Dysterheft. *Hamline University, St. Paul, MN.* (Sponsor: Robert Pettitt, FACSM)

(No relevant relationships reported)

Law enforcement officers (LEO) require speed, strength, agility, and endurance for their job; however, the training requirements for many LEO departments are minimal. Tactical-specific high-intensity interval training (TS-HIIT) and jiu-jitsu martial arts practices are theoretically effective in improving performance in tactical fields, however no research exists this. **Purpose:** To examine whether TS-HIIT and jiu-jitsu training is more effective than current training practices to improve physical and psychological variables of experienced LEO. **Methods:** 10 experienced LEO were recruited from local departments. Baseline testing included the Perceived Stress Scale (PSS), WHO Quality of Life (WQ), General Self-Efficacy Scale (GSES), and skills-test. The skills-test examined upper-body maneuverability, heavy-object manipulation, lower-body power output, shooting accuracy, ground grappling/gun retention, memory recall, and decision-making. LEO then completed a six-week TS-HIIT and jiu-jitsu program for three hours per week. LEO repeated baseline measures after completion and will again at three months post-completion. **Results:** Despite previous experience, 65% of LEO failed baseline tests. Preliminary t-test analysis revealed significant improvements in grappling technique, timing, and score ($p = 0.02$) as well as time to complete the skills-test ($M = -6.65$ s; $p = 0.01$) post-intervention. Improvements on the grappling test were noted by less time gain control of the situation, prolonged time to failure, or improving from failed baseline tests to passing post-intervention. Two of the 10 LEO did not improve on the grappling test. LEO recalled 30% more phrases during the memory retention test post-intervention ($p = 0.01$). Post-intervention, there was no significant change in shooting accuracy ($p = 0.37$), perceived stress levels, (PSS; $p = 0.58$), or perceived quality of life (WQ; $p = 0.30$). The decision-making task was removed due to a number of participants having already viewed the specific scenarios used during data collection. **Conclusion**: Preliminarily, results indicate that a TS-HIIT and jiu-jitsu program may be critical for improving LEO fitness levels, memory retention, and gun retention skills. Three-month follow-up testing will be completed January 2018 to examine skill retention.

G-35   Free Communication/Poster - Running

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3144   Board #13   June 2 8:00 AM - 9:30 AM

Longitudinal Comparison Of Polarized Vs. High Intensity Multimodal Training In Recreational Runners

Andrew Carnes. *Bellarmine University, Louisville, KY.* (Sponsor: Sara E. Mahoney, FACSM)

(No relevant relationships reported)

Empirical endurance training studies support a polarized distribution, i.e., a high volume of low intensity training combined with less at high intensity. Few studies include recreational runners, who typically train with low volume. CrossFit Endurance© (CFE) targets these runners, emphasizing low volume, high intensity intervals and multimodal circuit training. Anecdotally, CFE enhances performance to a similar extent as higher volume run training, but empirical data have not been available.
PURPOSE
Longitudinally compare changes in performance and fitness after 12 weeks of CrossFit Endurance© or polarized training in recreational runners.
METHODS
Twenty-one (N=21) participants completed 12 weeks of CrossFit Endurance (CFE), n=12, or polarized endurance training (PET), n=9. Both groups trained 5 d · wk⁻¹. PET ran 5 d · wk⁻¹ while CFE ran 3 d · wk⁻¹ and performed CrossFit 3 d · wk⁻¹ (run + CF 1 d · wk⁻¹). Duration, intensity, and distance were recorded via GPS and HR monitoring. Intensity was classified as low, moderate, or high (Zone 1, 2, or 3) according to ventilatory thresholds. PET was prescribed greater volume (295 ± 67 min · wk⁻¹), predominantly in Z1 ($86/14\%$ in $Z1/\geq Z2$). CFE emphasized lower volume (110 ± 18 min · wk⁻¹) Z3 running ($48/52\%$ Z1/$\geq$Z2). Performance (5-km TT) was assessed at baseline (BL) and at 6 (MID) and 12 weeks (POST). VO₂ max and body composition (BC) were assessed at BL and POST.
RESULTS
Two-way ANOVA showed a significant main effect of time on TT ($F = 40.1$, $p < .001$, $\eta_p^2 = 0.74$), VO₂ max ($F = 24.0$, $p < .001$, $\eta_p^2 = 0.56$), and BC ($F = 20.2$, $p < .001$, $\eta_p^2 = 0.51$), and a significant group*time interaction on VO₂ max ($F = 4.13$, $p = .05$, $\eta_p^2 = .18$). Both groups ($p \leq .001$) improved TT from BL–POST (-88 $\pm$ 55 s), BL-MID (-57 $\pm$ 40 s), and MID-POST (-31 $\pm$ 37 s). VO₂ max (46.2 ± 6.8 to 49.1 ± 7.4 ml·kg·min⁻¹) and BC (15.5 ± 6.7 to 13.0 ± 6.9 %BF) improved BL - POST ($p < .001$ for both). However, the VO₂ max increase was larger in PET (4.3 ± 3.6 vs. 1.78 ± 1.9 ml·kg·min⁻¹). No interaction occurred for TT ($F = 0.23$, $p = .79$) or BC ($F = 0.02$, $p = .88$).
CONCLUSION
Recreational runners achieved similar improvement in 5-km performance and body composition through polarized training or CFE, but PET yielded a greater increase in VO₂ max. Both programs appear efficacious for recreational athletes. Extrapolation to longer distances requires additional research.

3145   Board #14   June 2 8:00 AM - 9:30 AM

Optimal Inspiratory Muscle Training Dose(s) to Enhance Respiratory Function Characteristics and Running Performance

Kyle R. Barnes, Sara M. Dansforth, Katie G. Smyth. *Grand Valley State University, Allendale, MI.* (Sponsor: Stephen Glass, FACSM)

(No relevant relationships reported)

PURPOSE Inspiratory muscle training (IMT) is a form of resistance training for the muscles primarily involved in the processes of breathing using a resisted breathing trainer. However, the optimal IMT loading parameters to elicit specific physiological adaptations are unknown. The authors adopted a dose-response design to determine the IMT load most effective for enhancing various inspiratory muscle function characteristics and performance. **METHODS:** 29 trained runners performed a 1-mile (1609-m) time trial and a series of breathing tests using an inspiratory breathing trainer and software. Runners were then randomly assigned to 1 of 5, six week IMT programs ranging in resistance from 30-70% of peak strength index (S_{IND}) in 10% increments. Maximal and submaximal inspiratory breathing tests were repeated each week and 1-mile performance was repeated after six weeks. To identify the optimal IMT group (resistance) for each measure, each runner's percentage change was modeled as a quadratic function of the rank order of the intensity of IMT. Uncertainty in the optimal IMT and in the corresponding effect on the given measure was estimated as 90% confidence limits (CL) using bootstrapping. **RESULTS:** There was a clear optimum for performance at Group 3.2 (52% of S_{IND}) with a possibly beneficial effect of 3.2% (CL = 2.8-3.5%). There was a strong trend toward Groups 2 to 3 (40-50% of S_{IND}) having the optimal IMT resistance to improve S_{IND} (mean improvement of 36.5%, CL = 29.2-45.7%), peak inspiratory flow (19.5%, 13.3-24.4%), training load (37.8%, 27.4-46.3%), flow (40.3%, 28.6-54.1%), power (52.3%, 43.5-65.1%), and energy (45.6%, 29.4-60.9%) with very-likely beneficial effects on all measures. Improvements in inspiratory volume (15.3%, 10.7-17.4%) were optimal at Group 4.0 (60% S_{IND}). Correlations between changes in performance and changes in inspiratory muscle function characteristics were trivial-small. IMT training at 2-wk was unlikely or possibly beneficial with the magnitude of effects trivial-small. At 4- and 6-wk, effects were greater and more beneficial than the previous 2-wk with no visual plateau in improvements. **CONCLUSION:** IMT between 40-50% of S_{IND} appears to be optimal for most inspiratory muscle characteristics, while IMT at slightly higher resistances (~52% S_{IND}) is optimal for 1-mile performance.

SATURDAY, JUNE 2, 2018

3146 Board #15 June 2 8:00 AM - 9:30 AM

Feasibility of Predicting Bone Mineral Density in Distance Runners with an Artificial Neural Network

Alec C. Miller, Kevin S. Ryan, Toni D. Uhrich, Kristof Kipp. *Marquette University, Milwaukee, WI.* (Sponsor: Paula E. Papanek, FACSM)

(No relevant relationships reported)

Bone mineral density (BMD) is used to assess the risk of stress fractures in distance runners. Given that the standard assessment of BMD with Dual X-ray Absorptiometry (DXA) is very expensive, a possible solution would be to establish models that can predict BMD from data that is easier and cheaper to acquire. Artificial Neural Networks (ANN) are able to model non-linear and complex associations between biomechanical and physiological variables, and could pose a solution to the aforementioned problem. **PURPOSE**: Determine the feasibility of predicting BMD in distance runners with an ANN. **METHODS**: BMD of the femoral neck was assessed in twenty-three collegiate distance runners (16 male) using DXA. They also ran on an instrumented treadmill at their long-slow distance pace. Ground reaction forces (GRF) were collected and Rate of Loading (RoL) was derived. Average peak values were calculated for the right and left leg, and were pooled for all analyses. Simple and multiple linear regression models were used to assess associations between input (body mass, GRF, RoL) and output variables (BMD). In addition, a three-layer feedforward ANN with 20 hidden neurons was trained fifteen separate times to also model the same associations. The prediction ability of all models was compared based on their associated correlation coefficients. Further, the root mean squared error (RMSE) of the multilinear regression model and ANN were also compared. **RESULTS**: Significant simple linear correlations were found between BMD and body mass (r = 0.645, p = 0.008), BMD and GRF (r = 0.534, p = 0.038), and BMD and RoL (r = 0.567, p = 0.025). In addition, the multiple linear regression model (adjusted r = 0.630, p = 0.001, RMSE = 0.161) and ANN (training r = 0.865, p = 0.001; test r = 0.697, p = 0.003; RMSE = 0.161) were also able to fit predict the association between input and output variables. **CONCLUSIONS**: An ANN can feasibly predict BMD in distance runners, and is able to do so better than standard regression models. While the developed ANN performed well with the inputs of body mass, GRF, and RoL, there are other variables (e.g., stride parameters or caloric balance) that should be included in future studies, as they are easier to assess and would provide a more holistic model of known risk factors for stress fractures in distance runners.

3147 Board #16 June 2 8:00 AM - 9:30 AM

The Effect of Physiological Performance Variables on 3000m Times in Collegiate Mid-Distance and Distance Runners

Matthew Miltenberger, Alexander Zubko, Shala Davis, FACSM, Chad Witmer. *East Stroudsburg University, East Stroudsburg, PA.* (Sponsor: Dr. Shala Davis, FACSM)

(No relevant relationships reported)

Collegiate mid-distance (MD) runners and distance (D) runners compete in the 3000m. Previous research has identified VO_2max, velocity at lactate threshold (vLT), %VO_2max at lactate threshold, and running economy (RE) to correlate with 3000m performance. Research is lacking on if differences in these variables, and pacing strategy, affects 3000m performance between groups. **PURPOSE:** To identify how physiological performance variables relate to 3000m time, and if differences in these variables, and pacing strategies, occurs between groups. **METHODS:** 11 male NCAA Division II runners (5 MD, 6 D) were used. Subjects completed a 3000m time trial on a synthetic 200m indoor track, where 3000m time and split times were recorded using a single-beam timing gate. A discontinuous 3-minute stage lactate threshold protocol was used to measure vLT, lactate threshold (LT), and running economy at 14.5km/h, 16km/h, and 17.5 km/h ($RE_{14.5}$, RE_{16}, $RE_{17.5}$). A modified Astrand VO_2max test was used to assess VO_2max, with the speed set at 16.1km/h and grade increasing 2% every two minutes. **RESULTS:** VO_2max (r=-.629), $RE_{14.5}$ (r=.632), RE_{16} (r=.756), %VO_2max at LT (r=0.675), 600-1200m time (r=.784), 1200-1800m time (r=.962), and 1800-2400m time (r=.719) significantly correlated to 3000m time (p<0.05), when merging subjects. In the D group, %VO_2max at LT (r=.875), RE_{16} (r=.853), 600-1200m time (r=.882), and 1200-1800m time (r=.965) significantly correlated to 3000m time (p<0.05). In the MD group, 1200-1800m time (r=.932) significantly correlated to 3000m time (p<0.05), and VO_2max had a trend towards significance with 3000m time (r=-.829, p=.083). Statistically different mean differences in VO_2max (D=67.00±2.64 vs MD=63.56±1.52ml/kg/min), and vLT (D=15.10±0.19 vs MD=14.33±0.35km/h) was observed between groups (p<0.05). A graphical difference in pacing strategy was observed between groups. **CONCLUSION:** 1200-1800m time is the most important split time for 3000m performance. VO_2max was the best physiological performance indicator in MD runners, and RE_{16} was the best physiological performance indicator in D runners. Runners should be trained differently according to their training status, to improve 3000m performance.

3148 Board #17 June 2 8:00 AM - 9:30 AM

Long Ground Contact Time Enhances Running Economy at High-Intensity Running

Fumiya TANJI, Hayato OHNUMA, Ryosuke ANDO, Tatsuaki IKEDA, Yasuhiro SUZUKI. *Japan Institute of Sport Sciences, Tokyo, Japan.*

(No relevant relationships reported)

Running economy (RE) determines the difference in distance running performance in highly-trained runners. Studies have highlighted RE importance during high-intensity running. Although RE is related to ground contact time (Tc), the relationship between RE at high-intensity running and Tc is not elucidated. It is also unclear whether the hamstrings muscle, which contribute to high-intensity running, affect RE and Tc. **PURPOSE:** We aimed to clarify the relationships among RE, Tc at intensity below and above the lactate threshold (LT) run, and hamstring muscle's cross-sectional area in highly-trained long-distance runners. **METHODS:** We enrolled 11 highly trained male distance runners (IAAF score: 1038 ± 48). They underwent treadmill running test to assess the LT, and RE. RE was evaluated at 270 (RE270) and 360 m/min (RE360) as the intensity below and above the LT, respectively. Tc was also valuated at the same velocity (Tc270; Tc360). Both medial and lateral hamstring muscles' cross-sectional areas (MHA and LHA, respectively) were calculated using MRI at 50% position of the right thigh. **RESULTS:** The subjects' LT, RE270 and RE360 were 337 ± 17 m/min, 0.90 ± 0.08 kcal/kg/km, and 1.00 ± 0.07 kcal/kg/km, respectively. The Tc270, Tc360, MHA and LHA values were 195 ± 17 ms, 164 ± 9 ms, 1.24 ± 0.18 cm^2/kg$^{0.67}$, and 0.99 ± 0.11 cm^2/kg$^{0.67}$, respectively. RE270 showed a significant relationship with Tc270, MHA, and LHA (r = -0.81, 0.75, and 0.60, respectively; $P < 0.05$), but no relationship was noted with IAAF score (r = -0.55; $P = 0.08$). Tc270 was related to MHA and LHA (r = -0.63 and -0.67; $P < 0.05$). Although RE360 showed a significant relationship with IAAF score, Tc360, and MHA (r = -0.73, -0.65, and 0.69, respectively; $P < 0.05$), no relationship was noted with LHA (r = 0.35; $P = 0.30$). Tc360 did not exhibit any significant relationship with MHA (r = -0.55; $P = 0.08$) and LHA (r = -0.52; $P = 0.10$). **CONCLUSION:** The findings of this study are as follows: (a) RE at high rather than low intensity is related to running performance; (b) longer Tc enhances RE; (c) superior RE and long Tc at low intensity are related to small hamstring muscles, but these associations disappear, except between RE and MHA, at high intensity. These results suggest that long Tc at high-intensity contributes to superior RE, but not to hamstring muscles, and leads to higher running performance.

3149 Board #18 June 2 8:00 AM - 9:30 AM

Relationship Between Running Economy and Achilles Tendon Length.

Jacquelyn Crow, Eric Sobolewski, Randolph Hutchison, Scott Murr. *Furman University, Greenville, SC.* (Sponsor: Tony Caterisano, FACSM)

(No relevant relationships reported)

Longer tendon length has been shown to be related to better running economy because longer tendons can store more energy to produce more force during concentric contraction. Running economy is traditionally defined as having a lower VO_2 at the same submaximal speed. However, studies have not tested if this relationship also occurs in male and female elite distance runners at faster speeds. **PURPOSE:** To determine if Achilles tendon length influences running economy. **METHODS:** The researchers used ultra sound technology to measure the right Achilles Tendon length of twenty-two varsity collegiate runners (20.09 ± 1.63 yrs), 12 males (178.44 ± 6.74 cm, 65.21 ± 6.62 kg) and 10 females (167.22 ± 7.73 cm, 54.45 ± 4.80 kg). After the researchers measured Achilles Tendon length, participant completed a VO_2 max test and running economy was determined by assessing VO_2 at submaximal speeds. The men ran at speeds of 10.0, 10.4 and 10.8 mph, and the females ran at speeds of 8.4, 8.8, and 9.2 mph. The relationship between tendon length and running economy was assessed using Pearson correlation coefficients. **RESULTS:** For collegiate male runners, there was a significant negative relationship between Achilles Tendon length and running economy (r = -0.76 — -0.71, $p \leq .01$). When tendon length was normalized to height (tendon length/height) the relationship between tendon length and running economy was no longer significant (r = -0.32— -0.24, p = 0.32-0.45). For collegiate female runners, there was no significant relationship between Achilles Tendon length and running economy alone (r = 0.24-0.39, p = 0.06-0.51) or when normalizing to height (r =0.35—0.44, p =0.23-0.40). **CONCLUSION:** These findings indicate that longer Achilles Tendons in collegiate male runners are related to improved running economy. In collegiate female runners, tendon length is not significantly associated with running economy. However, there was a negative correlation between Achilles Tendon length and running economy for the males and a positive correlation for the females indicating that longer tendon length might be more beneficial for male runners and shorter tendon might be slightly more economical for females. Other factors besides tendon length attribute to running economy, but this study indicates that for male's tendon length plays a role in running economy.

3150   Board #19   June 2 8:00 AM - 9:30 AM

Impact of Wearing Compression Pants on HR, RPE, Lactic Acid During a Submaximal Run

Jacob Whitmore, Mike Ryan, Shinichi Asano, Paul Reneau. *Fairmont State University, Fairmont, WV.*
(No relevant relationships reported)

Compression pants, waist to ankle, have grown in popularity among recreational and athletic populations for improving performance, however, minimal is known about the effects of compression pants on submaximal exercise. **PURPOSE:** The purpose of this study was to investigate the impact of wearing compression pants on physiological responses to a 12 min run. **METHODS:** College aged males (n=8) participated in three separate running sessions. Subjects initially performed a graded exercise test to anchor the RPE scale. Thereafter subjects were assigned to run on a treadmill at a set speed of 8 mph for 12 minutes either while wearing or not wearing compression pants, order of tests was randomized. Lactic acid, HR, and RPE were recorded every 3 minutes during the test, and every 3 minutes after the test for 6 minutes. Subjects were instructed to wear the pants for no longer than 30 minutes prior to the running tests. Dependent T-tests were performed on LA, HR, and RPE at each 3 min measurement of the test and recovery, with an alpha set at p<.05. **RESULTS:** Lactic acid levels were significantly lower (p<.05) with compression pants on at the 12 and 18 minute marks. RPE was significantly higher (p<.05) with the compression pants on at the 3 and 6 minute marks. No other significant differences (p>.05) were found in RPE and no significant differences (p>.05) were found in HR.

Test	With/Without Compression	3 min	6 min	9 min	12 min	15 min	18 min
LA (mmol/l)	With Compression	9.78 (5.95)	8.04 (2.10)	9.15 (4.55)	8.85* (4.24)	9.28 (5.85)	5.3* (2.05)
	Without Compression	11.18 (6.56)	9.45 (4.94)	10.65 (6.0)	12.25* (4.12)	11.74 (6.25)	9.25* (3.06)
HR (bpm)	With Compression	135 (18.85)	150 (22.93)	160 (19.83)	162.5 (21.37)	112 (9.8)	106 (15.3)
	Without Compression	138.5 (17.1)	146 (21.17)	162 (16.42)	168 (18.27)	121.6 (20.65)	110.5 (11.7)
RPE	With Compression	10.63* (1.4)	11.88* (1.73)	12.5 (2.14)	13.88 (1.73)	9.38 (1.69)	8.25 (0.89)
	Without Compression	9.5* (1.93)	10.88* (1.96)	12.25 (1.83)	13.38 (2.26)	9.86 (1.64)	8.75 (1.16)

(*p<.05)

CONCLUSION: Wearing compression pants was shown to lower your lactic acid levels at the 12 min point and 6 min after completion of submaximal exercise. RPE was shown to be higher initially but then the differences became non-significant. Compression pants were shown to not make any significant changes in HR.

3151   Board #20   June 2 8:00 AM - 9:30 AM

Modeling Critical Speed and D′ in Elite Track & Field Athletes

Timothy J. Fulton, Robert F. Chapman, FACSM. *Indiana University, Bloomington, IN.*
(No relevant relationships reported)

PURPOSE: 1) To determine if there are sex differences in critical speed (CS) and $D′$, 2) to develop a model to predict CS, and 3) to determine the percent of CS various races are run at in elite track and field athletes.
METHODS: Inclusion criteria were athletes with personal best times in each of the 1500m, 3000m, and 5000m events faster than 4:10, 8:55, and 15:20 (women) or 3:38, 7:45, and 13:30 (men) since January 1, 1997. CS and for each athlete were calculated using the linear method [D = CS * t + $D′$, where D is the distance ran and t is the time it took (in seconds) to cover that distance]. A second data set was compiled which included all those who met the above criteria *and* had a 10,000m time faster than 32:15 (women) or 28:00 (men).
RESULTS: 115 women and 127 men met the initial inclusion criteria. A subset of athletes, 51 women and 48 men, also met the 10000m inclusion criteria. The average Pearson correlation coefficient for the regression line used to calculate CS and $D′$ was > 0.9999. As expected, men had a significantly faster CS (m/s) than women (6.10 ± 0.13 vs. 5.39 ± 0.13; $p < 0.001$), however $D′$ (m) was not significantly different (204.0 ± 35.8 vs. 197.5 ± 39.6; $p = 0.18$). For both men and women, 5000m time was the best predictor of CS. The men's prediction model was CS = -0.0105 * 5000m time (s) + 14.347 ($R2 = 0.9522$; $p < 0.001$) and the women's was CS = -0.00761 * 5000m time (s) + 142.180 ($R2 = 0.9313$; $p < 0.001$). 1500m race pace was 112.8 ± 2.8% (women) and 113.2 ± 2.8% (men) of CS. 3000m race pace was 106.7 ± 1.5% (women) and 107.1 ± 1.7% (men) of CS. 5000m race pace was 103.6 ± 0.7% (women) and 103.7 ± 0.7% (men) of CS. 10000m race pace was 98.7 ± 1.5% (women) and 98.6 ± 1.5% (men) of CS. There were no significant differences between men's and women's race pace as a percent of CS for any race distance ($p = 0.24 - 0.55$).

CONCLUSIONS: As CS represents the greatest wholly oxidative metabolic rate, men's faster CS is likely due to their known ability for greater oxygen delivery and consumption compared to women. The lack of difference in $D′$ may be due to similar phosphocreatine stores (per kg dry muscle mass) between sexes. Additionally, coaches and athletes that want to know CS for training design or race pacing applications may be able to utilize the prediction equations if data on a full range of performances is not available.

3152   Board #21   June 2 8:00 AM - 9:30 AM

Heart Rate Variability in middle-aged Sprinters and Endurance Runners

Lysleine Alves de Deus, Thiago dos Santos Rosa, Caio Victor de Sousa, Samuel da Silva Aguiar, José Morais Souto Filho, Patrick Anderson dos Santos, Lucas Duarte Barbosa, Herbert Gustavo Simões. *Universidade Católica de Brasília, Brasília, Brazil.*
(No relevant relationships reported)

Aging is associated with decreased autonomic balance which could be assessed by Heart Rate Variability (HRV). Exercise training improves autonomic balance, but there is a lack in the literature regarding the HRV profile of middle-aged sprinters and endurance runners. **PURPOSE:** The effects of lifelong endurance and sprint training on cardiac autonomic balance were assessed in middle-aged master athletes, and compared with age-matched controls and young untrained individuals. **METHODS:** Participants (n=81) were 8 master sprinters (MS; 51.75±11.08yrs), 8 endurance runners (EN, n=8, 51.14±5.36yrs), 17 age-matched untrained (CON, 47.47±6.00yrs) and 48 young controls (YC, 25.40±3.87 yrs). For the acquisition of RR intervals (iRR) (Polar RS800X Heart Rate Monitor®) the participants remained seated for 15-min, with the final 10-min being considered for analysis. HRV was measured using Kubios software. A two-way ANOVA with repeated measures was applied. **RESULTS:** All studied parameters did not differ between MS and EN {Time Domain [HR (bpm) 59.00±6.13 vs. 58.94±12.75], [R-R (ms) 1030.45±107.45 vs. 1068.77±206.17], [SDNN (ms) 57.35±20.07 vs. 80.66±71.07], [RMSSD (ms) 40.88±20.07 vs. 38.93±20.44]; Non-linear domain [SD1 (ms) 28.93±14.20 vs. 27.56±14.46]}, whose demonstrated a reduced HR and elevated mean R-R intervals in comparison to both YC [(HR (bpm) 69.64±9.81) and (R-R 883.93±124.11)] and age-matched individuals [(HR (bpm) 70.06±6.63) and (R-R (ms) 865.11±78.39)]. It was observed a lower HRV for middle-aged CON {[RMSSD (ms) 20.23±5.87], [SDNN (ms) 37.79±10.15] and [SD1 (ms) 14.31±4.15]} compared to YC {[RMSSD (ms) 43.33±26.41], [SDNN (ms) 67.07±28.77] and [SD1 (ms) 30.66±18.69; p<0.05]}. These last age-related changes were not observed for MS and EN. **CONCLUSION:** For the master athlete, regardless of being endurance runner or a sprinter, both training modes are similarly beneficial, attenuating the effects of aging on the autonomic balance.

3153   Board #22   June 2 8:00 AM - 9:30 AM

A Comparison of Two VO$_{2max}$ Treadmill CPETs in Highly Trained Distance Runners

Ryan A. Vanhoy[1], Stephanie A. Sullivan[2], Claudio L. Battaglini, FACSM[2]. *[1]University of Mississippi, University, MS. [2]University of North Carolina at Chapel Hill, Chapel Hill, NC.* (Sponsor: Claudio Battaglini, FACSM)
(No relevant relationships reported)

Measuring maximal oxygen consumption (VO$_{2max}$) via treadmill testing is a popular procedure for testing aerobic power and subsequently developing exercise prescriptions. Previous studies have produced conflicting results when comparing horizontal and incline graded treadmill protocols designed to assess VO$_{2max}$, and the variability may be due to the heterogeneity of subjects, having different fitness levels and backgrounds. **PURPOSE:** To prospectively compare the VO$_{2max}$ value attained during a horizontal (increment in speed only) (SOVO$_{2max}$) and an inclined (constant speed with increment in grade only) (GOVO$_{2max}$) cardiorespiratory exercise tests (CPETs) in highly trained distance runners. A secondary purpose examined if the ventilatory threshold (VT) determined from the SOVO$_{2max}$ and GOVO$_{2max}$ CPETs occurred at the same percent of VO$_{2max}$ (% VO$_{2max}$ @ VT). **METHODS:** After a familiarization session performing the Bruce Protocol, VO$_{2max}$ and % VO$_{2max}$ @ VT were evaluated in 16 male distance runners, some who preferred hilly terrain and some who preferred flat or track running, using the SOVO$_{max}$ and GOVO$_{max}$ CPETs. Dependent samples t-tests were used to compare the VO$_{2max}$ and % VO$_{2max}$ @ VT results between the SOVO$_{2max}$ and GOVO$_{2max}$ CPETs. **RESULTS:** VO$_{2max}$ values were significantly higher from the GOVO$_{2max}$ in comparison to the SOVO$_{2max}$ protocol (76.1 and 71.2 mLO$_2$/kg/min, p=. 005); however, the % VO$_{2max}$ @ VT was not significantly different between the GOVO$_{2max}$ and SOVO$_{2max}$ protocols (77.5% and 77.2%, p=.825). **CONCLUSION:** Higher VO$_{2max}$ values were attained on the GOVO$_{2max}$ CPET, even on those who reported they were track athletes and favored running on the flat surfaces. These results agree with previous research that found athletes who train and compete on an exclusively flat surface or hilly terrain both tend to produce higher VO$_{2max}$ values on CPETs that include changes in treadmill grade. However, due to the non-significant difference in % VO$_{2max}$ @ VT observed between the SOVO$_{2max}$ or GOVO$_{2max}$ CPETs,

for the determination of training thresholds, runner specialty (flat versus hill runners) should therefore be considered when selecting the most appropriate CPET in this athletic population.

3154   Board #23   June 2 8:00 AM - 9:30 AM

Effects of Hip Strengthening on Running Mechanics and Chronic Leg Pain in Recreational Athletes

Jennifer Bossi[1], Samantha Everett[2], Vanessa Rettinger[1], Adam Keath[1]. *[1]Anderson University, Anderson, SC. [2]Elon University, Elon, NC.*

(No relevant relationships reported)

PURPOSE: The effects of a hip strengthening protocol on posterior hip running mechanics and Functional Movement Screen scores were examined in recreational athletes with chronic leg pain.
METHODS: Subjects ($n = 12$) were instructed to run at a self-selected pace on a treadmill, while a two-dimensional video was recorded to assess posterior hip drop. Posterior hip drop angle was defined as the alignment of the PSIS during the stance phase as indicated by reflective markers. Subjects were also assessed using the Functional Movement Screen. A treatment group ($n = 7$) was then instructed to complete an 8 week hip abductor strengthening protocol in addition to their normal training routine, while a control group ($n = 5$) resumed normal training without a hip abductor strengthening protocol. Both groups were reassessed after 8 weeks to determine changes in posterior hip drop angles and FMS scores. Chronic leg pain was assessed using a 10 point visual analogue scale pre and post treatment.
RESULTS: A two-way mixed ANOVA revealed a significant interaction between the treatment group and time on hip drop measurement, $F(1, 10) = 6.383$, $p = .03$, partial η2 = .390. Hip drop showed a statistically significantly improvement in the treatment group (M = 0.43, SE = 0.17, $p = .03$) compared to the control group. No statistically significant interaction effects were observed for pain (F(1, 10) = .278, $p = .60$, partial η2 = .027) or FMS (F(1, 10) = .310, $p = .59$, partial η2 = .03). Follow-up within subjects univariate analysis showed significant mean improvements for the treatment group in pre and post ratings for hip drop (m= -.89, $p = .04$) and FMS (m = -1.28, $p = .03$) and no significant differences in pain.
CONCLUSIONS: Hip abductor strength training was observed to reduce hip drop angles and increase FMS scores which may lead to better posterior hip mechanics. These improvements alone however, will not reduce pain in recreational runners with chronic leg pain. Given the limited sample size, further research is warranted to identify what factors contribute to chronic pain reduction in recreational runners.

3155   Board #24   June 2 8:00 AM - 9:30 AM

Relationship between Daily Mileage and Upper Respiratory Illnesses in Collegiate Cross Country Runners

Joshua S. Hogg, Keith D. Randazzo, Suzanne L. McDonough, Michael C. Washam. *Mississippi College, Clinton, MS.*

(No relevant relationships reported)

The incidence of upper respiratory illnesses (URI) within endurance sports is commonplace and often results in decreased athletic performance. For this reason, avoidance of these illnesses is of utmost importance to the athlete. Previous research has identified a positive relationship between running mileage and frequency of URI; however, defining this threshold in terms of intensity and duration of exercise has not been well established. Little is known about underlying factors influencing this relationship. Greater insight into the relationship between mileage and URI will allow for better training and can help establish best practices for creating programs that can reduce the occurrence of URIs. **PURPOSE:** The purpose of this study was to investigate the relationship between endurance training and immune function. **METHODS:** Participants (N = 25, 13 females, 12 males; mean age 19 ± 3 years) were college undergraduate students. A survey consisting of the Wisconsin upper respiratory system measure (WURSS-21), Daily mileage, sleep, and diet logs were kept by each of the cross country athletes throughout the duration of this study. **RESULTS:** Correlations revealed a significant relationship between daily mileage and frequency of URI ($r = .10$, $p = .05$). Additionally, sleep and diet were significantly correlated with both mileage and URI frequency, which fulfilled prerequisites to test for moderation (Aiken & West, 1991). However, when sleep and diet were added to the model, neither was found to moderate the relationship between mileage and URI. **CONCLUSION:** Results suggest that as daily mileage increases there is a greater likelihood of URI. It was also revealed that vitamin C intake and hours of sleep did not affect this relationship. Future research on this should explore other factors that could potentially influence the relationship between miles run per day and URI.

3156   Board #25   June 2 8:00 AM - 9:30 AM

The Effect of Workload on Exercise Volume during Exhaustive Anaerobic Treadmill Running

Taylor Kennon, Taylor Bloedon, Boe Burrus, Young Sub Kwon. *Humboldt State University, Arcata, CA.*

(No relevant relationships reported)

Anaerobic capacity has implications in health and sport performance. Sprint interval training improves anaerobic capacity, aerobic factors as well as performance. Optimal durations for taxing anaerobic capacity have been shown to be 60 seconds, and have been elicited using Anaerobic Speed Test (AST). In order to maintain this optimal duration for multiple sets, a decreasing workloads method must be used as fatigue increases following each set. These workloading methods must be compared to determine which protocol allows for the maximum exercise volume to be achieved. **PURPOSE**: The purpose of this study was to compare the effects of three different workload protocols on exercise volume completed during multiple sets of exhaustive anaerobic running on a treadmill. **METHODS**: Twelve male subjects (mean ± SD; age = 22.7 ± 4 yr, height:172.9 ± 6.9 cm, weight:75.9 ± 10.3 kg, VO$_2$ max: 57.3 ± 6 ml/kg/min) completed three sessions of high intensity running on a graded treadmill with three different protocols using parameters adopted from the AST (20% grade, 8 mph to exhaustion). Four sets were completed during each protocol. Protocols included: 1) constant sets (CS): no descending workload in all four sets, 2) descending speed (DS): the speed is decreased by 10% for each subsequent set, 3) descending grade (DG): the grade is decreased by 10% for each subsequent set. **RESULTS**: Total exercise volume achieved during the four sets of the DS protocol was significantly higher than both the CS (p<0.01) and DG (p<0.01) protocols. Time to exhaustion achieved during the 2nd, 3rd and 4th sets of the DS protocol were significantly higher than the 2nd, 3rd and 4th sets of the CS protocol, all under p<0.01. Cadence during the 3rd set of the DS protocol was significantly lower than the 3rd set of the CS protocol (p<0.01). Additionally, cadence during the 4th set of the DS protocol was significantly higher than the 4th sets of the CS and DG protocols (p<0.01). **CONCLUSIONS**: The longer times per set and greater volume achieved during the DS protocol, in comparison to the DG and CS protocols, suggests the potential for a greater training effect. Differences in cadence values among the protocols could help explain differences in performance implicating muscle fiber type recruitment and fatigue.

3157   Board #26   June 2 8:00 AM - 9:30 AM

The Acute and Chronic Effects of Highly Cushioned Shoes on Loading Characteristics in Recreational Runners

Jessica L. Corkin[1], Sarah Clarke[1], Michael J. Bohne[2], Michael Stoolmiller[3], Scott N. Drum, FACSM[1]. *[1]Northern Michigan University, Marquette, MI. [2]Utah Valley University, Orem, UT. [3]Michigan State University, East Lansing, MI.* (Sponsor: Scott Drum, FACSM)

(No relevant relationships reported)

Highly cushioned shoes (HCS) are a popular choice for road and trail runners. Manufacturers suggested extra cushioning potentially reduces injury rates through superior shock absorption, implying less impact upon foot strike versus standard cushioned shoes (SCS). **PURPOSE:** To examine the effects of a 4-week HCS intervention on running-related impact forces in adult recreational runners. **METHODS:** Twenty-nine healthy runners (18-60 yrs of age) who had never worn HCS were randomized to either HCS intervention (INV) or SCS control (CON) groups, and wore HCS or SCS a majority of each training week. During pre and post-tests in a lab, all participants wore SCS first, followed by HCS, while running overground at a self-selected, monitored pace and striking embedded force plates in up to 30 total trials/session, at least 10 trials/shoe, to obtain impact peak (PK1) and active peak (PK2) forces, instantaneous loading rate (ILR), average loading rate (ALR), and contact time (CT). Runners recorded daily training data for 4-weeks. A repeated measures, mixed ANOVA was utilized to detect differences between shoes and groups. **RESULTS:** At pretesting, when comparing pooled data in SCS to HCS, no significant differences were found and all effect sizes were small. The acute (i.e., at baseline testing) response to the shoes yielded no statistically significant difference between shoe types. Additionally, there was no statistically significant difference between shoes over time (p >0.05) or between the groups over time (p>0.05). ILR was the variable closest to significance (p=0.066) with a small effect size (0.120). **CONCLUSION:** HCS do not cause alterations in ground reaction forces over a short-term (4-week) habituation period in recreational runners. Interestingly, there was a high drop-out rate in the HCS group of 18% due to self-reported adverse reactions (e.g., numbness, bruising, pain), but results indicated no differences in loading characteristics between shoe types. Still, transitioning to HCS should be a gradual process; however, more research is warranted in long-term HCS usage.

3158   Board #27   June 2 8:00 AM - 9:30 AM

Association Between Race Time, Body Mass, and Total Body Water in Ultramarathon Runners

Julie M. Cousins, Heather H. Betz. *Albion College, Albion, MI.* (Sponsor: Helaine Alessio, FACSM)

(No relevant relationships reported)

Acute bouts of prolonged endurance exercise have been found to significantly decrease body mass. Some researchers suggest that a decrease in body mass may improve performance in weight-bearing exercise. Yet, other researchers suggest the decrease in body mass may impair exercise performance. **PURPOSE:** The purpose of this study was to investigate the association between race time with changes in body mass (BM) and total body water (TBW) in ultramarathon runners. **METHOD:** 10 ultramarathon runners (age = 36.4 (10.0) years, race time = 5.7 (1.5) hours) were assessed with the InBody 270 bioelectrical impedance analysis (BIA) before and after a 50k race. The InBody 270 BIA measured BM, skeletal muscle mass (SMM), fat mass (FM), and total body water (TBW). Race time was recorded as the runners crossed the finish line. Statistical analysis was performed using paired t-test, multiple linear regression, and Pearson product-moment correlations. Significance was set to $p < 0.05$. **RESULTS:** BM significantly decreased by 2.15 (1.44) kg (p=0.001) while TBW showed a nonsignificant increase of 0.93 (1.79) kg (p=0.134). SMM decreased by 1.1 (1.24) kg (p=0.023) and FM decreased by 3.67 (1.83) kg (p<0.001). There was a positive correlation between race time and age (r =0.676, p=0.032). Multiple linear regression suggested that change in BM and TBW predicted 10% of the variance in race time. **CONCLUSIONS:** Change in BM and TBW were not significantly associated with race time. BM was significantly decreased following the ultramarathon race. A limitation of the study is the small sample size. Therefore, additional research is needed to examine the relationship between performance and changes in BM in a larger sample size of ultramarathon runners.

3159   Board #28   June 2 8:00 AM - 9:30 AM

Does Stance Time Predict Running Economy at Relative Speeds in Highly Trained Distance Runners?

Stephen T. Hammond, Timothy R. Lindsay, Stephen J. McGregor. *Eastern Michigan University, Ypsilanti, MI.* (Sponsor: Andrew Coggan, FACSM)

(No relevant relationships reported)

Running economy (RE) is an important component of distance running performance. Recent evidence suggests shorter stance times (ST) are related to superior RE and practitioners often recommend shorter ST for this benefit. However, overall, reports are equivocal, perhaps because comparisons are usually made at absolute running speeds, which fails to account for differences in relative fitness. To date, this relationship has not been explored at relative intensities. **PURPOSE:** To determine the relationship of ST and RE at absolute and relative running speeds. **METHODS:** 20 highly trained distance runners (13 M, 7 F; VO_{2max} = 67.6 vs 53.5 ml/kg/min) consented to procedures approved by EMU-HSRC. Session 1 included a critical speed (CS) field test to determine relative fitness and establish relative testing speeds. Session 2 included two treadmill tests for kinematic and metabolic measurements. For both tests, subjects ran at 10, 12, 14, and 16 km/h (absolute speeds) and at 75, 85, and 95% CS (relative speeds). Kinematic data were collected for 60 sec using lower-body optical motion capture (Plug-In-Gait; Vicon, Centennial, CO). Metabolic data were collected using open circuit spirometry (TrueOne 2400, ParvoMedics, Sandy, UT) during three-minute trials, where the last 60 sec of each stage was used to calculate RE. Linear regressions were used to determine the relationship between ST and RE expressed as mL/kg/km, $\%VO_{2max}$, and kcal/kg/km, done separately for absolute and relative speeds. α was set at .05. **RESULTS:** For absolute speeds, significant negative relationships were found between ST and RE expressed as mL/kg/km (β = -.374), $\%VO_{2max}$ (β = -.461), and kcal/kg/km (β = -.459) (all p < .01). For relative speeds, a significant negative relationship was found for RE expressed as $\%VO_{2max}$ (β = -.318) (p < .05) but not mL/kg/km or kcal/kg/km (p > .05). **CONCLUSION:** Contrary to some reports and recommendations, for comparisons using absolute speeds, shorter ST was related to inferior RE. Comparisons using relative speeds showed weaker or non-significant relationships. Therefore, changes in RE mediated by ST may depend more on individual exercise strain than absolute speed. Future investigations should consider using relative intensities for a more appropriate comparison between individuals.

3160   Board #29   June 2 8:00 AM - 9:30 AM

Run Performance is the Primary Factor in Determining Olympic Distance Triathlon Performance

Tyler J. Noble, Robert F. Chapman, FACSM. *Indiana University-Bloomington, Bloomington, IN.*

(No relevant relationships reported)

Introduction: Triathlon is a unique athletic event, given that it requires athletes to be proficient in three distinct disciplines: swimming, cycling, and running. Often, high achieving athletes in one of these disciplines are recruited to the triathlon event, but it is unknown as to which event proficiency is most important to triathlon performance. As a result, National Governing Bodies (NGBs) tasked with maximizing performance on the international stage may stand to benefit from the optimization of talent identification procedures. **Purpose:** To assess the relationship between discipline specific performance and overall triathlon performance. **Methods:** Performance data from all three disciplines (swim, cycle, run) were collected on each athlete (n = 430) for Olympic distance races (1.5k swim, 40k cycle, 10k run) contested during both the 2016 and 2017 World Triathlon Series (WTS, n=12). Performance in each discipline was ranked versus other competitors in the same race, based on time. Spearman rank-order correlations were then used to explore the relationship between discipline performance rank and overall performance rank. **Results:** Run rank was shown to have a strong, linear correlation with overall rank (r_s = 0.90, p < 0.01) while both swim (r_s = 0.37, p < 0.01) and cycle (r_s = 0.43, p < 0.01) ranks were shown to have mild linear relationships with overall rank. **Conclusion:** The strong linear relationship experienced between run rank and overall rank suggests that NGBs interested in maximizing triathlon performance at the Olympic distance may be best suited to engage in talent identification processes that place an emphasis on running ability.

3161   Board #30   June 2 8:00 AM - 9:30 AM

Acute:Chronic Workload Ratio is a Better Predictor of Running Injury than Average Weekly Running Volume

Allison H. Gruber, Emily G. Wagoner, Jacob E. Vollmar, Ashley B. Nguyen, Andrea K. Chomistek. *Indiana University, Bloomington, IN.* (Sponsor: Joseph Hamill, FACSM)

(No relevant relationships reported)

An acute:chronic workload (AC) ratio between 0.8-1.3 was shown to be protective against injury among athletes in rugby, cricket, and other sports but has yet to be applied to runners. **PURPOSE**: To assess AC ratio as a predictor of running-related overuse injury (RROI). **METHODS**: To date, 36 runners have been enrolled in a prospective injury for a minimum of 6 months. An average of 1.2 ± 0.8 injuries have been sustained by 19 runners. Weekly running volume (Rvol), running time, non-running exercise time, and RROI were recorded in a weekly online survey. RROI was defined as pain resulting in any reduction or stoppage of planned running. For each week of enrollment, AC ratio was calculated for running mileage (AC-vol), running time (AC-RT), and all-type exercise time (AC-ET) as the current week value divided by the mean of the previous four weeks. The average AC ratio was calculated across weeks from enrollment to date of injury for members of the injured group. AC ratio was calculated for all weeks of enrollment for members of the uninjured group. Univariate tests were used to assess the differences between injured and uninjured groups (α = 0.05). All variables were entered into a stepwise logistic regression model to determine the explanatory variables related to RROI incidence (α = 0.15). **RESULTS**: Significant differences between injured (I) and uninjured (U) groups were found for Rvol (I = 12.9 ± 8.9; uninjured 19.7 ± 14.4, P=0.011), AC-vol (I = 0.86 ± 0.26; U = 1.01 ± 0.09, P<0.001) and AC-RT (I = 0.94 ± 0.46; U = 1.06 ± 0.13, P=0.036). No other variables were significant between groups (P>0.05). Stepwise logistic regression identified that number of RROI, age, and mass were significant predictors of AC-vol (P<0.131) and that years running, height, and BMI were significant predictors of AC-RT (P<0.030). No significant predictors were identified for AC-ET (P>0.15). **CONCLUSIONS**: AC ratio using running time was a better predictor of RROI incidence than average miles/week, years running, and other common training variables. Reducing mileage or infrequent running training may increase the risk of RROI. AC ratio should be above 0.86 to prevent RROI, which is similar to the minimum threshold value for other sports reported in previous studies. Further study is needed to assess a maximum and minimum AC ratio that is considered 'safe' to prevent RROI.

G-36   Free Communication/Poster - **Soccer**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3162   Board #31   June 2 8:00 AM - 9:30 AM

Generalized Assessments of Mobility in Professional Soccer Athletes: Should Other Physiologic Characteristics Be Considered?

Bradley Lambert[1], Tyler Heimdal[1], Justin Vickery[1], Corbin Hedt[1], Joshua Harris[1], Michael Moreno[2], Stephen Crouse, FACSM[2], Patrick McCulloch[1]. [1]Houston Methodist Hospital, Houston, TX. [2]Texas A&M University, College Station, TX. (Sponsor: Stephen Crouse, FACSM)
(No relevant relationships reported)

The influence of body composition (Bcomp), and skeletal dimensions (SkD) on mobility screening conclusions is unknown. **PURPOSE:** Determine if each are correlated with balance, range of motion (ROM), and Functional Movement Screen (FMS) scores in professional soccer athletes (M&F). **METHODS:** Athletes provided informed consent to participate (♂18, 27±5 y, 79±9 kg | ♀16, 25±3 y, 63±4 kg). Bcomp and SkD were assessed using DXA. Balance and ROM were assessed via Y-balance (Y-bal) testing. FMS was used for movements listed in table. A two-tailed t-test and Chi-square were used for gender comparison of Y-bal and FMS respectively. Correlational analysis and Spearman's Rank Order were used to determine if Bcomp and/or SkD correlated with Y-bal or FMS measures. Correlations were defined as weak (r>0.4), moderate (r = 0.4-0.7), and strong (r>0.7). Type I error; α=0.05. **RESULTS:**

MEAN Y-BALANCE SCORE (reach / limb length)			
	Anterior	**Posteromedial**	**Posterolateral**	-
Men	0.65 ± 0.05	1.13 ± 0.08	1.06 ± 0.09	
Women	0.69 ± 0.07	1.20 ± 0.19	1.10 ± 0.08	
Sig.	NS	NS	NS	

FUNCTIONAL MOVEMENT SCREEN (1-3 Scale, % of Athletes Scored In Each Category)				
FMS SCORE	**Deep Squat**	**Hurdle Step**	**Inline Lunge**	**Shoulder Mobility**
Men 1	33%	8%	0%	14%
2	67%	75%	100%	50%
3	0%	17%	0%	36%
Women 1	0%	0%	0%	0%
2	94%	63%	28%	44%
3	6%	38%	72%	56%
Sig. Gender Diff.	p<0.05	NS	p<0.05	NS
FMS SCORE	**Straight Leg Raise**	**Trunk Stability Pushup**	**Rotary Stability**	
Men 1	6%	6%	6%	
2	47%	56%	94%	
3	47%	39%	0%	
Women 1	0%	22%	11%	
2	16%	44%	79%	
3	84%	22%	0%	
Sig. Gender Diff.	p<0.05	NS	NS	

Table 1. Values are presented as means ± SD for Y-balance scores. Y-balance scores represent averaged means of left and right limbs. For FMS scores, the proportion of each gender that scored 1 (worst), 2, or 3 (best) for each test was calculated based on range of motion. Type I error set at α=0.05

Y-balance: Weak correlations were found between anterior reach and height (r = -0.36), total lean mass (TLM) (r = -0.39), leg LM (r = -0.39), and trunk LM (r = -0.39) (p<0.05). Moderate correlations were found between posterolateral reach and pelvic width below the femoral head (r = 0.42), femur length (r = 0.44), and tibia length (r = 0.51). FMS: Moderate correlations were found between height and both; deep

squat (r = -0.400) and inline lunge (r = -0.63). Weak correlations were found between deep squat and both; TLM (r = -0.43) and trunk LM (r = -0.40). Strong correlations were found between inline lunge and TLM (r = -0.77), trunk LM (r = -0.73), and leg LM (r = -0.70). Pelvic width below the femoral head was found to be moderately correlated with deep squat (r = 0.40), straight leg raise (r = 0.45), and inline lunge (r = 0.60). **CONCLUSION:** Factors such as Bcomp and SkD likely influence diagnostic conclusions of commonly generalized mobility assessments in men and women soccer athletes. Further study is needed to determine if these variables could be used to improve testing value for improving performance and assessing injury risk.

3163   Board #32   June 2 8:00 AM - 9:30 AM

Profiles And Correlation Between Sprint And Agility K-test Of Elite Young Soccer Players As A Function Of Age

Lee Cabell[1], Frantisek Zahalka[2], Tomas Maly[2], Lucia Mala[2], Michal Dragusky[2], Arnold Baca[3]. [1]Arkansas Tech University, Russellville, AR. [2]Charles University, Prague, Czech Republic. [3]University of Vienna, Vienna, Austria. (Sponsor: Kevin Ford, FACSM)
(No relevant relationships reported)

Agility, acceleration, change of direction, deceleration, and sprinting are critical technical skills in soccer. Sprint performance relative to a new Agility K-test (KT) required testing among four age groups. **PURPOSE**: To determine the profiles and relationship between linear running speed and agility KT of elite young soccer players. **METHODS**: Elite Czech national level young male soccer players volunteered for his study and were divided into four age groups (16 yr, n_1 = 22; 17 yr, n_2 = 18; 18 yr, n_3 = 26; 19 yr, n_4 = 20). The KT consisted of the participants running at maximum speed between cones positioned in a "K" pattern on a field with artificial grass. The participants started and ended running at the intersection of the "K" pattern. A contact switch for time measurement was placed on the top of each cone which participants touched with the hand. The participants performed two trials and the time of test execution was measured in seconds. Times were measured in a 5-m (S5) and 10-m (S10) dash from a static position. Two-way (4x2) ANOVA and post-hoc Tukey HSD were used for statistical assessment. Pearson correlation coefficient test was used to correlate two dependent variables. P<.05. **RESULTS:** Factorial ANOVA indicated no significant interaction between sprint distance and age, $F_{3, 164}$=0.15, p=.93, but significant main effect for sprint distance, $F_{1, 164}$=2142.61, p<.01, and age, $F_{3, 164}$=3.06, p<.05. The 19-year old group significantly improved both sprint times compared to the other age groups. The correlation between sprint times and KT for individual age groups primarily showed weak to moderate non-significant correlations: 16 yr: r_{S5}=-0.24, NS; r_{S10}=0.24, NS; 17 yr: r_{S5}=0.46, NS; r_{S10}=0.39, NS; 18 yr: r_{S5}=0.22, NS; r_{S10}=0.46, p<.05; 19 yr: r_{S5}=0.36, NS; r_{S10}=0.36, NS. The correlation between sprint times for S5 and S10 for the individual age groups: 16 yr: r = 0.64, p<.01; 17 yr: r = 0.76, p<.01; 18 yr: r = -0.06, NS; 19 yr: r = 0.97, p<.01. **CONCLUSION**: The sprint distance main effect indicated that sprint times improve with participants' ages. The weak correlation between sprint and KT may suggest a different training program for young soccer athletes or individual training program for different ages. The significant correlation between the linear sprint distances shows a good choice for speed training.

3164   Board #33   June 2 8:00 AM - 9:30 AM

Changes in Lower Extremity Musculoskeletal Characteristics Associated with Ankle Sprain History in Intercollegiate Soccer Athletes

Mallory Faherty[1], Jennifer Csonka[2], Karl Salesi[2], Tara Moore[1], Robert Zarzour[1], Timothy Sell, FACSM[1]. [1]Duke University, Durham, NC. [2]University of Pittsburgh, Pittsburgh, PA. (Sponsor: Timothy Sell, FACSM)
(No relevant relationships reported)

Ankle sprains (AS) result in persistent neuromuscular deficits and increased risk of re-injury. Examining the effect of AS on lower extremity (LE) flexibility, strength, static balance (SB), and dynamic postural stability (DPS) may aid in the development of injury prevention and rehabilitation programs. **PURPOSE:** Determine side-to-side differences in LE flexibility, strength, SB, and DPS in intercollegiate soccer athletes with a history of ankle sprain (HAS). **METHODS:** Fifteen intercollegiate male and female soccer athletes with a HAS participated (Age:20.2±1.3years, Height:175.3±9.9cm, Weight:68.7±10.2kg). LE flexibility tests included weight-bearing and active ankle dorsiflexion, active knee extension, and straight leg raise. LE strength tests included ankle dorsiflexion/plantarflexion, ankle inversion/eversion, hip abduction/adduction, hip internal/external rotation, and knee flexion/extension. LE SB and DPS were assessed with a force plate collecting ground reaction forces (GRF). Single-leg SB was assessed under eyes-open and eyes-closed conditions. DPS was assessed during a single-leg landing task. Side-to-side differences were assessed using T-tests, Wilcoxon Signed-Ranks or Mann-Whitney U tests, as appropriate. Significance for all tests was set at p<0.05, a priori. **RESULTS:** Athletes with a HAS demonstrated significant side-to-side differences for weight-bearing ankle dorsiflexion

(p=0.044), ankle dorsiflexion strength (p=0.006), and knee flexion strength (p=0.023). No other significant differences were observed. **CONCLUSION:** Athletes with a HAS demonstrated persistent side-to-side differences despite returning to competition. These differences, including weight-bearing ankle dorsiflexion flexibility, ankle dorsiflexion strength, and knee flexion strength may predispose these athletes to re-injury. The results of this study should guide AS rehabilitation programs in an effort to mitigate these persistent changes in an attempt to prevent re-injury.

3165   Board #34   June 2 8:00 AM - 9:30 AM

Knee Alignment And Muscle Strength Ratios In Division III Female Soccer Players With Reconstructed Anterior Cruciate Ligament

Nina M. Robinson, Ana B. Freire Ribeiro. *Augsburg University, Minneapolis, MN.* (Sponsor: Dr. Mark Blegen, FACSM)

(No relevant relationships reported)

Intro: Anterior cruciate ligament tears are very common in sports that require contact, hard landing from jumps, or cutting, like soccer. Analyzing an athlete's knee valgus and muscle strength ratios may help reduce their risk for injury.
Objective: To compare knee valgus angles and the hamstring to quadriceps femoris strength ratio between healthy female Division III soccer athletes and athletes with ACL reconstruction, as surrogates for knee (re)injury risk.
Methods: Thirteen non-injured and three injured athletes completed a vertical drop jump (VDJ) from a 31 cm box and 1 Repetition Maximum tests (1RM) using seated knee curl and seated knee extension machines. Baseline and landing knee valgus angles (KVA) were measured using Dartfish software.
Results: There was a significant difference in quadriceps to hamstring ratio between injured and non-injured athletes (*p*=0.03), with injured individuals having an average ratio of 0.89 and non-injured 0.71. No significant difference was found in KVA from VDJ between injured and non-injured subjects (*p*=0.87). No significant relationship was found between KVA and quadriceps to hamstring ratios.
Conclusion: There are significant differences in hamstring to quadriceps strength ratios in injured female DIII soccer players compared to non-injured, suggesting it is a better screening than VDJ. KVA cannot be predicted by quadriceps to hamstring ratio and injury history.

3166   Board #35   June 2 8:00 AM - 9:30 AM

Knee Biomechanics in Division III Female Soccer Players with Reconstructed Anterior Cruciate Ligament (ACLR)

Marissa Guillou, Ana B. Freire Ribeiro. *Augsburg University, Minneapolis, MN.* (Sponsor: Dr. Mark Blegen, FACSM)

(No relevant relationships reported)

PURPOSE: To compare knee valgus angles (KVA) between healthy athletes and athletes with reconstructed ACLs in vertical drop jump and soccer specific drills.
METHODS: Sixteen NCAA Division III (DIII) female soccer players, ages 20.94 (±1.29), thirteen athletes with healthy ACL and three with an ACL reconstruction (ACLR). Knee Valgus Angles (KVA) were measured during vertical drop jump, ladder drill, dribbling drill and shooting drill using Dartfish. Paired t-tests compared the groups.
RESULTS: There were no differences in KVA between groups in any of the drills. Drop Jump KVA mean was 12.9± (SD±11.8)(p=0.87). Mean right leg KVA on ladder drill was 19.1±(SD±9.6)(p=0.95) and 17.2± (SD±8.3)(p=0.3) for left leg. Mean right leg dribbling drill average KVA was 15.8± (SD±8.5)(p=0.11) and 12.7±(SD±7.5) (p=0.16) for left leg. Mean right leg shooting drill average KVA was 19.9± (SD±7.3) (p=0.08) and 15.2± (SD±7.2)(p=0.29) for left leg.
CONCLUSIONS: Although there were no significant differences, between the injured and non-injured athletes for any drills, KVA in the injured athletes tended to be larger in game-like drills, suggesting they could be more meaningful in injury prevention assessment.

3167   Board #36   June 2 8:00 AM - 9:30 AM

Sweat Loss in Association With Measures of External Load in Adolescent Soccer Players

Timothy J. Roberts, Melissa L. Anderson, Tina L. Bonsignore, Kortney J. Dalrymple, Khalil A. Lee, Lindsay B. Baker, FACSM. *Gatorade Sports Science Institute, Bradenton, FL.* (Sponsor: Lindsay Baker, FACSM)

Reported Relationships: T.J. Roberts: *Salary; This study was funded by the Gatorade Sports Science Institute. The views expressed in this abstract are those of the authors and do not necessarily reflect the position or policy of PepsiCo, Inc.*

BACKGROUND: The use of technology to track workload and measurements of sweat loss to prescribe hydration strategies are now common practice. No study has explored the association of load variables to sweat loss in soccer athletes.
PURPOSE: To determine the association of load measures (total distance (TD), energy expenditure (EE)), body mass (BM), and sweat loss in adolescent soccer athletes during organized practice.
METHODS: Thirty-two adolescent soccer athletes (Male: n=16, 17 ± 1 y, 71.4 ± 6.7 kg; Female: n=16, 18 ± 1 y, 64.0 ± 8.4 kg) had workload measured during 3 in-season practices (21.9-25.4°C WBGT) using GPS/accelerometer technology. Total sweat loss was calculated from pre- to post-exercise change in BM, corrected for fluid/food intake (ad libitum), urine output, metabolic mass loss, and respiratory water loss. Practice type was assessed subjectively and categorized as small or large-sided games/drills based on the activities athletes engaged in during the majority (>50%) of the practice time. Girls practice 1 and 2 and boys practice 2 were small-sided. Girls practice 3 and boys practice 1 and 3 were large-sided. Multiple linear regression analyses were used to model the effects of independent variables (BM, EE, and TD) on total sweat losses. Data are shown as mean ± SD.
RESULTS: Boys covered 4.7 ± 1.4 km and expended 1595 ± 481 KJ (381 ± 115 kcal) in 81 ± 13 min practices. Girls covered 4.4 ± 0.9 km and expended 1310 ± 299 KJ (313 ± 72 kcal) in 81 ± 7 min practices. Total sweat loss was 1.3 ± 0.3 L in boys and 0.8 ± 0.2 L in girls. Models to predict sweat loss included: 1) BM and EE; and 2) BM and TD. Model 1 was significant in boys during practice 1 (r^2=0.73, p<0.001) and 3 (r^2=0.60, p<0.01), but not practice 2 (r^2=0.38, p=0.06). Model 1 was significant in girls during practice 3 (r^2=0.57, p<0.01), but not practice 1 (r^2=0.36, p=0.11) or 2 (r^2=0.32, p=0.12). Model 2 (not reported) was largely identical. **CONCLUSION:** The association between total sweat loss, BM, and workload was inconsistent among practices, which may be explained in part by practice type. Significant prediction models were found during practices that consisted of predominantly large-sided game/drill scenarios. This work provides a literature base for the exploration of associations between workload measures and physiological/metabolic variables.

3168   Board #37   June 2 8:00 AM - 9:30 AM

Effect of Maturation on Heart Rate During a Six-Week Plyometric Training in Female Soccer Players

Christina M. Mullen, Jeffrey B. Taylor, Michelle A. Aube, Audrey E. Westbrook, Anh-Dung Nguyen, James M. Smoliga, FACSM, Kevin R. Ford, FACSM. *High Point University, High Point, NC.* (Sponsor: Kevin R. Ford, FACSM)

(No relevant relationships reported)

Implementation of an anterior cruciate ligament (ACL) injury prevention program (IPP) has been recommended to coincide with the adolescent growth spurt as risk factors increase during and following this phase of maturation. Physiological responses to load during this stage of growth may result in a differing maximum heart rate (HR_{max}) during intense exercise. Understanding the relationship between physiological responses to load and maturation stage may result in more effective IPP in youth athletes. **PURPOSE**: To examine the effects of maturation on HR_{max} in adolescent soccer players over a six-week training program. **METHODS**: 34 female soccer players participated in a 6-week training study (age 13.3±1.5yrs; height 158.7±6.9cm; mass 50.0±9.6kg). Maturation groups were determined based on percent of adult stature (PAS) with 88-94% representing pubertal (n=9, PAS 91.6±2.0%) and 95-100% representing post-pubertal (n=25, PAS 97.7±1.7%). Three 30 minute sessions, separated into plyometric, resistance, and core strength training, were completed each visit for a total training time of 90 minutes three times per week. Participants wore HR monitors during each plyometric session. The initial exercises were adapted from ACL IPP, and intensity of each exercise was progressed weekly following the second week of training (5 total phases). HR_{max} was calculated for each participant during each session and averaged weekly. A linear mixed model (p<0.05) was used to determine the effects of HR_{max} over the six-week intervention in pubertal and post-pubertal female soccer players. Average HR during the first week of training was used as a covariate.
RESULTS: A significant interaction of maturational group and training week was found (p<0.04) with HR_{max}. A main effect of training week was found in both pubertal (p<0.001) and post-pubertal (p<0.01) groups. HR_{max} was significantly increased in both groups (week 1 to week 3, p<0.05) following the first two technique focused weeks of plyometric program with the pubertal group (184.3±4.7 BPM) having greater HR_{max} compared to the post-pubertal group (172.7±2.2 BPM) during week 3.
CONCLUSIONS: Physiologic responses to load was dependent on maturation stage and should be further examined in relation to reduced risk of injury following IPP. Funding supported by NIAMS/NIH R21AR069873

SATURDAY, JUNE 2, 2018

3169   Board #38   June 2 8:00 AM - 9:30 AM

Comparison of Pre And Postseason FMS Individual Test Scores In DIII Male Soccer Players

Ana B. Freire Ribeiro[1], Darby R. Lindgren[2], Jide Ifonlaja[1], Stuart Borne[3]. [1]Augsburg University, Minneapolis, MN. [2]North Dakota State University, Fargo, ND. [3]University of Saint Thomas, Saint Paul, MN. (Sponsor: Mark Blegen, FACSM)

(No relevant relationships reported)

The Functional Movement Screen (FMS) is a battery of seven tests scored on a 0-3 scale that aims to identify imbalances and asymmetries in the body (Cook, 2014). Within the FMS, the deep squat (DS) and active straight leg raise (ASLR) are good predictors of injury (Hotta et al, 2015, Hammes et al, 2016, and Zalai et al, 2014); therefore they were tracked pre and postseason, along with shoulder mobility (SM). Given that most soccer injuries occur during preseason (Hootman et al., 2007, NCAA 2017), it is hypothesized that athletes would have lower scores at preseason. **PURPOSE**: To compare pre and postseason DS, ASLR, and SM scores in NCAA DIII male soccer players. **METHODS**: Sixteen collegiate players were assessed in mid-August and late March. They completed the DS, ASLR, and SM tests and were rated by one athletic trainer certified in FMS. A paired t-test compared the pre and postseason scores. **RESULTS**: The mean preseason total score was 6.62 (SD=0.89), while the postseason mean was 6.88 (SD=1.15). Scores between the two seasons were not different (p=0.21). From pre to postseason, DS scores increased by 21% (p=0.059), ASLR scores increased by 5.8% (p=0.054), but SM scores decreased by 7% (p=0.18). **CONCLUSIONS**: DS, ASLR, and SM scores did not significantly change from pre to post-season. Sport-specific tests and a more sensitive rating scale could have yielded different results and should be further investigated.

3170   Board #39   June 2 8:00 AM - 9:30 AM

Differences Between the Bilateral and Ipsilateral Strength Asymmetries With Respect to Age, Contraction Velocity and Limb Preferences in Female Soccer Players.

Lucia Mala, Tomas Maly, Frantisek Zahalka, David Bujnovsky, Mikulas Hank, Michal Dragijsky. *Charles University, FPES, Prague, Czech Republic.*

(No relevant relationships reported)

During the soccer match, strength and power movements are accumulated on both lower extremities. This occurs in an asymmetrical manner and may gradually leads to higher shifts of myodynamic characteristics and strength asymmetries (SA). There are limited investigations of a combination of muscle SA and different age groups in female soccer players.
PURPOSE: To investigate of differences bilateral and ipsilateral SA in female soccer players of four age categories.
METHODS:
Elite female players (n=67) of 4 age categories (U17=13, U19=18, U18=20 and U19=15) performed isokinetic strength testing (Cybex NORM®, Humac, USA) for knee extensors (KE) and flexors (KF) at three angular velocities (AV: 60, 180, 300 °·s^{-1}). Bilateral strength ratios (Q:Q, H:H) and ipsilateral strength ratios (H:Q) were evaluated. Three-way Mixed-design ANOVA with two between subject effect (Age, Limb) and one within subject effect (AV) were used for evaluation. Bonferonni's *post-hoc* test and partial eta square (η_p^2) were also used for data analysis.
RESULTS:
We found a statistically significant effect of AV on bilateral ($F2,123$ = 5.52; p<.01; Wilk's Λ = 0.92; ηp^2 = .08) and ipsilateral ($F2,123$ = 4.87; p<.01; Wilk's Λ = 0.93; ηp^2 = .07) SA in four age groups. We found a significant higher SA between KF compare to KE (F1$_{,124}$ = 23-89, p<0.00, η²=0.16). With increasing AV from 60 to 180°·s^{-1}, significant changes in H:H appeared (H:H$_{60}$ = 7.81±0.60 % vs. H:H$_{180}$ = 11.03±0.73 %, p<0.01). The factor "Age" did not significantly affected SA in players (Bilateral: F$_{3,124}$ = 1.10, p>0.05, η²=0.03; Ipsilateral: F$_{3,124}$ = 1.85, p>0.05, η²=0.04). The interaction between "Age" and "Leg" had not significant effect (p>0.05) on SA for groups. Post-hoc analysis showed in dominant leg a significant difference in H:Q$_{60}$ = 54.73±0.92 % vs. H:Q$_{180}$ = 57.61±1.17 (p<0.01). Totally, 17 (~25%) risk results (>20%) of H:H was found in players in comparison to 3 (~5%) risk results in Q:Q.
CONCLUSION
The KF demonstrated a higher degree of the bilateral ratio in comparison to KE. Seventeen players (25%) had SA in KF higher than 20% at least at one AV. More attention should be paid to KF, where a higher percentage of SA was observed. Higher percentage of SA was seen at higher AV. The results may be beneficial for fitness coaches, physiotherapists, doctors and other clinical staff of female soccer players.

3171   Board #40   June 2 8:00 AM - 9:30 AM

High Intensity Interval Training Does Not Improve Cardiorespiratory Parameters In Trained Young Soccer Players

Stelios Poulos, Ilias Zacharogiannis, Giorgos Paradisis, Fotini Dagli, Maria Maridaki. *National and Kapodistrian University of Athens, Athens, Greece.*

(No relevant relationships reported)

Soccer performance is the result of technical, tactical, physiological and psychological attributes of the players. **PURPOSE**: The present study investigated the effect of high-intensity interval training (HIIT) and continuous moderate intensity training (CONT) on selected parameters of the cardiorespiratory function in young soccer players. **METHODS**: Thirty Greek amateur soccer players (mean ± sd, age 19 ± 2,21y, Body mass 71.19 ± 2.5 kg) were randomized into a high-intensity interval training group (HIIT, n = 10), a continuous moderate intensity training group (CONT, n = 10) and a control group (Control, n = 10). The intervention for HIIT and CONT groups was 16 more training sessions, 2 per week while CONTROL group continued regular soccer training routine. The HIIT group training sessions consisted either of 15s sprints interspersed by 15s of recovery at 120%VO$_2$max with 8 min total exercise time or they played 4x4 min (16 min total time) small-sided games (4v4) followed by 2 min recovery interval. The CONT group training sessions consisted either of 40 min continuous running at 70% VO$_2$max or 10v10 full field soccer game for 40min. **RESULTS**: Mean values ± sd pre and post-training for Body weight, (HIIT: 69.49 ± 8.39 v 69.0 ± 8.8; CONT: 71.2 ± 10.93 v 70.2 ± 11.01 kg), %fat, (HIIT: 13.02 ± 2.41 v 12.12 ± 2.49, CONT: 13.75 ± 2.19 v 13.82 ± 2.21), VO$_2$max, (HIIT: 55.08 ± 4.43 v 57.75 ± 5.63, CONT: 56.46 ± 4.61 v 58.41 ± 5.24 ml.kg^{-1}.min^{-1}), vVO$_2$max (velocity at VO$_2$max, HIIT: 15.9 ± 0.70 v 16.5 ± 0.52, CONT: 16.5 ± 1.51 v 16.7 ± 1.19 km.h^{-1}) and vVT (velocity at ventilatory threshold, HIIT: 11.8 ± 0.87 v 12.5 ± 0.69, CONT: 12.4 ± 1.03 v 12.5 ± 1.13 km.h^{-1}). VO$_2$max, vVO$_2$max and vVT improved 4.6, 3.6 and 5.6% only after HIIT training but the difference didn't pass statistical significance due to large sd of the sample. **CONCLUSIONS**: In conclusion, the combination of the training regiments of this study did not improve cardiorespiratory parameters of endurance performance in already trained young soccer players. There was, though, a tendency for better adaptations favors the time efficient HIIT training.

3172   Board #41   June 2 8:00 AM - 9:30 AM

Performance Differences Between Home And Away Fixtures And Halves In NCAA DI Women'S Soccer

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Reported Relationships: M.C. Gabler: *Consulting Fee; CMU women's soccer.*

PURPOSE: It is well documented that there is an advantage when playing games at home. The influence of home advantage on performance measures are not fully understood. The current study compared performance variables between wins and losses, home and away fixtures and also first and second halves to explore potential performance differences.
METHODS: 12 Division I female soccer players (19.5 ± 1.5 yrs, 166 ± 3.5 cm, 61.4 ± 4.8 kg) were included based on playing time criteria (≥ 60% total game time). Global positioning system (GPS) data was collected for conference games for one season (11 total games). Total distance (TD), distance covered (m·min^{-1}), high speed distance (HSD: 15.5 - 19.9 km·h^{-1}), and average player passes were recorded. Data was analyzed using Two-Way ANOVAs in Sigma Plot.
RESULTS: There were no differences in any measured variable between games won and games lost. TD was significantly greater for the first half compared to the second half (4632.5 ± 368.8m vs 4045.2 ± 364.6m; P = 0.002). TD was also significantly greater for the first half compared to the second half for both home (H) and away (A) games (P < 0.05). M.min^{-1} was significantly greater for the first half compared to the second half (119.9 ± 5.8m vs 113.1 ± 5.5m; P = 0.015). M.min^{-1} was also significantly greater for the first half compared to the second half for H games (P = 0.037). HSD was significantly greater in the first half compared to the second half (585.16 ± 75.3m vs 499.9 ± 71.9m; P=0.016). There was no difference in HSD between home and away games. Average passes were significantly greater for the H compared to A games (11.7 ± 2.6 vs 9.3 ± 1.7; P = 0.015). They were also significantly greater for the first half compared to the second half (P = 0.049). Additionally, average passes were significantly greater for the first half for H compared to A games (P = 0.036).
CONCLUSIONS: Game result had no effect on the measured variables. TD, m·min^{-1}, and HSD were greater for the first half compared to the second half regardless of location. Average passes were greater for the first half compared to the second half and for H compared to A games. This information could influence coaches' decision making.

3173   Board #42   June 2 8:00 AM - 9:30 AM

Match-Play Analysis Of Physiological And Movement Variables In Men's And Women's Division I Soccer Players

Ashley N. Triplett, Michael Vorkapich, James M. Pivarnik, FACSM. *Michigan State University, East Lansing, MI.*

(No relevant relationships reported)

HR monitoring, accelerometers, and GPS tracking have become popular tools to quantify activity intensity during soccer matches. Limited research has examined differences between men and women collegiate players using these tracking modalities. **PURPOSE**: To quantify the activity profile of Division I collegiate soccer players during games using HR response and GPS and to examine differences based on gender and position. **METHODS**: A team HR monitoring system was used to evaluate in-game HR response and quantify match-play movement patterns of 21 men and 21 women NCAA Division I soccer players who played >70 min in each of 3 games. Players were divided into 3 groups based on position (defender, midfielder, forward). Percentage of playing time spent above 80% of HR max and average %HRmax was calculated. Total distance/playing time and number of sprints above sprint threshold (men: accelerations >2.8m/s^2, women: accelerations >2.4m/s^2) were also calculated. ANOVA and student's t-test were used to determine differences. **RESULTS**: Forwards and midfielders had significantly greater distance/playing time and sprints/playing time than defenders (F: 115.2m/min, M: 115.7m/min, D: 103.0m/min) (F: 0.38sprints/min, M: 0.33sprints/min, D: 0.26sprints/min) (p<0.05). No positional differences were observed in average %HRmax or % of game time >80% of HRmax. Men had a greater average distance/playing time than women (113.0m/min vs 105.6m/min) (p<0.05). Men had significantly fewer average sprints/min above threshold than women (0.18/min vs 0.42/min) (p<0.05). No differences were observed in average %HRmax (M: 85.6%HRmax, W: 87.7%HRmax) or % of game >80% of HRmax (M: 80.6%, W: 88.3%) between genders. **CONCLUSIONS**: HR data illustrate that elite level soccer is a highly aerobic sport. Differences in distance/playing time and sprints based on position may be explained by positional requirements, with more constant movement required for midfielders and explosiveness for forwards. Men's soccer moves at a faster pace, explaining the difference in distance/playing time by gender; however, relative activity intensity (%HRmax) was similar between positions and gender. The gender difference in number of game sprints may be at least partially related to the threshold differences determined by the GPS system.

3174   Board #43   June 2 8:00 AM - 9:30 AM

The Effect of High Intensity Interval Training on Planned Agility Performance in Soccer Players

Tal Amasay, Sofia Jakobsson, Constance M. Mier, FACSM. *Barry University, Miami Shores, FL.* (Sponsor: Constance M. Mier, FACSM)

(No relevant relationships reported)

Inducing fatigue prior to agility training through high intensity interval training (HIIT) has shown to yield greater agility improvements compared to agility training alone. However, high levels of neuromuscular fatigue can impair the ability to implement proper technique and may increase injury risk associated with the explosive neuromuscular demand of agility performance. **PURPOSE:** To investigate the fatiguing effects of HIIT on agility performance, and determine if performance can be fully recovered following a short rest period. **METHODS:** Nineteen collegiate level soccer players participated in the study, nine men (22 ± 2 yrs) and ten women (20±2 yrs). Agility T-test were performed before (PRE), and twice following (POST 1 and POST 2) the completion of four 4-seconds cycle ergometer sprints. The four sprint intervals were separated by 25 s active recovery. POST 1 was performed immediately following the final cycle sprint whereas, POST 2 began two minutes after completion of POST 1. Repeated measures ANOVA and Bonferroni post hoc tests were used to determine significant differences in the time to complete the T-tests. **RESULTS:** During HIIT, average power from the first sprint to the last declined by 30.7 ± 9%. Time to complete the agility T-test significantly differed among the three tests (PRE: 10.46 ± .17 s; POST 1: 11.67 ± .33 s; POST 2: 10.96 ± .19 s; F(2, 54) = 6.174, p = .003). Post hoc test revealed an increase in time from PRE to POST 1 (p = .002), but no difference between PRE and POST 2 (p =. 473). **CONCLUSION:** These results show that acute fatigue from HIIT impairs planned agility, but performance can be recovered within a few minutes. Coaches can safely combine fatigue-inducing drills and planned agility training into same sessions with rest interval.

3175   Board #44   June 2 8:00 AM - 9:30 AM

Acute Hypoxic Exposures On Submaximum And Maximum Physical Performance In Soccer Players

rungchai C. chaunchaiyakul. *mahidol university, Nakonpathom, Thailand.* (Sponsor: Professor Chia-Hua Kuo, FACSM)

(No relevant relationships reported)

Acute hypoxic exposures on submaximum and maximum physical performance in Soccer Players.
Rungchai Chaunchaiyakul[1,*] Panik Avirutakan[2], Chusak Pattanamontri[2], Somporn Wannasiri[2] and Salinee Chaiyakul[3]
[1] College of Sports Science and Technology, Mahidol University, Thailand.
[2] Sports Authority of Thailand,
[3] Faculty of Allied Health Science, Walailak University, Thailand.
Purpose: This study was aimed to investigate cardiorespiratory and metabolic changes during acute hypoxic exposures on physical performance in soccer players. **Materials and method:** Male football players, who currently trained, participated. This study was approved by the Human Research Committee of Ethical Reinforcement for Human Research, Mahidol University, Thailand (MU-CIRB 2015/075 1905). A hypoxic chamber was used to simulate normobaric-normoxic (NOR, $F_1O_2 = 0.21$) and hypoxic (HYP, $F_1O_2 = 0.15$) condition. Cardiorespiratory and metabolic functions at rest and during exercise were monitored using an impedance cardiography (PhysioFlow®) and telemetry gas analyser (Oxycon Mobile®). Variables including heart rate (HR) stroke volume (SV), cardiac output (), respiratory rate (RR), tidal volume (V_T), ventilation ($\dot{V}_E$), oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$) and respiratory exchange ratio (RER), were monitored. Two separated progressive exercise tests were conducted on a cycle ergometer. **Results:** At submaximum exercise, no significant different of all resting variables between two groups were detected. HR, SV, VT, RR, VE, SaO2 and VO2 remarkably increased in the stepwise pattern ($p<0.05$) in parallel with all workloads. EDV, ESV, CO and VCO2 in both groups progressively increased ($p<0.05$) at the moderate to high workloads (90, 120 and 150 W). HYP showed the significantly higher HR ($p<0.05$) for all workloads, and significantly lower EDV and ESV at 150 W. At maximum exercise, HYP showed significant reductions in maximum values of HR, SV, EDV, ESV, CO, WR and VO2 ($p<0.05$), with increasing in RR, VE, VCO2, and RER ($p<0.05$). **Conclusion:** Hypoxic condition declines performance, VO2 and cardiac function at maximum exercise. Physiologic responses are mostly derived from respiratory compensation for all workloads. Thus, respiratory adjustment plays major role in acute normobaric-hypoxic condition.

3176   Board #45   June 2 8:00 AM - 9:30 AM

Unstable Surface Training Effects on Balance and Lower Limb Power in Adolescent Female Soccer Players

Ieng Si Chan, Li-Lan Fu. *National Taiwan Sport University, Taoyuan City, Taiwan.*

(No relevant relationships reported)

Soccer is a moderate contact sport and has a higher injury rate in female adolescent. Previous researches demonstrate the unstable surface training (UST) could improve the body's stability and movement control, thereby reducing the risk of injury during exercise. **PURPOSE**: The purpose of this study was to determine the effect of a 6-week unstable surface training program on dynamic balance and lower limb power in adolescent female soccer players. **METHODS**: Twenty female soccer players (age: 14.9 ± 0.75 yrs, height: 160 ± 6.02 cm, weight: 50.6 ± 6.5 kg) from a local Junior School were randomly divided into control group (n = 10) and exercise group (n = 10). All players underwent a regular soccer training 5 times per week. Participants in the exercise group received extra UST program (6 weeks, 3 times per week, 20 min per session). The training program included core muscle, lower limb strength and balance training by using the BOSU ball as a training tool. Vertical jump, 30 meters dash and the dynamic balance (Star Excursion Balance Test, SEBT) before and after the training program were assessed for all players. Paired sample t-test was used to analyze the difference between pre and post-tests in two groups. The significant level was set at α = .05.
RESULTS: In the exercise group, the SEBT scores significantly increased after UST ($p = .000$, pre 294 ± 23 % vs. post 332 ± 30 %). No significant difference was found in the control group ($p = .823$, pre 301 ± 17 % vs. post 299 ± 16 %). The time of 30 meters dash in exercise group was significantly improved after UST ($p = .047$, pre 5.38 ± 0.3 s vs. post 5.27 ± 0.27 s). No significant differences were found in control group ($p = 0.17$, pre 5.45 ± 0.21 s vs. post 5.61 ± 0.38 s). The vertical jump height in exercise group was significant increased after UST ($p = .008$, pre 30.88 ± 3.82 cm vs. post 32.1 ± 4.2 cm), but no significant difference in control group ($p = 0.405$, pre 31.08 ± 2.12 cm vs. post 30.36 ± 3.19 cm).
CONCLUSIONS: Six weeks UST could improve the dynamic balance, vertical jump and 30 meters dash performance in adolescent female soccer players. Incorporation of UST into the routine training of female adolescent soccer players is important for the development of sports fitness and possibly exercise performance.

SATURDAY, JUNE 2, 2018

3177   Board #46   June 2 8:00 AM - 9:30 AM

Heart rate Variability, Stress Tolerance and Performance Outcomes to Intensification and Tapering in Soccer Players

Luiz Claudio Reeberg Stanganelli, Diego H. Figueiredo, Diogo H. Figueiredo, Helcio R. Gonçalves. *State University of Londrina, Londrina-Parana, Brazil.*
(No relevant relationships reported)

PURPOSE: The aim of this study was to examine the effect of intensification weeks (IT) followed by a 1-week tapering (TP) phase leading up to a major competition, on heart rate variability (HRV), stress tolerance (ST) measures, and physical performance in sixteen male U19 soccer players.
METHODS: The study comprised 1 baseline week, 2 weeks of intensified training followed by a 1-week taper. Daily measures of HRV, ST (DALDA questionnaire) and internal training load (ITL) were collected through the training phases. Mean values of lnRMSSD (lnRMSSD$_{mean}$) and the coefficient of variation (lnRMSSD$_{cv}$) were determine on a weekly basis for each training phase. At the end of each training phases, the athletes performed the Yo-Yo Intermittent Recovery level 1 (Yo-Yo IR1) test, Counter movement jump, Squat jump, speed tests and a running anaerobic sprint test (Rast test).
RESULTS: A decrease in lnRMSSD$_{mean}$ with an increase in lnRMSSD$_{cv}$ were observed during the IT with an opposite response observed during TP. No difference was found for the Rast test among training phases (p>0.05). During IT all remaining performance variables decline (p>0.001) with a supercompensation during TP (p>0.001). A decrease in stress tolerance were found during IT (p>0.001) with a reduction during TP (p>0.001).
CONCLUSIONS: The present results suggest that decreases in vagal-related HRV with greater daily fluctuations during peak volume-based training loads may be a sign that the athletes are not 'coping' with the applied training load and may reflect the initial stage of physiological stress.

G-37   Free Communication/Poster - **Training**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3178   Board #47   June 2 8:00 AM - 9:30 AM

Training Strategies Maintain Performance Characteristics in Marines Selected for Marine Corps Special Operations Individualized Training Course

Scott D. Royer[1], Joshua D. Winters, FACSM[1], Kathleen Poploski[1], John Abt, FACSM[1], Andrejs Zalaiskalns[2], Scott Lephart, FACSM[1]. [1]*University of Kentucky, Lexington, KY.* [2]*United States Marine Corps Forces Special Operations Command, Camp Lejeune, NC.* (Sponsor: John Abt, FACSM)
(No relevant relationships reported)

Marines must complete an intensive Assessment and Selection (A&S) course prior to becoming a United States Marine Corps Forces Special Operations Command (MARSOC) Raider. Following selection, Marines are given training recommendations designed to maintain performance characteristics deemed relevant to successfully complete a rigorous nine-month Individualized Training Course (ITC). However, the time between the two courses is highly variable and training strategies are individually implemented by the Marine. **PURPOSE:** To evaluate the effectiveness of current training strategies following A&S and prior to ITC. **METHODS:** Fat free mass (FFM), fat mass (FM), anaerobic power (AP), anaerobic capacity (AC), aerobic capacity (VO$_2$max), knee flexion (KF), knee extension (KE), shoulder internal rotation (SIR), shoulder external rotation (SER), trunk extension (TE) and trunk flexion (TF) isokinetic strength were collected on 27 Marines (Age: 25.6 ± 2.9 years, Height: 1.78 ± 0.05 meters, Mass: 83.0 ± 8.4 kg, Post A&S to ITC Start: 183.8 ± 68.2 days) following A&S and directly prior to ITC. **RESULTS:** No significant changes were found in Marines between A&S and the start of ITC in FFM (*p=0.852*), FM (*p=0.119*), AP (*p=0.569*), AC (*p=0.388*), VO$_2$max (*p=0.594*), KF (*p=0.855*), KE (*p=0.843*), SIR (*p=0.868*), SER (*p=0.710*), TE (*p=0.590*), and TF (*p=0.971*). **CONCLUSION:** Performance characteristics were similar following selection and prior to the start of ITC, suggesting the current training strategies, as implemented and adopted for the varying time gaps post A&S, were effective at maintaining performance between courses. Although effective at sustaining performance levels, Marines still demonstrated deficits in AP (13.0 W/kg vs 12.65 W/kg respectively) compared to previous studies on MARSOC Raiders. Future training strategies may further benefit from an increased emphasis on AP in conjunction with current recommendations. Additionally, further research is needed to determine how performance characteristics are effected by variance in time between courses.

3179   Board #48   June 2 8:00 AM - 9:30 AM

The Influence Of Four-week Of Endurancetraining With Periodic CO Inhalation On Aerobic Capacity

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(No relevant relationships reported)

PURPOSE: Altitude training is commonly used to enhance aerobic capacity in competitive athletes. The rationale is hypoxic stimulation of EPO to raise blood Hb mass and concentration and therefore also O$_2$ transport capacity. We hypothesized that periodic inhalation of low levels of CO at sea level might be an easier method to achieve the same outcome.**METHODS**: 12 non-smoking male well trained football players volunteered to participate in this study. In a preliminary experiment in resting subjects, the concentrations of CO in exhaled gas and of CO and EPO in venous blood were measured before and then at 1h, 2h, 4h, 6h, 8h after inhaling a bolus of CO (1ml/kg BW) through a spirometer. For the main experiment, the subjects were divided into two groups (one group given inhaled CO (INCO) and a control group not given CO (NOCO)). All subjects participated in a four-week treadmill training program, running for 50 minutes at a speed of 90% of that producing each individual ventilation threshold, 3 times a week for 4 weeks. Prior to each training session, INCO inhaled a mix of CO (1ml/kg BW) and O$_2$ (4L) over two minutes, while NOCO inhaled a bolus of O$_2$(4L) over two minutes. Before and after 4 weeks of training, total hemoglobin mass (tHb), blood parameters (RBC, Hct, [Hb], MCVC), and VO$_2$ max were measured. **RESULTS**:In the first experiment, HbCO% increased from 0.7% to 5.81% (p<0.05) 1 hr after CO inhalation, decreasing gradually to 1.48% after 8 hours; EPO increased significantly 2 hours (p<0.05) after CO inhalation, peaking (42.3% higher than pre 1.912 **mIU/mL**) at 4 hours, and then decreasing gradually at 6 (2.465 **mIU/mL**) and 8 hours (1.759 **mIU/mL**); (2) tHb and VO$_2$max in INCO increased significantly after training (5.9% higher and 6.7% respectively, each p<0.05). However there were no such changes in NOCO; Oxygen uptake at a given submaximal intensity declined slightly both in INCO and NOCO, with the changes being more obvious in INCO. At 8, 10 and 12km/h, VO2 decreased by 7.08%, 2.13% and 3.43% respectively in INCO and by 1.56%(p=0.057), 5.74%(p=0.081) and 0.66%(p=0.059) in NOCO.
CONCLUSIONS:Circulating EPO increases sharply after a bolus of CO (1ml/kg BW), peaking at 4 hours after inhalation; Endurance training with CO inhalation increases tHb and VO2max and slightly reduced the energy cost of submaximal running.

3180   Board #49   June 2 8:00 AM - 9:30 AM

Prescription of Dry-land Resistance Training by Elite Swimming Strength and Conditioning Coaches.

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(No relevant relationships reported)

Purpose: No research to date has investigated the current practice of prescription of dry-land resistance training by elite swimming strength and conditioning (S&C) coaches. The aims of this study were to examine the prescription of dry-land resistance training modalities and exercises among elite swimming S&C coaches and explore coach's rationale and justification for prescribing dry-land resistance training modalities and dry-land exercises. **Methods:** Twenty-three (n = 21 males, n = 2 females) elite swimming strength and conditioning coaches from Ireland (n = 7), Great Britain (n = 5), Australia (n = 6) and the United States (n = 5) were recruited through their specific national governing bodies. Coaches completed an online questionnaire consisting of seven sections; participant information, informed consent, coach's biography, coach education, current training commitments, dry-land resistance training modalities exercises and additional information. **Results:** Results showed that coaches had varying levels of experience, education and worked with swimmers at regional (4.6 %), national (59.1 %) and international (36.4 %) levels. The most popular S&C accreditations were; National S&C Association (29.2 %), United Kingdom S&C Association (22 %) and Australian S&C Association (7.3 %). S&C coaches reported that their primary sources of information were their own experience (52.4 %), S&C coaches (14.3 %) and academic journals (9.5 %). In total four different resistance training modalities were reported and these included 95 dry-land resistance training exercises. **Conclusion:** Traditional resistance training was the most commonly practiced dry-land training modality with the pull up and squat reported as the most popular exercises prescribed by elite swimming S&C coaches. Future research should focus on exploring the specificity and transfer of specific exercises to swimming performance. This study highlighted that coaches need to have a clear understanding of the mechanisms that occur during sport specific movements such a swimming. Furthermore, there is a need for coaches to perform detailed needs analysis before prescribing dry-land resistance training programs as aquatic sports provide a unique challenge to the s S&C coach.

3181   Board #50   June 2 8:00 AM - 9:30 AM

Changes in Muscular Strength and Endurance Following Various Resistance Training Frequencies and Protocols in Untrained Females

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(No relevant relationships reported)

PURPOSE: To determine the impact of various resistance training protocols and frequencies on isometric and isokinetic strength and endurance in sedentary and recreationally active females.
METHODS: Forty-six female subjects (age= 22.7 ± 4.1) were randomly assigned to one of four groups that trained the knee flexors and extensors for 6 weeks. Training groups included a traditional group (TRAD) [3 sets (10, 10, 10 reps), 3x/wk at 70-80% of one repetition maximum (1RM)], two blood flow restriction groups [(BFR-1) 4 sets (30, 15, 15, failure), 1x/wk at 20-50% 1RM; and (BFR-2) 4 sets (30, 15, 15, failure), 2x/wk at 20-50% 1RM], and a one set to failure group (FAIL) [1x/wk at 75-80% 1RM]. Subjects fasted (for at least 8 hours) and were hydrated for pre and post testing sessions that included assessing isometric maximum voluntary contraction (MVC) of the knee extensors (60° of knee joint flexion), 10 repetitions of isokinetic knee extensions at 60°/s (ISO-60), and 10 reps at 180°/s (ISO-180), and 50 maximal knee extensions (50 REP) at 180°/s.
RESULTS: One-way ANOVA found no between-group differences in any of the outcome measures of interest at baseline. Repeated measures ANOVA found a significant time main effect for MVC ($p < 0.01$). There was also a significant time main effect ($p < 0.01$) and time*condition interaction ($p < 0.05$) for ISO-60 as well as a significant time main effect ($p < 0.01$) for ISO-180, with post torque values being greater than baseline. There was a significant time*condition interaction ($p < 0.04$) for percent decline in torque for the 50 REP test. All training groups had increases in strength (peak torque) following each training program, but the TRAD group had greater percent declines in torque from the average of first 3 reps to last 3 reps of the 50 contraction test on the posttest compared to the pretest (58% pre-training vs. 60% post-training) while the BFR-1 groups improved their ability to maintain torque over the 50 reps (63% pre-training vs. 59% post-training).
CONCLUSIONS: Findings indicate that the FAIL, BFR-1, and BFR-2 training programs can be as effective as the TRAD training program to improve isometric and isokinetic strength, but the BFR-1 group appeared to be able to maintain muscular endurance better than the TRAD group.

3182   Board #51   June 2 8:00 AM - 9:30 AM

The Relationship Between Macronutrient Consumption and an Off-Season Training Program in Female Athletes

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(No relevant relationships reported)

Sports performance and training are impacted by energy provisions. Adequate caloric and carbohydrate intakes are necessary for positive adaptations to exercise training, yet there is limited research examining dietary intake in relation to strength and power in female athletes. **PURPOSE:** To determine whether there are significant changes in weekly total caloric and macronutrient consumption, strength, and power and to determine whether changes in caloric and macronutrient consumption are significantly and positively related to changes in strength and power across a controlled eight-week, off-season resistance training program. **METHODS:** Eleven female volleyball players were examined on macronutrient consumption, strength, and power every two weeks over a period of eight weeks. A total of 5 assessments were conducted per subject. Anthropometric measures were taken to evaluate pre- and post-test measures of body mass index (BMI), lean body mass (LBM), and body fat (BF) percentage. Macronutrient consumption was measured using a three-day food log. Strength was assessed using a 3-repetition maximum (RM) bench press for upper body strength and a 3-RM back squat for lower body strength. A vertical jump was used to assess lower body power. Repeated-measures ANOVA and weighted regression analysis was used to compare assessments across time. **RESULTS:** Back squat and vertical jump significantly increased across the training program ($p<0.05$). Changes in caloric and carbohydrate intake were significantly related to the changes in vertical jump ($p<0.05$). Significant improvements were seen in BMI, LBM, and BF percentage ($p<0.05$). Bivariate correlations showed significant inverse relationships between pre-test BMI and pre-test caloric intake ($p<0.05$), as well as between post-test LBM and post-test carbohydrate intake ($p<0.05$). **CONCLUSION:** Changes in caloric and carbohydrate intake positively contribute to lower body strength and power in female athletes.

3183   Board #52   June 2 8:00 AM - 9:30 AM

Cardiometabolic Responses Of Body-weight Exercises With And Without Vibration

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(No relevant relationships reported)

Purpose: This investigation examined cardiometabolic responses of body-weight (BW) exercises with and without concurrent vibration. **Methods**: Eight men and six women performed a BW exercise protocol either on the floor (BW–V) or with a vibration platform (BW+V) in a randomized order. The BW exercise protocol consisted of three circuits of eight calisthenics-based exercises performed using Tabata intervals. Vibratory frequency and amplitude were set at 40 Hz and 4 mm, respectively. Oxygen uptake (VO_2), heart rate (HR), expired ventilation (V_E), and respiratory exchange ratio (RER) were measured throughout the protocol and during 30 min recovery. Blood lactate concentrations ([La]) were determined at rest and at the end of BW-V and BW+V. **Results**: The mean ($\pm$SE) VO_2 reached 22.11 (±0.51) and 23.28 (±0.82) ml·kg^{-1}·min^{-1} or 48% and 50% of VO_2max in BW-V and BW+V, respectively. The mean HR reached 156.63 (±4.15) and 162.22 (±4.40) beats·min^{-1} or 80% and 83% of HRmax in BW–V and BW+V, respectively. During the protocol, while the mean V_E was greater (p=0.031) in BW+V than BW-V, no differences were seen for VO_2, RER, and HR between the two conditions. During recovery, while mean VO_2 was greater (p=0.002), and RER was lower (p=0.033) in BW+V than BW-V, no differences were seen for V_E and HR between the two conditions. [La] were significantly elevated, but remain similar between the two conditions. **Conclusion**: Performing three circuits of eight BW exercises using Tabata intervals produces a sufficient increase in cardiometabolic responses. Metabolic potentiation associated with combining vibration with BW exercises seems to be influenced by how the exercises were carried out on a vibration platform.

3184   Board #53   June 2 8:00 AM - 9:30 AM

Single-joint Eccentric Knee Extension Training Induces Selective Hypertrophy: A Potential Preventive Measure Against Strain Injuries

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(No relevant relationships reported)

It is known that eccentric muscle action-induced strain injuries during sports activities (e.g. American football, soccer, etc.) often occur in the rectus femoris (RF). By using magnetic resonance imaging (MRI)-based transverse relaxation time (T_2) as an index of exercise-induced muscle edema, we recently reported that acute (unaccustomed) single-joint eccentric knee extension exercise specifically induced muscle damage in RF. **PURPOSE:** To test hypotheses that 1) single-joint eccentric knee extension training would induce greater hypertrophy in RF than its synergists, and 2) training-induced changes in muscle activity [i.e. increased electromyogram (EMG) amplitude] would be also greater for RF. **METHODS:** Twelve young males conducted single-joint isokinetic (180°/s) maximal eccentric contractions of the knee extensors 5-10 repetitions/set, 6 sets/session (3-5 sets in the initial 1-3 sessions), 2 sessions/week for 10 weeks. MRI-based anatomical cross-sectional area (ACSA) and T_2 of the quadriceps muscles [RF, vastus lateralis (VL), vastus medialis (VM) vastus intermedius (VI)] and EMG of the superficial muscles (RF, VL, VM) were measured weekly throughout the training period and pre- and post-training. Whole muscle volume of each muscle was also assessed pre- and post-training. **RESULTS:** ACSA significantly ($P < 0.05$) increased after week (W)4 or W9 in RF, VL, and VI but not in VM, without significant T_2 changes in all muscles throughout. Percentage change (%Δ) in muscle volume was significantly ($P = 0.01−0.02$) greater for RF (7.3 ± 4.5%) than VM (3.7 ± 2.9%) and VL (2.9 ± 3.0%). Agonist EMG amplitude significantly ($P < 0.05$) increased after W4 or W7 in all muscles, without significant differences in %Δ among muscles ($P = 0.292$, RF: 58.8 ± 35.0%, VL: 64.4 ± 62.0%, VM: 91.9 ± 97.3% at post). **CONCLUSIONS:** These results suggest that single-joint eccentric knee extension training induces greater hypertrophy in RF, while increases in muscle activity (i.e. neural adaptations) are similar among the synergists. Single-joint eccentric knee extension training would be a strong preventive measure against strain injuries in RF. Supported by JSPS KAKENHI (JP15J03228).

3185 Board #54 June 2 8:00 AM - 9:30 AM

Evaluation Of The LaxPrep ACL Injury Prevention Program

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(No relevant relationships reported)

Title: Evaluation of the LaxPrep ACL Injury Prevention Program
Neuromuscular-based warm-up programs are effective at reducing risk of lower extremity injury, but more research is needed on the perspective of the program instructor. LaxPrep is a lacrosse-specific, progressive 3-phase program that combines neuromuscular control, core strength, and balance training. Each phase features a series of 9-10 exercises that are to be practiced 2-3 times per week for a period of 3-6 weeks. Resistance bands are implemented in advanced phases of the program. The online training is based on the US Lacrosse website and takes 45-60 minutes to complete. **PURPOSE:** To characterize respondents who completed and implemented the LaxPrep training, which program phase was reached, and common barriers to implementation.
METHODS: A web-based survey (Tonic Health) was created and sent to 390 trainees who completed the online education course and intended to implement the LaxPrep program with their team.
RESULTS: 64 trainees (16%) responded to the survey. They included coaches, athletic trainers, and others for youth, high school, and college athletes across 27 states. 28% of respondents completed Phase 1, 28% completed Phase 2, 25% completed Phase 3, and 19% did not implement the program. Program instructors for youth teams cited 2 barriers to full implementation: the inability of young athletes to perform some of the exercises in advanced phases, suggesting the need for age-specific programs; and the accessibility and expense of resistance bands. High school and collegiate players were not as willing as youth players to participate and implement the program.
CONCLUSION: Challenges to program implementation were associated with the team's age group and included finding practice time, athlete willingness, and resistance band expense. These observations support the implementation of age-specific neuromuscular–based warm-up programs, starting at the youth level.
FUNDING: This research was supported by the US Lacrosse Center for Sport Science and the Georgetown University School of Medicine's MedStar Health Research Scholarship.

3186 Board #55 June 2 8:00 AM - 9:30 AM

The Effects Of A Shoulder Stretching And Strengthening Intervention On Shoulder Benchmarks And Disability In Collegiate Softball Players

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(No relevant relationships reported)

PURPOSE: To investigate the effects of a shoulder strengthening and stretching program on shoulder internal rotation (IR) and shoulder external rotation (ER) range of motion, throwing speed, and disability in collegiate softball players. **METHODS:** Eighteen Division I softball players (age=19.5±1.3 yrs, height=65.3±2.6 in, weight=148.4±20.8 lbs) completed a four week arm care intervention two to three days per week before practice during the preseason. The intervention consisted of two sets of eight repetitions of five resistance band exercises (shoulder horizontal abduction, shoulder scaption-flexion, shoulder extension, and shoulder IR and ER in abduction) and three sets of a 30 second shoulder IR stretch (sleeper stretch). Bilateral shoulder IR and ER were measured by cell phone inclinometer app, throwing speed was measured by radar gun, and shoulder disability was measured by the Disability of Arm, Shoulder, and Hand form. All outcomes were measured at pretest and posttest. Paired t-tests were used to compare athletes at pretest and posttest and significance was established at p≤0.05. **RESULTS:** The mean overall compliance rate was 95.3% ±12.4. The maximum compliance rate was 100% (n=14). The minimum compliance rate was 50% (n=1). Dominant shoulder IR increased significantly (54.7±13.6° vs 60.7±12.3°, p=0.011) and throwing speed decreased significantly (53.4±4.4 mph vs 51.8±4.3 mph, p=0.005) from pretest to posttest. There were no changes in non-dominant shoulder IR (67.6±12.8° vs 74.9±15.1°, p=0.052), dominant shoulder ER (90.9±14.8° vs 86.9±16.2°, p=0.481), non-dominant shoulder ER (83.9±12.7° vs 86.1±11.6°, p=0.413), or shoulder disability (9.1±5.7 vs 12.7±10.4, p=0.871) from pretest to posttest. **CONCLUSION**: The sleeper stretch increased shoulder IR without changing shoulder ER. Four weeks' time may have been insufficient to increase strength in the newly acquired shoulder range of motion, which may have resulted in a decrease in throwing speed. Disability did not change following the intervention, though disability may have been low at the start of the preseason.

3187 Board #56 June 2 8:00 AM - 9:30 AM

Salivary Testosterone-to-Cortisol Ratio in Collegiate Gymnasts over a Competitive Season

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(No relevant relationships reported)

Scant empirical literature can be found regarding female gymnasts' physiological hormonal responses to training and competition, especially at the collegiate level. **PURPOSE:** To understand the long-term physiological effects of a full competitive season of NCAA Division-I female gymnasts on hormonal responses. **METHODS:** Participants were 8 female athletes (ages 18-22) on the active roster of a university women's gymnastics team. Saliva samples were taken approximately 24 hours pre-competition at approximately the same time of day as schedules permitted. Saliva samples were collected via unstimulated passive drool. Salivary cortisol (C) and testosterone (T) concentration levels were determined using an enzyme immunoassay kit (Salimetrics, State College, PA, USA). Given the nested nature of the data, hierarchical linear regression models examining individual-level and team-level variables on testosterone:cortisol ratio (T:C) were conducted. **RESULTS:** The initial, simplified model indicated that T:C decreased over a competitive season ($p = 0.003$). Specifically, it was observed that T did not change over the competitive season, but C significantly increased. To examine alternative predictors over the season, other variables were examined in a second model, namely the number of events in which an athlete competed and whether the competition was a conference or non-conference competition. Conference competitions predicted significantly higher T:C than non-conference competitions ($p < 0.001$), and the number of events in which individuals competed predicted significantly higher T:C ($p = 0.001$). Surprisingly, the interaction between time and conference showed a significant decrease in T:C ($p < 0.001$), and the main effect of time became non-significant ($p = 0.186$). **CONCLUSION:** This is the first study of its kind to examine hormonal changes over a competitive season in female gymnasts. These findings indicate that the athletes had significant increases in cortisol without a corresponding increase in testosterone throughout the season, resulting in a decreased anabolic-catabolic balance. This perhaps contributed to an overtrained state as the season progressed. Further research should be conducted with this athlete population to optimize training and competition stress and recovery periods.

3188 Board #57 June 2 8:00 AM - 9:30 AM

The Effects Of The Alchemy Philosophy On Cardiovascular Health, Flexibility, And Strength

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(No relevant relationships reported)

Various styles of fitness training target different aspects of health. By utilizing different modalities of fitness, overall health can be improved. Alchemy is a relatively new type of exercise class that offers a blend of flexibility, strength, and cardiovascular training in a group fitness setting. Little research has been done to examine the effectiveness of the Alchemy approach on fitness outcomes. **PURPOSE**: To examine the effects of eight weeks of Alchemy training on flexibility, strength, and cardiovascular performance in healthy adults. **METHODS**: 12 men and 20 women were recruited to participate in this study. The pre-intervention protocol included testing peak torque of the knee joint and examining the strength of the hamstrings and quadriceps. A Vo2max test was completed to examine cardiovascular health. Flexibility was tested by examining ROM of hip flexion, ankle arc flexion, knee hyperextension, and closed dorsiflexion. Participants height and weight were also recorded. The eight-week intervention instructed participants to attend at least two Alchemy classes per week. All classes include disciplines of yoga, strength and cardiovascular training. After the intervention, participants return for post-intervention testing to examine changes in fitness areas. **RESULTS**: 32 participants (age 31.7 ± 8.9 yrs, weight 67.9 ± 13.4 kg, height 168.2 ± 7.5 cm) completed a battery of fitness tests, which included average peak torque (APT) of the quadriceps and hamstrings of both legs (APT right extension 106.7 ± 26.6, APT left extension 105.4 ± 24.3, APT right flexion 53.8 ± 14.8, APT left extension 50.9 ± 13.3). Mean Vo2max was 50.1 ± 10.5. Flexibility as measured by right and left hip flexion, right and left ankle arc, right and left closed dorsiflexion, and right and left knee hyperextension, was 106.1 ± 13.12, 106.5 ± 13.9, 74.8 ± 10.8, 78.5 ± 10.8, 35.2 ± 5.4, 34.1 ± 6.2, 7.9 ± 2.6, 8.3 ± 3.0, respectively. **CONCLUSIONS**: These results suggest that the participants are in good physical health, which may lead to small changes from an Alchemy-based training intervention. However, there did appear to be a bilateral discrepancy in quadricep and hamstring torque production which may be worth further examination in the future.

3189   Board #58   June 2 8:00 AM - 9:30 AM

Muscle Activation of Palmaris Longus and Flexor Carpi Radialis Muscles in Different Rock Climbing Holds

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(No relevant relationships reported)

Rock climbing is a popular sport with very dedicated athletes and fan base. Climbing performance, especially for new climbers, should increase when climbers develop the appropriate muscle strength to execute a variety of different climbing holds. **PURPOSE:** This study investigated which of four popular rock-climbing holds caused the greatest recruitment of the Palmaris Longus (PL) and the Flexor Carpi Radialis muscles (FCR). **METHODS:** Muscle activation was measured in eleven experienced rock climbers: seven males and four females. Electromyography (EMG) sensors were placed on PL and FCR muscles. Participants performed four different types of rock climbing holds in random order. The PL activation, in all holds, was greater than the FCR activation. **RESULTS:** The Sloper hold caused greater PL activation than the Jug, Crimp, or Pinch holds as well as greater activation for the FCR in the Crimp and Pinch holds.

Muscle Activation While Performing Climbing Holds				
Muscle Type	**Climbing Hold Type**			
	SLOPER	**JUG**	**PINCH**	**CRIMP**
Palmaris Longus m.	108.468	69.7*	77*	82.243*
Flexor Carpi Radialis m.	26.1	19.6	13.7[+]	13.53[+]
* = p<.05 compared to SLOPER in Palmaris Longus				
+ = p<.05 compared to SLOPER in Flexor Carpi Radialis				

CONCLUSION: Developing rock climbers should be able to increase their physical capacity to climb more quickly if they supplement their training with exercises aimed at increasing the strength and endurance of their PL muscle as it is highly recruited when executing holds. Ability to climb more difficult routes may advance quickly by training the Sloper hold as its performance required the greatest recruitment of both the PL and FCR muscles.

3190   Board #59   June 2 8:00 AM - 9:30 AM

Intra-day And Inter-day Reliability Of A Combined Pre-planned And Reactive Agility Protocol

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(No relevant relationships reported)

PURPOSE: To evaluate the reliability of a novel agility protocol using a wireless light system, consisting of pre-planned and reactive agility components. **METHODS**: Seventeen male athletes (19 ± 1 yrs; 85.1 ± 9.4 kg) completed 3 sessions, each separated by 3-7 days. Each session consisted of a standardized warm-up followed by 5 trials of the protocol, assessing time to complete each trial. Subjects reported to the laboratory at the same time of day for all 3 sessions to avoid differences in circadian rhythm. Pre-trial urine specific gravity measurements, 24-h dietary recalls (to assess macronutrient intake), and visual analogue ratings (to assess physical and mental fatigue) were measured, and results suggested no baseline differences between sessions (p>0.05, ANOVA). A two-way (day x trial) repeated measures ANOVA was used to assess differences in completion times, followed by Tukey's post hoc test where main effects were found. Reliability was determined using coefficient of variation (CV). **RESULTS**: Main effects were evident for day (p<0.0001) and trial (p<0.0001), yet no interactions were present. Post-hoc results revealed significantly slower completion times during day 1 (27.76 ± 1.33 sec), but no significant difference between day 2 (27.17 ± 1.38 sec) and day 3 (27.13 ± 1.18 sec). Completion times (intra-day) were significantly slower during trial 1 (28.07 ± 1.26 sec) and trial 2 (27.49 ± 1.37 sec), but no differences existed between trials 3, 4, and 5 (27.25 ± 1.30 sec, 26.91 ± 1.27 sec, and 27.04 ± 1.16 sec, respectively). The reliability analyses suggested a high consistency (for mean of trials 3-5) within each day (CV = 2.2%, 2.2%, and 1.3% for days 1, 2, and 3, respectively) as well as between days 1-3 (CV = 1.8%). **CONCLUSIONS**: The evaluated protocol is a reliable tool that may be used for future research investigating agility performance. An initial familiarization session is warranted, followed by a minimum of two familiarizations (or warm-up trials) prior to performing an initial test trial in each successive visit. This study was funded by the Gatorade Sports Science Institute. The authors are employed by the Gatorade Sports Science Institute, a division of PepsiCo, Inc. The views expressed in this abstract are those of the authors and do not necessarily reflect the position or policy of PepsiCo, Inc.

3191   Board #60   June 2 8:00 AM - 9:30 AM

Effects of Manipulating Stride Length on Ground Reaction Form and Wrist Velocity During Baseball Pitching.

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(No relevant relationships reported)

PURPOSE: Stride-leg ground reaction forces have been used to predict wrist velocity during baseball pitching and are likely influenced by stride length. The purpose of this study is to determine the effect of stride length on peak vertical ground reaction forces (Fzpeak) of the stride leg and wrist velocity in skilled baseball throwers. **METHODS**: Ten collegiate baseball pitchers (6 right-handed, 4 left-handed) completed one laboratory testing session in which they were instructed to throw a baseball as fast and accurately as possible. After a standardized warmup, a total of 15 throws (5 Normal-stride [NS], 5 Over-stride (NS +10% [OS]), and 5 Under-stride (NS -10% [US]) were performed on a dimensionally correct pitching mound equipped with a force platform (1200 Hz). Marker trajectory data (32 reflective markers) was tracked from 10 high-speed cameras at 240 frames/sec. Fzpeak was normalized for body weight (N/BW) and wrist velocity (m/s) was measured at ball release. **RESULTS**: When all stride lengths were combined, significant correlations were found between Fzpeak and wrist velocity (r=0.47; p<0.01). However there was no effect of stride length on either Fzpeak (NS=1.63±0.20, OS=1.59±0.19, US=1.60±0.22; p>0.05) or wrist velocity (NS=18.27±1.03, OS=17.95±1.00, US=18.12±0.85; p>0.05). **CONCLUSIONS**: These results confirm the relation between Fzpeak and wrist velocity. However, the data indicate that skilled throwers are able to compensate for changes in stride length up to 10% to maintain performance.

3192   Board #61   June 2 8:00 AM - 9:30 AM

Six-week Pilates Program Improves Postural Stability, Balance, And Isometric Back Strength In College-aged Athletes

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(No relevant relationships reported)

Pilates training engages core musculature and utilizes controlled repetitions of various movements to improve muscular strength and endurance, flexibility, balance, and posture. Although a growing body of research identifies the benefits of Pilates training for middle-aged and older adults, little emphasis has been placed on evaluating athletic populations. **PURPOSE:** To determine the effects of a short-term Pilates training program on postural stability, balance and core isometric back strength in NCAA DIII and competitive club sport athletes. **METHODS:** The experimental group of 16 off-season college-aged female athletes participated in a supervised Pilates training program, which took place two times each week for six weeks. The 30-minute Pilates sessions consisted of body weight training that progressed to the incorporation of dumbbells. Pre- and post-test measurements were taken in three functional tests, which included Force Plate Tandem Balance (FPTB), Limits of Postural Stability (LPS), and Biering-Sorensen Back Extension (BSBE). A control group of 10 college students, who maintained their normal physical activities, but were not involved in the Pilates training program, completed pre- and post-testing for comparison. **RESULTS:** There were no significant differences between the experimental and control groups at baseline testing. The control group did not show any significant changes between pre- and post-test measurements. The experimental group decreased path length in the FPTB assessment (39.8 inches vs. 36.5 inches, p<0.05). The experimental group also exhibited significant improvement in postural control score on the LPS assessment (37.1 vs. 47.4, p<0.001). Finally, there was a significant increase in seconds held during the BSBE assessment among the experimental group (172.4 seconds vs. 187.7 seconds, p<0.05). **CONCLUSION:** A six-week progressive Pilates program contributed to significant decreases in single-foot sway, increases in postural stability, and increases in isometric back strength in female college-aged athletes.

3193   Board #62   June 2 8:00 AM - 9:30 AM

Effect of Suspension Training on Selected Health Related Fitness and Functional Movement

Kelsey D. Bryan, A Tamlyn Shields, Alex T. McDaniel, Rachel E. Williams, Ryan Swiezy, Adrian Gonzalez, Andrew L. Ortiz, Brad R. Hollingsworth, Sarah A. Noland, Christa Douros, Raechel M. Santee, Phillip V. Morie, Lauren A. Ackerman, Emma C. Schmid, Tiago V. Barreira, Wayland Tseh. *University of North Carolina Wilmington, Wilmington, NC.* (Sponsor: Robert Wilkes Boyce, FACSM)

(No relevant relationships reported)

Although body weight training is included in the 2017 ACSM Top Fitness Trends, there is relatively little research quantifying the effects of suspension training on health-related fitness and functional movement. **PURPOSE:** To examine the impact of suspension training on selected health-related fitness variables and functional movement. **METHODS:** Fifteen individuals (11 females; 4 males; Age = 22.2 ± 3.2 yrs; Height = 172.0 ± 11.4 cm; Body Mass = 69.8 ± 19.2 kg) in a suspension training course completed 11 workout sessions over a 6-week period. Throughout each 30-minute exercise session, six body positions were utilized across push, pull, rotational, squat and lunge movements. Pre- and post-health-related fitness assessments included body composition, muscular endurance, flexibility, and a functional movement screen. Dependent t-tests were used to determine if there were mean changes in health-related fitness and functional movement. Due to multiple comparisons, Bonferroni correction was used, therefore, alpha level was set at .008. Cohen's Delta effect size was calculated for functional movement. **RESULTS:** There were no significant changes in mean fat mass, percent body fat, and push-ups. There were, however, positive changes in mean lean body mass (55.5 ± 18.4 kg to 56.3 ± 18.6 kg), sit and reach (42.2 ± 8.5 to 45.5 ± 8.3 cm, p= .004), and functional movement screen score (15.7 ± 2.1 to 17.7 ± 2.0). A large effect size was present for functional movement (Cohens' Delta = 0.98). **CONCLUSION:** Suspension training had a significant impact on lean body mass, flexibility and functional movement in as few as 11 thirty-minute sessions.

3194   Board #63   June 2 8:00 AM - 9:30 AM

The Effects of Ballistic Exercise on Cognitive Function

Allan Shook, Joshua A. Logan, Toria A. Crispin. *Slippery Rock University, Slippery Rock, PA.*

(No relevant relationships reported)

A strong connection between physical activity and cognition has been well documented in health science. Prior research suggests a strong relationship between both aerobic exercise training and slow-controlled resistance training with improvements in cognitive function (CF). Little research exists on the influence of high-force production (ballistic) strength training on CF. **PURPOSE:** To determine the effects of ballistic strength training on CF in an apparently healthy, college-aged population. **METHODS:** 21 low-risk participants (age 18-25 years) who had refrained from any ballistic strength training for at least six months were recruited to the treatment group. 19 individuals (age 18-25 years) served as controls. Treatment and control groups continued previous aerobic and traditional (slow-controlled) resistance training during the study. Both groups completed congruent (CONG) and incongruent (INCONG) sections of The Stroop Test, and the Trail Making Test, Part B (TMT-B), at baseline, and eight weeks later. The Stroop Test assessed the number of correct answers on CONG and INCONG questions and the completion time of the test. The TMT-B measured the correct completion time of the test. The treatment group met twice weekly for eight weeks and completed a ballistic training protocol. Pre- and post-test comparisons within and between subjects on CF were assessed. **RESULTS:** Completion time for both CONG and INCONG sections of The Stroop Test significantly improved from baseline to post-test for all participants (1.65 ± 3.59, p = .006; 2.17 ± 4.60, p = .005, respectively); however, there was no significant difference in between groups (F = .921, p = .847; F = 2.696, p = .450, respectively). All participants significantly improved from baseline to post-test on the TMT-B (9.74 ± 10.48, p < .001); however, there was no significant difference between the treatment and control group from baseline to post-test (1.82 ± 3.08, p = .564). **CONCLUSION:** CF improved in the treatment and control group but was not statistically different. Future research could investigate if ballistic strength training influences CF in sedentary individuals.

3195   Board #64   June 2 8:00 AM - 9:30 AM

The Effects of Pilates Training on Functional Movement Screen and Muscle Endurance for Cheerleaders

Yu-chen Chung, Nai-Jen Chang. *Kaohsiung Medical University, Kaohsiung City, Taiwan.*

(No relevant relationships reported)

Pilates provides a way to train core muscles. However, most researches in Pilates focus on how Pilates releases back pain. Functional movement screen (FMS) is a simple tool to assess a player's movement dysfunction. Nevertheless, there is no related research to investigate the efficacy on movement change and trunk muscular endurance after Pilates training of cheerleading dancers. **PURPOSE:** To investigate cheerleading dancers' capability of movements and muscular endurances after eight-week Pilates training. **METHODS:** Thirty cheerleading dancers were divided randomly into two groups, training (TRN: n= 15) and control (CTL: n= 15). TRN group had a regular practicing program which includes Pilates training with a licensed Pilates instructor. This training course was held three times a week, 50 minutes each course, for a total of 8 weeks. On the contrary, CTL group only maintained regular practicing. Functional movement screen (FMS) was adopted to assess capability of movements and body asymmetry, which includes seven fundamental movements (deep squat, hurdle step (HS), active straight leg raise, in-line lunge (ILL), active straight leg raise, trunk stability push up (TSPU), and rotary stability (RS). The test trunk extension, plank, and side plank were adopted to measure isometric endurance of abdominal and trunk muscles. **RESULTS:** After 8-weeks training, TRN group had significant improvements in FMS, indicating in HS (pre-test: 2.00 ± 0.53 vs post-test: 2.73 ± 0.46, p < .001), TSPU (pre-test: 1.73 ± 0.46 vs post-test: 2.2 ± 0.41, p = .004), RS (pre-test: 2 vs post-test: 2.67 ± 0.49, p < .001), totally FMS scores (pre-test: 16.40 ± 1.24 vs post-test: 19.00 ± 1.13, p < .001). Furthermore, the asymmetrical ratio on HS and ILL were improved by 67% and 100%, respectively. However, CTL group obtained few improvements. Regarding trunk endurance, TRN group had significantly increased isometric contraction time on trunk extension (p= .025), plank (p= .001), and side plank (p= .007) compared to CTL group. **CONCLUSION:** Eight-week Pilates training can significantly enhance FMS scores (movement function) and improve body asymmetrical problem. Moreover, Pilates is also helpful for increasing isometric endurance of abdominal and trunk muscles.

3196   Board #65   June 2 8:00 AM - 9:30 AM

Assessing Changes in Absolute and Relative One-repetition Maximum Bench Press After a Six-week Blindfolded Training

Ali Boolani[1], Masoud Moghaddam[2], Timothy Baghurst[2], Timothy Jones[3], Essameldin Hamido[3], Bert Jacobson, FACSM[2]. [1]*Clarkson University, Potsdam, NY.* [2]*Oklahoma State University, Stillwater, OK.* [3]*Tennesee State University, Nashville, TN.* (Sponsor: Bert Jacobson, FACSM)

(No relevant relationships reported)

PURPOSE: This study investigated changes in one-repetition maximum (1-RM) strength on the bench press following 6 weeks of vision-deprived resistance training in college-aged individuals. **METHODS:** Fifty-three resistance-trained individuals (males = 40, females = 13; age = 19.67 ± 1.12; height = 174.25 ± 9.58 cm; weight = 85.89 ± 22.18 kg; body fat % = 13.98 ± 10.54) were recruited to participate in a 6-week resistance training intervention. Testing procedures were completed pre- to post-training intervention, including the 1-RM bench press and body composition using BODPOD. Participants were matched by 1-RM/lean mass relative bench press strength and randomly assigned to either the experimental (E) or control group (C). Both groups completed 3 sets of the following upper-extremity exercises: barbell bench press, lat pull-down. standing shoulder press. overhead triceps extension, and biceps curl) 2 days a week for 6-weeks. The experimental group performed the exercises blindfolded and the C group were visually unimpaired. The participants progressively increased the loads and decreased the repetitions every 2 weeks (weeks 1-2 = 12-15 reps; weeks 3-4 = 8-12 reps; weeks 5-6 = 6-8 reps). A repeated-measures ANOVA was used to assess changes in 1-RM bench press between the groups. **RESULTS:** Statistical analysis yielded a significant ($p < .001$) improvement in absolute (E pre= 73.9±34.3kg, post=79.5±33.8kg, C pre=84.2±35.2kg, post=87.7±35.93kg), relative to body weight (E pre=0.9±0.3, post=0.9±0.3, C pre=1.0±0.4, post=1.0±0.4), and relative to lean mass (E pre=1.1±0.3, post=1.2±0.3, C pre=1.1±0.4, post=1.2±0.4) 1-RM bench press between the pre- to post-testing. However, there were no significant differences between groups ($p > .05$). **CONCLUSION:** Although there were no statistically significant differences between groups, there was a 7.6% change for the blindfold group compared to a 4.2% change for the blindfold group compared to the control group. The large standard deviations may explain why a statistical significance was not found. Further research needs to be conducted with better matching criteria.

3197   Board #66   June 2 8:00 AM - 9:30 AM

Cardiovascular Adaption From Altitude 3500-6400m Among Trekkers With Different Endurance Genotype Scores

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(No relevant relationships reported)

Purpose: to explore if and how the endurance genotype score would affect the cardiovascular adaption under reduced oxygen caused by the altitude elevation. **Method:** All 9 trekkers who participated in a 8000 meter peak climbing is studied. Nine genes (ADRB2,AQP1,COL5A1,NRF2,HFE,KCNJ11,PPARD,UCP3,HIF1A) that reported to be associated with endurance performances were measured and the total genotype score were obtained by adding up the genotype score of each genes. The trekkers were divided into two groups according to their genotype scores as high endurance group (score>0) and low endurance group (score<0). We defined cardiovascular adaption as the changes of morning pulse, systolic blood pressure and blood oxygen concentration. These parameters for cardiovascular adaptions were measured every 300-400 elevation of the altitude from 3500 m to 6400 m. Mean changes for each of parameters were compared for the two groups during the whole course.

Results: There were four trekkers in the low endurance group and five trekkers in the high endurance group (score: -2.5 vs.1.0). Due to small study sample, none of the comparison show statistical significance at 0.05 level. However, we were able to find that the high endurance score group maintained a higher blood oxygen level and smaller oxygen fluctuation as the altitude elevation. Though the systolic blood pressure showed higher fluctuation in the high endurance score group, mean systolic blood pressure were 3-13 mmHg lower at different altitudes. We also viewed that morning pulse increased as the altitude increased in both groups. However, compared to low endurance group, the mean pulses were lower for the high endurance group for each altitude from 3800m and above.

Conclusion: Different genotypes scores may indicate different oxygen carrying and utilizing ability which resulted in different cardiovascular adaptation manifestation among the trekkers.

Figure 1. Comparison of the Blood Oxygen Concentration Fluctuation from Altitude 3500 to 6400 meter

Figure 2. Comparison of the Systolic Blood Pressure Fluctuation from Altitude 3500 to 6400 meter

Figure 3. Comparison of the Morning Pulse Fluctuation from Altitude 3500 to 6400 meter
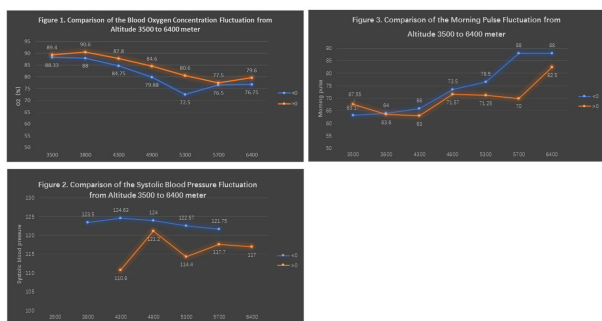
3198   Board #67   June 2 8:00 AM - 9:30 AM

Optimal Load For High-Speed Exercise

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(No relevant relationships reported)

PURPOSE: Identify an optimal load for knee extensions done on an exercise device called the Impulse (Impulse Technologies; Newnan GA). **METHODS**: Subjects (29 women, 15 men) made six laboratory visits. The first two visits entailed familiarization to the knee extension exercise. For their last four visits they did four 30-second knee extension sets with different loads (0, 3.4, 5.7, 8.0 kgs.) added to the Impulse weight sled per set. A Latin Squares design counterbalanced the set sequence, which limited the risk of an order effect and fatigue's impact on our results. Subjects rested 120 seconds between sets and were told to exert maximal effort. Average and peak force (AF, PF) data were each analyzed with a 2 (gender) x 4 (load) ANOVA, with repeated measures for load. Alpha = 0.05 and T-tests served as our post-hoc. **RESULTS**: AF and PF results (mean ± sem) appear below:

Average force (N)	0 kgs.	3.4 kgs.	5.7 kgs.	8.0 kgs.
Women	38.4 ± 1.5	70.1 ± 2.8	84.3 ± 3.5	92.8 ± 3.5
Men	44.5 ± 2.2	76.2 ± 4.4	85.9 ± 7.3	101.5 ± 6.2

Peak force (N)	0 kgs.	3.4 kgs.	5.7 kgs.	8.0 kgs.
Women	400.4 ± 21.8	708.1 ± 39.8	810.1 ± 44.9	857.3 ± 47.7
Men	529.5 ± 38.5	936.2 ± 69.3	1100.8 ± 77.2	1174.3 ± 76.7

Analysis of AF yielded a load effect, while PF produced a two-way interaction, in which men produced higher values than women for each load.
CONCLUSIONS: Results show significant inter-gender PF, but not AF, values per load examined.

3199   Board #68   June 2 8:00 AM - 9:30 AM

A Preceding Bout of Endurance Exercise Decreases Peak Power of the Arm Extensor Muscles

Luke Olsen[1], Bjorn Hansson[2], Tommy R. Lundberg[3]. [1]*University of Kansas, Lawrence, KS.* [2]*The Swedish School of Sport and Health Sciences (GIH), Stockholm, Sweden.* [3]*Karolinska Institute, Stockholm, Sweden.*

(No relevant relationships reported)

The combination of aerobic exercise (AE) and resistance exercise (RE) within a given training protocol, termed concurrent training (CT), lacks sufficient analysis concerning the upper body. In the lower body knee extensor muscles, we have previously demonstrated reduced peak power when AE precedes RE. However, postural requirements of the lower body, as compared to the upper body, may give rise to unique responses following CT. Thus, further investigation as to specific peak power alterations of the upper body muscles are warranted. **PURPOSE**:To investigate the effects of a preceding AE bout on muscle strength to subsequent RE of the arm extensors. **METHODS**: Healthy men (*n*=8) performed AE+RE (CT) for the elbow extensors in one arm, while the contralateral arm performed RE only. The AE consisted of unilateral, moderate endurance exercise (43±2 min of repeated elbow extensions) using an isokinetic dynamometer. After 15-min rest, subjects performed unilateral RE (4x7 iso-inertial RE) with a flywheel device for both arms targeting the arm extensor muscles. Work produced during AE and peak concentric power during RE were recorded. **RESULTS**: The AE bout resulted in a gradual increase in heart rate (126±12 bpm) with a parallel increase in RPE reaching the termination threshold (18±0.5 RPE). The implementation of AE prior to RE led to a 21% decrease (*p*=0.045) in arm extensor peak concentric power from 98W to 78W, respectively. There was no change in performance from pre- to post in the RE-only arm (94W to 89W). **CONCLUSIONS**: These results demonstrate that the implementation of AE prior to RE, as compared to RE alone, compromises peak concentric power adaptations of the arm extensors. The noticeable decrement in peak concentric power between pre- and post from the CT intervention (21%), relative to a similar study with the same testing protocol which targeted the lower body (10%), gives credence to the possibility that upper and lower body muscles respond differently to concurrent training.

3200   Board #69   June 2 8:00 AM - 9:30 AM

Quality of LifeImproved by Adequate Physical ActivityLevels Among University Employees

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine if quality of life is affected through different levels of physical activity and compare those to the national norms. This study also looked at the number of ACSM cardiovascular disease risk factors and different physical activity levels among university faculty.
METHODS: An SF-36, I-PAQ, and Health Questionnaire form was handed out to the participants to complete to the best of their knowledge.
RESULTS: Comparative analysis showed that there was a significant positive difference among the participants who were HEPA active in general health (p = 0.0354) and the active group in comparing emotional well-being (p = 0.0346) and physical functioning (p = 0.0498) when using one-way ANOVA. A Tukey-Kramer post hoc test was performed to prove honestly significant difference.
CONCLUSION: The results indicate that the university faculty had better quality of life scores in certain parts of the SF-36 sub-scales when being active and HEPA active. The university faculty seem to be at risk for some cardiovascular disease risk factors in which the need to reduce the risks by implementing an exercise-based health and wellness program within the university workplace should be considered in university workplace policies.

SATURDAY, JUNE 2, 2018

3201 Board #70 June 2 8:00 AM - 9:30 AM

Lower VO$_2$max In Individuals With A Family History Of Diabetes is normalized After 8-weeks Exercise

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(No relevant relationships reported)

A family history of type 2 diabetes (FH+) is considered a risk factor for insulin resistance and poor cardiorespiratory fitness. However, it is not known if exercise induced improvement in maximal aerobic capacity (VO$_2$max) is impeded by a FH+. **PURPOSE**:The purpose of this study was to determine if normoglycemic, sedentary, Hispanic men with FH+ have a lower VO$_2$max compared to those without a family history of type 2 diabetes (FH-) and if the improvement in VO$_2$max after 8-weeks of combined exercise training is comparable between FH- and FH+.**METHODS**: 19 participants (mean ± SEM: age:23±0.56 years; BMI: 26.9±0.98 kg/m^2) underwent 8 weeks of combined exercise training (35 min aerobic at 60-75% VO$_2$max followed by 6 full-body resistance exercises (3x/week)). VO$_2$max was measured using ParvoMedics 2400 metabolic measurement system during a standardized graded exercise test performed on a treadmill. Body composition was assessed by DXA. **RESULTS**: VO$_2$max was significantly lower in FH+ compared to FH- at baseline (3.57 ± 1.7 vs. 4.08 ± 0.15 L/min; p=0.04). After 8 weeks of combined exercise training FH+ significantly improved VO$_2$max (3.57 ± 0.17 to 3.82 ± 0.16 L/min; p=0.002), whereas no improvement was observed in FH- (4.08 ± 0.15 to 4.21 ± 0.17 L/min; p=0.16). There was no difference in VO$_2$max between groups after 8 weeks of exercise training (p=0.67). Lean body mass significantly improved in both groups (FH- 56.6 ± 2.1 to 58.5 ± 2.1 kg; p=0.01; FH+ 51.8 ± 1.95 to 53.4 ± 1.79 kg; p=0.01) and fat mass remained unchanged (p=0.38). **CONCLUSIONS**: A family history of diabetes may negatively impact cardiorespiratory fitness in a normoglycemic, sedentary, Mexican American population. A combined exercise training program (8 weeks) is effective in normalizing this defect.

3202 Board #71 June 2 8:00 AM - 9:30 AM

Effects Of Chronic Endurance Exercise Training On Serum 25(OH)D Concentrations In Elderly Japanese Men

Xiaomin Sun[1], Zhen-Bo Cao[2], Kumpei Tanisawa[3], Hirokazu Taniguchi[4], Takafumi Kubo[5], Mitsuru Higuchi, FACSM[6]. [1]School of Public Health, Xi'an Jiaotong University Health Science Center, Xi'an, China. [2]School of Kinesiology, Shanghai University of Sport, Shanghai, China. [3]Department of Physical Activity Research, National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. [4]Faculty of Agriculture, Ryukoku University, Shiga, Japan. [5]Graduate School of Sport Sciences, Waseda University, Saitama, Japan. [6]Faculty of Sport Sciences, Waseda University, Saitama, Japan. (Sponsor: Mitsuru Higuchi, FACSM)

(No relevant relationships reported)

Effects of chronic endurance exercise training on serum 25(OH)D concentrations in elderly Japanese men

Xiaomin Sun [1, 2, 7], Zhen-Bo Cao [3, 7*], Kumpei Tanisawa [4, 7], Hirokazu Taniguchi [5], Takafumi Kubo [6], and Mitsuru Higuchi FACSM [7]

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Higher levels of physical activity and cardiorespiratory fitness are positively related to serum 25-hydroxyvitamin D [25(OH)D] concentrations; however, the response of 25(OH)D concentrations to chronic endurance exercise training is unclear. **PURPOSE:** To elucidate whether serum 25(OH)D concentrations were directly increased by 5 weeks of endurance exercise training and influenced by changes in body fat in elderly men. **METHODS:** Twenty elderly Japanese men were randomized to either the 5-week endurance exercise training group (ET group; N=10) or the sedentary control group (SC group; N=10). Fasting blood samples were collected to determine serum 25(OH)D and other blood parameters. The visceral fat area and hepatic fat content were assessed by magnetic resonance imaging and proton magnetic resonance spectroscopy, respectively. **RESULTS**: After 5 weeks of endurance exercise training, the levels of maximal oxygen uptake (VO$_2$max) were significantly increased from 23.3 at baseline to 28.1 mL/kg/min at the endpoint for the ET group; levels were unchanged for the SC group. A significant seasonal reduction in serum 25(OH)D concentrations was observed in the SC group (P<0.05), while no change was found in the ET group. The results may be

partly attributed to the slight decrease in intrahepatic fat in the ET group. No changes were observed in percent body fat or visceral fat area. **CONCLUSIONS:** The results of our study suggest that 5 weeks of endurance training could inhibit the seasonal reduction in serum 25(OH)D concentrations without changes in body fat.

3203 Board #72 June 2 8:00 AM - 9:30 AM

The Effect of Hyperthermic Whole Body Heat Stimulus (Sauna) on Heat Shock Protein 70 and Skeletal Muscle Hypertrophyin Young Males

Brandon Jones, Scott Drum, FACSM. *Northern Michigan University, Marquette, MI.* (Sponsor: Scott Drum, FACSM)

(No relevant relationships reported)

PURPOSE: The aim of this study was to investigate if stimulating HSP70 by using a sauna (45 - 50◦C, 80% Humidity) three times per week, for 15 minutes, could aid skeletal muscle hypertrophy during six weeks of resistance training in a young (21.38 ± 1.9 yrs.), recreationally trained male population. **METHODS**: Thirteen subjects were randomly distributed into 3 groups [resistance Training + sauna (RT+S, n=5), RT + Relaxation (RT+R, n=5), and complete control (CON, n=3) or no training]. Primary dependent variables, observed in a pre- and post-test format, included: lean body mass (LBM), HSP70 concentration, and a 5 repetition maximum (5RM) back squat. **RESULTS**: When comparing groups (i.e., RT+S, RT+R, and CON), no significant main effects or interactions were observed (p > 0.05) over the 6-week intervention period for LBM, HSP70, and 5RM. The hypothesis that HSP70 would be upregulated to a greater extent with concurrently larger LBM and 5RM improvements in RT+S vs. the other groups was not supported. **CONCLUSIONS**: Although HSP70 and LBM were highest in RT+S after 6-weeks of heavy resistance training, RT+R improved the most on 5RM. Sauna use in combination with resistance training does not appear to augment muscle hypertrophy or strength. Despite this, it appears using sauna post RT does not hinder muscle growth and may be a viable strategy for maintaining muscle mass.

3204 Board #73 June 2 8:00 AM - 9:30 AM

Cost-Effective Personal Training Aid to Improve Leg Function Using Smart Exercise Application: Pilot Study

Byungjoo Noh, Eric Vasey, Kevin Phillips, Derek Verbrigghe, Myounghoon Jeon, Tejin Yoon. *Michigan Technological University, Houghton, MI.* (Sponsor: Sandra Hunter, FACSM)

(No relevant relationships reported)

As a personal training aid, a smart exercise application (SEA) has been developed to improve leg function such as balance and endurance.**PURPOSE**: The purpose of this study was to evaluate the functionality of SEA and validate the data output. **METHODS**: Thirteen healthy young adults (25.4 ± 8.3 years) attached an inertial measurement unit sensor (IMU; MetaWear C; mbientlab, Portola, San Francisco) and a research level accelerometer (ACC; Trigno wireless, Delsys Inc., Boston) on their thigh. Subjects sustained a one-leg half squat posture with 45 degrees of knee flexion as steady and accurate as possible. During the experiment, 3-axis acceleration data were collected using an IMU and ACC at 100 Hz and 1000 Hz respectively. The vertical direction acceleration was displayed as visual feedback on three different zones such as safety, warning, and failure. In addition to visual feedback, SEA created no sound, a warning sound at 1 Hz, and a high-frequency warning sound at 3 Hz on each zone respectively. As the acceleration exceeded a particular threshold value or passed the failure zone for a certain amount of time, the task was terminated and the time was logged as endurance time. The accuracy of IMU was assessed through Pearson's correlation between two data sets obtained from two systems. Bland-Altman plot was used to evaluate the discrepancy between measurements. **RESULTS**: Our application provided visual/auditory feedback as required and determined the task failure objectively. Our application was able to collect acceleration data accurately, as assessed by correlation and Bland-Altman plot. Correlations (r = 0.90 to 0.99, P < 0.001) between the output from the IMU and the reference output from the ACC were high. Bland-Altman plot also showed a low discrepancy between each of the two measures. The mean bias across all axes was -0.01 ± 0.01 m/s^2 with 95% LOA ranging from -0.14 to 0.13 m/s^2 (x-axis: 0.01 ± 0.04 m/s^2 (95% LOA: -0.07 to 0.09 m/s^2), y-axis: -0.02 ± 0.10 m/s^2 (95% LOA: -0.21 to 0.18 m/s^2), and z-axis: -0.01 ± 0.06 m/s^2 (95% LOA: -0.13 to 0.11 m/s^2)). **CONCLUSIONS**: These results suggest that there is potential for the application as a cost-effective personal training aid in the future. It may be useful in long-term interventions such as home-based training aimed at increasing balance and endurance in a healthy or clinical population.

3205   Board #74   June 2 8:00 AM - 9:30 AM

Changes In Upper-body Strength Are Dependent On Training Mode And Independent Of Strength Level

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(No relevant relationships reported)

Previous research has shown upper-body muscular strength gains are independent of fat-free mass (FFM) in men. Further, initial strength is typically higher when evaluated with machine weights (MW) than with free weights (FW). Lacking is information comparing the training effects of FW versus MW in men with comparable initial strength levels. **PURPOSE**: To evaluate the effect of resistance training (RT) using different modes on changes in upper-body muscular strength when controlling mode-specific initial strength.
METHODS: College men (n = 1,331) enrolled in a RT course volunteered to participate and initially performed 1RM bench press using free-weights (FW), seated horizontal press (SHP) or supine vertical press (SVP). FW (n = 218), SHP (n = 270), and SVP (n = 208) groups were matched for mode-specific initial strength. Groups were further divided into low, average, and high strength based on the bottom, middle, and top one-third of mode-specific 1RM. Each participant performed 12 weeks of linear periodization mode-specific RT using progressively heavier loads and reduced repetitions designed to achieve maximum strength improvement. Each participant performed auxiliary upper- and lower-body supplemental exercises in 3 sets of 6-10 repetitions.
RESULTS: A mode x strength level ANOVA noted significantly greater improvement with SHP (12.5 ± 7.0 kg) than with SVP (10.7 ± 7.0 kg) which was greater with FW (6.8 ± 5.9 kg) but no significant difference among low (10.3 ± 7.4 kg), average (10.4 ± 6.2 kg), and high (9.8 ± 7.9 kg) strength levels. The interaction was not significant (p = 0.45). The relationships between initial strength and strength change was nonsignificant and similar in SHP (r = 0.01), FW (r = -0.05), and SVP (r = 0.06).
CONCLUSIONS: Men of differing strength levels gain similar amounts of upper-body strength when training with different RT modes. In participants with equal initial strength, training with one mode does not appear to offer any significant advantage over training with a different mode.

3206   Board #75   June 2 8:00 AM - 9:30 AM

Testosterone Response Following Five Crossfit® Open Workouts

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(No relevant relationships reported)

PURPOSE: To determine the effect of sex and lean mass (LM) on the testosterone (T) responses to five unique CrossFit® Open (CFO) workouts. **METHODS:** LM was measured via Dual-Energy X-Ray Absorptiometry (DXA) within two weeks of the onset of the 2016 CFO in recreationally-trained adults (males-n=5, 34.4±3.8 yrs, 175.5±5.1cm, 80.31±9.7kg; females-n=5, 35.5±7.0yrs, 159.0±7.1 cm, 76.93±21.4kg). During each week of the 5-week competition, saliva samples were collected prior to (PRE) the competitors' warm-up, immediately (IP), 30- (30P), and 60 min post-exercise (60P) and analyzed for concentrations of T. All workouts were completed at the same gym; mid-day during the first four weeks (WK1-WK4) and on the night of the final challenge's release (WK5). Separate two-way (sex x time) repeated measures analyses of variance were performed to assess the percent change from PRE-values in T during each week. Pearson's correlation coefficients were calculated between all LM measures and T responses, quantified as the area under the curve, of each week. **RESULTS:** Although no (sex x time) interactions were found, significant (p<0.05) main effects for time were observed on WK2-WK4 where T was elevated from PRE at IP (162.1-191.7%, p≤0.015) and 30P (40.2-59.8%, p≤0.040). T was also elevated at 60P on WK3 (62.8%, p=0.015). Additionally, a trend (p<0.01) was noted for elevated T at IP (p=0.077) and 30P (p=0.033) on WK1. The T response was not related to any LM measure **CONCLUSION:** The majority of the CFO events observed in this study elicited an elevation in salivary T from PRE-values. These elevations were not affected by the athlete's sex or quantity of LM.

3207   Board #76   June 2 8:00 AM - 9:30 AM

A Preliminary Investigation of the Relationship Between Training Volume and Body Fat in Triathletes

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(No relevant relationships reported)

PURPOSE: Appropriate levels of body fat are critical to optimal health and athletic performance, particularly for endurance athletes such as the triathlete. Therefore, the purpose of this study was to explore the potential relationship between body fat percent and training volume in triathletes over a competitive season while controlling for caloric intake.
METHODS: Participants were 12 male and 13 female triathletes. Body fat percent, determined through dual-energy x-ray absorptiometry, for male and female triathletes was 13.3% (±4.63%) and 21.4% (±6.12%) respectively. Training volume was determined by exercise duration and intensity over 24 weeks. Caloric intake was assessed through a seven-day dietary recall.
RESULTS: Average daily energy intake was 2,366 (±714) kcals/day for all participants, males reported consuming an average of 2,776 (±774) kcals/day and females reported consuming 1,987 (±386) kcals/day. Overall training volume (Intensity*min) for the 25 participants over the 24-weeks was 37,661 (±16,478), with males averaging 44,948 (± 18,433) and females averaging 30,934 (± 11,377). For males, a bivariate correlation revealed that total training volume (r = -0.66) was significantly associated with body fat percent. However, total training volume was not statistically significantly related to body fat percent for females. Preliminary analyses using multiple linear regression indicated that for males the independent variable (total training volume) explained 49% of the variance in body fat percent (p < .05) while controlling for total kcals. Training volume was a significant predictor of body fat percent for males (β = -0.976; t = -2.40; p = 0.04). For females, the multiple regression indicated that there was not a significant amount of the variance explained in body fat percent by training volume while controlling for kcals.
CONCLUSIONS: Given its potential impact on athletic performance and overall health and wellness it is important to consider possible contributors to body fat. It was surprising to document a significant influence of training volume on body fat percent in men but not women in this study. Further studies are needed to better understand the current findings.

3208   Board #77   June 2 8:00 AM - 9:30 AM

The Effects of Gender and Training Status on Optimal Loads for Developing Muscular Power

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(No relevant relationships reported)

Muscular power is required in varying degrees for differing situations (fall prevention, sport performance, etc.) and populations (athletes, elderly, clinical populations, etc.). Generally, greater muscular power is achieved at lower percentages of maximal strength (1RM); however, these intensities have not been evaluated based on gender or training status. **PURPOSE**: To determine the optimal loading intensity for developing maximal lower and upper body muscular power for trained and untrained men and women. **METHODS**: Forty-one men and women (resistance trained or untrained) completed a 1RM test for the leg press and barbell bench press. Following at least 48 hours, subjects returned to perform single repetitions, in randomized order, at 20, 30, 40, 50, 60, 70 and 80% of their 1RM for each exercise to determine lower and upper body muscular power. Mixed-model ANOVAs were used to determine if there were any significant differences between the within-subject variable (intensity or %1RM) and between-subject factors (gender and training status). **RESULTS**: Significant main effects were observed for intensity (F=44.2, p<0.001) and gender (F=31.3, p<0.001) for the leg press with males producing more power at each intensity with maximal power output occurring at 60% 1RM (which was significantly different (p<0.001) from 20, 30, 40% 1RM but not different from 70 or 80% 1RM). The bench press analyses revealed significant main effects for intensity (F=54.7, p<0.001), gender (F=101.9, p<0.001) and training status (F=17.5, p<0.001), as well as significant interactions for %1RM X gender (F=10.2, p<0.001) and %1RM X training status (F=3.2, p<0.001). Males produced more power (p<0.001) at each intensity with maximal power output occurring at 50% 1RM compared to females who produced maximal power at 40% 1RM. Trained subjects had significantly higher power outputs (p<0.001) at each intensity with the greatest power produced between 40-60% 1RM, while untrained subjects achieved maximal power between 40-70% 1RM. **CONCLUSION**: In order to obtain maximal power outputs for large lower or upper body muscle groups, relatively low intensities ranging between 40-70% 1RM depending on gender and training status should be used.

Abstracts were prepared by the authors and printed as submitted.

SATURDAY, JUNE 2, 2018

3209   Board #78   June 2 8:00 AM - 9:30 AM

Influence of Psychosocial Wellness Factors on Training Duration in Triathletes

Michelle B. Stockton[1], Barbara McClanahan[1], Christopher Vukadinovich[2]. *[1]University of Memphis, Memphis, TN. [2]St. Jude Children's Research Hospital, Memphis, TN.* (Sponsor: Lawrence Weiss, FACSM)

(No relevant relationships reported)

PURPOSE: Training duration is an important factor in athletic performance, especially long endurance events such as triathlons. While the majority of attention in training duration has focused on physical factors, psychosocial wellness factors may also influence training duration. Therefore, the purpose of this study was to explore the influence of psychosocial wellness on triathlete training duration.
METHODS: Participants established their own training regimen and recorded training duration (minutes) for each sport. Total training duration was calculated by summing training duration for each sport across six months. Participants also completed a multi-dimensional wellness assessment during the laboratory visit. The 70-item self-report assessment consisted of seven subcategories with Likert scale responses 1-5. Total scores were calculated for each category as well as a composite wellness score.
RESULTS: Participants were 14 male and 9 female triathletes. Total training duration for all participants was 12,880 (±5536) minutes over 6-months with males reporting an average of 13,435 ($\pm$ 5990) total minutes, and females reporting 12, 017 ($\pm$ 4961) total minutes. Preliminary analyses using multiple linear regression indicated that the multiple-dimensions of psychosocial wellness (drugs and driving, social, emotional awareness, emotional control, intellectual, occupational, and spiritual) explained 73.8% of the variance in total training duration for all the participants (p = .002). Social (β = .804), intellectual (β = -.757), occupational (β = 1.091), and spiritual (β = -.749) were significant predictors at the univariate level. For males, the multiple-dimensions of wellness explained 94.3% of the variance in total training duration (p = .002) with social (β = 1.226), intellectual (β = -.650), occupational (β = 1.332), and spiritual (β = -.914) being significant predictors. For females, the psychosocial wellness factors did not significantly influence training duration.
CONCLUSIONS: Study results illustrate the importance of understanding potential psychosocial influences on training duration for triathletes. Further research is needed to determine the multiple dimensions of psychosocial wellness on all aspects of training in order to develop ideal strategies for optimal performance.

3210   Board #79   June 2 8:00 AM - 9:30 AM

Effects Of High Concentration Oxygen Intervention On Physiological Recovery From High Intensity Hammer Throwing Training

Chung-Wen Chen[1], Szu-Kai Fu[2], Jen-Chun Lo[2], Kuo-Wei Tseng[2], Chang-Chi Lai[2]. *[1]National Taiwan Sport University, Taoyuan City, Taiwan. [2]University of Taipei, Taipei City, Taiwan.*

(No relevant relationships reported)

Purpose: To investigate the effects of high-concentration oxygen inhaled on repeated hammer throwing efficiency and the recovery of physiological fatigue. **METHODS**: Five hammer players completed 10 throws with both normobaric oxygen and high-concentration oxygen interventions with a 7-day interval. Each bout consisted of 10 repeated throws with a 5-minute rest between each throw. For high-concentration oxygen intervention, each subject was given 5 minutes of highly concentrated oxygen inhalation after each throw; no specific application for normobaric oxygen intervention. Distance, blood lactate (La), rating of perceived exertion (RPE), heart rate (HR) and recovery heart rate were measured at baseline (pre-exercise) and after each throw.
Results: All variables were changed significantly after the 1st-10th throws ($p < .05$) following high-concentration and normobaric oxygen intervention, but no significant intervention × times was found in all dependents variables (Distance, La, RPE, HR and recovery heart rate) during the repeated throws. **Conclusion:** The results suggested that high-concentration oxygen inhalation intervention did not improve the rate of blood lactate metabolism, and the recovery of heart rate and rating of perceived exertion after high intensity throws.

G-38   Free Communication/Poster - Performance

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3211   Board #80   June 2 8:00 AM - 9:30 AM

Effects Of A Caffeine-carbohydrate Mouth Rinsing On Sprinting Kinetics And Kinematics In Fasted Athletes

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(No relevant relationships reported)

Carbohydrate mouth rinsing during an intermittent fasting has been reported to be advantageous for endurance performance; however, there appears to be no clear effect on repeated sprints. What has not been investigated previously is the effects of combined caffeine and carbohydrate (CAF-CHO) mouth rinsing on speed-endurance performance commonly performed by track and field athletes during a fasted state.
PURPOSE: To determine the influence of CAF-CHO mouth rinsing on sprinting kinetics and kinematics, as well as subjective exertion during a speed-endurance bout performed in a fasted state. **METHOD:** In a counterbalanced, single-blind random order design, eleven (n = 11) well-trained National level male sprinters and middle-distance runners performed three 15-sec all-out sprints on a Woodway nonmotorized force treadmill, interspersed with 2-min active recovery between sprints. Athletes rinsed 25 ml of CAF-CHO (4g carbohydrate, 5 mg caffeine), or a similarly coloured placebo solution (PLA) prior to warm-up (30-min pre-trial), 1-min pre-trial, and the mid-way of each period of active recovery. On one occasion, no mouth rinse (NMR) was administered. The study was conducted within the second and third quarters of Ramadan, and each session separated by at least 72 hours. **RESULTS:** At the start of each trial, the rating of perceived exertions (RPE), readiness to train, blood glucose, and lactate concentrations were similar (p > 0.05). A significant primary effect of trial (3 x 15 seconds sprint) was observed for the distance (p = 0.019), revealing a longer average distance achieved in the CAF-CHO compared to PLA trial (69.80 $\pm$ 3.57 vs. 68.08 $\pm$ 3.22; p = 0.026; EF: 0.5), and NMR (69.69 $\pm$ 3.82; p = 0.680; EF: 0.2). The difference between NMR and PLA also approached significance (p = 0.073; ES: 0.5). The CAF-CHO intervention also obtained better results in all other sprint measures such as average velocity, peak acceleration, and peak horizontal force, although these differences were not significant. Post-trial RPE was higher during NMR (7.23 $\pm$ 1.92) as compared to CAF-CHO (6.54 $\pm$ 2.15) and PLA (6.38 $\pm$ 1.94) (p = 0.247).
CONCLUSION: In challenging metabolic conditions, CAF-CHO mouth rinsing might have potential to improve measures of sprint training performance with a positive ergogenic effect on speed endurance performance.

3212   Board #81   June 2 8:00 AM - 9:30 AM

Association of Performance Physiology Measures with Sports Performance Tests

Therese Wichmann, Marissa Burnsed-Torres, Michael Hahn. *University of Oregon, Eugene, OR.*

(No relevant relationships reported)

PURPOSE: Common fitness tests such as the Yo-Yo Intermittent Recovery Test and the Beep Test have previously been validated against laboratory-based assessments and shown to be accurate. The purpose of this study was to assess whether the Gauntlet, an unexplored fitness assessment, was an accurate assessment of individual fitness compared to standard laboratory-based physiological tests. The Gauntlet test requires athletes to complete a set of maximal effort runs, with a one-minute break in between each stage (Stage 1: 814.6m, Stage 2: 907.3m, Stage 3: 453.7m, Stage 4: 226.8m, Stage 5: 100m) with the goal of achieving the best overall time. **METHODS:** Subjects (n=18) first completed a lactate threshold test and VO_{2max} test in the laboratory. After four to fourteen days, subjects then completed the Gauntlet on an outdoor track. Lactate, VO_{2max} and heart rate were recorded during the laboratory session, and heart rate, lactate, and time of completion per stage and overall time to completion were recorded during the Gauntlet test. **RESULTS:** Preliminary correlation analyses showed a positive relationship between VO_{2max} (ml·kg^{-1}·min^{-1}) to Time to Completion of the Gauntlet (r = 0.89, P= 1.29E-15), VO_{2max} Maximum Heart Rate to Gauntlet Maximum Heart Rate (r = 0.80, P= 0.0011), and VO_{2max} 3-min Post Lactate to Gauntlet 3-min Post Lactate (r = 0.66, P= 0.0188). **CONCLUSION:** These results indicate that the Gauntlet is an accurate estimate of aerobic fitness when compared to laboratory-based physiological tests. Therefore, the Gauntlet could be implemented into common exercise programs or sport specific training to assess an individual's level of fitness without the need for laboratory testing.

3213   Board #82   June 2 8:00 AM - 9:30 AM

Effects of Depth Jump Implementation on Sprint Performance in Collegiate and Club Sport Athletes

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(No relevant relationships reported)

Introduction; Depth jumps (DJ) are popular high-intensity plyometric exercises typically reserved for highly-trained individuals. DJs cause an individual to undergo high amounts of stress during the eccentric and concentric phase. This extreme loading allows individuals to increase lower body strength and power output. Muscular strength and power have a transfer effect to sprint speed; however, few have examined if implementing DJs into training can increase sprint speed.
Purpose; The purpose of this study was to determine if the implementation of DJs into a sprint training program would increase sprint speed more so than sprinting alone.
Methods; 5 collegiate level and 13 club level athletes participated in this study (6 males and 13 females). Subjects performed 3 maximal 40-yard sprints with 3 to 5 minutes of rest between sprints. Subjects were randomized into either a control group, a sprint training group, or a DJ group. The DJ and sprint group performed 2 training sessions/week, with both groups performing the same sprint training protocol. The DJ group had DJs of varying intensities. Following 6 weeks of implementation, subjects were retested on the 40-yard sprints in the same manner as before.
Results; One-way ANOVA were conducted using paired comparisons to determine significance. Significant differences were observed after implementation for the 40-yard sprint (-.24±.43s) (P<.01), 20-30yard split (-.13 ± .11s) (P<.05), and a 20-40yard split (-.20 ± .18s) (P<.01). No differences were observed between groups. The DJ group changes showed the largest effect sizes of any group in these measures; 1.12, 1.6, and 2.5 respectively.
Discussion; The effect sizes of the changes in sprint speed demonstrate that DJs may benefit sprint speed. It can be concluded from this study that maximal sprint speed was improved more so than acceleration due to the improvements observed from 20-30yards and 20-40yards. These indicate the maximal speed phase of sprinting. Further research is needed to determine if DJs can improve sprint performance in highly-trained athletes.

3214   Board #83   June 2 8:00 AM - 9:30 AM

Comparison Of The Effects Of A Novel Structured Nanotechnology Water On Physical Performance.

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(No relevant relationships reported)

Purpose
A new type of water that uses nanotechnology to alter the physical and chemical properties of water molecules to enhance its bioavailability was compared to other commonly consumed beverages for the effect on physical performance.
Methods
Thirty male college athletes (21-23 y) were randomly divided into three groups, nanotechnology structured water (N), Gatorade (G), ordinary water (W) for a 3-month training program. Participants were blinded to their beverage and were instructed to consume their respective beverage at 500 ml/kg body weight over the course of each day during the 3-month training period, with other fluids consumed ad libitum. All participants completed the same set of pre-post physical tests: resting heart rate (RHR); sprinting; jumping, in which participants jumped 10 consecutive times with the difference in height jumped between the first and last jump recorded; obstacle course, which measured for accuracy in completing the course; and peak exercise heart rate on a 60-min steady-state treadmill run (EHR).
Results
Post-training test results were analyzed for differences among groups using an ANCOVA, which accounted for any baseline differences among groups. All significant results were then subjected to a post-hoc analysis to determine specific differences. For sprinting, the N group (10.0s) was faster than both G (11.5s; p=0.025) and W (13.5s; p<.001). The N group had lower EHR (112.6bpm) compared to G (138bpm; p<.001) and W (157bpm; p<.001). The N group had a lower jump differential (25cm) then G (41cm; p<.001) and W (59cm; p<.001). In the obstacle course, N had a mean score of 86.6, which was higher than G (70; p<0.001) and W (63; p<0.001). The only variable that was not different among groups on the post-test was RHR (p=0.33).
Conclusions
This is the first known study to measure the effect of structured nanotechnology water magnalife on physical performance, and these results indicate that participants consuming nano-water performed better on a series of physical tests compared to other beverages. However, this study had used a small population of male athletes only. Future studies should be larger and include a variety of populations to gain a better understanding of the possible ergogenic effects of nano-water.

3215   Board #84   June 2 8:00 AM - 9:30 AM

The Effects Of A Six-week Ketogenic Diet On The Performance Of Short-duration, High-intensity Exercise: A Pilot Study

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(No relevant relationships reported)

There is much controversy surrounding the use of very high fat, low carbohydrate ketogenic diets and athletic performance. Specifically, it has been hypothesized that anaerobic activity, which is primarily fueled by ATP that is formed through the metabolism of carbohydrate sources, may be hindered when utilizing a ketogenic dietary approach. PURPOSE: The current study was designed to investigate how switching from a habitual diet to a ketogenic diet for 6 weeks would affect the performance of short-duration, high-intensity exercise. METHODS: Eight men and seven women (N = 15; 30.2 yr ± 4.11) were randomly assigned to either the ketogenic diet (KETO; n = 8) or the control group (CON; n = 7). All subjects were trained in CrossFit for at least 3 months prior to the study. Several measures of anaerobic performance were assessed at baseline and following 6 weeks utilizing the following series of standardized exercise tests: timed 500m row, Wingate Anaerobic Test, and 3-repetition maximum (3RM) deadlift. Aerobic capacity was also assessed by measuring VO2peak. Subjects continued their regular CrossFit training during the 6 week period and dietary intake was recorded. RESULTS: A significant increase (p < .05) in mean power output (MPO; W/kg) from baseline (M = 8.24 ± 1.15) to 6 weeks (M = 8.70 ± .82) was found the CON group. No significant interactions (p > .05) were found between diet and test time for any of the other measured exercise variables. No significant differences (p > .05) were found in the KETO group from baseline to 6 weeks in any of the measured exercise variables. No significant differences in body weight (lbs) were found from baseline to 6 weeks in either group (KETO; 183.8 ± 31.71 vs. 181.03 ± 30.28, CON; 166.38 ± 35.77 vs. 166.88 ±37.28). Attrition rate was 33% in the KETO group and 30% in the CON group. CONCLUSION: A 6-week ketogenic diet did not affect the performance of short-duration high-intensity exercise. Our data does not support the hypothesis that ketogenic diets induce detriments in the performance of activity that is anaerobic in nature. The current study took place over a 6 week period, allowing for keto-adaptation to occur; results may be different if a shorter time period were utilized.

3216   Board #85   June 2 8:00 AM - 9:30 AM

Inconsistency of Bilateral Asymmetry BetweenSprinting and Jumping Performance: Rethinking Leg Dominance

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(No relevant relationships reported)

The concept of leg dominance is complicated as bilateral muscular strength/power asymmetry is linked to poor performance and/or injury risk. Bilateral asymmetry during 2-leg (2L) jumping appears to define performance, rather than limit it. During 2L jumping, the leg that developed the greatest torque/velocity is defined as dominant. **PURPOSE**: to investigate the relationship between apparent leg dominance in jumping and sprinting. **METHODS:** Men (n=18; football, basketball) and women (n=17; basketball, soccer, volleyball) athletes competing in intercollegiate sports completed repeat trials of sprint and jump testing. Sprint: three trials of a 12-m sprint with step-by-step kinematic data collected with an infrared timing system. Jump: repeat trials of 2L and single-leg (1L- left leg; 1R-right leg) squat jump without countermovement conducted on individual force plates to determine jump impulse (IMP$_J$). Jump height (JHt) was calculated from flight time (Δt). Data were averaged across trials. Asymmetry index was calculated as (L-R)/(0.5*(L+R)). Bilateral facilitation/deficit was determined from jump performance as (1L+1R)/2L. Differences were tested with ANOVA; p<0.05. **RESULTS:** Men (1.70±0.17 s) were faster than women (1.82±0.11 s). Horizontal acceleration (a) decreased from the first to last stride while, horizontal velocity (v) increased throughout. In contrast, step-by-step a was asymmetric while v increased linearly. a and v were always greater in men. There were no differences in 1L and 1R JHt (left & right: men: 22.0±11.7 & 21.5±11.6 cm;women: 12.4±2.7 &12.7±2.9 cm, respectively). 1L and 2L (men: 39.6 ± 3.6 cm; women: 26.4.± 4.2 cm) JHt was greater in men. Bilateral asymmetry (AI range 40 to -58%) was noted in IMP$_J$ during 2L; both groups produced a greater jump impulse in one leg (men: 135±18 & 110±13.2 N; women: 92±18 N & 74±15 N). 2L performance was associated with a bilateral deficit (n=12) or facilitation (n=19) and was unrelated to JHt (r=-0.25). There was no relationship between the dominant leg during 2L jumping and sprinting. **CONCLUSION:** There is a non-linear, asymmetric acceleration pattern associated

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with short distance sprinting which appears to define leg dominance in sprinting. There appears to be a dominant leg during sprinting and 2L jumping, which is not consistent across performance.

3217   Board #86   June 2 8:00 AM - 9:30 AM

Acute Effects of Beta-Alanine on Exercise Performance Variables.

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(No relevant relationships reported)

Beta-Alanine (BA) is converted to carnosine which serves to lower acid levels in the muscle by acting as an intramuscular buffer to H+ ions. BA supplementation may increase carnosine synthesis in muscle, leading to reduced muscle fatigue with exercise. **PURPOSE:** To determine the effects of an acute dose of BA (4 grams, 30 min before testing) on muscular power, muscular endurance and aerobic performance. **METHODS:** 21 recreationally active men (24.5±1.5yrs, 1.8±0.1m, 79.2±9.3kg) and 15 women (25.7±2.2yrs, 1.6±.0.1m, 55.1±8.1kg) participated in a placebo controlled, double blind cross-over design study. Subjects were tested on 3 separate days with a 24-hour washout period between test visits. Visits consisted of 4 tests done in the following order: vertical jump on a jump mat, repetition of 70% leg press and chest press max until failure, and a 4-kilometer time trial (4km) on a cycle ergometer. The first testing visit established the 1-repetition maximum on the leg and chest press and familiarization with testing procedures. Subjects were randomized to BA or placebo on the 2nd and 3rd visit. Comparisons of the effects of BA and placebo on exercise test values were made using two-way ANOVA with repeated measures (p<0.05). **RESULTS:** BA showed a significant increase from baseline in the number of reps performed on both the leg press (15.7±5.5 vs. 22.9±7.3 repetitions, p<0.001) and chest press (12.0±5.8 vs. 17.7±5.4 repetitions, p<0.001). Placebo showed a small non-significant increase from baseline in the number of reps performed on both the leg press (15.7±5.5 vs. 17.3±5.3 repetitions, p=0.055) and chest press (12.0±5.8 vs. 12.6±5.6 repetitions, p=0.059). The increases in the BA group were statistically different from the change in the placebo group (leg press, p<0.001 and chest press p<0.001). BA showed a significant increase from baseline in aerobic power (132.0±49.1 vs 144.0±48.8 Watts, p<0.001) during the 4km. Placebo showed a small non-significant increase from baseline in aerobic power (132.0±49.1 vs 134.3±49.4 Watts, p=0.080) during 4km. The increase in aerobic power in the BA group was statistically different from the change in the placebo group (p<0.001). **CONCLUSION:** A single 4 gram dose of BA improves muscular endurance and aerobic power in recreationally active young men and women.

3218   Board #87   June 2 8:00 AM - 9:30 AM

The Influence of Different Walking Conditions on Walking Parameters

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(No relevant relationships reported)

PURPOSE: This study investigated the relationship between characteristics of walking parameters and walking parameters of different walking conditions. **METHODS**: The participants were 54 university students who had the habit of exercising (32 men and 22 women, 19.6 ± 0.7 years). Participants were asked to walk on flat and sloped ground. On the flat ground, they were asked to walk freely with a subjective intensity of "Light (ratings of perceived exertion (RPE) 11)" and "Somewhat hard (RPE 13)." The average slope was 4% for both upward and downward conditions and participants walked freely on both. Participants wore a wearable device attached to the left wrist that measured their walking speed, cadence, stride, and heart rate. **RESULTS**: On the flat ground, in all walking parameters, RPE 13 showed significantly higher values compared to RPE 11 (walking speed: 5.35 ± 0.49 versus 4.48 ± 0.43 km/h, cadence: 121.9 ± 8.8 versus 113.0 ± 7.3 steps/min, stride: 73.2 ± 6.8 versus 65.8 ± 6.8 cm, respectively; $P < 0.05$). On the sloped ground, walking speed on the upward slope showed significantly lower values compared to that on the downward slope and the free-walking speed on flat ground(upward slope: 4.85 ± 0.27 km/h, downward slope: 5.27 ± 0.38 km/h, flat ground: 5.25 ± 0.30 km/h). However, heart rate was significantly higher on the upward slope than in other conditions(118.8 ± 16.9 beats/min, 103.5 ± 14.0 beats/min, 107.8 ± 18.2 beats/min, respectively). Multiple regression analysis was performed with walking speed as the dependent variable and cadence and stride as independent variables. Results showed that for walking on the flat ground, the standardized coefficient for stride was higher than that for the cadence under all conditions. Although the same trend was found for walking on downward slopes, for walking on upward slopes, the standardized coefficient for cadence was higher than that for the stride. **CONCLUSIONS**: Walking parameters tended to be similar for walking on flat ground even when conditions changed; however, it became clear that characteristics of walking parameters on upward slopes varied from those of other conditions.

3219   Board #88   June 2 8:00 AM - 9:30 AM

Physiological Performance Predictions Based on Simple Assessments

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(No relevant relationships reported)

Muscular strength and cardiovascular capacity are important determinants of athletic performance. Fundamental assessments include lower body strength (e.g., squat max), upper body strength (e.g., bench press max), and aerobic capacity (VO_2 max). For coaches who lack equipment to measure these parameters, it is important to know if there are feasible alternatives to accurately evaluate their athletes. **PURPOSE**: To determine if simple strength and aerobic assessments can be used in the place of equipment-intensive testing to evaluate college athletes. **METHODS**: Fourteen collegiate male rugby players were recruited and tested. Independent variables were age, height, weight, vertical jump, and 10-yard dash. Dependent variables were body fat percent (BF%) via hydrostatic weighing, bench press max, squat max, and VO_2 max. Data were collected twice during the competitive season, one month apart. Multiple linear regression tested how well the simple assessments predicted the traditional performance measurements. **RESULTS**: On average, athletes were 19.6 years of age with a BMI of 25.2 kg/m², 13.4% body fat, VO_2 max of 45.5 ml/kg/min, bench press of 186.7lb, squat max of 269.5lb, 10-yard dash of 1.7 seconds, and vertical jump of 22.2 inches. At baseline, BMI (p<0.001) and 10-yard dash (p=0.023) predicted BF% (R²=0.881; p<0.001). Significance was preserved at follow-up (R²=0.751; p<0.001). At baseline, holding age constant, 10-yard dash predicted VO_2 max (β=-31.4; p=0.002); the model was significant (R²=0.714; p=0.004) and was strengthened at follow-up (R²=0.780; p<0.001). Holding age and BMI constant, 10-yard dash predicted bench press (β=-222.7; p=0.023); the model was significant (R²=0.732; p=0.011) and retained at follow-up (R²=0.750; p=0.009). At baseline, holding BMI constant, squat max was predicted by vertical jump (β=8.9; p=0.005) and 10-yard dash (β=-263.5; p=0.013). The model was significant (R²=0.923; p<0.001) and retained at follow-up (R²=0.913; p<0.001). **CONCLUSIONS:** In a sample of college rugby athletes, age, height/weight, vertical jump, and 10-yard dash were sufficient predictors of BF%, bench press, squat, and VO_2 max. Our results indicate that it may be reasonable for comprehensive athletic evaluation to be simplified to accommodate a lack of equipment.

3220   Board #89   June 2 8:00 AM - 9:30 AM

Relationship Between Clock Gene Expression, MEQ Score, and Exercise Performance

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(No relevant relationships reported)

PURPOSE: To examine the relationship between human clock gene expression, chronotype, and morning/evening exercise performance. **METHODS**: Fifteen healthy young males were recruited for this study. The peak time of *Period 3 (PER3)* expression in hair follicle cells was evaluated as an indicator of the biological circadian rhythm and the Morningness-Eveningness Questionnaire (MEQ) score was used to determine the chronotype (morning, intermediate, or evening). Hair follicle cells were collected over a 24-h period at 4-h intervals from 06:00 hours by firmly holding and pulling the facial hair root. Morning and evening exercise performance was evaluated using a bleep test. The tests were performed at least one week apart using a cross-over design at 10:00 and 18:00 hours. As a physiological index, oral temperature was measured before exercise, and heart rate was measured before and during exercise. Partial correlation was used to examine the relationship between MEQ score and the peak time of *PER3* expression, exercise performance, and oral temperature. Paired *t*-tests were used to compare physiological variables between morning and evening performances. **RESULTS**: There was a moderate positive correlation between the peak time of *PER3* expression and evening performance (r = 0.700, P = 0.053). A significant correlation was found between the oral temperature at 10:00 and improvement in performance at 18:00 (evening performance) compared to that at 10:00 (r = 0.735, P < 0.05). There was no relationship between the MEQ score and performance. There was no significant correlation between the peak time of *PER3* expression and the MEQ score. **CONCLUSIONS**: The present study suggested that the internal clock time evaluated based on gene expression may affect exercise performance. When the peak time of *PER3* expression is late, performance may be higher at 18:00 compared to that at 10:00. Higher body temperature at 10:00 may be a good marker for higher performance at 18:00. Further research is required to investigate the relationships among circadian rhythm of clock genes expression, chronotype, and performance in competing athletes.

3221   Board #90   June 2 8:00 AM - 9:30 AM

Changes in Blood pH and Ammonia Following Repeat Sprint Performance

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(No relevant relationships reported)

The relationship between relative intensity and changes in blood pH and ammonia are not well characterized. **PURPOSE:** The primary aim of the study was to determine how changes in relative exercise intensity following repeat sprint performance affect changes in blood pH and blood ammonia concentrations. **METHODS:** Healthy college-age males (n = 12) completed completed one 30 second Wingate cycle sprint test as a familiarization trial. A minimum of 48 hours after the familiarization trial, participants returned to the lab. Resting venous and capillary blood samples were obtained to determine blood ammonia, pH, and lactate levels. Participants then completed 3 Wingate sprint tests, separated by 5 minutes each. Finger capillary blood was immediately obtained after each test to determine lactate and pH values. After the final test, an additional venous blood sample was obtained to determine blood ammonia values. **RESULTS:** Data are shown as 1st vs. 2nd vs. 3rd tests, respectively. There was a significant effect for time for peak power (750.08 ± 39.55 vs. 675.42 ± 30.01 vs. 615.60 ± 37.72 Watts); F = 4.66, p = 0.05, mean power (632.67 ± 30.71 vs. 561.25 ± 22.16 vs. 524.40 ± 26.46 Watts); F = 5.04, p = 0.04, pH (7.72 ± 0.01 vs. 7.63 ± 0.02 vs. 7.62 ± 0.02); F = 70.18, p < 0.01, and lactate (12.36 ± 1.14 vs. 14.10 ± 1.13 vs. 16.95 ± 1.22 mg/dL); F= 42.02, p < 0.01. Blood ammonia values did increase from pre- to post-exercise (0.33 ± 0.09 vs. 1.07 ± 0.22 mg/dl); t = 3.62, p < 0.01, but there was no correlation between post-exercise ammonia values and change in peak or mean power. There was a weak, but significant correlation between change in peak power and change in pH ($R^2 = 0.34$, p = 0.05) and change in mean power and change in pH ($R^2 = 0.44$, p = 0.02). **CONCLUSIONS:** Greater reductions in peak power and mean power correlated with change in blood pH, but not post-exercise ammonia values.

3222   Board #91   June 2 8:00 AM - 9:30 AM

Impact of Calf Temperature Changes on Neuromuscular Function in Elite Taekowndo Athletes

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(No relevant relationships reported)

PURPOSE: This study investigated the impact of lower body temperature changes on neuromuscular function in elite Taekowndo athletes.
METHODS: Eighteen Korean National Taekwondo Team athletes (10 men, 24 ± 2 yrs, 190 ± 5 cm, 77 ± 11 kg; 8 women, 24 ± 3 yrs, 174 ± 7 cm, 63 ± 10 kg) were recruited. They participated in two separate tests. In one test, their calf was cooled by ice packs. In another test, their calf was warmed by hot packs. Before and after each thermal treatment, Hoffmann reflex (H-reflex; Hmax, Mmax, H/Mmax ratio), static (eye-closed single leg balance, eye-closed single leg balance, in sec) and dynamic balance (leg reach to front, left-back diagonal, and right-back diagonal directions, in cm) and four different jumps (Counter Movement Jump, Counter Movement Jump Arm Throwing, Drop Jump, and Stiffness Jump) were tested. Test order was randomly assigned. The room temperature was maintained at 23-25°C and 60% relative humidity.
RESULTS: Calf skin temperature was 33.2 ± 1.1 and 33.2 ± 0.5°C before and 12.2 ± 1.5 and 40.1 ± 1.3°C after cooling and warming test, respectively. Hmax increased by cooling from 4.5 ± 1.9 at rest to 5.6 ± 1.7 mV (p<0.05) while no changes were noticed after warming (p>0.05). No changes were found in Mmax after both thermal treatments. H/Mmax ratio was increased after the cooling from 51.3 ± 9.6 to $65.3\pm17.8\%$ (p<0.05) while no changes were found in warming treatment (from 47.0 ± 28.5 to $65.3\pm17.8\%$, p>0.05). Dynamic balance significantly increased after warming (p<0.05), but static balance was not changed after warming (p<.05). Cooling decreased both static and dynamic balances. Drop Jump reduced by cooling from 53.3 ± 12.9 to 45.1 ± 11.0 cm, but other jump performances were not significantly changed after thermal treatments.
CONCLUSIONS: Hmax, which represents neural activation, was increased after cooling. Mmax, which is directly related to muscle neuron activation, was not significantly changed by thermal treatment. These explain an increase of H/Mmax ratio after cooling. Cooling impacts on motor neuron pool activation. Balance and jump performances decreased after cooling, and dynamic balance increased after warming.

3223   Board #92   June 2 8:00 AM - 9:30 AM

No Effects of Skin Pressure Depth on Reaction Time

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(No relevant relationships reported)

Depth of pressure on skin mechanoreceptors may affect reaction time. Athletes such as wrestlers that depend on skin proprioception for performance may utilize reaction time differences based on pressure differences. It is unknown whether training could affect this response. **PURPOSE**: The purpose of this study was to determine whether depth of pressure or athlete status affects reaction time. **METHODS**: Forty college students (20 wrestlers, 15 non-wrestling athletes, and 5 non-athletes) participated in a reaction time study where three weights (5 g, 10 g, and 30 g) were dropped from 50 cm onto the bicep while subjects were blindfolded and wearing earplugs. Each weight was dropped three times in a randomized order. All trials were recorded using a high-speed camera (Fastec IL3) at 1200 Hz and calculated as the time from skin deformation until first hand movement. After removal of outliers, 36 subjects' data for the average reaction time to the weight drops (29 wrestlers, 13 non-wrestling athletes, and 4 non-athletes) were analyzed using a 3x3 (weight x group) General Linear Model in SPSS v. 24. **RESULTS**: There were no main effects for athlete status group or weight ($p = 0.38$), even though heavier weights elicited a non-significant faster response (5 g = 140.28 ± 16.44 ms, 10 g = 136.75 ± 17.63 ms, 30 g = 128.86 ± 18.02 ms). **CONCLUSIONS**: There is no evidence to suggest that wrestlers should train to react to a variety of contact pressures on the upper arm.

3224   Board #93   June 2 8:00 AM - 9:30 AM

Acute Cognitive Anxiety is Positively Related to Maximal Strength Performance

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(No relevant relationships reported)

A flexible program allows the athlete to choose the daily training session based upon their readiness prior to the session. There is no consensus regarding the best pre-training readiness assessment. One proposal has been that elevated acute anxiety would be related to performance, however, there are equivocal findings related to the benefit of high anxiety and strength performance. **PURPOSE**: Therefore, the purpose of this investigation was to examine the relationship between somatic and cognitive anxiety on acute one-repetition maximum (1RM) back squat performance. **METHODS**: Fifty-eight resistance-trained males (n=41) and females (n=17) (age: 23 ± 3yrs; body mass: 80.64 ± 16.49 kg) completed the Revised Competitive State Anxiety Inventory-2 (CSAI-2) questionnaire prior to performing a 1RM back squat. Additionally, participants completed a perceived self-efficacy (PSE) questionnaire in which participants stated what they believed they were 100%, 75%, and 50% confident they could squat for a 1RM. Next, following a 5-minute dynamic warm-up, subjects completed a validated 1RM back squat protocol. To provide the dependent variable the difference of each PSE value was taken from the 1RM (1RM-PSE). Pearson's product moment correlations were then utilized to determine the relationship between the somatic and cognitive anxiety subscales of the CSAI-2 and 1RM-PSE difference at each reported percentage of confidence. **RESULTS**: Participants squatted more than predicted at the 100% (13.25 ± 18.00 kg) and 75% confidence (3.5 ± 15.75 kg) and less than predicted at 50% confidence (-5.00 ± 15.25 kg). Cognitive anxiety was positively and significantly related to 1RM-PSE at all confidence levels: 100% (r=0.43, p<0.01), 75% (r=0.41, p<0.01), and 50% (r=0.37, p<0.01), while somatic anxiety was not significantly related to performance at any confidence level (100%: r=0.16, p=0.23; 75%: r=0.16, p=0.24; 50%: r=0.04, p=0.77). **CONCLUSIONS**: These results indicate that increased acute cognitive anxiety is associated with better than predicted squat strength, while increased acute somatic anxiety is not associated with acute strength. If utilizing a flexible training template, cognitive anxiety should be one of the pre-training readiness factors which is used to select resistance training load.

3225   **Board #94**   **June 2 8:00 AM - 9:30 AM**

A 3-year Analysis of Game Demands in Women's Division I College Basketball

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(No relevant relationships reported)

Women's division I college basketball is demanding, thus non-contact injury rates are high, and key performance markers such as lower body power may decline at the end of the season due to high chronic training stress. Quantifying and monitoring athlete training loads is fundamental to managing injury risk, explaining acute changes in performance, increasing understanding of training responses, and planning and modifying training. Wearable devices using GPS and accelerometry (i.e., Catapult® OptimEye S5) provide new opportunities for advancing sport science in basketball. To date, no research has examined the game demands of women's division I college basketball using Catapult® technology.
PURPOSE: To quantify the game demands of 6 women's basketball players from a top Division I program (.781% win percentage) over a 3-year period, and to compare the positional differences of guards and posts during regular- and post-season games, and wins versus losses.
METHODS: Six female athletes (20.35 $\pm$ 1.6 yrs) wore Catapult S5® units in a garment resembling a sports bra during 89% of practices and games (Catapult Sports, Melbourne, Australia). Data were collected in real-time. Data, including Player Load (PL), Player Load per minute (PL/min), Inertial Movement Analysis (IMA), and Jumps (volume and intensity), were analyzed using Catapult OpenField Software (Version 1.14.1+).
RESULTS: For the 3-year period, average player load ranged from 613-642, and it increased each year. This indicates that athletes were able to continue to increase their average player load each season. Average player load and average player load per minute was higher for wins than for losses. High IMA was similar for wins and losses. When data were examined by player position, guards accumulated higher average player loads, and higher average player loads per minute than posts. Differences in IMA by player position were inconsistent from year to year.
CONCLUSIONS: Wearable devices such as Catapult ® provide important workload information that can be used to assess and guide player practice and game demands, including differences by player position. Future research should examine how player load relates to specific aspects of game performance (FT %, FG%) and to injury prevention.

3226   **Board #95**   **June 2 8:00 AM - 9:30 AM**

Assessing The Impact Of A Governed Focal Point On Broad Jump Performance In Collegiate Females

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(No relevant relationships reported)

The broad jump (BJ) test is frequently utilized to evaluate how far a person can jump and what their resulting lower body power will be. Hence, it is important that the BJ test be administered correctly for a person to jump as far as possible. The standard BJ test has no set focal point for a subject which causes the subject to look wherever they choose. However, prior research with vertical jump performance suggests a set focal point contributes to higher jumps. Therefore, it is logical to assume that a set focal point may assist in greater BJ performance, but to the best of the researchers' knowledge, the impact of a governed focal point (FP) vs. non-governed focal point (NFP) on BJ performance has not been assessed. **PURPOSE:** To investigate the potential differences between a FP vs. NFP on BJ performance in no less than averagely fit college-age females. **METHODS:** After having descriptive data (Ht., Wt., BF%, age) recorded, 33 averagely fit college-age females participated in an 8 min dynamic warm-up. Subjects were then given a four minute passive recovery (PR) period after the warm up and then completed four familiarization jumps (ie. trials). After another 4 min PR period, subjects completed two series of jumps (ie. four trials apiece) in a counterbalanced order with either a FP or NFP for each jump. The FP and NFP jump series were separated by 4 min of PR. The farthest jump for FP vs. NFP was compared using Paired-Samples t-Tests with significant differences occurring at p $\leq$ 0.05. **RESULTS:** No significant differences (p = 0.291) occurred between FP (180.74 $\pm$ 19.9 cm) and NFP (179.63 $\pm$ 20.0 cm). **CONCLUSION:** The results suggest that FP has no significant impact on BJ performance using no less then averagely fit college-age females, yet 39.4% of the subjects did benefit from an FP. Future research may be required to assess the impact of FP vs. NFP on broad jump performance using no less than averagely fit college-age males as well as athletes who perform horizontal jumping actions (running long jump, triple jump, etc.). Additional research may be required to assess the impact of a sports specific focal point vs. non-governed focal point on broad jump performance with no less than averagely fit female and male population.

3227   **Board #96**   **June 2 8:00 AM - 9:30 AM**

Effect Of Exercise On Cognitive Performance And Systemic Bdnf Levels In An Elderly Mexican Population

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(No relevant relationships reported)

The ageing is a progressive process that reduces the functional abilities that affect the life in humans. Furthermore, studies have indicated that the ageing is associated with morphological changes in the hippocampus, the last condition seem induces cognitive deficiencies. **PURPOSE**: To determine the effect of a functional exercise training on cognitive performance and systemic BDNF in an elderly Mexican population. **METHODS**: 19 elderly-healthy participants (Age = 69. 1$\pm$ 7.5 yr.; body weight (BW) = 74.3 $\pm$ 12.8 kg; height = 155 $\pm$ 0.7 cm; BMI = 29.7 $\pm$ 5.6 kg/m²) were recruited in this study. The subjects were randomly divided in two groups: Control (C; n=11; 10 women; 1 man) and Functional Exercise (FE; n=8; 6 women; 2 men). Before to start the FE program. The physical activity level (PA) and the years of education (YE) were determined in the groups. The PA was not statistically different in the groups (C: 6.24 $\pm$ 3.05 vs FE: 8.7 $\pm$ 1.49, p= 0.07). The YE was similar between the groups (C: 5.81 $\pm$ 1.5 vs FE: 6.9 $\pm$ 2.9 yr, p=0.3). After this, the FE program was applied. The protocol consisted in 36 sessions of aerobic and stretching exercises. 24 hours of finished, the exercise program the miminetal test and the 6-minute walking test (6 MWT) was applied in the two groups. The systemic BDNF levels at basal state also were evaluated. **RESULTS**: The FE walked more distance in the 6MWT compared with C (C: 329.1$\pm$ 39.6 m vs EF: 844.4 $\pm$ 172.6, p< 0.01). The cognitive performance was better in FE with respect to C (C: 21.18$\pm$4.2 vs FE: 27.44 $\pm$ 0.8 (p<0.01). There was a positive correlation between the distance walked in the 6MWT and the cognitive performance (r=0.68, p<0.01). Finally, FE showed lower systemic BDNF levels than C (C: 18 676 $\pm$ 2264 pg/ml vs FE 15 766 $\pm$ 2064 pg/ml, p=0.01). **CONCLUSION**: The data of the present study suggest that FE to long-term improved the cognitive performance in older people. However, the last effect was not accompanied with a higher BDNF concentration in the periphery at least in a Mexican population.

3228   **Board #97**   **June 2 8:00 AM - 9:30 AM**

Associations Between Off-Season Player-Tracking Data and Changes in Vertical Jump Parameters in Female Basketball Players

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(No relevant relationships reported)

Commercial player-tracking systems help quantify the volume and intensity of activity during practices and games. When combined with neuromuscular fitness testing data, longitudinal analysis of player-tracking data may provide insight into the dose-response relationship between training loads and changes in fitness levels. Such insights may ultimately help drive the program design process for athletes so as to optimize their physiological adaptations and maximize their readiness.
PURPOSE: Examine the associations between player-tracking data and changes in vertical jump parameters over the course of off-season training in Division I female basketball players.
METHODS: Ten female collegiate basketball players were recruited at the beginning of off-season training. They each performed countermovement jump (CMJ) tests on two force plates before and after three months of off-season training. Each testing session involved CMJ's with three loads (0, 20, 40 kg). The ground reaction force data were used to calculate the average concentric force and velocity of each CMJ. The data from the three load conditions were used to establish a force-velocity profile and estimate maximal force at zero velocity (F_0 [m/s]) and maximal velocity at zero force (V_0 [N/kg]). Training loads were monitored with a player tracking system during each practice of the off-season. Each players' Player Load (PL) and Player Load per Minute (PL/Min) were recorded for each practice and averaged over the entire off-season period. Simple linear regression models were used to determine the associations between average off-season player-tracking data and changes in force-velocity parameters.
RESULTS: The changes in F_0 and V_0 across the off-season were -.65$\pm$1.24 and 3.29$\pm$5.04, respectively. The average off-season PL and PL/Min were 442$\pm$47 and 5.00$\pm$0.54, respectively. Off-season PL did not correlate to changes in F_0 (r = 0.03; p = 0.93) or V_0 (r = 0.02; p = 0.95). Off-season PL/Min was also not correlated to changes in F_0 (r = 0.01; p = 0.97) or V_0 (r = 0.06; p = 0.86).

CONCLUSION: Neither average off-season PL or PL/Min were able to predict changes in CMJ force-velocity parameters. The average volume and intensity of off-season practice sessions did therefore not affect the jumping ability of female Division I basketball players.

3229   **Board #98**   June 2 8:00 AM - 9:30 AM

The Relationship Between Lower Extremity Strength and Overhead Squat

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(No relevant relationships reported)

Impaired lower extremity muscle strength can put athletes at risk of injuries. Assessing the relationship between muscle strength and knee instabilities during overhead squat (OHS) can help prevent injuries of collegiate female athletes. **Purpose:** Examine the relationship between lower extremity muscle strength and the depth and knee wobbling during overhead squat (OHS). **Methods:** Eight in-season Division 1 collegiate women's tennis athletes and 10 in-season Division 1 collegiate women's basketball athletes (age: 18.94 ± 1.35 yrs., height: 1.75 ± 0.08 m, weight: 71.61 ± 14.05 kg) participated. Participants' knee flexor, extensor, and hip abductor muscle strength were measured with a hand held dynamometer and the average of three trials was normalized by body weight (%BW). Participants then performed three consecutive OHS as low as possible and were video recorded for post processing from the frontal and sagittal planes. Following the assessment, participants were grouped into Above Parallel (AP) or Below Parallel (BP) depth and knee wobbles or no wobbles during OHS. **Results:** The mean differences of knee flexor, extensor, and hip abductor strength were compared for BP and AP groups. Three participants were grouped into BP and 15 were grouped into AP. An independent t-test showed significant differences of left hip abductor strength of AP (mean=17.82 ± 4.05 %BW), compared to BP (mean=21.67 ± 1.41 %BW); t(18)= -2.900, *p*= 0.016. No significant differences were found between muscle strength and knee wobbling. **Conclusion:** Overall, no relationship between knee wobbling and the lower extremity strength was found. However, there was a statistically significant relationship in OHS depth and hip abductor strength on the left side. Previous studies have demonstrated decreased hip abductor strength may cause patellofemoral pain syndrome (PFP) and knee valgus. Future studies should look at increasing hip abductor strength and its effects on PFP and knee valgus during functional movements.

3230   **Board #99**   June 2 8:00 AM - 9:30 AM

Hypersomnia is Negatively Related to Maximal Strength Performance

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(No relevant relationships reported)

Previously, ratings of performance self-efficacy (PSE) have been positively related to athletic performance. However, it has been proposed that sleeping dysfunction may disrupt PSE predictions. **PURPOSE**: Therefore, the purpose of this investigation was to examine the relationship between insomnia and hypersomnia on self-predicted acute one-repetition maximum (1RM) back squat performance. **METHODS**: Fifty-eight resistance-trained males (n=41) and females (n=17) (age: 23±3 yrs; body mass: 80.64±16.49 kg) completed the Oviedo Sleep Questionnaire (OSQ) prior to performing a 1RM back squat. Additionally, participants completed a PSE questionnaire regarding what they believed they were 100%, 75%, and 50% confident they could squat for a 1RM. Then following a brief dynamic warm-up, subjects completed a validated 1RM back squat protocol. The difference of each PSE value was then taken from the 1RM and converted to percentage (1RM-PSE) to assess differences between predicted and actual 1RM outcomes. Next, the 1RM-PSE value was converted to a percentage to determine the percentage difference between actual 1RM and predicted 1RM at each level of confidence. Pearson's product moment correlations were used between the insomnia and hypersomnia subscales of the OSQ and the percentage 1RM-PSE difference at each confidence level. **RESULTS**: Participants squatted a greater amount than predicted at 100% (14.21 ± 22.86%) and 75% (4.71 ± 15.28 %) levels of confidence, and less than predicted at the 50% confidence level (-2.04 ± 12.16 %). Hypersomnia was inversely and significantly related to the 1RM-PSE percentage difference at the 50% confidence level (50%: r=-0.26, p<0.05) and approached significance at the 75% confidence level (r=-0.23, p=0.08). However, hypersomnia was not significantly related to the 1RM-PSE percentage at 100% confidence (r=-0.18, p=0.18). The insomnia subscale was not significantly related to performance at any level of prediction confidence (100%: r= -0.04, p=0.79; 75%: r=0.07, p=-0.63; 50%: r= -0.04, p=0.78). **CONCLUSIONS**: These results indicate that hypersomnia (i.e.

acute excessive sleepiness) is associated with worse than predicted maximal strength performance in the squat at lower PSE confidence level. Therefore, acute sleep patterns should be considered as a readiness assessment.

3231   **Board #100**   June 2 8:00 AM - 9:30 AM

Acute Anxiety is Not Significantly Related to Repetitions Performed in the Back Squat

Hector G. Paez[1], Michael H. Haischer[1], Daniel M. Cooke[1], Joseph P. Carzoli[1], Amber M. Shipherd[2], Trevor K. Johnson[1], Edward P. Davis[1], Robert Varieur[1], Robert F. Zoeller[1], Michael Whitehurst, FACSM[1], Michael C. Zourdos[1]. *[1]Florida Atlantic University, Boca Raton, FL. [2]Texas A&M University-Kingsville, Kingsville, TX.*

(No relevant relationships reported)

Flexible resistance training programs allow for athletes to autoregulate daily training variables based upon readiness prior to the training session. Although factors such as physical recovery, anxiety, and sleep can affect acute performance there is no consensus regarding the best training evaluation to assess readiness to train. In fact, somatic and cognitive anxiety have been both positively and negatively related to athletic performance, thus the findings for these factors as readiness indicators are equivocal. The Revised Competitive State Anxiety Inventory-2 (CSAI-2) is a common scale which allows for the acute assessment of both anxiety traits.**PURPOSE**: Therefore, the purpose of this investigation was to examine the relationship between somatic and cognitive anxiety using the CSAI-2 scale on maximal repetitions performed at 70% of one-repetition maximum (1RM) in back squat. **METHODS**: Fifty-eight resistance-trained males and females (age: 23±3yrs; body mass: 80.64±16.49 kg) completed the CSAI-2 questionnaire prior to performing a 5-minute dynamic warm-up and a 1RM back squat. Following 1RM testing, subjects had a standardized rest period of 10 minutes prior to completing two single-repetition sets on the squat at 30%, 40%, 50%, 60%, 70%, 80% and 90% of the established 1RM for which the data is included elsewhere. After the submaximal single repetition sets, subjects had a 10-minute rest period before completing one set on the back squat to volitional failure at 70% of the established 1RM. Pearson's product moment correlations were then utilized between the somatic and cognitive anxiety subscales of the CSAI-2 to determine if any relationship existed with the number of repetitions completed at 70% of 1RM. **RESULTS**: Somatic anxiety (r=-0.20, p=0.13), cognitive anxiety (r=0.19, p=0.17) and self-confidence (r=0.05, p=0.72) subscales of the CSAI-2 were not significantly correlated with back squat performance during maximal repetitions to failure at 70% of 1RM. **CONCLUSIONS**: None of the CSAI-2 subscales were related with repetitions performed to volitional failure in the squat. However, we caution that this analysis did not examine maximal strength performance, and should only be applied to repetitions performed to failure at submaximal intensities.

3232   **Board #101**   June 2 8:00 AM - 9:30 AM

Grit is Not Significantly Related to Repetitions Performed in the Back Squat

Robert J. Pratt[1], Michael H. Haischer[1], Daniel M. Cooke[1], Joseph P. Carzoli[1], Amber M. Shipherd[2], Trevor K. Johnson[1], Edward P. Davis[1], Robert Varieur[1], Robert F. Zoeller[1], Michael Whitehurst, FACSM[1], Michael C. Zourdos[1]. *[1]Florida Atlantic University, Boca Raton, FL. [2]Texas A&M University-Kingsville, Kingsville, FL.*

(No relevant relationships reported)

Several psychological factors have been linked to acute strength performance through a variety of psychometric analyses. Recent research suggests that the "grittier" a person is, the greater their perseverance and passion for long-term goals. Although grit has shown promise in predicting long-term performance, the association between grit and acute strength performance is yet to be determined. **PURPOSE**: Therefore, the purpose of this investigation was to examine the relationship between grit as determined by the Short Grit Scale (Grit-S) and total repetitions performed to volitional failure at 70% of one-repetition maximum in the back squat. **METHODS**: Fifty-eight resistance-trained males and females (age: 23±3yrs; body mass: 80.64±16.49 kg) completed Grit-S prior to performing a one-rep max back squat (1RM). Following a 5-minute dynamic warm-up, subjects completed a validated 1RM back squat protocol. Following 1RM testing, subjects had a standardized rest period of 10 minutes prior to completing two single-repetition sets on the squat at 30%, 40%, 50%, 60%, 70%, 80% and 90% of the established 1RM for which the data is included elsewhere. After the submaximal single repetition sets, subjects had a 10-minute rest period before completing one set on the back squat to volitional failure at 70% of the established 1RM. A Pearson's product moment correlation was utilized to determine any relationships between Grit-S total repetitions performed at 70% of 1RM. **RESULTS**: There was a wide range of repetitions performed across all subjects (6-28) with an average of 14±4 repetitions. However, grit as determined by the Grit-S was not significantly related to total repetitions performed at 70% of 1RM in the back squat (r=-0.11, p=0.42). **CONCLUSIONS**: These results indicate that higher levels of grit are not associated

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with repetitions performed to failure and submaximal back squat intensities. However, we suggest that the Grit-S should be used to assess long-term commitment to athletic training as well as a possible indicator of chronically improved performance.

3233   Board #102   June 2 8:00 AM - 9:30 AM

Relationship Between Fitness Testing and Performance Statistics in Baseball: A Longitudinal Study

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(No relevant relationships reported)

Fitness testing (FT) is a contributing factor for success in most sports. Little evidence exists related to baseball FT and performance statistics (PS). **PURPOSE:** To examine relationships between FT and selected PS in NCAA Division I baseball team. **METHODS:** We followed the same players for a period of 5 years and we recorded their FT and PS, N = 414 (age 19.8 ± 1.3 yr; weight 89.9 ± 8.3 kg). Grip strength (GS), vertical jump height (VJ), and squat 1RM (SQ) were examined with regards to batting average % (b/avg%), slugging % (slg%), on-base % (ob%), earned run average (era), batting average against % (b/avg-a%), and strike-out per innings pitched for 9 innings (so/ip)*9. FT and PS were normalized to z-scores. Missing data were estimated from least squares prediction from non-missing variables. Multiple forward stepwise regression was used to evaluate the relative impact of FT on PS (JMP® Pro 13). **RESULTS:** GS is significantly correlated with b/avg% (r=0.26, p<0.0001), slg% (r=0.34, p<0.0001), ob% (r=0.23, p<0.001), era (r=0.39, p<0.0001), and so/ip*9 (r=0.1, p=0.03). VJ is significantly correlated with slg% (r=0.17, p=0.0007), era (r=0.25, p<0.0001), b/avg-a% (r=0.14, p=0.005), and so/ip*9 (r=0.18, p=0.0002). SQ is significantly correlated with b/avg% (r=0.30, p<0.0001), slg% (r=0.37, p<0.0001), era (r=-0.10, p=0.04), b/avg-a% (r=-0.14, p=0.005), and so/ip*9 (r=0.26, p<0.0001). Era was selected as the independent variable with the highest goodness of fit significantly correlating with GS (p<0.0001), VJ (p<.0001), and SQ (p<0.0001) with adjusted R^2=0.23. **CONCLUSIONS:** The results indicate that FT correlates with PS. GS, VJ, and SQ appeared to provide the greatest predictive power of era PS. FT accounted for 23% of the variance in era PS. Besides GS, VJ, and SQ, a prudent FT approach for performance coaches may be to also focus on improving other FT variables, such as bench press, standing long jump, 10-m sprint, back strength, and flexibility. This approach may translate to improved PS other than era PS.

3234   Board #103   June 2 8:00 AM - 9:30 AM

The Short Grit Scale Does Not Relate to Acute One-Repetition Maximum Back Squat Performance

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(No relevant relationships reported)

An individual's level of "grit" is determined by their perseverance and passion for long-term goals. Existing data have demonstrated that grit has predicted success above what could be explained by talent alone. However, these existing data are based upon subjective questionnaires, including a recent meta-analysis in which grit was measured in relation to academic performance. To our current knowledge there is no research that evaluates the relationship between grit and acute athletic performance. **PURPOSE**: Therefore, the purpose of this investigation was to examine the relationship between grit as determined by the Short Grit Scale (Grit-S) and acute one-repetition maximum (1RM) back squat performance. **METHODS:** Fifty-eight resistance-trained males and females (age: 23±3yrs; body mass: 80.64±16.49 kg) completed the Grit-S questionnaire prior to performing a 1RM back squat. Additionally, participants completed a perceived self-efficacy (PSE) questionnaire in which participants stated what they believed they were 100%, 75%, and 50% confident they could squat for a 1RM. Next, following a 5-minute dynamic warm-up subjects completed a validated 1RM back squat protocol. To provide the dependent variable the difference of each PSE value was taken from the 1RM (1RM-PSE). Pearson's product moment correlations were then utilized between the Grit-S and 1RM-PSE difference at each reported percentage of confidence. **RESULTS**: Participants squatted more than predicted at the 100% (13.25±18.00 kg) and 75% confidence (3.5±15.75 kg) and less than predicted at 50% confidence (-5.00±15.25 kg). Grit-S was not significantly correlated with 1RM-PSE Difference at all percentages; 100% (r=0.17, p=0.21), 75% (r=0.20, p=0.14), 50% (r=0.11, p=0.40). **CONCLUSIONS**: These results indicate that the character trait, grit, as measured by the Grit-S is not a factor which explains acute maximal strength performance. However, since grit is defined as someone's perseverance and passion for long-term goals we suggest that grit be investigated as a possible factor influencing chronic athletic performance and improvement over time.

3235   Board #104   June 2 8:00 AM - 9:30 AM

Effects of Weighted vs Light-Rope Jumping on Upper Extremity Strength and Countermovement Jump Performance

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(No relevant relationships reported)

Purpose: To compare the effects of weighted versus light-rope jumping on maximal upper extremity strength and jump performance. **Methods**: Twenty-two recreationally active females (Age: 20.27 ± 1.03yrs; height: 165.05 ± 7.17cm; mass: 68.97 ± 16.37kg) participated in a four-week rope-jumping training intervention. Assessment measures were obtained pre-and post-training intervention. Maximal isometric strength of the elbow flexors (EF), elbow extensors (EE), and grip strength (GS) were assessed via dynamometry. Additionally, countermovement jump (CMJ) height, peak power (PP), and peak velocity (PV) values were assessed using a jump mat and linear position transducer. Following pretesting, participants were randomly assigned to either a weighted rope (WR: .91kg; n = 11) or light rope (LR: .11kg; n = 11) group. The training protocol consisted of participants performing two, 4-minute sets of alternating 30s of jumping (cadence of 120/min) with 30s of rest; a third set was added to the training protocol during weeks three and four. Repeated-measures analyses of variance were performed on all pre- and post-testing measures. **Results**: No time x group interaction was revealed ($p > 0.05$), however, a main effect of time was observed for both GS and EF (F(1, 20) = 6.25, $p = 0.021$ & F(1, 20) = 5.78, $p = 0.026$, respectively), revealing increases in both groups for EF (WR: 6.3%; LR: 7.5%) and GS (WR: 8.7%; LR: 3.2%). CMJ height analysis revealed no interaction ($p > 0.05$), however, a main effect of time (F(1, 19) = 5.611, $p = 0.029$) was observed. PP and PV analyses revealed no significant interactions ($p > 0.05$), however, a main effect of time was observed for both PP and PV (F(1, 19) = 9.54, $p = 0.006$ & F(1, 19) = 7.33, $p = 0.014$, respectively). Collectively, CMJ height, PP, and PV values increased in the WR group by 5.5%, 6.5%, and 6.6%, and in the LR group by 1.1%, 1.9%, and 1.25%, respectively. **Conclusion**: Although no differences were observed between groups in strength nor jump performance, our data suggest that consistent jump rope training, regardless of rope weight, has a significant influence on upper extremity strength and jump performance.

3236   Board #105   June 2 8:00 AM - 9:30 AM

Performance Factors Related to Throwing Distance in Collegiate Track Athletes

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(No relevant relationships reported)

Purpose: The purpose of this study was to identify potential correlations between upper and lower body power, balance, flexibility, and body composition in relation to actual throwing performance in collegiate throwers. **Methods**: 12 collegiate throwers (8 male, 4 female; minimum of 4 years of experience) performed a series of functional tests and a competition level throw. Participants performed a brief warm up prior to each test. Upper body power was determined using a seated medicine ball throw (9kg male, 6kg female) performed laying on a bench at a 45° incline. Lower body power and reaction time were measured using a vertical jump mat (Probotics Inc, Hunstville, AL) which provided jump height, ground reaction time, and an overall power factor (OPF). Balance was assessed during single leg trials for each leg on a Biodex balance system (Biodex Medical Systems Inc., Shirley, NY). Flexibility was assessed by sit and reach. Body composition was measured by means of air displacement plethysmography (Bod Pod; Cosmed USA Inc. Concord, CA). Functional testing results were compared to actual competition throws, which took place at a sanctioned meet within 3 days of testing. Comparisons between functional tests and competition throws were made using Pearson's R (linear) and Spearman's Rho (nonlinear) tests to identify correlations. **Results**: Nonlinear correlations were found between throwing distance and body fat percentage (rho=-0.699; p=0.011), and OPF (rho=0.609; p=0.047). Linear correlations were found between throwing distance and overall lead leg stability (r=0.701; p=0.011), and lead leg medial/lateral stability (r=0.688; p=0.013). **Conclusions**: These data suggest that body fat percentage, lower body power, and lead leg stability are each correlated with throwing distance. Improvements in these areas could lead to improvements in overall throwing distances in collegiate throwers.

3237   Board #106   June 2 8:00 AM - 9:30 AM

Anthropometric and Performance Statistics Comparisons in Baseball Pitchers: A Longitudinal Study

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(No relevant relationships reported)

Athletic ability, performance, and motor skills depend greatly on human proportionality. Practicing sports at a high level is associated with a person's ability to meet the biomechanical demands of a particular sport or playing position. The ideal somatotype of athletes in different sports and within the same sport has been described. However, there is limited evidence regarding the association between the anthropometric characteristics, such as body weight (BW), body height (BH), and body fat % (BF%) of collegiate baseball pitchers and baseball performance statistics (PS). **PURPOSE:** To compare BW, BH, BF% and selected baseball-specific PS, such as earned run average (era), batting average (b/avg-a%), and strike-out per innings pitched for 9 innings (so/ip)*9 in NCAA Division I pitchers; to examine the relationship between BW, BH, BF% and baseball-specific PS. **METHODS:** During a 5-year period, 210 collegiate pitchers (age 19.7 ± 1.2 yr; weight 92 ± 8.2 kg) were assessed for body weight (BW), body height (BH), and body fat % (BF%). The following pitchers' baseball statistics were collected: era, b/avg-a%, and (so/ip)*9. BW, BH, BF%, and PS were normalized to z-scores. Missing data were estimated from least squares prediction from non-missing variables. Forward multiple stepwise regression was used to evaluate the relative impact of BW, BH, and BF% on PS (JMP® Pro 13). **RESULTS:** BH is significantly correlated both with b/avg-a% (r=-0.18, p=0.0104) and era (r=0.22, p=0.0010). BW is significantly correlated with (so/ip)*9 (r=0.22, p=0.0016). BF% is significantly correlated with both era (r=-0.26, p=0.0001) and (so/ip)*9 (r=-0.14, p=0.0472). Strike-out per innings pitched for 9 innings was selected as the independent variable with the highest goodness of fit significantly correlating with BW (p=0.0004), BH (p=0.0004), and BF% (p=0.0022) with adjusted R^2=0.12. **CONCLUSIONS**: The results indicate that BW, BH, and BF% of pitchers correlate with b/avg-a%, era, and (so/ip)*9. BW, BH, and BF% appeared to provide the greatest predictive power of (so/ip)*9. The selected anthropometric variables accounted for 12% of the variance in (so/ip)*9. Runs are usually scored by hits. Coaches and trainers want pitchers to prevent runs. Therefore, they may need to account for other factors besides BW, BH, and BF%.

3238   Board #107   June 2 8:00 AM - 9:30 AM

Effect Of Warm-up Intervention On Physical Performance: Meta-analysis

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(No relevant relationships reported)

Warm-ups have been often used prior to exercise and sports. Numerous warm-up intervention studies have been conducted to maximize physical performance, yet results remain controversial. **PURPOSE:** The purpose of this study was, using meta-analysis techniques, to examine the effect of warm-up intervention on physical performance. **METHODS**: Relevant studies were identified by conducting electronic databases such as Medline, Cochran Library, and SPORTDiscus by a systematic literature search (key terms: warm-up and physical performance). Outcome measurement of physical performance included sprint, jump, flexibility, agility, power, and sports related skills (ball dribbling and penalty kick). Standardized mean difference effect size (ES) was calculated based on the difference in physical performance between pre- and post-intervention or post values of treatment and control group, respectively. A random effects model was used to provide an overall ES and 95% confidence interval (CI). Moderator analyses were conducted to evaluate the effects of study gender, warm-up type (static vs. dynamic), and performance type (sprint vs. jump vs. flexibility vs. others) on overall ES. Heterogeneity was examined using Cochran's Q statistic. All analyses were conducted using Comprehensive Meta Analysis (Version 3). **RESULTS**: Out of 1379 potentially relevant articles, 54 studies were selected based on initial screening of titles and abstracts. A total of 12 studies met the inclusion criteria and 71 ESs were calculated. The overall mean ES was not significant (ES = .035; 95% CI = -.058, .128). Moderator analyses showed that studies with flexibility (.196; .074, .318) had a greater ES than sprint (-.127; -.328, .073), jump (.020; -.100, .140), and others (.089; -.268, .446), $Q_{between}$ (Qb) = 8.491, df = 3, p = .037. However, other moderator variables had no effect on the mean ES: warm-up type, Qb = 1.800, df = 2, p = .407; gender, Qb = 0.243, df = 2, p = .886. **CONCLUSION**: In this meta-analysis, the evidence is insufficient to conclude that the warm-up interventions are effective in improving physical performance. However, warm-up might have a small effect on improving flexibility.

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Positional Impact on Physiological and Performance Variables in Women's Collegiate .22 Bore Rifle Shooting

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(No relevant relationships reported)

Competitive rifle shooting is rapidly becoming a staple sport in American collegiate athletics. Over 300 universities in the United States now have shooting programs. Accurate shooting requires immense physiological and biomechanical control. **PURPOSE:** The purpose of this study was to determine physiological (heart rate [HR] and respiratory rate [RR]) and performance differences in three shooting positions (Stand, Kneel, and Prone) during competitive .22 caliber bore rifle shooting. **METHODS:** 9 Division I collegiate women's rifle shooters participated in the study. HR and RR data were collected for each participant via a bio-harness. Each participant completed 10 sighting shots and 10 performance shots recorded for accuracy, using an NCAA approved computer scoring system. Each participant shot in the three positions following NCAA competition rotation. A one-way ANOVA was run to determine the impact of positioning on all variables of interest, with post-hoc LSD analysis on all significant omnibus results. **RESULTS:** A significant difference was noted for Total Score ($F(2,25) = 6.258$, p = 0.007). Post-hoc analyses revealed that scores were significantly worse in the Stand position (80.0 ± 9.6) compared to Prone (92.5 ± 5.1, p = 0.002). Kneel score (86.8 ± 6.6, p = 0.066) compared to Stand approached, but was not statistically different. Significance was approached with RR (p = 0.059), with RR being highest in Prone (6.4 ± 2.1 breaths), compared to Stand (4.4 ± 2.1 breaths) and Kneel (3.9 ± 1.3 breaths). No significant differences were noted for HR (p =0.862). **CONCLUSION:** The data suggest that the Prone position yielded the highest scores, and a potentially elevated RR. This suggests that the ground-assisted positioning of the rifle, and slightly elevated RR, aid in scoring accuracy in collegiate women's .22 caliber rifle shooters. Conversely, lowest scores were recorded in the Stand position. This could be due to the weight (~17lb) of the rifle needing to be held steady in this position.

3240   Board #109   June 2 8:00 AM - 9:30 AM

Validation Of Triathlon Time Prediction Methods For Amateur Triathletes

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(No relevant relationships reported)

Individuals new to triathlon may have difficulty accurately predicting their finish time. Equations (Schabort et al., Hue et al.) have been developed that predict Olympic distance triathlon finish time. However, triathletes were elite level with a sample size of 10 or fewer, making it uncertain if these findings are relevant to a larger sample of amateur triathletes. An online calculator (QT2) is also available to predict triathlon times, but it has not been validated. **PURPOSE**: To assess the criterion and convergent validity of two scientific equations and the QT2 in predicting actual finish time of an Olympic distance triathlon for amateur triathletes. **METHODS**: Participants were collegiate, amateur triathletes who completed an Olympic distance triathlon during 2017. Participants performed six exercise tests, as close to their race as possible, either before or after, and all tests were performed on separate days. Body composition was assessed via BodPod. Three of the exercise tests (peak treadmill speed, 4 W/kg cycle, 30-minute bike/20-minute run) were used in the scientific equations. For these, participants visited the laboratory at Michigan State University or Eastern Michigan University on three separate occasions. Blood lactate was measured for each test. The remaining three exercise tests, which participants completed on their own (400y swim, 20-minute cycle, 5k run), were used in the QT2. Pearson correlations evaluated relationships for criterion and convergent validity. Eight amateurs could not complete the 4 W/kg cycle, so analyses were also run with their data removed. **RESULTS**: Twenty-seven triathletes (20.6 ± 2.0 years, 37.0% female, actual finish time $2:48:00 \pm 0:34:32$) have completed testing. The QT2 (r=0.865, p<0.001), Hue (r=0.883, p<0.001), and Schabort (r=0.392, p<0.05) were associated with actual finish time. The QT2 and Hue (r=0.859, p<0.001) and Schabort and Hue (r=0.394, p<0.05), were associated with each other. When athletes who modified the 4 W/kg cycle were removed from the analyses, relationships with Schabort disappeared. **CONCLUSIONS**: The QT2 and Hue equation were closely associated with actual finish time. The QT2 involves easily accessible tests, unlike both scientific equations, which require blood lactate testing. Because of this, the QT2 may be preferred by amateurs.

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The Effects of Simulated Altitude Masks on Aerobic Endurance in Trained Individuals

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(No relevant relationships reported)

Oxygen-dependent exercise at altitude has demonstrated ability to increase maximal oxygen uptake over a time. Traditional means of altitude training can be time-consuming and expensive, so alternative methods that simulate altitude exposure have been developed. These masks maintain that they induce the same cardiorespiratory fitness changes that an athlete training at altitude would experience. They also claim that these improvements occur in a shorter training periods than typical altitude training protocols. However, there is little research to support these claims. **PURPOSE:** The purpose of this study is to measure the potential effects of training at a simulated altitude on aerobic endurance using a two-week YMCA cycle ergometer protocol. **METHODS:** Based on subjects' VO_2max scores, 17 subjects were put into one of three groups, a control group (CG), a group training without the mask (No-mask), and a group training with the mask (mask). Each training session had the participants cycle for twelve minutes, at 50-60% of their heart rate reserve (HRR), followed by a 3-minute cool-down. Eight training sessions were completed within two weeks. **RESULTS:** Using a 3X2 mixed ANOVA, for within subjects, there was not a significant increase in VO_2max ($F(1,2,14)=.873$, $P>.05$). Means ± SD for CG were pre 44.72±9.69 and post 45.07±8.96ml/kg/min. Means ± SD for no-mask group were pre 42.70±8.83 and post 44.10±11.47ml/kg/min. Lastly, the means ± SD for mask group means were pre 45.50±8.72 and post 47.91±8.96ml/kg/min. There were no significant differences in VO_2max between the control and experimental groups ($F(1,2,14)=.170$, $P>.05$) either. Although the between groups data was not statistically significant, there was a greater increase in the mask group's aerobic endurance compared to the two other groups. **CONCLUSION:** When looking at the increase in VO_2max in response to a leg ergometer protocol, all three groups demonstrated an increase in VO_2max at the completion. Those who trained with simulated altitude masks showed the greatest improvement from pre- to post-testing, which could be a result of the mask use, in addition to the participant's outside training. The improvement shown in the other two groups may be a result of the participants' continued training outside of the study, as well as other factors.

3242   Board #111   June 2 8:00 AM - 9:30 AM
Dynamic Strength Following Focal Knee Joint Cooling

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(Sponsor: Perry, Arlette C, FACSM)
(No relevant relationships reported)

Focal knee joint cooling (FKJC) has been found to increase quadriceps strength during isometric contraction. It is unknown, however, if a similar response will occur with dynamic modes of muscle contraction such as concentric and eccentric. **PURPOSE:** To determine the effects of FKJC on isometric, concentric and eccentric modes of muscle contraction in the quadriceps muscle. **METHODS:** Twenty-one subjects (age=22.7±3.1year, height=170.4±10.8cm, weight=74.2±16.4kg) without lower extremity injury participated. All subjects received 20 minutes of FKJC for which two 1.5L plastic bags, filled with crushed ice, were applied to the anterior and posterior surface of the knee joint. The same bags filled with candy corn were used in the same manner for the sham treatment. FKJC and sham treatments were randomly administered to subjects on different days. An isokinetic dynamometer was used to quantify strength during isometric contraction and concentric and eccentric contraction at 60°/s and at 180°/s. For each muscle contraction mode, subjects were asked to perform 3 repetitions at their maximal effort before and immediately after treatment. Knee extension peak torque (Nm) was calculated, and the mean of the 3 trials for each mode of muscle contraction was used for statistical analysis. Separate 2 (treatment condition) by 2 (time) repeated measures ANOVAs were conducted with the alpha level set at .05. **RESULTS:** There were no significant interactions or main effects for any of the contraction modes ($p>.05$). For display of descriptive data, pre-and post-ice treatment's means and standard deviations are presented: isomeric (pre-ice:234.0±67.5, post-ice:237.5±72Nm), concentric 60°/s (pre-ice:188.5±58.1, post-ice:185.1±58.1Nm), concentric 180°/s (pre-ice:170.6±50.5, post-ice:169.2±53.5Nm), eccentric 60°/s (pre-ice:246.5±88.8, post-ice:250.1±85.0Nm), eccentric 180°/s (pre-ice:224.8±75.0, post-ice:223.8±76.2Nm). **CONCLUSION:** Twenty-minutes of FKJC did not change quadriceps strength during isometric, concentric, or eccentric muscle contraction. FKJC is not beneficial for increasing quadriceps isometric or dynamic strength in healthy individuals.

3243   Board #112   June 2 8:00 AM - 9:30 AM
Longitudinal Correlation of Sleep Time, Strength Gains, and Performance in Collegiate Baseball Players: A Pilot Study

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(No relevant relationships reported)

Sleep time influences lean body mass in dieting adults; sleep has not been demonstrated to influence anabolic processes in collegiate athletes. Longer sleep time is correlated with improved performance in sports.
Purpose: We followed 14 baseball players to describe sleep patterns and investigate their relationship to strength gains from weight training and performance parameters over a semester.
Methods: The study was approved by Roanoke College IRB. 14 baseball players were chosen at random and agreed to participate. Body composition was determined pre and post study by bioimpedence. Sleep/wake time were recorded using Actigraph monitor. Participants followed standard preseason conditioning & weight lifting regimen; 3 lift maximum pre and post study were recorded for biceps curl, dip, chest press, shoulder press, pull up and squat. Pitchers accuracy of fastball and skill pitches (curve, etc) were recorded during games.
Results: 13 of 14 athletes completed the study. 1 withdrew due to injury. The players sleep profile showed a significant difference between the shortest (311+/- 48 min/night) and longest sleepers (430+/- 54 min/night) (p<0.05). For statistical evaluation, "short sleepers" (<6.0 hours, n=8) and "long sleepers" (>6 hours, n=5) categories were used. Body composition: long sleepers tended to gain less body fat (0.22 +/- 0.64%) compared to short sleepers (0.63 +/- 1.65%) but was not significant (p=0.61) Long sleepers had strength gains in all 6 weight categories compared to short sleepers but changes were not significant (p=0.6). Pitching accuracy (strikes/total pitches) for fast ball correlate with night-before-performance sleep time, but were not significant.
Conclusion: This study demonstrates remarkable variation of sleep time in baseball athletes over a semester; the shortest sleepers had about 180 fewer hours of sleep than longest sleepers. Pilot data on weight training and performance demonstrates interesting trends relative to sleep time, but the study is not powerful enough to generate statistically significance. Our body composition results agree with previously published data and suggest further study is warranted.

G-39   Free Communication/Poster - **Recovery**
Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3244   Board #113   June 2 8:00 AM - 9:30 AM
Jumping To Conclusions: The Recovery-Monitoring Service 'Jump Test' Is Sensitive To Neuromuscular Fatigue in Recreational Runners

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Reported Relationships: L.J. Montzingo: *Consulting Fee; Under Armour Connected Fitness.*

Numerous studies over the last decade have shown a relationship between countermovement vertical-jump (VJ) performance and training load in both competitive team-sport athletes as well as in elite runners. As such, VJ performance serves as a marker of neuromuscular fatigue. However, less clear is the degree to which this relationship persists in non-elite, recreational 'run' athletes. 'Jump Test' is a footwear-integrated self-testing utility that measures and analyses repeated-VJ performance. **PURPOSE**: To determine how repeated-VJ performance, as measured before each training bout by average flight time and monitored via 'Jump Test', varies with training load in recreational 'run' athletes over a six-week period. **METHOD**: Eleven moderately trained (1-6 runs/week, 10-60 miles/week, >3 months) subjects (2F, 9M; 33.6 +/- 4.5 years) were enrolled voluntarily. Subjects followed a six-week training program devised to impose significant training loads that could be deemed counter-productive to performance (i.e. induce over-reaching if not over-training). Training was divided into three 2-week phases: baseline training (BL), overload training (OL), and active recovery (AR). Each weekday subjects performed the 'Jump Test' and rated their perceived level of muscle soreness. Training data was collected and analyzed via the mobile application *MapMyRun*. Chronic and acute training loads were computed. Training phase comparisons were made using paired T-tests. **RESULTS**: VJ performance decreased progressively throughout the first week of OL (z-score, -0.2 +/-1.0, OL vs 0.3 +/-0.8, BL; p < 0.01). Furthermore, reduced jump scores correlated with an increase in chronic training load (5.8 +/-3.8, OL vs. 3.1 +/-

2.5, BL r = -0.45, p < 0.01) and an overall increase in subjects' self-reported muscle soreness (2.7 +/- 0.9, OL vs. 3.4 +/-1.0, BL; r = 0.3, p < 0.01) during that week. **CONCLUSION**: Pre-workout, repeated-VJ performance was measured with a shoe-borne, jump-testing utility in recreational athletes over six weeks of variable training load. It was found VJ performance fluctuates with training load and perceived muscle soreness. The close relationship demonstrated between jump scores and self-reported measures suggests 'Jump Test' is a practical tool for monitoring neuromuscular fatigue and informing training load.

3245   Board #114   June 2 8:00 AM - 9:30 AM

Evaluating The Potential Impact Of Fatigue On Ultimate Frisbee Players During Tournament Play

Jared Feister, Robert T. Sanders, Chris Carver, Hannah E. Nelson, James Kelly, Andy Bosak, James Schoffstall, FACSM. *Liberty University, Lynchburg, VA.* (Sponsor: Dr. James Schoffstall, FACSM)

(No relevant relationships reported)

Previous research has evaluated the quality of recovery from bouts of athletic events. Various measures have been used to assess recovery, yet most methods were somewhat problematic for rapid data collection. When costs are a limitation, it may be best to seek less expensive alternative methods of evaluating recovery. **PURPOSE:** To evaluate potential fatigue of collegiate ultimate frisbee athletes over two days of tournament play (TP) utilizing the perceived recovery status scale (PRSS) and ratings of perceived exertion (RPE). **METHODS:** Nineteen college-aged males participated in the study. Occurring over two days of TP, PRSS and RPE were recorded during 5 frisbee matches with each match separated by 30min. Two minutes prior to the first and second half, PRSS was recorded for each athlete and 2 minutes after each half, RPE was recorded. **RESULTS:** Significant differences occurred in PRSS with a decrease in values from the 2nd to the 5th matches (p = 0.006) and within the 2nd half of comparable matches (p = 0.031). No RPE recordings were significant. **CONCLUSION:** The results suggest that much of the variance in fatigue and fatigue-related measures occur between the 2nd and 5th matches of TP. The cumulative effects of fatigue during TP may have been a result of several potentially uncontrollable factors. Note, decreased perceived recovery could be related to the increased stress levels that occurred because of the amplified significance of the final match. Future research may evaluate other quantifiable recovery data (i.e. HRV and GPS) during tournament play.

3246   Board #115   June 2 8:00 AM - 9:30 AM

An Assessment of a 15 vs. 30 Second Recovery Period on Vertical Jump Performance

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(No relevant relationships reported)

The vertical jump (VJ) test is often used to assess an individual's lower body peak power. The standard recovery time between subsequent jumps is typically 30 seconds (secs) with a completion of 3-6 jumps. Prior studies have reported no significant difference between 30 vs. 60 secs recovery on VJ performance. However, it may be possible that a shorter passive recovery (PR) period may allow for maintenance or improvements in jumping performance versus the standard recovery time and therefore, potentially contribute to a more time efficient testing session. In contrast to this, if an individual is not completely recovered before their next jump, it is possible that their performance may be diminished compared to earlier jumps. To the best of the researchers' knowledge, the impact of a shorter PR period, such as 15 vs. 30 secs PR, on VJ performance has not been assessed. **PURPOSE:** To investigate potential differences between a 15 vs. 30 secs PR period on VJ performance in no less than averagely fit college-age males. **METHODS**: After measuring descriptive data (Ht., Wt., BF%, age), 31 averagely fit college-age males completed an 8 minute (min) dynamic warm-up on a cycle ergometer. Subjects were given a 4 min PR during which their reach height was measured. Following the PR, four familiarization jumps were completed using a VJ measurement device. After another 4 min PR, the subjects completed 2 series of jumps, with 6 trials each, in a counterbalanced order with either 15 (FIF) or 30 (THI) secs of recovery between each jump. The FIF and THI jump series were separated by 6 min of PR. Excluding the first jump, the highest jump for FIF and THI were compared using Paired-Samples t-Tests with significant differences occurring at p ≤ 0.05. **RESULTS:** Significant differences (p = 0.016) occurred between FIF (69.64 ± 8.61 cm) and THI (70.35 ± 8.99 cm). **CONCLUSION**: The current results suggest that 30 secs of PR between jumps is optimal recovery for performance during the VJ test, while 15 secs of PR may hinder peak VJ performance in averagely fit college-age males. Although THI was less than a centimeter above FIF, a sufficient number of subjects had improved performance during THI. Future research may assess the impact of 15 vs. 30 secs PR on VJ performance using highly fit collegiate athletes that use vertical jump as a sport specific movement.

3247   Board #116   June 2 8:00 AM - 9:30 AM

The Effect Of Varying Self-myofascial Release Duration On Subsequent Athletic Performance

Jake Phillips, David Diggin, Deborah L. King, Gary A. Sforzo, FACSM. *Ithaca College, Ithaca, NY.* (Sponsor: Gary Sforzo, FACSM)

(No relevant relationships reported)

Self-myofascial release (SMR) treatments appear to enhance joint range of motion (RoM) and restore movement function but the effects of different SMR durations on athletic performance have yet to be examined. **PURPOSE**: To investigate the effects of different SMR treatment durations (1 minute and 5 minutes) on joint RoM, power, and agility. **METHODS**: Twenty-four volunteers participated with ankle and knee joint RoM assessed using modified weight-bearing (WBL) and kneeling lunge (KL) tests. Vertical jump (VJ) performance and pro-agility (PA) sprint performance were also examined. All tests were conducted before and immediately after one-minute (SMR_1) and five-minutes (SMR_5) of SMR and immediately following a control (CONTR) condition. SMR was done on the quadriceps and triceps surae muscle groups using a standardized protocol and foam roller. Differences in dependent variables (VJ height, PA run time, WBL distance, KL angle) between treatment groups (SMR_1, SMR_5, CONTR) at two time-points (pre- and post-treatment) were analyzed using a 3 x 2-way repeated measures analysis of variance (ANOVA). Alpha = 0.05. Effect sizes (ES) were calculated to clarify the magnitude of the effect of differences between means from pre- to post-treatment for each treatment condition. **RESULTS**: KL angle increased following SMR_5 (16.4 %; ES = 0.85) when compared with SMR_1 (12.5 %; ES = 0.58). WBL distance showed little change following SMR treatments and the CONTR condition exhibited little effect on RoM tests. VJ height decreased following SMR_5 (5.1 %; ES = 0.26) but changed little following SMR_1 (0.7 %; ES = 0.03) and CONTR (1.9 %; ES = 0.10) conditions. PA run time improved slightly following SMR_1 (1.1 %) but deteriorated following CONTR (1.2 %) and SMR_5 (0.5 %). Effect size calculations for changes in PA, however, were trivial across all conditions (0.06 – 0.15). **CONCLUSION**: Extended periods of SMR may be recommended should improvements in joint RoM be required. If power output is a critical requirement of subsequent tasks, prolonged SMR treatment (i.e., 5-min) should be avoided.

3248   Board #117   June 2 8:00 AM - 9:30 AM

Fascia Stretch Training-7 Induces Similar Metabolic Response, But Lower Mechanical Stress

Filipe Dinato de Lima[1], Ubiratan Contreira Padilha[1], Amilton Vieira[1], Marco A. Dourado[1], Lee E. Brown, FACSM[2], Martim Bottaro[1]. [1]*University of Brasília, Brasília, Brazil.* [2]*California State University, Fullerton, CA.* (Sponsor: Lee E. Brown, FACSM)

(No relevant relationships reported)

The strength training is the most efficient modality to improve muscle volume and strength in health and disease. Recently, a new method of training including static stretching named Fascia Stretch Training (FST-7) has emerged. It is argued that the FST-7 could induce greater muscle swelling, known as an important hypertrophic stimulus. However, the acute responses to FST-7 have not been established. **PURPOSE**: To compare mechanic and metabolic responses from FST-7 with traditional strength training protocols. **METHODS**: Twelve resistance-trained men (age: 29.0 ± 6.1 years; weight: 84.4 ± 10.3kg; height: 1.78 ± 0.06m) participated of the study. The volunteers attended to the laboratory in four non-consecutive days. The first session was used to familiarization with the testing procedures. On the following sessions, volunteers performed randomly one of the three training protocols: 1) FST-7: seven sets of 10 isokinetic knee extension with a 40-sec rest-interval and 20-sec of quadriceps static stretching; 2) Control (CON): seven sets of 10 isokinetic knee extension with a passive 40-sec rest-interval; and 3) Traditional (TRA): seven sets of 10 isokinetic knee extension with a passive 120-sec rest-interval. Total work (TW) of each protocol was recorded. Muscle swelling (MS) and blood lactate (BL) was measured before and after each exercise protocol. Repeated measures multifactorial ANOVA was used to analyze data. **RESULTS**: On TW, there was a significant main effect for protocol (F = 23.843; p < 0.001). FST showed a lower TW (11823.01 ± 1735.06J) than CON (13976.08 ± 2378.07J) and TRA (15510.77 ± 2250.56J). On MS, there was no significant protocol and time interaction (F = 0.380; p = 0.69). All protocols showed a similar increase in MS after training session (p < 0.001). On BL, there was no significant protocol and time interaction (F = 2.166; p = 0.14). All protocols showed a similar increase in BL after training session (p < 0.001). **CONCLUSIONS**: FST, CON and TRA induce a similar increased in metabolic responses. However, FST produce lower mechanic stress than CON and TRA. These results suggest that FST may not be a superior stimulus than previous traditional strength protocols to induce muscle hypertrophy.

Abstracts were prepared by the authors and printed as submitted.

SATURDAY, JUNE 2, 2018

3249　Board #118　June 2 8:00 AM - 9:30 AM

Could Knee Extension And Leg Press Exercises Induce Different Time Course Of Muscle Recovery?

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(No relevant relationships reported)

Single- (SJ) and multiple-joint (MJ) resistance exercises are recommended for strength and hypertrophic gains. However, the levels of mechanical strain and hence muscle damage may be distinct between MJ and SJ resistance exercises. Studies comparing symptoms of muscle damage following MJ and SJ exercises are lacking. **PURPOSE**: This study investigated the time course of symptoms of muscle recovery after two knee extension exercises in resistance-untrained men.
METHODS: Seven men (25 ± 4 yrs) were randomly assigned to perform a unilateral MJ multi-joint resistance exercise (i.e. leg press, LP) and a unilateral single-joint resistance exercise (i.e. seated knee extension, KE) with the contralateral limb. Participants performed 8 sets of 10 repetition maximum of both exercises with 2 min rest between sets. Muscle edema (ME), peak torque (PT), 1-legged countermovement (CMJ), and muscle soreness (MS) were measured pre, post, 24, 48, 72 and 96h following exercise.
RESULTS: ME of the rectus femoris returned to baseline at 48h after LP exercise, and at 24h after the KE exercise. ME of the vastus lateralis recovered at 24h after both exercises. PT recovered at 24h, and there was no difference between both exercises ($p>0.05$). CMJ returned to the baseline values 72h after the LP exercise, and 24h after the KE exercise. Muscle soreness of the rectus femoris was greater at 48h after KE when compared to LP exercise. There was no difference between exercises in the magnitude of MS response in vastus lateralis ($p>0.05$).
CONCLUSIONS: Resistance-untrained men experience different muscle recovery following LP and KE exercises. The MJ condition was more stressful for knee extensors muscles than SJ, taking more time to recover from muscle damage.

3250　Board #119　June 2 8:00 AM - 9:30 AM

Assessment of Countermovement Jump Performance Recovery in Professional Soccer Players Using an Inertial Sensor

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(No relevant relationships reported)

Purpose
We recently demonstrated accelerated recovery of strength and more rapid resolution of pain in professional soccer players wearing phase change material (PCM) cooling garments post game. During that study, recovery of countermovement jump (CMJ) mechanics was assessed using a wireless inertial sensor (BTS G-Sensor 2, Brooklyn, NY). The purpose of this study was to compare recovery of CMJ mechanics between PCM and control and thereby determine if this sensor is useful for assessing recovery.
Methods
In a randomized, crossover design, 11 elite professional soccer players wore either PCM shorts cooled to 15°C (PCMcold) or ambient temperature (PCMamb; control) for 3 h after a game. CMJ performance was assessed pre game and at 12, 36 and 60 h post game. The following metrics were assessed: flight height (calculated from time in air), jump height (flight height + difference between standing height and takeoff height), low force (unweighting during initiation of countermovement), countermovement (distance dropped during countermovement), force at end of countermovement, rate of force development, eccentric power, peak propulsive force, maximum power, and peak landing force. Data are expressed as % of baseline and analyzed with Treatment (PCMcold vs. PCMamb) by Time (Baseline, 12, 36, 60 h post game) repeated measures ANOVA.
Results
Over the 3-day post-game period PCMcold resulted in better CMJ flight height (PCMcold 104% of baseline, PCMamb 90%; P=0.007) and jump height (PCMcold 110%, PCMamb 95%; P=0.035). Other kinetic and kinematic measures were not different between PCMcold and PCMamb. Overall, low force was progressively higher on the days after the game (P=0.018, 55% higher at 60 h) indicating that players did not unweight themselves as much during the initiation of the countermovement. Additionally, peak landing force was progressively lower on the days after the game (P=0.012, 89% of baseline at 60 h). These effects on low force and landing force did not impair recovery of jump heights as jump heights had fully recovered by 60 h.
Conclusions

The better CMJ performance when players wore PCM cooling shorts post game is evidence of accelerated recovery. This inertial sensor provides a portable and practical means of assessing recovery in elite soccer players.

3251　Board #120　June 2 8:00 AM - 9:30 AM

Effect Of Cold Water Immersion On Skin Temperature: A Thermography Study

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(No relevant relationships reported)

Cold water immersion (CWI) is a recovery method in sports, acting through a reduction in body temperature and improved muscular function by limiting post-exercise inflammation. Infrared Thermography (IRT) is a non-invasive technique to measure skin temperature, and has been used in the diagnosis of hyperthermic muscles, such as occurs with delayed onset muscular soreness. To our knowledge, there are no studies using IRT to analyze the skin temperature in the recovery process following fatiguing exercise. **PURPOSE**: To compare the effect of two CWI protocols as a recovery treatment on skin temperature. **METHODS**: 40 healthy male subjects (age 21.8 ± 2.76 yrs, body mass 73.15 ± 8.15 kg, height 176.6 ± 5.3 cm, and body fat $13.5 \pm 3.4\%$). Subjects went through a fatiguing protocol: 8 sets/30 secs countermovement jumps with 90 second pauses between series. Subjects were randomized in three conditions: control group (CG) (passive recovery, 12 min sitting in a 23 °C room); continuous CWI (CnCWI) (12 min in water at 12 ± 0.4 °C); and intermittent CWI (InCWI) (2 min CWI at 12 ± 0.4 °C, 1 min in a controlled environment at 23°C, until the 12 min of CWI were completed). Maximal lower limb skin temperature (MST) was measured at pre, post24 and post48 hours via IRT camera (FLIR T450). Repeated measures ANOVA were used. Significance was set at p< 0.05.
RESULTS: No between group interaction effects were found in the dominant limb in the frontal plane (F(4,74)= 0.89, p= 0.47): post24 (CG: 33.5±1.1°C vs. CnCWI: 33.4±1.4°C, InCWI: 33.7±0.8°C); post48 (CG: 34.2±0.9°C vs. CnCWI: 33.9±0.8°C, InCWI: 33.6±0.8°C), or in the posterior plane (F(4,74)= 0.54, p= 0.70): post24 (CG: 33.3±1.2°C vs. CnCWI: 33.3±0.7°C, InCWI: 33.5±0.9°C); post48 (CG: 33.2±0.8 vs. CnCWI: 33.8±1.9°C, InCWI: 33.5±1°C). Similarly, no between group interactions were observed in the non-dominant limb in the anterior plane (F(4,74)= 0.68, p= 0.64): post24 (CG: 33.4±1.0°C vs. CnCWI: 34±2.1°C, InCWI: 33.6±0.9°C); post48: (CG: 34.1±0.9°C vs. CnCWI: 33.9±1 °C, InCWI: 34.0±1°C), or for the posterior plane (F(4,74)=0.70, p=0.59), post-24 (CG: 33.1±0.9°C vs. CnCWI: 33.2±0.7°C, InCWI: 33.5±1°C); post48 (CG: 33.1±0.9°C vs. CnCWI: 33.3±0.7°C, InCWI: 33.6±1.1°C).
CONCLUSIONS: Neither CWI protocol reduced mean or maximal lower limb skin temperature at 24 nor 48 hours post fatiguing protocol.

3252　Board #121　June 2 8:00 AM - 9:30 AM

Reproducibility of the RMSSD Index of Heart Rate Variability in Recovery After Exercise

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(No relevant relationships reported)

Heart rate variability (HRV) is an important parameter that allows evaluate parasympathetic reactivation after physical exercise. However, because its a cardiac phenomenon evaluated in non-stationary conditions, it is fundamental to evaluate its reproducibility in post exercise recovery. **PURPOSE**: To analyze whether the RMSSD index of HRV shows reproducibility in both passive and active after maximal exercise recovery. **METODOLOGY**: Eleven young healthy (22.1 ± 3.2 years, 23.5 ± 2.3 kg/m²) and untrained men (36.1 ± 5.2 mL/kg/min) were evaluated. HRV was evaluated by LnRMSSD (heart rate monitors - transformed into a natural logarithm), which reflects the parasympathetic activity, after maximal progressive exercise (cycle ergometer) every 30s throughout the 10 min of test and retest of passive recovery (seated position) and active (5 min at 15W e then at 5 min passively) after exercise. The Shapiro Wilk test was used to test the normality of data, test T-Student's and Wilcoxon were used to compare each recovery of test and retest (p<0,05). Intraclass correlation coefficient (ICC) was used to evaluate the relative reproducibility and standard error of measurement (SEM) and coefficient of variation (CV) to the absolute reproducibility. **RESULTS**: There was difference between test and retest for LnRMSSD only at 120s (p: 0.00) in passive recovery and at 420s (p: 0.04) in active. Reproducibility was observed to both recovery types - in passive recovery: very high at 90, 270, 480 and 570s (ICC: 0.90 - 0.95) and high at 60, 120 to 240, 300 to 450, 510, 540, 600s (ICC: 0.72 - 0.89); at active recovery: high at 30, 150, 240, 270, 330 to 420, 480, 510 and 540s (ICC: 0.70 - 0.87) and moderate at 60, 120, 180, 210, 300, 450, 570 and 600s (ICC: 0.50-0.69). During passive recovery CV varied between 12.83 - 39.73% and SEM between 0.33 - 1.14 ms and during active recovery varied between 16.58 - 39.51% and 0.43 - 1.05 ms. **CONCLUSION**: The RMSSD index is reproducible in

both passive and active recovery after maximal exercise in young men. Therefore, it can be used as a reliable index to evaluate cardiac parasympathetic reestablishment after maximal exercise. Supported by CNPq (process 443361/2014-2) and CAPES.

3253   Board #122   June 2 8:00 AM - 9:30 AM

Perceived Recovery Status is Associated with Back Squat One-Repetition Maximum Self-Efficacy

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(No relevant relationships reported)

Self-efficacy (SE) is defined as an individual's belief in their ability to successfully complete a task. According to SE theory, physiological and affective states can exert influence on efficacy beliefs, thereby affecting performance outcomes. Additionally, fluctuation in daily readiness can also impact performance outcomes due to factors such as stress, sleep problems, or poor physiological recovery from previous bouts of training. To evaluate daily readiness through the assessment of these performance factors, a variety of scales and questionnaires exist. One such assessment, the Perceived Recovery Status (PRS) scale, asks individuals to indicate how well recovered they feel on a 0-10 Likert scale. However, despite widespread usage of the PRS scale, no study has examined if pre-training recovery is indeed related to increased SE. **PURPOSE**: To investigate the relationship between recovery as indicated by the PRS scale and SE in resistance trained individuals prior to a one-repetition maximum (1RM) back squat test. **METHODS**: Fifty-eight resistance-trained males (n=41) and females (n=17) (age: 23±3 yrs, body mass: 80.64±16.49 kg) completed the PRS scale and a modified version of the Self-Efficacy Questionnaire for Athletes (mSEQ-A), prior to a 1RM back squat test. The mSEQ-A required participants to rate, on a 0-100 Likert scale, how confident they were that they could beat their previous back squat personal record by any load. Next, following a 5-minute dynamic warm-up, subjects completed a validated 1RM back squat protocol. A Pearson's product moment correlation was used to determine any relationships between PRS ratings and SE beliefs. **RESULTS**: Mean PRS rating was 7.7±1.5, while mean mSEQ-A rating was 52.4±35.7. Regression analysis revealed that the PRS scale was significantly related to SE as determined by the mSEQ-A (r=0.39, p<0.05). **CONCLUSIONS**: The PRS scale was significantly related to SE. These findings reflect the fact that individuals who perceived themselves to be more well-recovered, also perceived themselves to be more likely to succeed in a 1RM test.

3254   Board #123   June 2 8:00 AM - 9:30 AM

Electromagnetic Field Application Effects on Recovery and Power after Sport-Specific Exercise Intervention: Feasibility Study

Nauris Tamulevicius[1], Tanuj Wadhi[1], Emily A. Daniels[1], Guillermo R. Oviedo[2], Stephen Baeder[1]. *[1]The University of Tampa, Tampa, FL. [2]University Ramon Llull, Barcelona, Spain.*
(No relevant relationships reported)

Electromagnetic field application (EFA) has demonstrated increased vasomotor function of vessels throughout the body and thus on microcirculatory blood flow regulation in the clinical population. It is unknown if EFA can positively influence recovery and improve physical conditioning in tennis players. **PURPOSE**: To determine if EFA optimizes recovery and improves anaerobic/power parameters in female college tennis players. **METHODS:** Subjects for this study consisted of female NCAA Division II tennis players (n=7, age 19.7±1.3 y.o., weight 65.7± 9.7 kg, height 168.1 ±2.04 cm). EFA was used 22 times across a 4 week period after sport-specific training or after matches. EFA protocol included 8 minutes of laying on the BEMER EFA, which transmitted weak electromagnetic field of flux density 35-50 µTesla (highest level). Subjects were also required to express their Rate of Perceived Fatigue (RPF scale 0-10) before and after every application. Standardized 30 s Wingate tests were performed before the 1st week of the application, 1 week after, 3 weeks after, and 4 weeks after EFA recovery protocol. Heart rate (HR), O_2 saturation and blood lactate (BL) were analyzed pre, post, post-1 min, post-3 min, post-5 min, and post-10 min after the Wingate tests. **RESULTS:** Absolute Peak Power (APP) increased after 22 EFA applications from 428.7±118.5 W to 491.5±113.4 W (p=0.063) and Relative Peak Power (RPP) increased from 6.5±1.2 W/kg to 7.5±0.9 W/kg (p=0.063). BL levels decreased post-1minute from 11.2±1.15 mmol/L to 9.8±1.5 mmol/L (p=0.063). ΔRPF before and after application decreased significantly from 2.57±0.79 to 1.43±0.79 (p=0.034). Although APP, RPP, and BL post-1minute improved, it was not significant (p=0.063) possibly because of the relatively small sample size. Changes in other anaerobic/power parameters were not as notably expressed. **CONCLUSION:** Improved microcirculatory blood flow could suggest that APP and RPP increased over the span of a 4-week period in female tennis players. Significant decrease in RPF

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suggests that EFA might be an effective tool to use for recovery after sport-specific training and/or matches for tennis players. Considering the observed changes in 4 weeks, supplementary studies using a larger sample size should be explored.

3255   Board #124   June 2 8:00 AM - 9:30 AM

Effects of Recovery Type on Blood Lactate and Performance Following Repeated Wingate Tests in Females

Madison L. Kirkpatrick, Boe M. Burrus. *Humboldt State University, Arcata, CA.* (Sponsor: Vincent J Paolone, FACSM)
(No relevant relationships reported)

The optimal type of recovery to maximize performance and regain homeostasis after maximal exercise in sport has mixed results. There is a lack of research on the effect of a longer duration active recovery protocol on blood lactate and performance in repeated Wingate tests. Also, minimal research exists with females in this area. **PURPOSE:** To determine if an active recovery of a prolonged duration at a moderate intensity is more beneficial for subsequent anaerobic performance than passive recovery by analyzing blood lactate and anaerobic performance variables across Wingate tests. **METHODS:** Subjects completed an incremental test to determine their peak power output, and 50% of peak power was used as the active recovery intensity. A 15 minute recovery time frame was used. Blood lactate measurements were collected after the first Wingate, at five-minute increments of the recovery protocol, and after the second Wingate. RPE was also collected after each Wingate test. **RESULTS:** A significant interaction was found between recovery and time for blood lactate ($F = 6.935$; p = 0.000). Blood lactate levels were significantly lower for the active recovery trial at all time points of recovery, but no significant difference in performance was observed for any of the variables measured between the passive and active trials. **CONCLUSION:** Based on previous research, the lower lactate values and performance might not be as connected as previously thought. However, the lower lactate levels can still be beneficial to recovery after intense exercise and repeated attempts, but there may be no effect of blood lactate clearance on performance. It is possible that a buildup of H^+ ions decreases muscle cell contractility enough for both recovery types that differences in performance between the two conditions are miniscule and therefore may be negligible when using the current parameters.

3256   Board #125   June 2 8:00 AM - 9:30 AM

Respiratory Impedance Enhances Recovery and Performance During Repeated Bouts of High-Intensity Exercise

Peggy A. Plato, Isabel L. Romero, Olivia M. Nierhake, Andrew W. Tsao. *San Jose State University, San Jose, CA.* (Sponsor: Craig Cisar, FACSM)
(No relevant relationships reported)

Impedance threshold devices (ITD) were initially developed to maintain blood pressure during battlefield trauma. By creating a greater negative intrathoracic pressure, venous return is enhanced (Ryan et al., 2008). Convertino et al. (2005) found that spontaneous breathing through an ITD increased stroke volume and cardiac output during the initial 10 s of standing from a squat position and was an effective countermeasure against hypotension initiated by the squat-to-stand test. **PURPOSE:** This study evaluated the efficacy of using an ITD during recovery following three consecutive 30 s, high-intensity exercise bouts on a bicycle ergometer. **METHODS:** Fifteen participants (11 men, 4 women, 24 ± 1 years-of-age, $M \pm SEM$) completed two exercise conditions separated by at least 7 days: control (no ITD) and breathing through an ITD during recovery (ResQGARD®, Advanced Circulatory Systems, Eden Prairie, MN). Each exercise bout was performed with a resistance set at 60 g/kg body weight followed by a 4 min recovery between bouts. **RESULTS:** Ratings of perceived exertion ranged between 7.9 and 9.5 on the Borg category-ratio scale during the three exercise bouts with ratings slightly lower during the ITD condition ($F(1, 54) = 4.774$, $p < .05$). There was a significant interaction effect for ratings of perceived recovery ($F(3, 40) = 2.980$, $p < .05$) with participants indicating they felt better recovered after bout 3 when using the ITD. There was also a significant interaction effect for mean power ($F(2, 28) = 3.842$, $p < .05$) with power better maintained during bout 3 when using the ITD (416 ± 32 W vs. 400 ± 34 W for the control condition). In contrast, there were no significant effects of the ITD on peak power or blood lactate compared to the control condition. **CONCLUSION:** Using an ITD between repeated bouts of high-intensity exercise may help individuals feel better recovered and, thus, able to maintain higher mean power during subsequent exercise bouts.

SATURDAY, JUNE 2, 2018

3257   Board #126   June 2 8:00 AM - 9:30 AM

The Effect Of Self-myofascial Release As A Warm-up On Muscular Strength And Power

Theodore M. DeConne, II, Marc Robertson, William Lunn. *Southern Connecticut State University, New Haven, CT.*
(No relevant relationships reported)

Individuals are often instructed to use a foam roller as a warm-up (WU), despite a lack of evidence supporting performance enhancement claims attributed to foam rolling self-myofascial release (FR-SMR). Studies have investigated whether foam rolling can be used to enhance performance; however, more research is required.
PURPOSE: To determine whether variations of an acute bout of FR-SMR WU will affect maximal muscular strength and power performance differently than a placebo SMR WU.
METHODS: Adult men (N=3) and women (N=3) [N=6, age=23.5 ± 3.39 years, height=66.08 ± 4.77 cm, and average mass=67.46 ± 17.57 kg] were recruited for the study. This study was an intra-participant design consisting of one condition comparing the impact of three different WU conditions on two performance tests. Each participant randomly performed one of the three WU conditions each day: 1) FR-SMR plus dynamic WU (FR-D), 2) FR-SMR only (FR), and 3) FR "shadowing" plus dynamic WU (noFR-D). The "shadowing" condition involved the foam rolling movements without the actual roller. Routines were separated by a week, for a total of three weeks. The performance tests were completed after each WU in the following order: a counter-movement squat jump (CMSJ) on a force platform and 10 repetitions maximum (10RM) bench press. The CMSJ was used to measure relative maximal power and the 10RM bench press was used to assess relative maximal strength. A one-way multivariate ANOVA was used to test significance in performance between WU conditions (p < 0.05).
RESULTS: There were no significant differences in maximal strength or power between FR-D, FR, and noFR-D (relative maximum power: FR-D=54.93 ± 3.92 W/kg, noFR-D=56.03 ± 5.95 W/kg, FR=56.59 ± 4.08 W/kg; relative maximum strength: FR-D=0.83 ± 0.34 kg/kg, noFR-D=0.82 ± 0.33 kg/kg, FR=0.88 ± 0.36 kg/kg) (*p*=0.980).
CONCLUSIONS: Integration of FR SMR into a WU offers no additional benefits to produce maximal strength or power. While FR did not enhance maximal strength and power, FR did not appear to be detrimental to the production of maximal strength and power.

3258   Board #127   June 2 8:00 AM - 9:30 AM

The Effects of a Proprietary Resistance Garment Technology on Exercise and Recovery Energy Expenditure

John Paul M. Arreglado, Samantha Silva, Edward Jo. *Cal Poly Pomona, Pomona, CA.*
(No relevant relationships reported)

Previous research demonstrates the benefits of compression exercise garments as it relates to performance and recovery. For instance, compression garments have attenuated delayed onset of muscle soreness and increased the rate by which muscular contractile kinematics were restored. However, the overall body of research related to the use of compression garments have failed to evaluate its full complement of potential applications in sport and exercise. Physiclo with their Pro Resistance Technology has innovated a new line of compression garments that may apply added resistance to physical movements ranging from every day activities to high intensity athletic training. In turn, the purported benefits include facilitated performance and body composition adaptations due the added metabolic demand and musculoskeletal stress. There is limited empirical information regarding the effects of such class of compression garments on energy expenditure across various exercise modes. PURPOSE: The purpose of this investigation is to examine the effects of Physiclo compression garments on exercise and recovery energy expenditure in NCAA collegiate athletes. METHODS: In a randomized, cross-over design study, 16 healthy male (n=8) and female (n=8) subjects underwent a series of exercises wearing either the experimental (Physiclo) compression garment (EXP) or general exercise attire (CON) while simultaneously undergoing indirect calorimetry and heart rate measurements. RESULTS: When examining the data in aggregate the EXP increased oxygen consumption and energy expenditure by 15%, ventilation rate by 22%, and heart rate by 18% during an entire bout of exercise in comparison to non-specialized sports garments (p<0.05). The improvement in oxygen consumption, energy expenditure, ventilation and heart rate was statistically equivalent between sexes and among each exercise task. Post-workout recovery measures for oxygen consumption, energy expenditure, ventilation, and heart rate did not differ between EXP and CTL conditions. CONCLUSIONS: We conclude that the use of the Physiclo compression garment may enhance the metabolic demand of an exercise bout which provides some insight into their benefits relating to performance and physiological adaptations to training.

3259   Board #128   June 2 8:00 AM - 9:30 AM

Sleeping Patterns of NCAA D1 Collegiate Athletes: A Sex Comparison

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(No relevant relationships reported)

PURPOSE: To compare male and female sleep surrounding competition in NCAA Division 1 athletes. **METHODS**: 22 collegiate male soccer athletes (mean±SD; age, 20±0 y; height, 181.2±6.5 cm; mass, 79.4±6.9 kg) and 11 collegiate female cross-country runners (mean±SD; age 19±1 y; height 168.4 ± 7.7 cm; mass 58.8 ± 9.6 kg) participated in this study, in which their sleeping behaviors were captured using a wrist-worn actigraphy device throughout the entire competitive season. Metrics captured included: Heart rate Variability (HRV), Hours of Sleep (SleepHours), Sleep Need (SN), Sleep Efficiency (SE), Sleep Disturbances (SD), Wake Time (WT), Light Sleep Time (LS), Slow Wave Sleep Time (SWS), Rapid Eye Movement Sleep Time (REM), and Time in Bed (TiB). A linear mixed effect model assessed the differences between male and female athletes during one night prior to competition (COMPpre) and the night following competition (COMP). The total number of observations and the number of athletes were recorded (COMPpre: 300 observations, 33 athletes; COMP: 267 observations, 30 athletes). The results are reported as mean difference (MD) with 95% confidence intervals (95%CI). **RESULTS**: The female athletes experienced significantly less SN on COMPpre than males (MD [95%CI], - 0.53h [-1.00, -0.05], p=0.03). No other sleep variables were significantly different on COMPpre.
In regards to COMP, the female athletes obtained more SleepHours, LS, REM, and TiB than males (SleepHours, 1.13 h [0.11, 2.15], p=0.03; LS, 0.98h [0.29, 1.66], p=0.01; REM, 0.63h [0.32,0.94], p<0.001; TiB, 1.24h [0.25, 2.23], p=0.02). However, females experienced more SD than their male counterparts (SD, 3.77 [1.17, 6.37], p=0.01). The female athletes also experienced less SWS than males on COMP (SWS, -0.41h [-0.76, -0.06], p=0.02). **CONCLUSION:** The findings of this study illustrated that the female athletes were more rested prior to competition, which could be related to the men's team having midweek games and less sleep continuity. Future investigation is warranted to determine the potential causes of the differences on COMP. Increased sleep duration and quality could positively affect performance on the field and in the classroom, which is important for the collegiate cohort. Future studies should standardize the sleep quality metrics relative to SleepHours.

G-40   Free Communication/Poster - Muscle Architectural Adaptations - Hypertrophy and Atrophy

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3260   Board #129   June 2 9:30 AM - 11:00 AM

Effects Of Glutamine Supplementation On Overload-induced Muscle Growth And Function In Mice

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(No relevant relationships reported)

Muscle hypertrophy induced by functional overload (FO) provides an *in vivo* model to study muscle growth. Glutamine has been shown to improve muscle function, maintain contractile protein levels, and reduce inflammation; however, its effects during muscle growth is unclear. **PURPOSE:** These experiments tested the hypothesis that glutamine supplementation positively impacts the skeletal muscle response to a growth stimulus as evidenced by greater hypertrophy, increased growth factor levels, and improved contractile function compared to placebo. **METHODS:** Mice underwent FO of the plantaris or sham surgery. *In vivo* plantaris force and fatigue resistance (% of maximal force after 10 contractions) were measured 14 days after FO or sham in mice receiving daily glutamine (1 g/kg body mass) or placebo (n= 7-9/group). Insulin-like growth factor 1 (IGF-1) was measured in the plantaris by ELISA after 14 days of FO or sham. Data were analyzed with 2-way ANOVAs. **RESULTS**: FO increased plantaris mass independent of treatment; however, glutamine tended to enhance muscle hypertrophy compared to placebo (Placebo: 15 ± 0.6 vs. 28 ± 2 mg and Glutamine: 16 ± 0.5 vs. 34 ± 3 mg, for sham and FO, respectively, p<0.05). Maximal isometric force relative to body mass was unchanged with FO, independent of glutamine. Fatigue resistance was increased with FO compared to sham, independent of glutamine (Placebo: 39 ± 4 vs. 50 ± 5% and Glutamine: 33 ± 2 vs. 56 ± 2%, for sham and FO, respectively, p<0.05). Muscle levels of IGF-1 were significantly increased with FO, independent of glutamine

(Placebo: 55 ± 7 vs. 848 ± 131 pg/mg protein and Glutamine: 25 ± 10 vs. 813 ± 174 pg/mg protein, for sham and FO, respectively, $p<0.05$). **CONCLUSIONS:** Functional overload was associated with significant hypertrophy, elevated IGF-1 levels, and increased fatigue resistance, but these adaptations were not enhanced with glutamine supplementation.
Supported by Iowa Space Grant Consortium Undergraduate Research Award

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3261   Board #130   June 2 9:30 AM - 11:00 AM

Contribution Of Exercise, Physical Activity, And Protein To Functional Cross-sectional Area And Intramuscular Adipose Tissue

Kyle J. Hackney[1], Nathan D. Dicks[1], Kara A. Stone[1], Christopher J. Kotarsky[1], Allison M. Barry[1], Jill Keith[1], Steven Mitchell[2], Wonwoo Byun[3], Sherri N. Stastny[1]. *[1]North Dakota State University, Fargo, ND. [2]Sanford Health, Fargo, ND. [3]University of Utah, Salt Lake City, UT.*
(No relevant relationships reported)

Muscle cross sectional area (CSA) has historically been used as a measure for skeletal muscle size, however, functional cross sectional area (FCSA), defined as the area of muscle isolated from adipose tissue within the CSA, is more closely associated with muscular health. The visible adipose tissue beneath the muscle fascia, defined as intramuscular adipose tissue (IMAT), has also been linked to metabolic abnormalities at increased levels in clinical populations. In contrast, in some healthy populations IMAT may be used as a fuel source for physical activity (PA) and dietary intake may influence IMAT.
PURPOSE: This study examined factors that predicted FCSA and IMAT in the knee extensors (KE) of younger and older men and women. **METHODS:** Ninety-eight participants (46 male, 52 female) were classified as younger (20-35 yr) and older (50-65 yr) as well as sedentary (< 2 days per week) and active (3+ days per week) based on self-reported age and concurrent resistance and aerobic exercise training status. All participants completed anthropometry measurements, lower body muscle function testing, a 3-day dietary intake log, and wore an accelerometer for seven days. Participants then completed magnetic resonance imaging (MRI) scanning of the lower limbs. Muscle CSA was determined by manually tracing the KE and FCSA and IMAT were derived through color thresholding. Independent samples t-tests were conducted and two separate step-wise regression analyses were performed to predict FCSA and IMAT. **RESULTS:** IMAT (cm^2) was significantly higher in the sedentary (3.74 ± 1.93) vs. active (1.85 ± 0.56) as well as in older (3.14 ± 2.05) vs. younger (2.74 ± 1.25) (P < 0.05). Protein intake (g·kg·day^{-1}) was also significantly higher in active (1.63 ± 0.55) vs. sedentary (1.19 ± 0.40) (P < 0.05). Gender, age, concurrent exercise training status, and protein intake significantly predicted 70% of the variance in FCSA (P < 0.01), while concurrent exercise training status and light PA predicted 33% of the variance in IMAT (P < 0.01). **CONCLUSION:** Concurrent exercise, protein intake, and light PA are major determinants of skeletal muscle health and may require further investigation to mitigate aging and activity related loss of muscle quality. Funding: Sanford Health/NDSU Collaborative Research Seed Grant Program

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3262   Board #131   June 2 9:30 AM - 11:00 AM

Muscle Morphology is Not Altered in PGC-1α Transgenic Mice following Bupivacaine Injection

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(No relevant relationships reported)

Peroxisome proliferator-activated receptor-γ coactivator-1α (*PGC-1α*) is a transcriptional activator shown to stimulate mitochondrial biogenesis. *PGC-1α* overexpression has been shown to reduce muscle damage and wasting in a variety of pathophysiological conditions. However, how *PGC-1α* accomplishes this is unknown. **PURPOSE:** To examine the effects of muscle specific overexpression of *PGC-1α* on muscle fiber size distribution, cross-sectional area (CSA), 4EBP-1 protein content, and *MyoD* gene expression during muscle regeneration. **METHODS:** 23 C57BL/6 (WT) and 24 Transgenic (A1) mice were used for this study, with A1 mice having muscle specific overexpression of the protein *PGC-1α*. Mice were injected with either PBS or Bupivacaine (MAR) at 12 weeks of age. Tibialis anterior (TA) muscle and tibias were excised 3 days and 28 days post injection. Tissue was immediately frozen for morphology and gene expression analysis using RT-qPCR. **RESULTS:** *PGC-1α* gene expression was 15-fold greater in A1 mice compared to WT mice (p<0.05). There was no difference in TA mass/Tibia length ratio in any mice 3 days or 28 days post-injection with bupivacaine. In WT mice 3 days post-bupivacaine injection, *MyoD* gene expression was 50% higher (p< 0.05) than the PBS control group. In A1 mice 3 days post-bupivacaine injection, *MyoD* gene expression was 75% lower than PBS control group. P-4EBP-1/4EBP-1 content was 50% higher in WT mice 3 days post-bupivacaine injection compared to the PBS control group. In A1 mice 3 days post-bupivacaine injection, P-4EBP-1/4EBP-1 was ~50% lower compared to the PBS

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control group (p<0.05). 28 days post-bupivacaine injection there was a 18% decrease in CSA in WT mice, however there was no change in CSA of A1 mice (p<0.05). In WT mice 28 days post-bupivacaine injection, there was an increase in the proportion of small fibers (<300µm^2) and a decrease in the proportion of large fibers (>900µm^2). In A1 transgenic mice 28 days post-bupivacaine injection, there were no differences in fiber size distribution. **CONCLUSION:** Muscle specific overexpression of *PGC-1α* has been shown to protect muscle from damage. We demonstrate no change in muscle morphology in mice that overexpress *PGC-1α* in muscle. The altered microenvironment could be due to a shift away from proliferation of myoblasts towards differentiation.

3263   Board #132   June 2 9:30 AM - 11:00 AM

Characterizing a Novel Rodent Exercise Model to Explore the Permanency of Myonuclear Accretion During Muscle Adaptation

Cory M. Dungan, Kevin A. Murach, Ivan Vechetti, Jr, John J. McCarthy, Charlotte A. Peterson. *University of Kentucky, Lexington, KY.* (Sponsor: Brian Noehren, FACSM)
(No relevant relationships reported)

Myonuclear density increases during skeletal muscle hypertrophy, and it has been postulated that newly-acquired myonuclei are permanent and constitute a "muscle memory" of previous adaptation; however, the available evidence supporting this is equivocal. **PURPOSE:** To determine if myonuclear accretion in skeletal muscle is permanent following a period of prolonged detraining after training utilizing a novel progressive weighted-wheel running (PoWeR) protocol. **METHODS:** PoWeR training involved the progressive addition of weight (2-6g) to an un-balanced running wheel over 8 weeks. Four month old female C57Bl/6J mice (n=8-10/group) performed PoWeR, while another cohort performed PoWeR followed by 12 weeks of detraining. Age-matched ambulatory controls were used for baseline comparisons. Following training and detraining, the soleus and plantaris muscles underwent immunohistochemical analyses. **RESULTS:** Wet weight of the soleus muscles, when normalized to body weight (mg/g), was greater in the PoWeR trained mice when compared to the in the controls, 0.48 ± 0.05 and 0.36 ± 0.02, repectively (P<0.05). Similarly, normalized plantaris muscle mass was increased following PoWeR training (0.51 ± 0.04) when compared to the controls (0.58 ± 0.05; P<0.05). This resulted in a 32% and 14% increase in normalized wet weight after PoWeR in the soleus and plantaris muscles, respectively (P<0.05). Fiber cross-sectional area (CSA) was 22% greater in the soleus and 15% greater in the plantaris (P<0.05), while myonuclei per fiber increased by 32% and 41% in the soleus and plantaris, respectively (P<0.05). Additionally, there was a fiber-type shift toward a more oxidative phenotype in the soleus and plantaris. After detraining, normalized muscle wet weight and muscle fiber CSA are returning towards baseline, while the fiber-type distribution shifted from slow-to-fast. Myonuclear density following detraining is currently being quantified. **CONCLUSION:** PoWeR provides a methodological advantage over exercise models currently used in mice since it is non-surgical, and elicits oxidative and hypertrophic adaptations in both slow-twitch and fast-twitch muscles. Moreover, the data gathered in this study will provide new insight into the plasticity of myonuclear number following detraining of hypertrophied muscles.

3264   Board #133   June 2 9:30 AM - 11:00 AM

Effect Of Repeated Bouts Of Resistance Exercise On Skeletal Muscle Proteolytic Response In Rat.

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(No relevant relationships reported)

Resistance training (RT) increases the skeletal muscle mass and strength. It has been reported that activation of the mammalian target of rapamycin (mTOR) signaling, which is important for skeletal muscle protein synthesis, is attenuated by increasing exercise bout. However, the effect on proteolytic response is unclear. **PURPOSE**: The present study aimed to investigate the changes in proteolytic responses to repeated bouts of resistance exercised. **METHODS**: Male Sprague-Dawley rats were randomly assigned into four groups: Sedentary (SED), resistance-exercised with 1bout (1B), 2bouts (2B), 3bouts (3B). RT protocol consisted of 50 repetitions of maximal isometric contraction of the right gastrocnemius muscle by direct electric stimulation under anesthesia. Muscle samples were collected 3h and 6h after the final exercise session. **RESULTS**: Phosphorylation of p70S6K increased in all trained groups (1B: 15 fold, 2B: 10 fold, 3B: 8 fold, P<0.05). And there was also significant difference between 1B and 3B. The protein ubiquitination increased in all trained groups of 1.2-fold in SED (P<0.05). And Light chain 3 (LC3), which is a marker for autophagy, increased in all trained groups of 1.5-fold in SED (P<0.05). MuRF-1 mRNA showed a significant 5.1-fold increase with training (P<0.05). However, there were no effect of repeated bouts of RT in muscle proteolytic response. **CONCLUSIONS**: The present results suggest

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that the muscle protein proteolytic response was activated by RT. In addition, the activation of mTOR signaling attenuated with the increase in RT bouts, but the level of activation of proteolytic response did not change.

3265　　Board #134　　　　June 2 9:30 AM - 11:00 AM

Elevating Protein Synthesis: Turn it Down a Notch

Joshua R. Huot, Susan T. Arthur. *University of North Carolina at Charlotte, Charlotte, NC.*
(No relevant relationships reported)

PURPOSE: Notch signaling is thought to be crucial in regulating skeletal muscle regeneration, however, the impact Notch signaling has on other skeletal muscle processes (e.g. protein synthesis) remains unclear. The purpose of this project was to determine the effects of Notch inhibition on protein synthesis during the myogenic program.
METHODS: C2C12 cells were treated with or without a λ-secretase inhibitor (GSI) to determine the effect of Notch inhibition on anabolic signaling and protein synthesis during myoblast proliferation and differentiation. Samples were collected and analyzed for components of Notch, anabolic signaling (PTEN/AKT/mTOR pathway), and protein synthesis (via puromycin incorporation).
RESULTS: GSI treatment reduced Notch signaling: c-myc ($P < 0.05$) and Hes1 ($P < 0.01$). GSI treatment elevated pmTOR Ser2448 ($P < 0.05$), pmTOR Ser2481 ($P < 0.05$), pTSC2 Thr1462 ($P < 0.05$), and protein synthesis ($P < 0.05$) in C2C12 myoblasts. GSI-treated C2C12 myotubes demonstrated increases in pAKT Thr308 ($P < 0.01$), pAKT Ser473 ($P < 0.05$), pTSC2 Thr1462 ($P < 0.001$), pmTOR Ser2448 ($P < 0.05$), and protein synthesis ($P < 0.01$). GSI treatment lowered PTEN expression in myotubes ($P < 0.05$).
CONCLUSIONS: These results demonstrate that Notch signaling may regulate protein synthesis via the PTEN/AKT/mTOR pathway.

3266　　Board #135　　　　June 2 9:30 AM - 11:00 AM

Apoptosis In Recovering Human Skeletal Muscle after High Intensity Cycling In Men Receiving Ergogenic Rg1 Compound

Chia-Hua Kuo, FACSM, Jin-Fu Wu. *University of Taipei, Taipei, Taiwan.*
(No relevant relationships reported)

PURPOSE: To examine the impact of high intensity exercise on cell death in human skeletal muscle during recovery with Rg1 supplementation, which has been shown to increase endurance performance. **METHODS**: Using randomized double blind placebo controlled crossover design, twelve young men were studied on three occasions: Placebo, Rg1 (1 mg) and Rg1 (5 mg) supplementation 1 h prior to a high-intensity exercise. Biopsied samples were taken from vastus lateralis before, immediately after and 3 h after a 1-h cycling exercise at 75% VO$_{2max}$. **RESULTS**: Apoptotic and necrotic cells in vastus lateralis increased immediately after 1 h cycling (80-140% and 80-120%, $P < 0.05$), concurrent with macrophage infiltration (both CD68+ and CD163+). Increases in iNOS and myogenic factor Myf5 mRNA levels after exercise were further elevated during Rg1 supplemented trial. Rg1 (5 mg) significantly increased high intensity endurance performance and accelerates the disappearance of apoptotic and necrotic cell number occurred 3 h after exercise during recovery. **CONCLUSION**: High intensity exercise increased cell death in human skeletal muscle after high intensity aerobic exercise. The ergogenic compound Rg1 accelerates phagocytosis to remove unhealthy muscle cell in exercised skeletal muscle.

3267　　Board #136　　　　June 2 9:30 AM - 11:00 AM

Systemic Effect On Myotube Size After Sprint Exercise Combined With Nutrients

Hakan C. Rundqvist[1], Janelle Tarum[2], Mona Esbjörnsson[1], Fawzi Kadi[2], Eva Jansson[1]. *[1]Karolinska Institutet, Stockholm, Sweden. [2]School of Health and Medical Science, Örebro University, Örebro, Sweden.*
(No relevant relationships reported)

PURPOSE: To study systemic effects of sprint exercise combined with nutrient ingestion on muscle cell hypertrophy. It was hypothesized that the size of human muscle cells increases when they are exposed to post-exercise serum in nutrient but not in placebo condition. Previously studies have shown that oral ingestion of essential amino acids (EAA) and carbohydrate results in higher activation of Akt/mTOR signalling and higher rate of muscle protein synthesis following sprint exercise in humans. Both local and systemic factors may contribute to these effects. Moreover, If the nutrient-induced effects on signalling and muscle protein synthesis result into muscle hypertrophy is not known. In this study we "isolate" the systemic effects by exposing cultured muscle cells for post sprint exercise serum from either nutrient ingestions or placebo.

METHODS: This study is based on a previous study, were healthy subjects performed three 30-s sprints with 20 minutes rest in between. Subjects ingested a flavoured drink containing EAA and maltodextrin (nutrient) or only flavoured water (placebo) during the sprint exercise session up to 15 min after the last sprint in a randomized order with one month interval. Blood samples were collected before during and up to 200 minutes after the last sprint and were analyzed for EEA, insulin lactate and glucose. Human myoblasts were isolated from vastus lateralis and differentiated into multinucleated myotubes, which were cultured in serum collected from 5 subjects from the sprint exercise study described above. Blood samples, obtained at 80 min after the last sprint, were chosen since the peak values for the accumulation of insulin and EAA occur approximately at that time point.
RESULTS: Both serum insulin (6-fold; $P<0.05$) and plasma leucine levels (2.6-fold; $P<0.01$) were higher after nutrient compared to placebo 80 min post-exercise. Plasma lactate and glucose levels did not differ between the conditions. Myotube size was 16% larger after exposure to post sprint exercise serum obtained during nutrient as compared to placebo ($P<0.05$).
CONCLUSIONS: Systemic factors may stimulate muscle hypertrophy after sprint exercise when combined with nutrient ingestion. If such a systemic effect may be counteracted by intracellular metabolic perturbations after sprint exercise is not known.

3268　　Board #137　　　　June 2 9:30 AM - 11:00 AM

Comparing Muscle Hypertrophy and Myosin Heavy Chain Content between Relative Intensity and Repetition Maximum Resistance Training

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(No relevant relationships reported)

Comparison of resistance training (RT) methodologies is a critical component of determining appropriate and specific recommendations for health and human performance. Repetition maximum (RM) training typically consists of performing each exercise to momentary failure, thus providing a RM each day of training. Relative intensity based on sets and repetitions (RI$_{SR}$) conversely uses a percentage of a maximum or estimated maximum, typically not leading to failure. **PURPOSE:** To compare 10-weeks RI$_{SR}$ or RM resistance training on skeletal muscle fiber size and protein accretion in well-trained subjects. **METHODS:** Fifteen well-trained males (age = 26.9+3.9yrs, body mass = 86.2+12.1kg) participated in the study (RI$_{SR}$ group, n=7; or RM group, n=8). Muscle biopsies of the vastus lateralis were sampled 72 hours before beginning the intervention and again 72 hours after the final training. The 10-week RT program consisted of several phases: strength-endurance, maximum strength, a planned overreach, and a taper. The RM group achieved a daily maximum in each lift while the RI$_{SR}$ group used a variety of submaximal training loads not leading to muscular failure. Workloads measured by volume load were similar between groups ($p>0.05$). A 2x2 mixed design ANOVA and effect size using Hedge's g were performed for Type I cross-sectional area (CSA), Type II CSA, myosin heavy chain (MYH)1, MYH2, and MYH7. **RESULTS:** RI$_{SR}$ significantly increased Type I CSA ($p = 0.018$) and Type II CSA ($p = 0.012$). None of the MYH proteins reached statistical significance for either group ($p>0.05$). Between-group effect sizes favored the RI$_{SR}$ group for all variables: Type I CSA g=0.48, Type II CSA g=0.50, MYH1 g=0.31, MYH2 g=0.87, and MHY7 g=0.59. **CONCLUSIONS:** These results suggest RT utilizing a RI$_{SR}$ approach may provide superior intramuscular outcomes compared to RM training in higher level lifters.

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Elevated Myostatin Expression Promotes Skeletal Muscle Fibrogenic Cell Expansion Following ACL Injury

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(No relevant relationships reported)

Anterior cruciate ligament (ACL) injuries induce quadriceps muscle maladaptations that contribute to protracted weakness. We have previously shown negative morphological and cellular changes in the quadriceps following an ACL injury that promote a pro-fibrotic muscle environment. There are many unknown initiators and contributors to fibrotic pathways and understanding the mechanisms, cell types, and factors involved in the progression of fibrosis is critical for developing treatment strategies.
PURPOSE: To determine the contribution of myostatin to the development of a pro-fibrotic muscle environment following an ACL injury.
METHODS: We obtained muscle biopsies from the injured and non-injured vastus lateralis of young adults (n=14; 23±4 yr). Expression of myostatin, transforming growth factor-β and other regulatory factors were investigated. Immunohistochemical analyses were performed to assess fibrogenic cell expansion, and primary fibroblasts were isolated from muscle biopsies and subsequently treated with myostatin *in vitro*.

RESULTS: Injured limb skeletal muscle demonstrated an approximate 100% increase in myostatin gene (p < 0.005) and protein (p < 0.0005) expression, which correlated (p < 0.05) with fibroblast abundance in the injured limb. Human fibroblasts expressed the activin type IIB receptor, underscoring the regulatory ability of myostatin. Treatment with myostatin induced a 70% increase in the proliferative rate of primary human muscle-derived fibroblasts (p < 0.05).
CONCLUSIONS: These findings support an integral role for myostatin in promoting fibrogenic alterations within skeletal muscle following an ACL injury. Supported by NIH grants: K23 AR062069 and P30 AG024832 and the John Sealy Memorial Endowment Fund.

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Comparisons The Strength Performance of Sarcopenia Defined by AWGS & EWGSOP Criteria Among Elderly

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(No relevant relationships reported)

PURPOSE: The aim of the present study was to identify a better criteria of sarcopenia for community-dwelling older Taiwanese.
METHODS: Sixty-two community dwelling people (48 men and 14 women) over 65 years were recruited from Taoyuan, northern Taiwan. Participants were interviewed by trained investigators using Short Portable Mental Status Questionnaire (SPMSQ) and Physical Activity Readiness Questionnaire. Body composition was measured by skinfold (SF) and Body Mass Index (BMI). Strength functional performances were obtained by sit to stand (SS), arm curl (AC), eight-inch walk (EW), grip strength (GS), knee strength (KS) using the standard procedures. Sarcopenia was defined according to the Asian Working Group for Sarcopenia (AWGS) and Report of the European Working Group on Sarcopenia in Older People (EWGSOP). One-way ANOVA test was used to compare the differences within groups.
RESULTS: Of the 62 subjects (76.79 ± 5.32 yrs), 18 were classified in sarcopenia group (ASG) and 44 were normal group (ANG) by AWGS. Ten were classified in sarcopenia group (ESG) and 53 were normal group (ENG) by EWGSOP. The strength performances were different in ASG and ANG, included in SS, AC, EW, GS left and GS right hand (p<0.05), except KS extension and flexion (p>0.05). The strength performances were also different in ESG and ENG, included in AC, EW, GS left and GS right hand, except SS, KS extension and flexion (p>0.05), as listed in Table 1.
CONCLUSIONS: Both AWGS and EWGSOP can effectively define sarcopenia in community-dwelling older Taiwanese, especial AWGS. Supported by NSC 97-2410-H-179-007-MY2.

Table 1. Strength performance different between Sarcopenia and normal elderly				
	ASG	ANG	ESG	ENG
SS (times)	10.62 ± 4.05*	13.87 ± 3.24	11.78 ± 4.28	13.76 ±3.22
AC (times)	13.31 ± 7.00 *	18.30 ± 4.96	14.71 ± 6.64*	18.29 ± 5.09
EW (second)	7.63 ± 3.23 *	6.08 ± 1.68	7.55 ± 2.87*	5.94 ± 1.61
GS left (kg)	21.52 ± 3.65 *	29.82 ± 7.00	22.82 ± 4.17*	30.24 ± 7.19
GS right(kg)	21.28 ± 2.90*	30.71 ± 6.46	23.34 ± 4.57*	30.94 ± 6.69
KS extension (kg)	20.23 ± 8.34	23.55 ± 6.10	22.29 ± 7.89	23.04 ± 6.25
KS flexion (kg)	12.52 ± 5.18	13.46 ± 3.57	13.83 ± 5.01	13.02 ± 3.43

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Long-term Physical Inactivity Exacerbates Hindlimb Unloading-induced Soleus Muscle Atrophy In Young Rats

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(No relevant relationships reported)

Physical inactivity (sedentary lifestyle) in adulthood increases a degree of aging-related skeletal muscle weakness; however, it has been unclear whether long-term physical inactivity in childhood exacerbates subsequent disuse-induced skeletal muscle atrophy.

PURPOSE: This study investigated the effects of long-term physical inactivity in childhood on subsequent hindlimb unloading-induced muscle atrophy in rat soleus muscle.
METHODS: Forty-eight 3-week-old male Wistar rats were assigned randomly into control (CON, n = 24) or physical inactivity (IN, n = 24) groups. Rats in the IN group were housed in a narrow cage with half of the usual floor space to limit the range of their movement. After 8 weeks (12-week-old), the rats (CON & IN) were exposed to hindlimb unloading. The soleus muscles were quickly removed before (0 d, n = 6/each group), 1 day (1d, n = 6/each group), 3 days (3d, n = 6/each group) and 7 days (7d, n = 6/each group) after unloading. mRNA and protein levels were determined by RT-PCR and Western blot analysis. Statistical significance was established at p<0.05.
RESULTS: Although 7-days of hindlimb unloading significantly decreased soleus muscle weight (CON; -28%, IN; -33%, p<0.001), the decrease was drastically in IN group (Inactivity × Unloading, p = 0.0009). A significant interaction between inactivity and unloading (p<0.01) was observed on the HDAC4 and NF-kB protein expressions. The HDAC4 and NF-kB expressions in the IN group increased significantly 1 day after onset of hindlimb unloading (CON; 1.4 and 1.2, IN; 5.1 and 2.7 fold change from each 0d, respectively). Moreover, their downstream targets *Myogenin* and *MuRF1* mRNA levels were upregulated by long-term physical inactivity (Inactivity, p<0.05).
CONCLUSIONS: Our data suggest that long-term physical inactivity exacerbates hindlimb unloading-induced disuse muscle atrophy in young rat soleus muscle, which may be mediated by HDAC4 and NF-kB-induced *MuRF1* mRNA upregulation. Supported by JSPS KAKENHI Grant Number 17K01765.

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Blood Lipid is Associated with Skeletal Muscle PPARδ Protein Content after a 10-week Resistance Exercise Training

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(No relevant relationships reported)

Peroxisome proliferator activated receptors (PPARs) are main regulators of blood lipid profile while PPARδ is the most abundant PPARs isoform in skeletal muscle. Although skeletal muscle is a major player in lipid metabolism, the association between muscle PPARδ and blood lipid profile is currently unknown. **PURPOSE**: The purpose of this study was to investigate the association between muscle PPARδ protein content and blood lipid in the context of resistance exercise training. **METHODS**: Fifteen untrained, healthy young men (n=8) and women (n=7) performed a 10-week progressive whole-body resistance exercise training program. Muscle samples were obtained from the vastus lateralis muscles 24 hours before the first exercise and 24 hours after the last exercise. Blood samples were collected from antecubital veins immediately before the first and the last exercises. Western Blotting was conducted to quantify the PPARδ content, and serum lipid profile was analyzed. **RESULTS**: While PPARδ protein content was not correlated with blood lipid profile before the training, it was negatively correlated with total cholesterol (R=-0.731, R-square=0.534, P=0.04) and LDL (R=-0.746, R-square=0.557, P=0.033) after the training. **CONCLUSION**: The results imply that resistance exercise training may enhance the regulation of blood lipid via PPARδ.

Coefficient of Determination of Skeletal Muscle PPARδ Protein Content to Serum Lipid Profile		
	PPARδ Protein Content (AU)	
	Before Training	After Training
Triglyceride (mg/dL)	0.023	0.086
Total Cholesterol (mg/dL)	0.027	**0.534 ***
HDL (mg/dL)	0.025	0.033
LDL (mg/dL)	0.012	**0.557 ***
* P<0.05, significant correlation. Data are R-square (R²).		

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Comparing The Effects Of Nexrutine And Exercise In Modulating The Pathophysiology Of Cachexia In Treatment Naïve Prostate Cancer Mouse Model

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(No relevant relationships reported)

Oncologists encourage nutritional and physical interventions to improve outcomes in cancer patients with cachexia; however, it is inconclusive how these interventions

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affects the pathophysiology of cachexia. **PURPOSE:** To compare the effects of Nexrutine® (Nex; a natural bark extract of the Amur cork tree) and exercise in modulating the pathophysiology associated with cachexia in treatment naïve transgenic adenocarcinoma of mouse prostate (TRAMP) model. **METHODS:** Forty-five, 10-week old male TRAMP mice were randomized to control (Con), Nex (600 mg/kg pelleted into chow) or exercise (Ex; voluntary wheel running). At 4, 8, 12 and 20 weeks, gastrocnemius muscle was collected to quantify intramuscular IGF-1, myostatin, TNF-α, proteolysis-inducing factor (PIF) and ubiquitin (Ub). An ANOVA with Tukey's post hoc test was done with significance set at $p < 0.05$. **RESULTS:** Analysis of gastrocnemius mass revealed significant group differences (F=4.159, p=0.02) with both Nex and Ex groups having greater mass compared to Con ($p < 0.05$). A treatment response was observed for myostatin (F=4.762; p=0.01), PIF (F= 8.633, p=0.001) and Ub (F=19.55, p<0.001). Specifically, Ex mice had significantly lower concentrations of myostatin, PIF and Ub compared to Con ($p < 0.01$). Group comparisons at 20 weeks showed significantly lower concentrations of PIF (F= 22.85, p<0.001) with Ex (p<0.001) and Nex (p=0.03) significantly lowering PIF concentrations compared to Con. Time point comparisons for Ub revealed significant differences at weeks 4 (F=32.35, p<0.001) and week 8 (F=16.24,p=0.002), respectively, with Ex mice having significantly lower concentrations of Ub compared to Con mice (p=0.004) at both time points. **CONCLUSION:** The results of this study suggest that Nex and Ex similarly maintain muscle mass in treatment naïve TRAMP mice by reducing tumor specific cachectic protein PIF. Exercise was capable of reducing downstream Ub; however, the mechanisms by which Nex elicits a protective effect require further study.

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Dietary Protein Intake and Muscular Health with Aging: Countermeasures for Sarcopenia and Dynapenia

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(No relevant relationships reported)

Protein intake and aerobic and resistance exercise have been suggested as effective stimuli for muscle growth and function in the young and old. However, the magnitude of these stimuli combined is not completely understood. **PURPOSE:** To examine relationships between total protein intake and combined aerobic and anaerobic training on muscle size and strength in sedentary and active adults. **METHODS:** A total of 98 subjects were divided into the following groups: active younger females (AYF), sedentary younger females (SYF), active older females (AOF), sedentary older females (SOF), active younger males (AYM), sedentary younger males (SYM), active older males (AOM), and sedentary older males (SOM). Subjects completed an assessment of knee extensor peak torque (KEPT), a 3-day dietary intake log, and magnetic resonance imaging (MRI) scan for muscle cross-sectional area analysis of the right quadriceps (CSAq). Two stepwise regression models were used to examine the relationship of gender, protein intake, activity level, and age, with CSAq and KEPT. **RESULTS:** Mean differences are displayed in the table below. Gender, protein intake, age and physical activity were predictive for CSAq (F (1, 93) = 11.798, R^2 = 0.725, p < 0.01). Additionally, gender, age, and physical activity were predictive for KEPT (F (1, 94) = 14.309, R^2 = 0.631, p < 0.01). **CONCLUSION:** The results suggest that changes in skeletal muscle size and strength are related to differences in age, gender, total daily protein intake, and physical activity. Furthermore, concurrent exercise appears to be an intervention to potentially mitigate sarcopenia and dynapenia in older adults.

	AYF	SYF	AOF	SOF	AYM	SYM	AOM	SOM
KEPT	152.1 ± 26.8	138.6 ± 32.9#†	122.5 ± 28.4*†¥	101.9± 21.7*#†¥∘	254.3 ± 57.8*	195.1 ± 35.1#	214.3 ± 39.6*‡	185.8 ± 48.2#¢
CSAq	55.8 ± 7.3	50.7 ± 78.5*†	50.1 ± 6.6#†¥	42.1 ± 6.7*#†¥∘	85.1 ± 13.0*	65.8 ± 10.1#	74.6 ± 7.4*‡	64.8 ± 7.7#‡¢

*denotes significance from AYF, # denotes significance from AYM, † denotes significance from SYM, ‡ denotes significance from SYF, ¥ denotes significance from AOM, ¢ denotes significance from AOF, ∘ denotes significance from SOM. All significance levels set at p<0.05

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Constant And Progressive Resistance Exercise Reduces Anabolic Signaling But Inreased Myofiber Hypertrophy In Human Skeletal Muscle

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(No relevant relationships reported)

PURPOSE: To determine the effects of progressive (PR) and constant (CO) loading induced by resistance exercise (RE) on anabolic signaling, myofibrillar damage and selective type I and II myofiber hypertrophy when RE is prolonged and interrupted over time.
METHODS: 15 healthy male subjects (24 +- 3 years) conducted six weeks of progressive (PR) (n=8) or constant (CO) (n=7) RE on a leg extension and leg press machine. Subjects conducted in sum 14 training units with 3 training sessions per week. Each session consisted of 3 sets with 10-12 repetitions on each machine. At baseline (T0) after the 1st (T1), 3rd (T2), 7th (T3), 10th (T4), 13th (T5) and 14th (T6) RE session, skeletal muscles biopsies from vastus lateralis muscle were collected at 45min post RE. Subjects of PR increased RE load by 5% each week while in the CO group RE-load was constant. Continuous training was performed up to T5 and stopped for 10 days followed by a final TU 14. **RESULTS**: In PR and CO increases in p70s6k and rpS6 phosphorylation (P<0.05) were detected at all time points (T1-T6) compared to T0. However, rpS6 and p70s6k was decreased from T1 to T4 in PR (p<0.05) but not in CO. Reduced signaling recovered after pausing RE in PR with an increase from T5 to T6 (p<0.05). Myofibrillar damage was increased in PR and CO (p<0.05) at T1 but gradually decreased up to T5 in both groups. There was a tendency for lower myofibrillar damage in PR at T4 and T5. Type I myofibres showed increased myofiber diameter (8%) at T5 (p<0.05) with no group differences. Type II fibers increased (12%) in both groups (p<0.05) but more in PR than CO at T5 (p<0.05).
CONCLUSIONS: While PR offers increased potential for type II myofiber hypertrophy and increases sarcomeric stability over the time course of repeated RE compared to CO, it is associated with decreased anabolic signaling upon repeated RE stimulation. Anabolic signaling does not reflect structural adaptability but its decreased sensitivity towards loading.

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Amino Acid Transport and Metabolism Alterations Following 12 Weeks of Resistance Training with Supplementation

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(No relevant relationships reported)

PURPOSE: Amino acid transporters within skeletal muscle have gained attention for their potential role in stimulating muscle protein synthesis (MPS). The purpose of this study was to determine if amino acid transporters and proteins involved in amino acid metabolism are related to skeletal muscle hypertrophy following resistance training with different nutritional supplementation strategies. **METHODS:** 43 untrained, college-aged males were separated into a Maltodextrin Placebo (PLA, n=12), Leucine (LEU, n=14), or Whey Protein Concentrate (WPC, n=17) group and underwent 12 weeks of total-body resistance training performed 3 days per week while supplementing twice daily. Each group's supplement was standardized for total energy, fat, and LEU and WPC groups were standardized for total Leucine (6 g/d). Skeletal muscle biopsies were obtained prior to training (PRE) and ~72 h following subjects' last training session (POST). **RESULTS:** LAT1 protein levels demonstrated a time (p<0.001; 3.01-fold increase) and group effect (p=0.043), whereby PLA increased significantly more than LEU and WPC (p<0.05; 5.01-fold vs. ~2-fold increase). A time effect was observed for PAT1 (p=0.047; 1.36-fold increase) and BCKDHA (p<0.001; 1.81-fold increase) protein levels, while SNAT2, BCAT2, and ATF4 protein levels were unaltered (p>0.05). Changes in muscle fiber cross sectional area (CSA) demonstrated a time effect for Type I fibers (p=0.045; +370 µm) and Type II fibers (p<0.001; +1061 µm). No strong, significant correlations existed for changes in assayed proteins with changes in Type I or II fiber CSA, nor were PRE protein values indicative of alterations in muscle CSA. **CONCLUSIONS:** LAT1 protein levels increase in response to resistance training, and LEU and WPC supplementation reduced training-induced increases in this protein. Furthermore, proteins related to amino acid transport and metabolism do not appear to dictate skeletal muscle hypertrophy.

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Resistance Training-Induced Muscle Hypertrophy is Related to Androgen Receptor Content not Intramuscular or Systemic Hormones

Robert Morton[1], Koji Sato[2], Michael Gallaugher[1], Sara Oikawa[1], Paul McNicholas[1], Satoshi Fujita[3], Stuart Phillips, FACSM[1]. [1]McMaster University, Hamilton, ON, Canada. [2]Kobe University, Kobe, Japan. [3]Ritsumeikan University, Shiga, Japan. (Sponsor: Stuart Phillips, FACSM)

(No relevant relationships reported)

There is substantial inter-individual variability in resistance exercise training (RET)-induced skeletal muscle hypertrophy. **PURPOSE:** To determine if systemic circulating and/or intramuscular hormones were related to the RET-induced hypertrophy. **METHODS:** Resistance-trained young men (mean ± SEM; 23 ± 1 yr, 86 ± 2 kg, 181 ± 1 cm, previously performing RET ≥2 times per wk for 4 ± 2 yr) undertook individually supervised RET four times per week for 12 wk. Fat- and bone-free (lean) body mass (LBM) and individual fibre type cross sectional area (CSA) were evaluated by dual x-ray absorptiometry and immunohistochemistry, respectively. Backwards elimination and principal component regression were used to evaluate shared variance between systemic proposedly anabolic hormones and RET-induced changes in muscle mass (n=49). Intramuscular free testosterone levels, dihydrotestosterone levels, 5α-reductase expression, and androgen receptor content were evaluated in the highest- (HIR; n=10; Δ LBM = 2.1 ± 0.8 kg) and lowest- (LOR; n=10; Δ LBM = 0.6 ± 0.9 kg) responders to the 12 wk of RET. **RESULTS:** No hormone measured before exercise, after exercise, pre-intervention, or post-intervention, using unadjusted or principal component regression, shared significant common variance with the change in type 1 CSA, type 2 CSA, or LBM. No hormone, in blood- or muscle, was different between HIR and LOR. The steroidogenic enzyme 5α-reductase increased following RET in the HIR (P<0.01) but not the LOR (P=0.32). Androgen receptor content remained unchanged with 12 wk of RET, but was higher in HIR versus LOR both pre- and post-intervention. **CONCLUSION:** Neither systemic nor intramuscular hormones are related to RET-induced skeletal muscle hypertrophy in resistance-trained young men. Instead, these data demonstrate that intramuscular androgen receptor content may be an important component of the individual variation between high- and low-hypertrophy responders to RET.

3278   Board #147   June 2 9:30 AM - 11:00 AM

Ghrelin Attenuates Muscle Atrophy In Tumor-bearing Mice

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(No relevant relationships reported)

Cachexia is a multi-organ syndrome characterized by muscle and fat wasting. Ghrelin is a hormone known to release growth hormone and to stimulate appetite by binding to its receptor growth hormone secretagogue receptor (GHSR)-1a. However, recent data suggest that not all effects of ghrelin are mediated through this receptor. **PURPOSE**: To investigate if ghrelin attenuates cancer-induced muscle atrophy in a GHSR-1a-independent manner. **METHODS**: 5-6-month-old male C57BL/6J GHSR-1a wildtype (WT) and knockout (KO) mice were inoculated with 1×10^6 heat-killed (HK, control) or live Lewis Lung Carcinoma (LLC) cells in the right flank. When the tumor was palpable (1 wk), tumor-bearing mice were injected with vehicle (saline solution, TV) or ghrelin (0.8 mg/kg, TG), IP twice a day, while HK mice were injected with vehicle (n = 8-10). Body weight, lean body mass and fat mass were measured by NMR before tumor implantation and 2 weeks after tumor noted. Gastrocnemius (GAS) muscles were harvested for analysis 2 weeks after tumor noted. **RESULTS**: Tumor implantation induced a significant decline in body weight and fat mass in both strains. As expected, ghrelin attenuated the fat loss in WT (TV vs. TG: -52% vs. -23% from baseline, p = .009) but not in KO (TV vs. TG: -56% vs. -60%, p = .85). Tumor-induced muscle loss was attenuated by ghrelin from 16% to 8% in WT (p = .004) and from 25% to 19% in KO (trend in significance, p = .06). Similarly, the decrease in fiber cross-sectional area of GAS muscles was prevented by ghrelin in WT (TV vs. TG: p = .008; HK vs. TG: p = .472) but this difference did not reach significance in KO. In addition, the mRNA levels of 'atrogenes' atrogin-1 and MuRF-1 in GAS muscle significantly increased in response to tumor implantation in both strains. With ghrelin treatment, the increase of atrogin-1 and MuRF-1 in WT was decreased by 5-fold (p = .022) and 7-fold (trend, p = .058), respectively. In KO tumor-bearing mice, the attenuation of atrogin-1 and MuRF-1 by ghrelin was 5-fold (p = .008) and 6-fold (trend, p = .07), respectively. **CONCLUSION**: Ghrelin mitigates cancer-induced muscle atrophy at least in part through GHSR-1a-independent mechanisms.

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Resistance Training-induced Decrease In Circulating C1q Is Associated With Attenuated Muscle Degradation In Senescent Mice

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(No relevant relationships reported)

Our recent study has showed that reduction of aging-induced elevation of serum C1q level by resistance training was involved in muscle hypertrophy in old adults. C1q activates Wnt/β-catenin in aged muscle, resulting in enhancement of muscle protein degradation-related genes, such as MuRF-1 and Atrogin-1. Although resistance training attenuates muscle protein degradation, it is still unclear that resistance training-induced decrease in serum C1q level is associated with attenuation of muscle protein degradation. **PURPOSE**: The purpose of this study was to investigate whether resistance training-induced change in circulating C1q level affects muscle protein degradation in senescent mice. **METHODS**: Male 13-week-old SAMP1 mice (Young) and 38-week-old SAMP1 mice (Aged) were randomly divided into three groups; young-sedentary control (Young-Con), aged-sedentary control (Aged-Con) and aged-resistance training (Aged-RT) groups (n=10 each group). Resistance training was performed 3 days a week for 12 weeks using a climbing ladder with 70% of 1 repetition maximum weight. **RESULTS**: Muscle strength and mass and cross-sectional area (CSA) of tibialis anterior muscle in the Aged-Con group significantly decreased as compared with the Young-Con group (p<0.05), whereas those in the Aged-RT group significantly increased as compared with the Aged-Con group (p<0.05). Serum C1q level and expression levels of muscle β-catenin, MuRF-1 and Atrogin-1 proteins significantly increased in the Aged-Con group as compared with the Young-Con group (p<0.05), whereas those expression levels in the Aged-RT group significantly decreased as compared with the Aged-Con group (p<0.05). Additionally, serum C1q level was positively correlated with protein expression levels of muscle MuRF-1 (r = 0.713, p<0.05) and Atrogin-1 (r = 0.584, p<0.05), but was negatively correlated with muscle mass (r = -0.469, p<0.05) and CSA (r = -0.595, p<0.01). **CONCLUSIONS**: These results suggest that resistance training-induced decrease in serum C1q level is associated with attenuation of muscle protein degradation thereby leading to muscle hypertrophy in senescent mice.

G-41   Free Communication/Poster - **Movement Disorders**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3280   Board #149   June 2 9:30 AM - 11:00 AM

Relationship Between Variability Of Posterior Lower Extremity Muscles And Speed In Individuals With Parkinson's Disease

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(No relevant relationships reported)

Background: Individuals with Parkinson's Disease (PD) demonstrate progressive decreases in gait speed and difficulty with intralimb coordination when walking. Commonly, people with PD walk with reduced step length that may be associated with suboptimal activation of flexor muscles including the gastrocnemius and hamstrings. Individuals with PD often increase cadence to overcome reduced step length regardless of walking speed. Therefore, investigation of variability in locomotor muscles while walking overground may provide insight into walking behavior during community ambulation. **Purpose**: To determine associations between variability of lower extremity muscle activation and gait speed during the stance phase to swing phase transition in individuals with PD. **Methods**: Adults with idiopathic PD completed the 10-meter walk (10MW) overground at their preferred walking speed while on their anti-Parkinson's medication. Surface EMG was placed bilaterally on the biceps femoris (BF), medial hamstrings (MH), and medial gastrocnemius (MG). Gait events (heel contact, toe off) were identified via lower extremity kinematics using a motion capture system. Coefficients of variation during (CV) during 50-60% of the normalized gait cycle, identified as terminal stance phase (tST) and 60-70% of the gait cycle, termed initiation of swing phase (iSW) were calculated for the three muscles. **Results**: 9 adults (7M, age $\bar{x}$=71.0, height $\bar{x}$=172.2cm, weight $\bar{x}$=78.0kg) walked overground

(x̄=16 steps used in analysis), with an average gait speed of 1.12 ± 0.19m/s. Those with slower gait speeds (<1.1m/s), had a higher mean CV of MG activation during iSW (p=0.02). There was no difference between the CV of the MH, BF during tST and iSW. However, there was an interaction between gait speed and CV of the MH and BF with variability in the MG activation during iSW (p<0.01). Variability was primarily due to differences in duration, timing, and magnitude of activation for these muscles during each step. **Conclusion**: Uniformity of the timing and magnitude of muscle activation was related to gait speed in individuals with PD. Increased step to step variability of MG, BF, and MH activation and timing suggests a less stable gait pattern with functional consequences in people with PD.

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Different Elbow Positions Do Not Interfere In Handgrip Strength In Parkinson's Disease

Sacha Clael, Camila Wells, Elaine Brandão, Rafaela do Vale, José Celi, Junhiti Nagazawa, Tamara Paiva, Jhonatan Rodrigues, Liana Caland, Lidia Bezerra. *University of Brasília, Brasília, Brazil.*

(No relevant relationships reported)

The studies with handgrip strength have been using the protocol of American Society of Hand Therapists (ASHT), in which the elbow is maintained flexed at 90º. However, people with Parkinson's disease (PD) show general loss of strength and the contraction of the muscles used to sustain this position may be not possible and may reduce the value of handgrip strength. **PURPOSE:** The aim of the study was to analyze if there is difference in handgrip strength in people with PD between the two elbow positions: flexed (ASHT protocol) and extended. **METHODS:** Handgrip strength was measured in both arms in 31 persons (22 men and 9 women), age 66.06 ± 8.48, diagnosed clinically with PD with the elbow at two positions: flexed (ASHT protocol) and extended. Positions comparisons were made using paired t-test and clinical effect with test d Cohen. A p-value of ≤ 0.05 was adopted. **RESULTS:** Handgrip strength of the right arm with the extended elbow was similar to that obtained with the flexed elbow (p > 0.05; d = -0.04). Handgrip strength of the left arm with the extended elbow was similar to that obtained with the flexed elbow (p > 0.05; d = -0.12). There are not statistical difference between elbow positions in both arms side.
Table 1 - Comparisons between elbow positions.

Side	Elbow in Extension (Mean ± SD)	Elbow in Flexion (Mean ± SD)	p	d
Right	31.48 ± 8.77	31.87 ± 9.24	0.64	-0.04
Left	28.58 ± 8.04	29.61 ± 8.63	0.07	-0.12

p = significantly; *d* = Cohen test
CONCLUSIONS: There are no differences between elbow positions, people with PD can do handgrip strength with elbow in extension if will be more comfortable.

3282   Board #151   June 2 9:30 AM - 11:00 AM

Analysis Of Cortical Hemodynamics During Dual Task Walking In Individuals With Parkinson's Disease

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(No relevant relationships reported)

In addition to motor deficits, cognitive issues are common among individuals with Parkinson's disease (PD). Executive function plays an important role in performing multi-tasks, such as dual task walking (DTW). Compromised gait and cognitive functions are often observed in people with PD when they perform DTW, which can affect their activities of daily living. Limited research examined the brain activity during DTW in people with PD.
PURPOSE: To analyze cortical hemodynamic activities of the prefrontal cortex (PFC) during DTW in individuals with PD. **METHODS:** 11 individuals with PD (aged 72.8 ± 5.53) and 10 controls (71 ± 10.56) participated in this cross-sectional study. All participants completed a series of walking trials under three test conditions including usual walking (W), walking with serial three subtraction (WS3), and walking with autobiographical memory tasks (WQA). They were asked to walk at a comfortable pace while a functional near-infrared spectroscopy (fNIRS) system captured oxyhemoglobin (HbO2) values of the PFC. All participants completed five trials for each test condition on a 30-meter walkway. Each walking trial consisted of 20-second quiet standing, 30-second walking, and 20-second quiet standing.
RESULTS: The PD group showed overall higher HbO2 values across all three test conditions than the control. Repeated measures analysis of variance (ANOVA) revealed significant differences among three conditions in both groups (all *p*-values <.05). Post hoc analyses showed that the PD group significantly increased HbO2 values from W to WS3 by 39.6% as well as from W to WQA by 26.7 %, but no change was noted between WS3 and WQA. The control group showed significant differences in HbO2 values in all pairwise comparisons among three conditions. In addition,

a significant groups x conditions interaction was found in HbO2 values (*p*<.01).
CONCLUSION: DTW elicited a greater level of brain activation with an increase of cortical hemodynamics in individuals with PD as compared to control. Furthermore, our results suggest that cortical hemodynamic responses to various level of difficulties in concurrent tasks were different between people with and without PD. These findings should be considered when providing dual task motor training is provided for people with PD.

3283   Board #152   June 2 9:30 AM - 11:00 AM

Differences in Muscle Activity During Cycling in Healthy Aging and Parkinson's Disease: Pilot

Rebecca J. Daniels, Christopher A. Knight. *University of Delaware, Newark, DE.*

(No relevant relationships reported)

DIFFERENCES IN MUSCLE ACTIVITY DURING CYCLING IN HEALTHY AGING AND PARKINSON'S DISEASE: PILOT
Rebecca J. Daniels, Christopher A. Knight
University of Delaware, Newark, DE
Coordination in cycling, defined by EMG burst timing, is well studied in healthy adults and trained cyclists. Little is known about these parameters in older adults (OA) and people with Parkinson's disease (PD), though cycling is a commonly prescribed exercise modality in these populations. **PURPOSE:** To investigate muscle activity patterns during cycling in OA and PD compared to healthy young adults (YA). It was hypothesized that people with PD would exhibit less discrete bursts, evidenced by prolonged burst duration, compared to OA and YA. **METHODS**: Participants were 4 OA (73.3±4.9 years, BMI=27.2±5.7 kg•m^{-2}, 3 males), 6 adults with PD (71±11.9 years, BMI=30.7±7.3 kg•m^{-2}, 6 males, Hoehn & Yahr stage 1-3), and 5 YA (21±1.6 years, BMI=22.6±1.8 kg•m^{-2}, 4 males). Electromyograms (EMG) were recorded from the vastus lateralis (VL), medial gastrocnemius (GA), biceps femoris, soleus (SO), tibialis anterior (TA), and rectus femoris (RF) of the dominant leg during recumbent bicycling. Subjects cycled at 60, 80, and 100 revolutions per minute (RPM) at the lowest resistance setting. EMG was rectified and normalized to the peak EMG during the 80 rpm condition in each muscle. A 4rth order low pass Butterworth filter with a cutoff of 7 Hz was used to create linear envelopes. Timing of the EMG burst onset and offset were calculated in relation to top dead center, as well as EMG burst duration over 10 revolutions per subject in the 60 and 100 RPM conditions. A 2x3 repeated measures analysis of variance was used to compare the timing of EMG activity for each muscle between the 60 and 100 rpm conditions among the groups. Significance was set at p<0.05. **RESULTS**: There were no significant group by cadence interactions. Cadence effects were observed in burst duration of TA (F=9.53, p<0.01), SO (F=12.98, p<0.01), VL (F=10.97, p<0.01), RF (F=6.21, p=0.02), and GA (F=7.89, p=0.01). Compared to YA, people with PD had 86.6° longer burst durations in TA (F=6.34, p<0.01), 69.1° in VL (F=8.73, p<0.01), and 65.7° in GA (F=5.57, p=0.01). **CONCLUSION**: Although preliminary, these results suggest that increased burst durations in key muscles during cycling alter coordination in people with PD.

3284   Board #153   June 2 9:30 AM - 11:00 AM

Spatial Measures Of Straight-line Walking And Walking With A Turn In People With Parkinson's Disease

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(Sponsor: Randall Keyser, FACSM)

(No relevant relationships reported)

Dynamic balance is often impaired in people with Parkinson's Disease (PD). Control leading to and during a turn for people with PD further challenges dynamic balance and is a common contributor to a loss of balance. During a task with a turn, people with PD modify walking patterns in order to maintain dynamic balance. These modifications, however, may vary among people with PD. Identification of walking behaviors that contribute to impaired dynamic balance is key to improve function and development of balance-focused interventions for people with PD.
PURPOSE: To determine differences in spatiotemporal measures between straight-line walking and walking with a turn in people with PD.
METHODS: Ten adults with PD (2F/8M, age: 69.9±8.9; height: 169.6±8.1cm; weight: 75.3±8.3kg) walked across a 6m pressure sensitive walkway in 1) a forward direction (F) and 2) a forward walk including a 180° turn (T). The right (R) leg was identified as the OUT leg and the left (L) identified as the IN leg. Participants were categorized based on time to complete the Timed Up and Go (TUG) test. Five adults had TUG times faster than the mean, 9.27s, and five were slower. Step length (SL), width (SW), and foot angle (FA) were examined during both trials. An unpaired, Welch's t-test was used for analysis between groups.
RESULTS: Those with faster TUG times had larger SL (L: p=0.0006; R: p=0.0004) and SW (L: p=0.0004; R: p=0.0008) bilaterally during F trial compared to slower. During the T trial, the faster group increased SL bilaterally (L: p=0.0022; R: p<0.0001) and increased SW on the L (p=0.035), but not the R. FA was less in the faster group during F trial for the R leg (p=0.0352), but was greater for the R leg in the T trial (p=0.0001).

CONCLUSIONS: Individuals with faster TUG times demonstrated increased SL, SW, and reduced R FA during straight-line walking. Individuals with decreased SW may have compensated for impaired stability by decreasing SL. When walking included a turn, individuals with faster TUG times increased SW in the IN leg and increased the FA of the OUT leg compared to those with a slower TUG time, suggesting that people with PD who have functional impairments may utilize different strategies than those with without. Increased understanding of spatiotemporal aspects including during a turn is critical to optimize treatment.

3285   Board #154   June 2 9:30 AM - 11:00 AM

Breathing And Vision Effects On Balance, Attention, And Respiratory Complexity During Standing In Parkinson's Patients

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(No relevant relationships reported)

INTRODUCTION: Regulation of balance requires attentional involvement inversely proportional to efficacy of postural control system. Sample entropy (SE) of center of pressure (CoP), a non-linear measure, reflects complexity of postural control system indicating attentional involvement. Parkinson patients (OAP) may requisite more attention during balance than healthy controls (OAH). Due to internal perturbances during standing, respiration may affect balance in individuals with deteriorated postural control systems.
PURPOSE: To investigate 1) effects of breathing and visual conditions on attention and balance 2) group effect on respiratory complexity, attention, & balance between OAP & OAH.
METHODS: 12 subjects, OAH (n=6) & OAP (n=6), were recruited and instructed to stand on force plate, feet oriented 15° apart and look at 5cm-diameter spot eye level on wall 1.5m away. Subjects were asked to maintain balance for 2 minutes under eyes open and eyes closed conditions and thoracic (Th), abdominal (Ab), & neutral breathing conditions. Meanwhile, Th and Ab motion was record through Biocapture system, all equipment synched. SE was calculated in Matlab for CoP in anteroposterior (X) ($SampEn_{CoPx}$) and mediolateral (Y) ($SampEn_{CoPy}$) directions and Th ($SampEn_{Th}$) and Ab ($SampEn_{Ab}$) motion. CoP-related measures were calculated in Bioanalysis software for average velocity ($\bar{v}$) (cm/s), 95% sway area (SA) (cm^2), and average displacement in X (D_x) and Y (D_y) directions (cm).
RESULTS: Group, breathing, & visual effects were examined on non-linear and CoP-related measures via Factorial MANOVA with later application of ANOVAs as needed. Significant group and visual effects were seen in CoP-related measures, Wilks' Lambda = .363 (p< .000) and .781 (p<.034), respectively. OAP showed greater D_x (.5363 ± .2411 vs .2963 ± .1424), SA (10.7677±10.6678 vs. 4.8564±3.6306), and $\bar{v}$ (3.1264±1.1616 vs. 2.4184 ± .9371) than OAH, while EC showed greater $\bar{v}$ than EO (3.1904±1.2207 vs. 2.3343 ± .7770).
CONCLUSION: OAPs showed similar attentional involvement and respiratory complexity with OAH during standing balance, though OAP displayed worse balance performance than OAH. Breathing condition did not significantly affect attentional involvement or balance performance. Visual condition significantly affected balance performance.

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The Effects of Cadence on Torque Asymmetry

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(No relevant relationships reported)

Bilateral asymmetry in peak crank toque has been observed in both cyclist and non-cyclist. However, the relationship between exercise intensity, cadence rates, and bilateral asymmetry is not fully understood. Additionally, a need for establishment of normative values for bilateral asymmetry still exists. **PURPOSE:** Therefore, the purpose of the current study was to examine bilateral asymmetry in peak crank torque during 3 graded exercise tests (GXT) at 3 different cadence zones. **METHODS:** 20 subjects, 10 females and 10 males, participated in this study. Subjects were classified to either a cycling trained group (CT, n=8) or no-cycling trained group (NCT, n=12). Over the course of 3 visits subjects, both groups performed 3 GXTs at 3 different cadence zones. Cadence zones consisted of Self-Selected (SS), High (100 to 115 rpm), and Low (55 to 70 rpm). The first GXT was performed at the SS cadence with the remaining two being performed either at High or Low cadence, which was randomly assigned. Peak crank torque was measured using a dual power meter on cycle ergometer, and calculated as the absolute difference between the lower limbs. Peak crank torque was assessed at the initial stage (IS), the stage in which the onset of blood lactate accumulation (OBLA) occurred, and the stage in which peak power output (PPO) was achieved for the 3 different GXTs. Two way repeated measures ANOVA was used to determine if significant differences between groups and conditions existed. **RESULTS:** Significant group by condition interactions were present. No significant condition differences were present between all cadences zones (IS, OBLA, or PPO)

(P>0.05). No significant group differences were present at IS or OBLA. However, significant group differences were present at PPO (CT 7.69±5.61 vs. NCT 4.42±4.47). **CONCLUSION:** The findings of the current study suggest that torque is unaffected by cadence selection at IS, OBLA, and PPO. The current study also showed that significant differences did not exist between the CE and NCE in torque asymmetry until PPO. This finding suggests that at PPO cyclist may be altering their kinematics in order to maintain desired cadences or power outputs more so than non-cyclists. Therefore, further research is needed to understand the potential effect on cycling performance.

3287   Board #156   June 2 9:30 AM - 11:00 AM

Fast Six-minute Walking Induced Abductor Hallucis Muscle Recruitment In Individuals With Flatfoot

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(No relevant relationships reported)

Purpose: This study examined lower extremity muscle activities before and after six-minute treadmill walking at highest speeds in individuals with flatfoot. **Methods:** Eight individuals with flatfoot (4 women, 4 men, age= 24.8±2.4 years) with no other history of lower extremity injury in six months and no neurological disease, participated in this study. Subjects were first screened using subtalar static navicular drop tests. Surface electromyography (BIOPAC system, USA) of the abductor hallucis muscle (AbdH), tibia anterior, gastrocnemius, and peroneus longus muscles were recorded during maximum voluntary isometric contractions (MVIC). Next, three-dimensional motion capture system (Vicon motion system, UK) was used to assess dynamic navicular mobility during walking. Subjects were then asked to walk on the treadmill at their maximal pace for 6 minutes. After walking, the MVIC and dynamic navicular mobility were assessed again. Median frequency (MedF) of EMG during MVIC was calculated for both before and after 6-minute walking. **Results:** Our preliminary results show substantial increase in the MedF of the AbdH (10.2Hz ± 29.9Hz), suggesting an increase in motor unit recruitment in AbdH with 6-minute fast treadmill walking. MedF of tibia anterior was significantly decreased 16.7 ± 11.5Hz after fast treadmill walking, but no significant change was observed in peroneus longus and gastrocnemius. Subjects exhibited similar navicular drop before (17.3 ± 5.4 mm) and after (16.0 ± 5.2 mm) fast treadmill walking. **Conclusion:** Six-minute fast treadmill walking induced greater muscle recruitment of the AbdH in individuals with flatfoot. We infer that the AbdH of flat foot doesn't function as a dynamic stabilizer during walking. However, how increased work loads in other lower extremity muscles results in greater activity of AbdH remains to be investigated. The observation that muscle activity of AbdH increased when the other extrinsic muscle fatigue indicates that 6 minutes walking can serve as functional training of the intrinsic muscles to support the medial longitudinal arch.

3288   Board #157   June 2 9:30 AM - 11:00 AM

Heel Strike Provokes 'Position of No Return' during Side-Cutting Maneuver.

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(No relevant relationships reported)

Knee valgus (VL) and internal rotation (IR) combined with hip adduction (AD) and IR, so called "position of no return (Ireland 1999)", is a risky position for non-contact ACL injury. To date, what motion factor induces this multi-articular excursion is not well studied.
PURPOSE: To examine whether a foot strike pattern (forefoot or heel first) differentiates the multi-articular loading pattern and results in the risky hip and knee kinematics during side-cutting.
METHODS: Twenty-five collegiate athletes performed side-cutting on the force plate (FP) in heel impact (HC) and forefoot impact (FC) conditions. In HC, subjects were asked to strike heel first when they touch the FP, in FC, the subjects used their forefoot to touch the FP throughout the stance phase. Kinematic and ground reaction force data were measured with the optical motion capture system and FP from 10 trials for each condition. The hip and knee 3D moments were calculated. The occurrence rate of simultaneous knee VL+IR combined with hip AD+IR moments in each time increment of 100 % stance phase was compared between conditions (Chi-square test, $p < 0.01$). The peak knee and hip joint angular velocities (JAVs) were also compared between conditions using paired sample t-test with $p < 0.01$.
RESULTS: HC showed significantly higher occurring rate of the hip AD+IR combined with knee VL+IR moments than that of FC in first 50 % of stance phase (HC vs FC, maximally 22 % vs 13 %, $p < 0.01$, Fig.1). Peak knee VL, hip AD and hip, IR JAVs in HC were significantly higher than those in FC (HC vs FC, 178.3 ± 84.2 vs. 136.6 ± 70.2, 170.5 ± 65.1 vs. 127.6 ± 73.0, 165.4 ± 84.1 vs. 103.7 ± 50.1, [unit : deg/s], $p < 0.01$).

Abstracts were prepared by the authors and printed as submitted.

CONCLUSION: The heel strike was found to induce the knee VL+IR combined with hip AD+IR moments, which forced the joints to move toward the 'position of no return', implying that the heel strike may increase the risk of ACL injury. Decelerating with forefoot is therefore recommended for a safety multi-articular biomechanics.
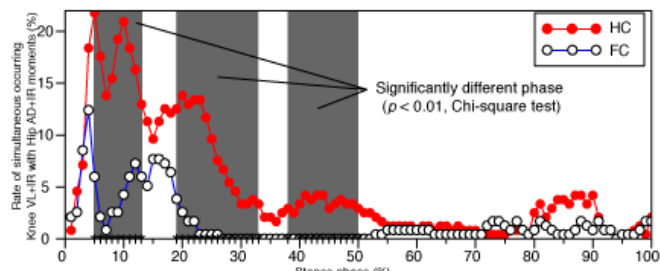
Fig 1. Time course difference of the rate of simultaneous occurring of the Knee VL+IR combined with hip AD+IR during side-cutting motion. Gray-shaded zones showed the significant rate differences between foot conditions.

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Motor Unit Discharge Characteristics And Walking Performance Of Individuals With Multiple Sclerosis.

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(No relevant relationships reported)

PURPOSE: To examine the associations between strength, force steadiness, and motor unit discharge characteristics of lower leg muscle with assessments of walking performance and disability status in individuals with multiple sclerosis (MS).
METHODS: Persons with MS (n=23, 9 men, 53 ± 7 yrs) attended 1 to 3 evaluation sessions that were performed before, immediately after, and 4 wks after a clinical trial of neuromuscular electrical stimulation. Outcomes included 3 questionnaires (Patient Determined Disease Steps [PDDS], Modified Fatigue Impact Scale [MFIS], and MS Walking Scale-12 [MSWS-12]), 25-ft walk test, 6-min walk test, and maximal torque and force steadiness (10 and 20% MVC) for lower leg muscles. High-density surface EMG recordings were obtained from the tibialis anterior (TA), soleus (Sol), and medial gastrocnemius (MG) during the steady contractions and decomposed into discharge times of motor unit action potentials.
RESULTS: Greater levels of self-reported disability (PDDS, MFIS, MSWS-12) were associated with less distance walked in 6 min and longer times to walk 25 ft. Mean interspike intervals (ISI) were 110 ± 23 ms and 102 ± 22 ms (10% and 20% MVC force, respectively) for TA motor units (n= 1,634), 138 ± 36 ms and 135 ± 34 ms for MG motor units (n=696), and 150 ± 33 ms and 145 ± 34 ms for Sol motor units (n = 902). A multiple regression model explained 40% (P=0.001) of the variance in 6-min distance with two predictor variables: mean ISI of MG (partial r = -0.48) and MVC dorsiflexor torque of the more affected leg (partial r=0.37). Similarly, another multiple regression model explained 47% of the variance (P<0.001) in 25-ft time with three predictor variables: mean ISI of soleus (partial r=0.51), MVC dorsiflexor torque of the more affected leg (partial r = -0.43), and force steadiness of the plantar flexors (partial r = 0.39).
CONCLUSION: Moderate amounts of the variance in two walking tests for persons with MS were explained by mean discharge times of action potentials by motor units in plantar flexor muscles during steady submaximal contractions, the strength of the dorsiflexor muscles in the more affected leg, and force steadiness during an isometric contraction.
This research was supported by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the NIH (R03HD079508).

3290   Board #159   June 2 9:30 AM - 11:00 AM

Overground Locomotor Training in Incomplete Spinal Cord Injury: Effects on Balance and Gait

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(No relevant relationships reported)

Introduction: Restoration of ambulatory function in individuals with motor-incomplete spinal cord injury is the primary aim of rehabilitation. However, optimal training methods to improve balance and gait in this population have not been established. **Purpose:** To determine changes in balance and gait following a task-specific, performance-based training protocol for overground locomotor training (OLT) in individuals with motor-incomplete spinal cord injury (iSCI). **Methods:** Convenience sample, pilot study. Nine males and three females (38.5±16.4 years old,

AIS C or D, >6 months post-SCI) participated in two 90-minute OLT sessions per week for 12 to 15 weeks. OLT sessions are built on three principles of motor learning: practice variability, task-specificity, and progressive overload (movement complexity, resistance, velocity, volume). Training uses only voluntary movements without body weight support, robotics, or other assistive devices. Subjects used ambulation aids as necessary. Outcome measures collected at baseline and post-intervention. Measures of interest include Berg Balance Scale (BBS) and Functional Ambulation Inventory (SCI-FAI) for all participants. Spatiotemporal measures were collected from six participants that walked on a pressure-sensitive walkway. **Results:** 11 participants completed OLT and one participant completed 15 of 24 sessions due to scheduled surgery. The BBS scores showed a mean score improvement of 4.33±4.64 (p<0.01). SCI-FAI scores showed a mean score increase of 2.17±3.76 (p=0.07), with six of the participants scoring at least 18 out of 20 possible points post-training. One individual progressed from using a rolling walker pre-training to no assistive device post-training. SCI-FAI score for this individual did not change [19/20] but preferred gait speed increased 168% [0.30 to 0.81 m/s], step length increased 104% [0.33m to 0.68m], and mean center of pressure to center of mass (CoP-CoM) distance in the sagittal plane increased 132% [2.55cm to 5.91cm] after training. **Conclusion:** This pilot demonstrates improvements in balance and some gait characteristics using a novel task-specific, performance-based OLT for chronic motor incomplete SCI.

3291   Board #160   June 2 9:30 AM - 11:00 AM

Decline in Gait Speed Across Clinical Populations Indicates Increased Risk of Falling

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(No relevant relationships reported)

The process of aging is typically associated with a general decline in sensorimotor and neuromuscular function that become apparent during different movements including gait. Spatiotemporal measures at preferred walking speed have be used to quantify functional capacity of a person's walking ability and, clinically, to assess the impact neurological disorders have on gait. For example, persons with multiple sclerosis (MS) and Type 2 diabetes (T2DM) often present with gait and balance problems which can lead to increased risk of falling. **PURPOSE:** This study was designed to assess differences in gait and falls risk for healthy individuals compared to persons diagnosed with MS or T2DM. **METHODS:** Twenty three healthy adults (controls), 23 persons diagnosed with MS, and 23 individuals with T2DM participated in this study. Falls risk was assessed using the Physiological Profile Assessment (PPA). For gait, participants performed 3 trials at their preferred gait speed while walking across a pressure sensitive mat. Measures of velocity, step length, stride length, and step time were used to assess gait. A within-subject, repeated-measures generalized linear model was used to analyze the data. **RESULTS:** The results revealed significant differences in falls risk between the three groups with the MS persons exhibiting the greatest risk score (MS 2.51±1.4, T2DM 0.84±0.7, control 0.22±0.6). There was significant group difference in walking velocity with the MS persons walking at a significantly slower velocity (mean 89.6m/s) compared to the controls (mean 117.2m/s) and the T2DM group (mean 111.8 m/s; $F_{2,64}$=14.12, p<0.001). The differences in walking speed were also reflected by significant differences in step length ($F_{2,64}$=12.50, p<0.001) and stride length ($F_{2,64}$=11.39, p<0.001) between the three groups. The changes in step/stride length were not reflected by similar changes in step/stride time. **CONCLUSION:** Overall, significant differences in walking speed and spatiotemporal parameters were found between healthy adults and individuals with MS and T2DM. The decline in gait speed appears to be associated with an increased risk of falling. The basis for the reduction in gait speed would appear to be driven by reductions in the length of the step/stride taken rather than alteration of the duration of the step/stride events.

G-42   Free Communication/Poster - Walking Biomechanics

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3292   Board #161   June 2 9:30 AM - 11:00 AM

Influence Of Different Sole Thickness On Biomechanical Parameters Of Human lower Extremity

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(No relevant relationships reported)

Background: Different athletic shoe outsole thickness can influence human movement from the aspects of both performance enhancement and injury prevention.
Purpose: To investigate the influence of different outsole thickness on lower extremity muscle activity, kinematics, and kinetics during walking and running.

Method: Twelve male college students (age: 20.9±0.7, height: 172.0±2.1cm, body mass: 63.0±3.4 kg) were tested. Four sole thickness (original commercial shoe, 1, 2, and 3 cm increased outsole thickness) were tested. Elastic modulus was tested using a universal testing machine (Instron-5544, US). The running tests were performed on a treadmill with a fixed speed (3.33 m/s) and continued for 8min. Walking tests were performed on a force platform (AMTI, US, 400×600mm). A motion capture system (VICON, Oxford, UK) was used to obtain kinematic data. Wireless surface electromyography testing system (Noraxon, US) was used to obtain the surface electromyography (sEMG) data. One-way analysis of variance with repeat measures (ANOVA) was used to compare differences in muscle activity, kinematic, and kinetic outcome variables. Statistical significance was set at $\alpha = 0.05$.

Results:

The 1 cm sole thickness has the highest elastic modulus (0.80MPa) and the 3cm is the lowest (0.25MPa). The co-contraction index value of 1cm group was significantly less than the others in both initial (0.55±0.14, P<0.05) and final (0.53±0.13, P<0.05) stage of running. At the toe off, the knee angle of 2 cm (131.0±9.5 deg, P<0.05) and 3 cm (132.7±4.6 deg, P<0.05) group increased significantly comparing to 0cm (125.0±5.4 deg) group in walking test.

Conclusion:

The outsole thickness of 1cm reduced muscle co-contraction during running. Knee joint increased with the increasing of sole thickness at the time of toe off when walking.

3293   Board #162   June 2 9:30 AM - 11:00 AM

How Pain Management for Osteoarthritic Knee Influences Gait: A Case Study

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(No relevant relationships reported)

Osteoarthritis (OA) is the most common joint disorder in the US. Pain management has been a commonly investigated treatment for knee OA, little is known about the effects pharmacologic interventions have on gait. **PURPOSE:** To investigate the effects of pharmacological interventions on gait. **METHODS:** A 47-year-old male (1.7 m, 75 kg) with a diagnosed left knee medical compartment OA with severe bone on bone joint space narrowing with marginal osteophytes and subchondral sclerosis participated in this study. Three medication regimens (no medication (NM), over the counter NSAID (NSAID), and a prescription pain medication (PPM)) were used for this study. Trials were randomized and data was collected at the end of a week with a 7 day wash out period before the next trial. Testing consisted of a 5-minute walk at a self-selected pace on an instrumented treadmill. Data was collected using Vicon Nexus and sagittal plane kinematics and kinetics were analyzed using Visual 3d. **RESULTS:** At the ankle the PPM led to a peak plantarflexion moment that was two times greater at push-off (0.66 Nm/kg) compared to the NM condition (0.31 Nm/kg) in the affected limb. At the knee, the NM condition had more flexion at both foot contact and flexion during loading compared to both the PPM and NSAID in the affected limb. The loading knee extension moment of the affected limb was elevated in the NM condition (2.3 Nm/kg) compared to the PPM condition (1.5 Nm/kg). When comparing the affected limb to the unaffected limb, the loading knee extension moment was more symmetrical between the two sides in the PPM condition compared to both the NM and the NSAID condition. The affected knee experienced greater loading in the sagittal plane in both of these conditions. **CONCLUSION:** The results of this case study suggest that medications alter lower extremity biomechanics of both the affected and unaffected limb during gait. In the sagittal plane it appears that at the knee the use of prescription medication leads to more symmetrical gait in loading and reductions in knee loading moments. At the ankle the prescription pain medication appears to allow for the push-off moment to be increased and more similar to healthy gait. When considering the sagittal plane at the ankle and knee the prescription pain medication appears to restore normal and healthy gait patterns in a subject with knee OA.

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The Effect of Change on Stride Length on Muscular Activity and Energy Cost during Walking

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(No relevant relationships reported)

Human bipedalism is the most unique locomotive form in the terrestrial environment and can be performed for a prolonged period of time. To maintain this form of locomotion humans have adopted physiological and mechanical strategies to minimize and conserve energy. **PURPOSE:** To study the effects of stride length change on the electromyographic (EMG) activity of the quadriceps and hamstring muscle groups and oxygen consumption. **METHODS:** Male (n=6) subjects (age = 23.25 ± 0.95 years) were recruited for this study. Height, weight, body composition

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(bioelectrical impedance analysis), and stride length (SL) were measured. Surface EMG activity of the right quadriceps and hamstring muscle group, heart rate, and oxygen consumption(VO_2) were measured during walking at self-selected (SS) speed at the following stride lengths: (1) SS, (2) 10% below SS, (3) 20% below SS, (4) 10% above SS, (5) 20% above SS, and (6) 30% above SS. Repeated measures ANOVA were used to determine serial patterns and paired t-tests for differences between different SL. **RESULTS:** VO_2 was significantly lower at SS SL than 20% below SS SL and VO_2 of 20% below SS SL was lower than 10% below and 10% above SS SL. VO_2 of 10% and 20% above SS SL was lower than 30% above SS SL (P < 0.05). Heart rate was significantly lower at SS SL than 20% below and 10% and 30% above SS SL. Heart rate of 10% and 20% above SS SL was lower than 30% above SS SL (p<0.05). EMG activity in the quadriceps muscle was significantly lower at SS SL than 20% below SS SL and EMG activity of 20% below SS SL was significantly lower than 10% below SS SL. EMG activity of 10% above SS SL was lower than 20% above SS SL (P<0.05). There were no differences in the EMG activity of the hamstring muscle group. **CONCLUSION:** Preliminary results from this ongoing study demonstrate that energy costs increase at values above and below self-selected stride length at a SS speed, resulting in a U-shape curve in oxygen consumption and muscle activity in quadriceps muscle. SS SL appears to be optimal in terms of walking energy efficiency compared to shorter and longer SL. These results suggest that the SS locomotive pace in humans is that at which the most efficient energy cost can be maintained. Further studies are necessary to investigate the effect of stride length alteration training on the energy cost and efficiency of walking.

3295   Board #164   June 2 9:30 AM - 11:00 AM

Does Music-Based Rhythmic Auditory Cueing Alter the Correlation Structure of Stride Times?

Scott W. Ducharme, Dylan C. Perry, Colleen J. Sands, Elroy J. Aguiar, Christopher C. Moore, Catrine Tudor-Locke, FACSM. *University of Massachusetts, Amherst, Amherst, MA.* (Sponsor: Catrine Tudor-Locke, FACSM)

(No relevant relationships reported)

The time interval from heel strike to subsequent heel strike (i.e., stride time) has been shown to be statistically persistent, i.e., long or short stride times are likely to be followed by subsequent stride times of similar magnitude. This persistence is thought to represent complex, adaptive locomotor behavior. Rhythmic auditory cueing (RAC) entails instructing participants to synchronize their foot strike timing to an auditory metronome. While RAC reduces stride time variability, it also eliminates stride time persistence, which may indicate reduced adaptability. Alternatively, matching foot strike timing to a musical tempo instead of a metronome may yield less precise temporal synchronization, thereby preserving the correlation structure of the time series. **PURPOSE:** To determine if music-based RAC reduces the persistence of stride time variability. **METHODS:** Nine young, healthy adults (mean±SD age 22.9±2.0 years, height 171.0±11.7 cm, mass 75.4±14.9 kg) walked along an oval course (40 m) for six 5-minute trials. Three of the trials consisted of walking at self-selected slow, normal, and fast walking speeds. The remaining three trials entailed participants walking while matching their foot strike timing to the tempo of a song. Using a commercially available app, the tempo of a single song was altered to 80, 100, and 125 beats per minute. Participants performed separate, randomly ordered trials while matching each song tempo. Stride times were obtained via an ActiGraph accelerometer at the right heel. Detrended fluctuation analysis was used to quantify the extent of statistical persistence of stride times. A repeated-measures ANOVA was used to test for effects of RAC on stride time persistence. **RESULTS:** There was a main effect of RAC on stride time persistence ($F_{1,8} = 5.26$, $p = 0.05$), as persistence decreased when participants entrained to music, compared to self-selected walking. However, this effect was not consistent across all participants, as 3 of the 9 individuals exhibited greater persistence during RAC trials. **CONCLUSION:** Similar to reports of metronome entrainment, synchronizing step timing to music resulted in an overall modified correlation structure closer to random, which is associated with less adaptive behavior. Future studies may consider testing RAC to more complex songs with various beats.

3296   Board #165   June 2 9:30 AM - 11:00 AM

Does Arm Swing Frequency Match Alterations in Stride Frequency during Treadmill Walking?

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(No relevant relationships reported)

PURPOSE: To determine whether arm swing frequency matches alterations in stride frequency above and below preferred stride frequency while walking on a treadmill at a range of speeds.

METHODS: At each of 4 self-selected speeds, 10 female participants (mean age: 27.6 yr, range: 20-47 yr) walked on a treadmill while attempting to match their stride frequency to the beat of an audio metronome beating at one of three different

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frequencies: 90%, 100%, and 110% of the preferred stride frequency at that speed. Speeds used were: Low (slowest kinematically smooth speed), Mid1 (0.2 mph below "most comfortable" speed), Mid2 (0.2 mph above "most comfortable" speed, and High (fastest normal walking speed). On three separate days, participants completed, in a randomized order, 12 5-minute trials at each combination of the 4 walking speeds and 3 stride frequency levels. From video of the third test session, actual stride frequency and arm swing frequency was determined for 10 consecutive strides/swings in both the third and fourth minutes of the trial.

RESULTS: Seven of the ten participants were able to maintain actual stride frequencies very close to the nominal frequency of the metronome; actual SF values were different from nominal SF values by an average of only 1.6% (range 0.7% to 7.4%) in this group, while the other three participants were unable to match the nominal SF successfully (range 15% to 21% different from nominal). For the seven participants who could achieve the nominal SF, the correlation between arm swing frequency and stride frequency was almost exact (r2=0.99). Interestingly, the three participants who could not achieve the nominal SF also had arm swing frequencies that correlated very strongly with their stride frequency (r2=0.99).

CONCLUSIONS: The very tight coupling of the frequency of alternation of the arms and legs in our participants, even when using stride frequencies above or below the preferred frequency for a given speed, indirectly supports a common central pattern generator source for the pacing of these movements.

This research project was funded by a 3M Faculty/Student Collaborative Grant through the St. Catherine University, St. Paul, Minnesota.

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Local Dynamic Stability is Affected By Soldier-Relevant Torso Loads and Gait Speeds

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(No relevant relationships reported)

For soldiers, falling while carrying heavy loads can lead to serious injury. Nonlinear analyses, such as local dynamic stability (LDS), can quantify gait stability. LDS can be affected by both load and speed. Studies on soldier-relevant torso loads at multiple speeds are lacking.
PURPOSE: To determine if soldier-relevant loads at 3 speeds affect LDS of the trunk and pelvis during gait.
METHODS: 10 healthy adults (5M, 5F) walked on a treadmill at 3 speeds (1.15, 1.35, 1.55 m/s) under 3 loaded vest conditions (1.3, 15, 27 kg). Trunk and pelvis marker data were collected for 2 min. Short term local divergence exponents (LDE) of marker velocity data in the mediolateral, anteroposterior and vertical directions (ML, AP, V) were calculated to quantify LDS by measuring the rate at which each stride changes from the prior stride. Larger LDE values indicate decreased LDS. Linear regressions analyses tested the effects of load (L1, L2, L3) and speed (S1, S2, S3).
RESULTS: LDS decreased with increased load in all directions at the trunk (LDE Mean±SD; ML: 0.44±0.02, 0.45±0.02 for L2 and L3 respectively, $p = 0.001$; AP: 0.39±0.02, 0.41±0.01, 0.43±0.01 for L1, L2 and L3, $p ≤ 0.009$; V: 0.68±0.04, 0.72±0.04, 0.77±0.04 for L1, L2 and L3, $p ≤ 0.021$) and in the vertical direction at the pelvis (0.55±0.04, 0.58±0.40, 0.62±0.39 for L1, L2 and L3, $p ≤ 0.019$). Conversely, ML and AP LDS increased with increasing speed at the trunk (ML: 0.48±0.02, 0.44±0.02, 0.41±0.02 for S1, S2 and S3, $p < 0.001$; AP: 0.43±0.01, 0.41±0.01, 0.39±0.02, $p < 0.001$ for S1 vs S2 and S1 vs S3) and pelvis (ML: 0.32±0.02, 0.30±0.01, $p = 0.004$ for S1 vs S2; AP: 0.42±0.02, 0.37±0.03, 0.36±0.02, $p ≤ 0.001$ for S1 vs S2 and S1 vs S3). However, vertical LDS decreased with increasing speed at the trunk (0.71±0.04, 0.71±0.05, 0.75±0.04, $p ≤ 0.012$ for S1 vs S3 and S2 vs S3) and pelvis (0.57±0.04, 0.57±0.05, 0.61±0.02, $p ≤ 0.006$ for S1 vs S3 and S2 vs S3).
CONCLUSIONS: Preliminary results suggest that increasing speed with a heavier load increases stability. However, the decrease in vertical LDS with increased speed indicates that more energy may be required to control the vertical motion of the trunk and pelvis, and may lead to earlier fatigue. Inclusion of more participants may reveal interaction effects of load and speed not yet detected.
Funding: BU's Dudley Allen Sargent Research Fund and the DoD SMART Scholarship.

3298 Board #167 June 2 9:30 AM - 11:00 AM

Long Term Functional Metrics Following Direct Anterior Total Hip Arthroplasty

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(No relevant relationships reported)

Total hip arthroplasty (THA) is an effective treatment for patients suffering from end-stage primary hip osteoarthritis. The most common reported outcomes of THA relate to restoration of mobility and decrease of pain. Gait velocity and the Timed Up and Go (TUG) provide functional metrics to quantify improvements during rehabilitation.
PURPOSE: The purpose of this study was to examine differences in gait velocity and TUG measures in direct anterior approach THA patients during recovery compared to healthy controls.
METHODS: Eight unilateral THA patients and 11 healthy controls were recruited for participation. Data collection occurred pre-operatively and at 6 time-points up to 2 years post-operatively. Participants performed 6 walking trials over a 4-m walkway to determine self-selected velocity and 3 TUG trials. A 2x7 repeated measures ANOVA assessed differences in mean gait velocity and TUG (α<0.05).
RESULTS:A significant interaction was found for both velocity (p = 0.002) and TUG (p < 0.01). Post-hoc analysis identified a significant time effect in the THA group for velocity (p <0.01) and TUG (p = 0.01). Post-hoc independent t-tests identified that THA velocity was less than controls at three-weeks post-operatively; there was a significant effect of time in the THA group (Figure 1a). There were no significant group differences in TUG at any time point, but there was an effect of time in THA group TUG measures (Figure 1b).
CONCLUSIONS: Improvements in gait velocity and TUG measures within in THA group supports THA as a successful treatment. However, changes in velocity over time may suggest functional degradation at the 2 year time-point. While there are no differences between 1 and 2 year velocities, we observed THA participants exhibiting a faster velocity at 1 year than six-weeks post-operatively. Yet at 2 years, velocity was no longer faster. This suggests that long-term maintenance of functional measures should remain a clinical consideration for THA patients.

Figure 1a. Average self-selected gait velocities for total hip arthroplasty patients (THA) and healthy control (CTRL) groups across data collection time-points. * p <0.05 for difference between groups. For THA group only, † p < 0.05 for difference compared to pre-surgery, ◊ p < 0.05 for difference compared to 3 weeks post-surgery, Υ p < 0.05 for difference compared to 6 weeks post-surgery.
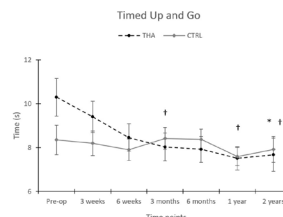
Figure 1b. Average Timed Up and Go completion times for total hip arthroplasty patients (THA) and healthy control (CTRL) groups across data collection time-points. For THA group only, * p < 0.05 for difference compared to pre-surgery, † p < 0.05 for difference compared to 3 weeks post-surgery.

3299 Board #168 June 2 9:30 AM - 11:00 AM

Concurrent Validity Of A Gait Analysis Application Vs. Slow-motion Video For The Assessment Of A 400 M Walk Test

Nathan W. Saunders, Alexandra Colacino, Meghan Hess, Brianna Gassman, Uriel Ibarra-Moreno, Alyssa Braun, Morgan Kiser, Kennady Miller, Abigail Matsushima, Megan Salvatore. University of Mount Union, Alliance, OH.
(No relevant relationships reported)

Our lab developed a cell phone application to assess gait parameters during a 400 m Walk Test. It has the potential to improve the feasibility and effectiveness of allied healthcare professionals. **PURPOSE:** To test the concurrent validity of a cell phone gait assessment application by comparing results to those found through slow motion video analysis of participants completing a 400 m walk test. The hypothesis is that there will be agreement between the application and video for gait speed, cadence, and turn duration. **METHODS:** Seven female and six male apparently healthy adults (Age = 40.7 ± 7.5 years) participated in this study. Participants completed a single trial of a 400 m walk test at a self-selected pace on a 25-meter, linear course. Ends of the course were marked with a cone, and dashed lines were positioned 2.5 meters inward from each cone. Two investigators were present at each test session. One video recorded the participant with a cell phone camera at 30 fps, which was later analyzed for steady-state gait speed, cadence, and turn duration. A second investigator used the gait application to assess the same parameters in real time. Paired t-tests were used to test for significant differences between the two assessment methods. Significance was

established *a priori* at alpha = 0.05. **RESULTS:** There were no significant differences between the gait application and video for gait speed (1.694 ± 0.352 vs. 1.693 ± 0.347 m/s, respectively) or turn duration (4.165 ± 0.761 vs. 4.171 ± 0.762 s, respectively). There was, however, a small but significant difference between the gait application and video for cadence (129.9 ± 14.0 vs. 129.1 ± 13.6 steps/min , respectively). **CONCLUSION:** For middle aged adults across a broad spectrum of gait speeds, the gait application is a valid method to evaluate steady-state gait speed and turn duration of a 400 m walk test. Although there was a significant difference between the gait application and video for cadence, the one step per minute difference is not likely to be clinically meaningful.

3300   Board #169   June 2 9:30 AM - 11:00 AM

Amputee's Gait Assessment for Successive Steps by Miniature Triaxial Load Cells

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(No relevant relationships reported)

PURPOSE: To Evaluate the Amputee's Gait for Successive Steps.
An evaluation and assessment of human gait has been studied by using many systems to perform and analyze the spatio-temporal, kinematic, kinetic, neuro-muscular and energetic data. In order to understand the disorders of the human foot, it is essential to know its anatomy and biomechanics. Since the mechanics of the abnormal foot can adversely affect the normal functioning of the ankle, knee, hip and back, it was the purpose of this investigation to quantify the forces under different regions of amputee's foot and evaluate their gait. METHODS; Ranu's (1) system was used to evaluate specific aspects of foot functioning during abnormal gait. It consisted of a miniature triaxial load cell 8 mm in thickness and 19 mm square. A shoe was instrumented with five load cells, three on the sole and two on the heel. This system was used to measure forces under different areas of the feet of below knee amputees for successive steps. RESULTS: Six below knee amputees of mean age 47.2 years and mean weight 64.5 kg were investigated. The gait of amputees were studied from 1st step on a temporary pylon (1st Run) to a final 'normal' gait on a permanent prosthesis (2nd Run, one month later). Results for forces (Heel-Lateral, 1st Run) 40.5 ± 1.4, forces (1st Metatarsal, 1st Run) 2081.3 ± 62.4 and forces (Big Toe, 1st Run) 72.2. ± 2.46. Results for forces (Heel-Lateral, 2nd Run) 122.3 ± 4.1, forces (1st Metatarsal, 2nd Run) 156.1 ± 5.21 and forces (Big Toe, 2nd Run) 254.3 ± 8.8. These data clearly show a significant improvement in amputees gait from the 1st run and as compared with the 2nd run, 202 (Heel-Lateral), 93(1st Metatarsal) and 114 (Big Toe) % improvement, p > 0.10. CONCLUSIONS : It is concluded that this method of analyzing gait is sensitive, simple, accurate, and can be used as a diagnostic tool in the management of patients with lower extremity disabilities for successive steps. For amputees it was possible to identify misalignments from the output of the various load cells. This method also allowed in identifying and correcting problems in the painful below knee stump. It helped below knee amputees to walk nearly normally.
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3301   Board #170   June 2 9:30 AM - 11:00 AM

Non-linear Lower Extremity Joint Torque Changes Observed during Preparation for Walk-to-run Gait Transition

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(No relevant relationships reported)

PURPOSE: To investigate lower extremity torque components changes in preparation for gait transition with increased walking speed. **METHODS**: 11 male and 3 female college students (age: 22.6 ± 1.9 years, body mass: 75.4 ± 12.8 kg, height: 1.73 ± 0.08 m) were recruited for this study. Participants walked on a force plates embedded treadmill (AMTI, MA, USA) with continuously changed walking speed approaching walk-to-run transition. Ground reaction forces and kinematic data (VICON, Oxford, UK) were obtained at sampling rate of 1000 Hz and 200 Hz, respectively. The results of inverse dynamics were further decomposed into net joint torque (NET), gravitational torque (GTT), motion-dependent torque (MDT), contact torque (EXT), and generalized muscle torque (MST) for the last five strides before gait transition. Owe-way MANOVA employed to exam the difference among the five strides. Post hoc polynomial trend analyses were also employed to examine the trend with the five strides whenever suitable. **RESULTS**: Significant difference of all three lower extremity joints was detected during stance phase. Positive / negative values represent extension / flexion torque. EXT and MST of ankle (0.15 ± 0.02 vs. 0.15 ± 0.03 vs. 0.16 ± 0.02 vs. 0.15 ± 0.02 vs. 0.01 ± 0.01 nm/kg; -0.18 ± 0.02 vs. -0.18 ± 0.03 vs. -0.19 ± 0.03 vs. -0.18 ± 0.02 vs. -0.04 ± 0.01 nm/kg); knee (-0.60 ± 0.11 vs. -0.64 ± 0.11 vs. -0.74 ± 0.12 vs. -0.70 ± 0.11 vs. -1.34 ± 0.12 nm/kg; 0.51± 0.09 vs. 0.55 ± 0.09 vs. 0.63 ± 0.09 vs. 0.59 ± 0.10 vs. 1.25 ± 0.09 nm/kg) displayed significantly decrease / increase at last stride before gait transition during early stance phase (*p* < .05), as were the knee (-0.27 ± 0.03 vs. -0.31 ± 0.04 vs. -0.28 ±0.04 vs. -0.28 ± 0.04 vs. -0.13 ± 0.02

nm/kg; 0.36 ± 0.03 vs. 0.41 ± 0.03 vs. 0.39 ± 0.04 vs. 0.38 ± 0.04 vs. 0.23 ± 0.02 nm/kg) and hip (0.74 ± 0.08 vs. 0.78 ±0.07 vs. 0.73 ± 0.08 vs. 0.75 ±0.09 vs. 0.21 ± 0.04 nm/kg; -1.11± 0.07 vs. -1.15 ± 0.07 vs. -1.13 ± 0.06 vs. -1.15 ± 0.07 vs. -0.74 ± 0.03 nm/kg) responses at end of stance phase (*p* < .05). These variables also displayed significantly quadratic trend as speed increase (*p* < .05). **CONCLUSIONS**: Nonlinear changes in active / passive torques magnitudes observed during gait transition through continuously increased walking velocity. Gait transition was initiated during strides before gait transition.

3302   Board #171   June 2 9:30 AM - 11:00 AM

The Effect Of Soccer History On Tibial Strain During Load Carriage

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(No relevant relationships reported)

Tibia stress fracture (TSF) is common in military recruits. Female Soldiers experience a higher rate than their male counterparts. TSF occurs most frequently in Basic Combat Training (BCT) and has been partially attributed to repetitive impact loading from tasks such as load carriage. Tibia mechanical properties could be improved as a result of training with multi-directional loading (MDL) (e.g. soccer). However, it has yet to be determined whether the improved tibia strength observed with MDL could result in resistance of bone deformation (lower strains) due to load carriage. **Purpose:** To examine the effects of a soccer history and incremented load carriage on tibial bone strain. **Methods:** 20 female soccer players (20±1 yr) and 20 mass- and height-matched healthy women (21±1 yr) participated in this study. They completed four walking tasks with 0kg, 10kg, 20kg, and 30kg loads on a force instrumented treadmill at 1.67 m/s. Participants' tibia CT models were combined with subject-specific musculoskeletal models for forward-dynamic computer simulations and finite element analyses. Strains from the middle third of the bone shaft were analyzed. One-way ANOVAs were performed. α = 0.05. **Results:** Significant differences in strains were found among walking conditions and between the two groups (All p<0.0001). The mean ± SE strains during load carriages (0kg, 10kg, 20kg, and 30kg) were 562±3 μs, 634±3 μs, 736±7 μs, and 825±4 μs in tension for soccer players, and 684±3 μs, 791±3 μs, 1152±7 μs, and 1015±4 μs, for controls, respectively, resulting in an 18-36% difference in strains during load carriage. Compressive strains were 849±4 μs, 960±4 μs, 1092±10 μs, and 1180±7 μs in soccer players and 1039±4 μs, 1179±7 μs, 1749±11 μs, and 1552±7 μs in controls showing similar percent differences as tensile strains (18-38%). **Conclusion:** Participants with a soccer history benefited from significantly lower strains than healthy controls during incremental load carriage. Lower tibial strains during load carriage may be protective from TSF in those with a history of soccer, although this has yet to be demonstrated experimentally. These findings suggest that physical training involving MDL may be an ideal exercise modality for preconditioning prior to BCT for female recruits. US ARMY #W81XWH-15-1-0006.

3303   Board #172   June 2 9:30 AM - 11:00 AM

Older Adults That Choose To Not Report Their Falls History Biomechanically Present as Fallers

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(No relevant relationships reported)

Purpose: This study aimed to better understanding the gait biomechanics of individuals that voluntarily choose to not report their history of falling, or lack thereof, against older adults who self-reported a history of falling or not falling. **Methods**: The sample included 1390 people over the age of 60 years (failed to report = 182, fallers = 605, non-fallers = 603). Participants were recruited from multiple testing sites across the Southwest United States. Multiple analysis of variance was conducted to test for differences between individuals that failed to report (FTR), fallers (F), and non-fallers (NF), as well as group differences within variables of the pace factor, including cadence, gait velocity and stride length. For the multivariate analysis, alpha was set at α = 0.15 with follow-up analysis alpha corrected using the Bonferroni technique and set at α = 0.05. **Results**: MANOVA analysis for differences on the set of pace factor variables revealed that there is a significant difference between groups (p<0.001) on the set of variables inclusive of cadence, gait velocity and stride length. Follow-up univariate analysis revealed significant differences in each of the pace factor variables (p<0.05). Pairwise comparisons indicated the position of these differences. Specifically, with regard to cadence, there was no difference between FTR and F, however there is a significant difference between FTR and NF, with NF having significantly faster cadence (FTR = 93.5156spm, NF = 97.5341spm, p=0.005). Similarly, there was no difference between FTR and F in gait velocity, however there was a significant difference between FTR and NF, with NF presenting with significantly higher gait velocities (FTR = 60.6517cm/s, NF = 69.8126cm/s, p<0.01). Finally, in regards to stride length, FTR was not different from F, but was significantly different from NF, with NF presenting with significantly longer stride lengths (FTR = 77.3885cm, NF = 86.2104cm, p<0.01). **Conclusion**: In many falls

screenings, individuals are asked to self-report a history of falling. Based on these results, clinicians should understand that across pace factor variables established to be predictive of falls risk, individuals that choose not to self-report their history of falling appear to present with biomechanical measures that more closely resemble fallers.

G-43   Free Communication/Poster - **Macronutrient and Exercise Metabolism**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3304   Board #173   June 2 9:30 AM - 11:00 AM

Influence Of Short, Disrupted Sleep And High-intensity Interval Exercise On Fasting And Post-prandial Blood Lipid And Lipid-related Antioxidant Responses In Healthy Men

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(No relevant relationships reported)

Exercise is known to impart transient blood lipid responses that appear consistent with reduced cardiovascular disease risk; yet, it is unclear how short, disrupted sleep (SDS) modifies post-exercise fasting and postprandial blood lipid and lipid-related antioxidant responses to a single episode of exercise. **PURPOSE:** To determine the influence of a single night of SDS on fasting and postprandial blood lipid and lipid-related antioxidant responses after HIIE. **METHODS:** Fifteen male participants (age 31.1 ± 5.3 yr; weight 83.5 ± 11.4 kg; BMI 25.8 ± 2.7 kg/m²; VO_2max 49.1 ± 8.5 ml/kg/min) completed a non-exercise control trial after 9 to 9.5 hrs of reference sleep (REF), HIIE by treadmill running (90% and 40% of VO_2reserve in 3:2 min ratio) to expend 500 kcals after reference sleep (REF+EX) and HIIE after 3 to 3.5 hrs of short and disrupted sleep (SDS+EX) in a randomized crossover design. Blood samples were obtained by the same technician under standardized conditions just before, immediately after (IPE), 1 hr after exercise (1 HR) and just before a high-fat meal - 1240 kcals (56 g fat; 145 g carbohydrate; 38 g protein) and again 2, 4 and 6hrs after meal ingestion and at equal intervals during REF. Total, high-density and low-density lipoprotein cholesterol (HDLC and LDLC) and paraoxonase-1 concentration were measured up to 1 hr post-exercise. Post-prandial triglyceride was measured and area under the curves - total (AUCt) and incremental (AUCi) were calculated. Lipid and lipid-related antioxidant responses were analyzed using 3 (condition) by 3 (sample point) repeated measures ANOVAs. AUCt and AUCi were measured using one-way, 3 (condition) repeated measures ANOVAs. **RESULTS:** HDLC (+6.3%, p = 0.0023) and paraoxonase-1 (+10.8%, p <0.0001) increased and triglyceride (-18.5%, p <0.0001) decreased after REF+EX and SDS+EX; TAUCt and AUCi remained refractory to exercise and short, disrupted sleep. **SUMMARY:** Exercise transiently increased fasting HDL cholesterol and related antioxidant concentrations and reduced triglyceride levels, but did not modify total or incremental triglyceride AUC in response to a post-exercise high-fat meal. Short, disrupted sleep did not influence these responses.

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Effects Of Pre-exercise Sucrose Ingestion On Thermoregulatory Responses To 5-km Running

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(No relevant relationships reported)

PURPOSE: Carbohydrate feeding, in particular fructose, is associated with increased dietary thermogenesis and body temperature at rest. Whether these effects influence the thermoregulatory responses to heavy exercise remains uncertain. **METHODS**: A total of 28 runners (26 men, 2 women; 35.2 ± 9.6 years) with the ability to finish a 5-km in 16 to 23 minutes completed this randomized, double-blind, placebo-controlled trial. Runners were pair-matched based on their self-reported maximal 5-km running speed and assigned to consume a beverage containing 750 mL of water plus either 100 g of sucrose or 0.8 g of aspartame. Beverages were consumed 60 minutes before the 5-km, which was conducted at 93% of maximal 5-km speed in a temperate environment (21-22°C, 53% relative humidity). Gastrointestinal temperature, Thermal Sensation Scale (TSS) and Feeling Scale (FS) were recorded before beverage ingestion, every 10 minutes during rest, and every 1-km during the 5-km run. Rating of Perceived Exertion (RPE) was also recorded every 1-km. Two-way mixed ANOVAs with repeated measures and independent t-tests were used to examine treatment effects. **RESULTS**: Treadmill speed for the 5-km run was well-matched (13.8 ± 1.0 vs. 13.8 ± 1.0 km/h; $p = 0.98$) between the groups. Gastrointestinal temperature was not different between the carbohydrate (38.7 ± 0.4°C) and placebo (38.6 ± 0.4°C) groups by the end of the

5-km ($p = 0.49$). No group x time interactions or main effects for group were found for gastrointestinal temperature, TSS, FS, or RPE. A group x time interaction was found for TSS (F = 2.1, $p = 0.02$, partial $\eta^2 = 0.075$). Significant time effects were found for gastrointestinal temperature, TSS, FS, and RPE (all $p < 0.001$, partial $\eta^2 = 0.38$ to 0.91), with temperature, TSS, and RPE increasing, and FS decreasing, over time. **CONCLUSIONS**: Ingestion of 100 g of sucrose 60 minutes before exercise does not affect gastrointestinal temperature during near-maximal 5-km running in a temperate environment, and therefore does not likely modify the risk of heat illness.

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Blood Glucose Control Following Single-Leg and Double-Leg Cycling

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(No relevant relationships reported)

When exercise is confined to a small muscle mass, greater blood flow to that muscle allows for greater muscle specific intensity compared to whole body exercise. The greater muscle specific intensity results in greater glucose oxidation for any given VO_2 which may optimize exogenous blood glucose uptake following the exercise. **PURPOSE:** Thus, the purpose of this study was to determine the influence of reduced muscle mass exercise (single leg cycling) on post exercise blood glucose control. **METHODS:** Seven healthy college age students completed the study in which they arrived fasted and were administered an oral glucose tolerance test (OGTT) following 4 conditions: no exercise, following 30 minutes of single leg cycling, following 30 minutes of double leg cycling matched for VO_2, and following 30 minutes of double leg cycling matched for power. VO_2, RER, and carbohydrate oxidation were recorded throughout the exercise. Two 4 x 2 repeated measures ANOVAs were performed on condition (single leg, double leg VO_2 and double leg power) and time (baseline and average blood glucose as well as baseline and peak blood glucose). **RESULTS:** Despite the fact that carbohydrate oxidation was greater during the single leg cycling ((1.4 ± 0.45 grams) of carbohydrate utilized per minute during single leg compared to (1.0 ± 0.49 g/min) during double leg matched for VO_2 and (0.87 ± 0.43 g/min) during double leg cycling matched for power), there was no difference ($p > 0.05$) in average blood glucose uptake between single leg cycling (126 ± 8 mg/dL) and double leg cycling when matching for VO_2 (121 ± 10 mg/dL) and power (125 ± 10 mg/dL) when compared to baseline (124 ± 13 mg/dL). Additionally, there was no difference in peak blood glucose between single leg cycling (160 ± 17 mg/dL) and double leg cycling when matching for VO_2 (154 ± 20 mg/dL) and power (155 ± 19 mg/dL) when compared to baseline (159 ± 18 mg/dL). **CONCLUSION:** We conclude that the greater glucose utilization during single leg cycling had no effect on blood glucose uptake following an OGTT.

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Influence of Acute Resistance Exercise on Post-Exercise Glycemic Control

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(No relevant relationships reported)

PURPOSE: To study the effects of acute resistance exercise on the body's ability to regulate blood sugar in active, resistance trained, adults. **METHODS**: The study included eight participants (2 female, 6 male; age: 20.63±1.85 years; mass: 80.99±24.67 kg; height: 173.31±9.96 cm; body fat: 16.73±6.65%). Initially, informed consent, 10-repetition maximum (10-RM) for the three resistance exercises (squat, biceps curl, and bench press) and demographic measurements were obtained. Subjects completed three trials on separate days. One resting trial and two exercise trials (squat only; full body: all three exercises) were completed. The subjects performed five sets (6 reps/set) using the 10-RM load. In each exercise trial, the subject consumed a 25% carbohydrate beverage (4ml/kg of body mass) after completion of exercise. All trials (resting included) involved a 75-minute oral glucose tolerance test (OGTT). Blood glucose (BG), heart rate (HR), blood pressure (BP) and blood lactate (BL) measures were collected before and following exercise. Blood pressure, and HR were also measured following the OGTT. **RESULTS**: OGTT response was not significantly different based on trial. Area under the curve (AUC) did not differ significantly by trial. Resting AUC was 5.8% greater than the squat only trial and 2.5% greater than the full body trial. There were no significant differences between exercise trials for BL, HR, or mean arterial pressure (MAP). Rate of perceived exertion was significantly greater for full body (15.88 ± 1.81) vs. squat (13.63 ± 1.06). **CONCLUSIONS**: Resistance exercise was not shown to significantly affect glucose regulatory response during recovery. The volume of active muscle did not seem to influence the OGTT response. Resistance exercise may not be as potent as aerobic

exercise in promoting acutely enhanced glycemic control. Future investigations into post-exercise glycemic control should be expanded to include a larger sample size and varied resistance exercises.

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Accuracy, Precision And Comfort Of A Microdialysis Device For Continuous Real-time Blood Lactate Monitoring

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BACKGROUND: In critically ill patients blood lactate is measured as a marker of tissue perfusion, with increasing lactate being associated with insufficient perfusion and poorer prognosis. Serial monitoring of blood lactate is a valuable tool in predicting in-hospital mortality, with a better prognosis observed when blood lactate concentrations are decreasing. A device that allows for automated, continuous monitoring of blood lactate removes the need for a practitioner to draw samples, and could provide more effective patient monitoring. **PURPOSE:** Evaluate the performance of a peripheral intravenous microdialysis device and online *in-vitro* diagnostic lactate biosensor system for continuous automated blood lactate monitoring. **METHODS:** Twenty volunteers (age 27 ± 8 years; stature 175 ± 10 cm; mass 76.5 ± 13.8 kg) completed one experimental visit. An 18-gauge catheter was inserted into an antecubital vein, and a microdialysis device (MicroEye® PME012, Probe Scientific, UK) inserted into the catheter. The MicroEye® was perfused at 1mL/hour with 0.9% sodium chloride containing anticoagulant (Fondaparinux). The outlet of the MicroEye® was connected to the inlet of a lactate flow cell (ContinuMon®, Probe Scientific, UK) for continuous lactate monitoring. A second catheter was introduced into a peripheral vein in the contralateral forearm for reference blood sampling. Venous blood was sampled at 10-minute intervals throughout 30 minutes of rest, and at the end of five 3-minute incremental exercise stages, beginning at 70 watts and increasing by 35 Watts per stage. Comfort for each arm was assessed using a 9-point scale ranging from unnoticeable (8) to painful (0). The relationship and agreement between reference and MicroEye® values assessed via least mean square and Bland-Altman analysis. **RESULTS:** Paired samples falling within the clinical range (0-4 mM; n = 152) gave an R^2 of 0.93 (y = 1.002), a mean bias of 0.027 mM, and an upper and lower limit of agreement of 0.54 and -0.49 mM respectively. Subjective comfort was not different between the MicroEye(R) (7 ± 1) or reference arm (7 ± 1) at any point in the trial. **CONCLUSION:** The MicroEye(R) microdialysis cathetar and ContinuMon(R) continuous lactate monitoring system exhibits good agreement when following exercise induced blood lactate changes in the clinical range.

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Influence Of Muscle Action On Energy Expenditure: Concentric Vs. Eccentric Vs. Both

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(No relevant relationships reported)

PURPOSE: Previous studies have found the energy cost of eccentric exercise to be approximately 1/7 to 1/4 that of concentric exercise, but no study has directly compared concentric–and eccentric–only resistance exercise. Therefore, we compared energy expenditure between squats performed with concentric or eccentric muscle actions.
METHODS: 12 healthy men (20.9 ± 1.1yrs) with a BMI<26 performed three exercise protocols once weekly designed to compare energy expenditure between different muscle actions: concentric (CON), eccentric (ECC), and a trial incorporating both concentric and eccentric (BOTH). Subject's 1RM was determined using a plate-loaded squat machine. Each protocol was randomly assigned in a counterbalanced order and required subjects to perform 4 sets of 10 reps with 50% of 1RM. Repetition speed (2sec), ROM, and rest intervals were identical across protocols. Expired air was collected continuously before (15min), during (12min), and after (30min) each exercise protocol using a metabolic cart. Data were analyzed using a two-way repeated measures ANOVA, with Fisher's least significant difference (LSD) post hoc analyses wherever appropriate.
RESULTS: Rates of energy expenditure (kcal·min⁻¹) were significantly greater (p<0.05) during sets 1 through 4 of CON and BOTH compared to ECC (see Table). CON was also greater than BOTH for sets 2 and 4. After exercise, CON > ECC at +5 and +10min, and BOTH > ECC at +5min. Significant differences (p<0.05) in total energy expenditure (kcal) included CON (58.1 ± 6.27) > BOTH (50.7 ± 5.92) > ECC (40.9 ± 3.33).

CONCLUSION: When squats were performed with 2sec CON or ECC muscle actions and 50% of 1RM, the energy cost of ECC was 2/3 to 3/4 that of CON exercise, whereas previous studies have reported ECC was about 1/4 of CON. A possible explanation may be that slower muscle actions used in our study resulted in elevated energy cost of eccentric muscle actions due to increased time under tension.

	Set 1	Set 2	Set 3	Set 4	+5min	+10min
Energy Expenditure (kcal·min⁻¹)						
CON	4.3±0.44 #	4.5±0.45 #*	4.3±0.51 #	4.4±0.50 #*	2.6±0.59 #	2.0±0.32 #
ECC	3.3±0.30	3.0±0.27	3.0±0.33	2.9±0.33	2.0±0.39	1.7±0.30
BOTH	4.4±0.65 #	3.5±0.42 #	4.2±0.58 #	3.5±0.38 #	2.3±0.25 #	1.9±0.18

Values are MEANS±SD; # denotes p<0.05 vs corresponding ECC value; * denotes p<0.05 vs corresponding BOTH value; significance for this study was set at p<0.05.

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The Effects Of Exercise To Bmp-4-mediated Browning On White Adipose Tissue In Obese Rats

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(No relevant relationships reported)

PURPOSE: Bone morphogenetic protein-4(BMP-4) play a key role in regulating adipocyte differentiation and browning. The aim of this study is to observe the effect of treadmill running on the protein expression of BMP-4 and UCP-1 which is a marker protein associated with thermogenesis to discuss the effect of exercise on adipogenesis and browning in adipose tissue roundly.
METHODS: Before the formal experiment, we established a rat model of obesity with 8-week high-fat diet. The 20 11-week obese rats were obtained, and randomly divided into sedentary high-fat-diet group(SHD) and exercise high-fat-diet group(EHD). Other 20 11-week chow-diet rats were randomly divided into sedentary chow-diet (SCD) and exercise chow-diet (ECD) groups. Rats in the ECD and EHD had 8 weeks training (60%-70% VO$_2$max, 50 minutes/day, 5 days/week). The white adipose of Inguinal subcutaneous tissue (SAT), Periepididymal white adipose tissue (PAT) were collected.
RESULTS:1) In SAT, obesity has a very little effect in promoting protein expression of BMP-4 and UCP-1. Exercise significantly increased the protein expression of BMP-4 and UCP-1 on obese rats , but had little effect on chow diet rats. 2) In PAT, obesity can decrease the expression of BMP-4 protein, but little effect on UCP-1.Exercise significantly increased the protein expression of BMP-4 and UCP-1 on chow diet rats, but had little effect on obese rats.(The data are shown in table)
CONCLUSIONS: The effect of high-fat diet on adipocyte differentiation and browning is different in different tissues in obese rats, and exercise can exacerbates this differences.

Expression of BMP-4 and UCP-1 protein in adipose tissue				
	SAT		PAT	
	BMP-4	UCP-1	BMP-4	UCP-1
SCD	1.OO±0.00	1.OO±0.00	1.OO±0.00	1.OO±0.00
ECD	1.05±0.13	0.99±0.15	1.31±0.05[a]	1.19±0.08[a]
SHD	1.10±0.18	1.23±0.25	0.79±0.07[ab]	1.02±0.15
EHD	1.27±0.09[abc]	1.97±0.51[abc]	0.76±0.08[ab]	0.91±0.11[b]
[a] P<0.05vs.SCD each protein in the same tissue ; [b]P<0.05vs.ECD; [c] P<0.05vs.SHD				

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Acute Exposure to a High-Fat High-Sugar Diet Alters Wheel Running Activity

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(No relevant relationships reported)

BACKGROUND: Literature shows that chronic exposure to a high-fat high-sugar (HFHS) Western diet decreases voluntary physical activity, mainly through decreased duration of activity. **PURPOSE:** To determine if acute exposures to standard chow and a HFHS diet affect voluntary activity levels in male mice. **METHODS:** Eight-week-old male C57BL/6J male mice (n=20) were singly housed and provided with running wheels. Wheel running activity was measured daily via mounted odometers. Distance (km) and duration (min) were used to calculate average speed (m/min). Mice were randomly assigned to two experimental groups that alternated between the HFHS diet (20% protein, 35% carbohydrate, 45% fat, with 20% fructose water) and a standard chow diet (24.3% protein, 40.2% CHO, 4.7% fat) in three 5-day cycles followed by two 8-day cycles. At study initiation, Group 1 began with the HFHS diet and Group 2 began with standard chow. At the end of each cycle period, both groups switched to the opposing diet. Data were analyzed using a repeated measures model

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Abstracts were prepared by the authors and printed as submitted.

with distance, duration, and speed for each cycle as dependent variables and diet, group, and diet*group interaction as fixed effects. Alpha value was set a priori at 0.05 and post-hoc tests used Tukey's HSD. **RESULTS:** Acute exposure to the HFHS diet decreased speed (p=.0075), while distance (p=.7527) and duration (p=.1077) were not altered. No overall group effects on distance (p=.3670), duration (p=.3747), or speed (p=.5266) were observed; however, animals exposed to the chow diet first (Group 2) showed an increase in activity duration (p=.0040) when exposed to a HFHS diet in all cycles. **CONCLUSION**: Acute exposure to a HFHS diet only decreased speed, which is surprising given the literature on chronic HFHS exposure that has shown decreases in distance. The observed increase in activity duration in mice that had chow at the initiation of wheel-running exposure (Group 2) suggests that acute and chronic effects of a HFHS diet on physical activity level differ in mice.

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The Effect Of Interval Training On Aerobic Capacity In Mice Growth Restricted In Early Life

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(No relevant relationships reported)

Previous research has found that early life undernutrition increases the risk of cardiovascular disease later in life. It is hypothesized that exercise training could mitigate the cardiovascular impairments of early life undernutrition. PURPOSE: To evaluate the effects of early life undernutrition on changes in exercise capacity after 8 weeks of treadmill (TM) training in a mouse model. METHODS: Using a cross fostering model, pups were undernourished during gestation (GUN), lactation (PUN), or both (GUN+PUN) by feeding FVB mouse dams a low protein (8%) diet. The control (CON) group was fed an isocaloric diet (20% protein) during all windows of development. At PN21 (21 days post-natal), all mice were weaned and fed the control diet. Thus, all physiological effects of undernutrition were isolated to early life. To evaluate exercise capacity, maximal work on a TM was performed at PN39 (baseline), PN67 (midpoint), and PN95 (post). Starting at PN41, 28 mice were trained on the TM 5 days/week for 8 weeks with alternating 8 mins at 85% and 2 mins at 55% of their max workload for 1 hour. The sedentary group of 30 mice ran on the TM 3 days/week for 15 mins at 10m/min. Data were analyzed using a repeated measures ANOVA to detect change in exercise capacity over time and an ANOVA with Tukey post-hoc test (alpha level p<0.05) to detect differences in exercise capacity between groups. RESULTS: After 4 weeks of TM training, there was a significant difference in exercise capacity change over time between the TM trained (+5.0±3.9 J[FD1] oules (J)) and sedentary groups (+2.5±6.0J) (p=0.03). Differences in exercise capacity change over the first 4 weeks were trending toward significance between groups (GUN: 2.8±1.4J, PUN: 1.7±1.2J, PUN+GUN: 6.0±1.2J, CON: 4.6±1.4J,) (p=0.057). No significant changes were observed from weeks 4 to 8 between or within groups. CONCLUSION: Results indicate that 4 weeks of exercise training can improve exercise capacity in mice who were undernourished during gestation and gestation plus lactation, but not undernutrition during lactation only. PN1-21 is associated with cardiac growth and the nutrient restriction could potentially limit cardiac growth factors preventing stroke volume adaptations with training.

3313   Board #182   June 2 9:30 AM - 11:00 AM

Effects Of High-fat Diet And Exercise On Total Plasma Macronutrient Contents By Fourier-transform Infrared Spectroscopy

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(No relevant relationships reported)

High fat-low carbohydrate (HFLC) diets are increasingly considered by endurance athletes to enhance their performances and overall health. Total macronutrient contents in plasma may be affected by diets and exercise. **PURPOSE**: To examine the effects of HFLC diet and an acute bout of exercise on total plasma macronutrient contents in trained males. **METHODS**: Eight trained distance runners (age = 39.5±9.9 years and VO₂max = 47.9±7.6 mL/kg/min) that were on high-carbohydrate (HC) diets adopted the HFLC diet for 3 weeks, which consisted of 70% of overall caloric intake from fats and no more than 50g of carbohydrates. At the end of each diet trial, participants performed an indoor treadmill exercise for 50 minutes at varying race paces followed by an outdoor 5-km time trial. Overnight fasting blood samples were collected at pre- (baseline) and post-exercise (24-hours) to analyze changes in total plasma lipids, proteins, and carbohydrates using attenuated total reflectance Fourier-transform infrared spectroscopy (ATR FT-IR). The O-H stretch vibrational band of water was used to normalize the IR spectra and the protein content was quantified by measuring the amide I peak intensity at 1600 - 1700 cm⁻¹. To quantify the lipids and carbohydrates, the samples were lyophilized and measured by the intensities at 2800 - 3000 cm⁻¹ and 800 - 1200 cm⁻¹, respectively. **RESULTS:** The ATR FT-IR analysis showed that total plasma proteins remained unchanged (HC baseline = 135.20±4.20 and HFLC baseline = 135.24±3.91AU). However, the HC diet at baseline

showed a significant accumulation of lipids (30.06±7.75 AU, 95% CI = 6.93) and carbohydrates (42.92±11.62 AU, 95% CI = 10.39). Additionally, total lipids in the HC diet significantly decreased at 24-hours post-exercise (from 30.06±7.75 to 28.51±7.91 AU, p=0.016). **Conclusion:** A short-term high-fat diet does not significantly alter any macronutrient contents in plasma, whereas a high-carbohydrate diet increases an accumulation of lipids and carbohydrates. Elevated plasma lipids and carbohydrates with a high-carbohydrate diet may be due to decreased insulin sensitivity, which consequently led to increased plasma lipid contents. Notably, decreased total plasma lipid content following an acute bout of exercise suggests that lipids were the primary energy substrate.

3314   Board #183   June 2 9:30 AM - 11:00 AM

Methodological Considerations to Evaluate the Effect of Physical Activity on Fluoride Metabolism in Children

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(No relevant relationships reported)

Physical activity can influence absorption and excretion of fluoride (F). However, the evidence is still limited and often contradictory; studies in rats showed a significant reduction in plasma F concentration at light exercise intensity, while a study with healthy human adults had an increase in plasma concentration and a decline in renal clearance rate of F, with increasing exercise intensity. **PURPOSE**: To investigate recruitment and acceptance of an experimental protocol (phase I) and the development of methodological procedures (phase II). **METHODS**: Parents of children (5 to 8 years) were recruited from schools in Brazil. In phase I, parents were asked to complete socio-economic, physical activity (Netherlands Physical Activity Questionnaire) and feasibility questionnaire. The latter explored parents' willingness for their child to participate and reasons for refusing consent. In phase II, children participated in two test conditions: high intensity exercise and resting with blood lactate and F in urine and saliva samples collected before and after the exercise trial. **RESULTS**: Only 77 out of 350 parents approached agreed to participate. The majority (54.6%) of the families were from middle socio-economic class. Seventy percent of the children were considered predominately inactive according to an established cut-off point. Fifty-five percent of the parents who responded, would consent their child to participate in the study. The main reason for refusal of consent was collection of blood samples from children (62% and 69% said "no" for finger prick and vein blood collection respectively). In phase II, four children were recruited and one provided assent for blood collection. F concentration of parotid saliva from this participant was 0.01 μg/ml, both at rest and after exercise. Blood lactate concentration and mean F concentration increased from before (Pre) to after (Post) exercise (Lactate Pre: 4.3 mmol/l vs. Post: 14.4 mmol/l; Mean F concentration urine Pre: 0.58 μg/ml vs. Post: 0.63 μg/ml). **CONCLUSIONS**: Some of the questions related to recruitment rate and acceptability of measurements were answered in this study. However, participants' willingness to be randomized and their acceptance of and compliance with a high intensity exercise protocol still needs be explored in a randomized feasibility trial.

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Relationships Among Fatigue Thresholds Derived From Neuromuscular, Metabolic, and Ventilatory Parameters

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(No relevant relationships reported)

A number of fatigue thresholds have been developed to describe fatigue-induced changes in various physiological factors including muscle activation, blood lactate, and gas exchange. These fatigue thresholds, however, may correspond to different exercise intensities depending on the variable from which they were derived as well as their underlying mechanisms. **PURPOSE:** The purpose of the present study was to examine the relationships and compare power outputs among fatigue thresholds derived from neuromuscular, metabolic, and ventilatory parameters. **METHODS**: Fifteen college-aged males (mean age ± SD = 22.1 ± 1.7 years, 78.0 ± 9.4 kg, 176.5 ± 5.6 cm) volunteered to perform an incremental test to exhaustion on an electronically-braked cycle ergometer for determination of their physical working capacity at the fatigue threshold (PWC$_{FT}$), lactate threshold (LT), ventilatory threshold (VT), and gas exchange threshold (GET). The incremental test involved recording electromyographic (EMG) signals from the vastus lateralis as well as measurements of blood lactate from the fingertip and gas exchange using open circuit spirometry. **RESULTS**: The results of the one-way ANOVA with repeated measures and follow-up paired samples *t*-tests indicated that the LT (132 ± 14 W) occurred at a significantly ($P < 0.05$) lower power

output than the PWC_{FT} (153 ± 33 W), GET (155 ± 33 W), and VT (177 ± 27 W). In addition, the VT occurred at a higher output than the LT, PWC_{FT}, and GET, whereas there was no difference in power outputs between the PWC_{FT} and GET. Furthermore, there were no significant inter-correlations among any of the fatigue thresholds (r = -0.03 - 0.35), except between the GET and VT (r = 0.70). **CONCLUSIONS**: Based on the significant mean differences in power outputs and non-significant correlations, the findings of the present study indicated there were no relationships among indicators of fatigue identified through changes in muscle activation (PWC_{FT}), blood lactate (LT), and measurements of gas exchange (VT and GET). These findings suggested there is a dissociation among the exercise intensities associated with the PWC_{FT}, LT, VT, and GET, and thus, each originate from separate physiological mechanisms.

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Hemodynamic and Body Fluid Response to Water Ingestion

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(No relevant relationships reported)

Despite a paucity of information regarding the hemodynamic changes associated with moderate fluid ingestion, the popular, unsubstantiated recommendation for most adults to ingest 8 x 8 ounce glasses of water daily (1888 mL) remains prevalent. **PURPOSE:** The purpose of this study was to determine the hemodynamic and body fluid changes associated with consuming water at temperatures of 4º C & 37º C and two volumes of 7 & 21 mL/kg. **METHODS:** 10 subjects (age 22.3 ± 1.3 yr, ht. 1.74 ± .15 m., body mass(bm), 75.1 ± 18.5 kg, 4♂) reported to the lab in a euhydrated state and refrained from ingestion of food and beverage (except water) for 10 hrs and no water 2 hours pre-trial. 30 minutes of rest preceded venipuncture for hematocrit (H), plasma specific gravity (PSG), and plasma density (PD) analyzed by digital refractometry. Hemodynamic values of heart rate (HR), stroke volume (SV) and cardiac output (Q) were obtained by a non-invasive impedance cardiography system. All measures were obtained pre-water ingestion (PRE) and at 20 minute intervals following water ingestion (T1, T2, & T3). Immediately following the PRE, subjects ingested C7, C21, H7 or H21 with the volume calculated from individual bm at a mean of 526 and 1577 mL for 7 and 21 trials, respectively. Subjects served as their own control in the randomized assignment of trials. **RESULTS:** Statistical analysis by ANOVA was applied to these data and revealed NSD (p>.05) among all trials. Mean values for all four trials are depicted in the following table:

	PRE	T1	T2	T3
H (%)	46.2 ± 4.4	47.2 ± 6.8	46.1 ± 6.5	46.9 ± 5.9
PSG (gm/cm³)	1.035 ± .02	1.031 ± .02	1.026 ± .01	1.026 ± .01
PD (gm/mL)	1.025 ± .01	1.024 ± .01	1.024 ± .01	1.025 ± .01
HR (b/min)	62 ± 7	60 ± 7	59 ± 7	58 ± 7
SV (mL/b)	90.3 ± 14.5	93.8 ± 18.2	95.9 ± 15.8	98.7 ± 17.3
Q (L/min)	5.60 ± .80	5.60 ± .83	5.62 ± .79	5.72 ± .72

CONCLUSION: The ingestion of water in volumes and temperatures mimicking current practices among many adults results in minimal expansion of blood volume or changes in hemodynamic function. Apparently, consuming considerable water without excessive loss of fluid from either environmental conditions or exercise induced temperature regulation, is safe with no adverse impact on non-exercising individuals.

3317   Board #186   June 2 9:30 AM - 11:00 AM

Comparison Of Intramuscular Adipose Tissue Content Using Two-point Dixon Imaging With Two Segmentation Techniques Based On T1-weighted Imaging

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(No relevant relationships reported)

The adipose tissue infiltrated within the muscle is known as intramuscular adipose tissue (IntraMAT) and increasing of IntraMAT have a potential risk of insulin resistance. T1-weighted (T1W) imaging is one of the basic pulse sequences to measure IntraMAT using a histogram-based thresholding technique based on signal intensity. The Otsu and the Midpoint methods based on T1W imaging have been used to measure IntraMAT in the literature. Now two-point Dixon is recognized as the gold standard sequence to determine adipose tissue content. However, it is unknown that relationship between adipose tissue content determined by Dixon imaging and that determined by T1W imaging. **PURPOSE:** The purpose of this study was to compare IntraMAT content determined by Dixon imaging with T1W imaging which was calculated by

two different thresholding techniques, i.e. Otsu and Midpoint methods. **METHODS:** Subjects were 13 older (72 ± 6 years) and 19 young (26 ± 5 years) men. Axial images of the mid-thigh were taken using two-point Dixon and T1W imaging. From these images, IntraMAT content of vastus lateralis (VL) and biceps femoris-long head (BF-L) was calculated. For the T1W images, we applied two different segmentation algorithms, known as the Otsu and Midpoint methods, to determine adipose tissue. Using fat and water images by Dixon technique, IntraMAT content of VL and BF-L was also calculated. **RESULTS:** IntraMAT content in VL determined by Dixon and Otsu was significantly higher than that of Midpoint (Dixon 12.2 ± 2.4%, Otsu 11.0 ± 4.4 and Midpoint 0.6 ± 0.8%, p<0.01). IntraMAT content in BF-L determined by Dixon and Otsu were significantly higher than Midpoint (Dixon: 12.7 ± 3.2%, Otsu: 21.4 ± 10.0% and Midpoint: 1.7 ± 2.9%, p<0.01). Furthermore, IntraMAT content in BF-L determined by Otsu was significantly higher than Dixon (Dixon: 12.7 ± 3.2% and Otsu: 21.4 ± 10.0%, p<0.01). There were significant correlations of IntraMAT content between Dixon and Otsu in both muscles (VL: r=0.686 and BF-L: r=0.790, p<0.05) and between Dixon and Midpoint in both muscles (VL: r=0.403 and BF: r=0.766, p<0.05). **CONCLUSION:** Although Otsu method overestimates IntraMAT content of BF-L, it could apply with caution depending on muscle. Midpoint method is likely to underestimate compared with any other techniques, therefore, we should extra care to use it.

3318   Board #187   June 2 9:30 AM - 11:00 AM

Impact of Sitting on a Stability Ball on Metabolism and Vascular Resistance During Arm Ergometry.

Charles RC Marks, Jennifer Duggan, Emmanuel Jianis, Cecelia Goulette. *Oakland University, Rochester, MI.* (Sponsor: Jonathan K. Ehrman, FACSM)

(No relevant relationships reported)

Past studies demonstrated that sitting on a stability ball (SB) elevates submaximal VO_2 without affecting heart rate or blood pressure during arm ergometry when compared to sitting on a chair (C). However, no reports have been made to determine if nutrient metabolism or vascular resistance (VR) are also affected. **PURPOSE:** To determine if sitting on a SB affects fat and carbohydrate metabolism and vascular resistance during arm ergometry when compared to C. **METHODS:** Eighteen Female (22 +/- 3 yrs) and eleven male (23 +/- 3 yrs) apparently healthy participants underwent two stages of submaximal arm ergometry for two conditions (order randomized): sitting on a SB or sitting on a C. VO_2 and VCO_2 were recorded after the third minute of each stage and used to determine indicators of fat g/min (FAT) and carbohydrate g/min (CHO) use. Cardiac Output (Q) was assessed by CO_2 rebreathing and was measured immediately after the VO_2 and VCO_2 recordings. Blood Pressure (BP) was measured following the Q. BP was used for calculating mean arterial pressure (MAP) and then MAP and Q for calculating VR. Repeated Measures ANOVA was used to determine sitting mode effects (alpha = 0.05). **RESULTS:** There were no significant sitting mode effects for VR ($P = 0.334$) and CHO ($P = 0.120$). However, there was a significant sitting mode effect for FAT ($P = 0.017$). FAT was 24% to 36% higher on the SB (Stage 1: 0.114 +/- 0.112 g/min; Stage 2: 0.059 +/- 0.075 g/min) than on C (Stage 1: 0.087 +/- 0.102 g/min; Stage 2: 0.038 +/- 0.013 g/min). **CONCLUSION:** When compared to sitting on a C, exercising on a SB during arm ergometry can elevate an indicator of fat metabolism without affecting an indicator of carbohydrate metabolism or vascular resistance.

3319   Board #188   June 2 9:30 AM - 11:00 AM

The Influence of Environmental Temperature on Metabolic Flexibility in Young Healthy Adults During Exercise

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(No relevant relationships reported)

Metabolic flexibility is the ability of an organism to match fuel oxidation to its availability. It tends to be compromised in individuals suffering from metabolic diseases, lipo- and glucotoxicity, and mitochondrial dysfunctions. Recent incremental maximal oxygen consumption exercise studies performed in cold environments have demonstrated an increase in lipid oxidation over a wide range of exercise intensities. Whether metabolic flexibility is compromised or altered by a drive in lipid utilization during exercise in the cold remains unclear.
PURPOSE
The aim of the present study was to investigate whether metabolic flexibility is altered during incremental maximal exercise to volitional fatigue in a cold environment.
METHODS
Ten healthy participants (22 ± 1 yrs, 68.1 ± 7.8 kg, 169.7 ± 4.9 cm, 21.1 ± 9.7 %BF) dressed in shorts and a t-shirt, performed four maximal incremental treadmill tests to volitional fatigue, in a fasted state. Tests were performed in a cold (0.89°C ± 1.8) (CO) or a thermoneutral (TN) environment (22.0°C ± 0.9), with and without a pre-exercise ingestion of a 75-g glucose solution. Paired t-tests were performed to compare the effects of temperature using the difference between glucose and non-glucose conditions. Differences in averaged respiratory exchange ratio (ΔRER) during the

entire exercise period, maximal fat oxidation (ΔMFO), and where MFO occurred along the exercise intensity spectrum (ΔFat$_{max}$) were analysed via whole-body indirect calorimetry.
RESULTS
No statistical differences in fat utilization during CO exercise when compared to TN as indicated by ΔRER (0.05 ± 0.02 *vs.* 0.05 ± 0.02; p = 0.584), ΔMFO (0.21 ± 0.18 *vs.* 0.16 ± 0.13 g•min^{-1}; p = 0.133) and ΔFat$_{max}$ (13.3 ± 19.0 vs. 0.6 ± 21.3 %VO$_{2peak}$; p = 0.266) in CO and TN, respectively.
CONCLUSION
A cold environment increases lipid contribution as metabolic fuel during exercise, and may be considered in training and health-intervention strategies. In the present study, an acute glucose ingestion causing a shift in carbohydrate utilization, was similar in both the cold and thermoneutral environment, indicating that exercising in a cold environment does not compromise metabolic flexibility. Future exercise studies should investigate the metabolic influences of high-fat diets and acute lipid overload in cold and warm environments.

3320   Board #189   June 2 9:30 AM - 11:00 AM

Attenuated Fat Oxidation Rates in ME/CFS Patients

Jeff Cournoyer, Graham Salmun. *Nova Southeastern University, Miami, FL.*
(No relevant relationships reported)

Chronic Fatigue Syndrome (CFS) is a condition characterized in part by inexplicable severe fatigue, and post-exertional malaise (PEM), which is defined by crippling exhaustion coupled with flu-like symptoms resulting from physical and/or mental exertion. Fear of severe PEM in CFS patients often leads to extended inactivity periods and as a consequence, the disease state is characterized by a highly sedentary lifestyle with activity levels far below those typically observed in sedentary healthy controls (HC). Prior studies on CFS have observed impairments in aerobic capacity (VO$_2$ max) coupled with increased rates of perceived exertion during a GXT; however, no study to date has examined if these impairments in aerobic capacity are correlated with a reduced fat oxidative capacity at increasing exercise intensities. **PURPOSE** The purpose of our study is to identify changes in fat oxidation patterns during increasing exercise intensities as a result of the CFS disease state. **METHODS** Twenty male patients (39.6 ± 12.4 yrs) were divided into two groups: CFS (N=14) and HC (N=6). Participants were asked to perform a maximal exercise test on a cycle ergometer, with an initial resistance of 60 Watts and increasing by 30 Watts until volitional fatigue was reached or a peddling cadence of 55-65 RPM was no longer maintained. VO2 Max, time to exhaustion (tE), Maximal Fat Oxidation (MFO) and Total Fat Oxidation (TFO) were recorded for all participants and 2-tailed T-tests were used to determine significant differences between the two groups. **RESULTS** MFO (HC mean: 617 g/day, CFS mean: 339.5 g/day; p<0.05) and TFO (HC mean: 10 kcal, CFS mean: 2.8 kcal; p<0.05) were lower in CFS patients, but no significant difference was observed in tE (HC mean: 11.2 minutes, CFS mean: 8.1 minutes; p<0.05), VO2 Max (HC mean: 27.9 ml/kg/min, CFS mean: 26.3 ml/kg/min; p=0.66) or FatMAX (CFS: 41.2% of VO2 Max, HC: 48.9% of VO2 Max; p>0.05). **CONCLUSION** Patients diagnosed with CFS displayed significantly lower capacity for fat oxidation than HC, though their tE was not significantly less. This might indicate a propensity for CFS patients to spend more time in an anaerobic state.

3321   Board #190   June 2 9:30 AM - 11:00 AM

High Doses Of Branched-chain Amino Acids Supplementation Associated To Sprint Interval Training Improves Metabolic Profile

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(No relevant relationships reported)

High doses of BCAA supplementation have unclear effects on cardiovascular diseases (CVD) biomarkers and energy metabolism in humans, even more when its associated to sprint interval training (SIT).
PURPOSE: The aims of this study was to evaluate the effects of BCAA supplementation associated with SIT on energy metabolism and CVD biomarkers.
METHODS: 40 overweight and sedentary volunteers (height: 169 ± 8cm; age: 32 ± 7 y; weight: 74.5 ± 10.7 Kg) were randomly distributed into 4 groups: S-PLA= sedentary + placebo; S-BCAA= sedentary + BCAA; SIT-PLA= SIT + placebo and, SIT-BCAA= SIT + BCAA. Supplementation was 300 mg/kg^{-1}/dia^{-1} of BCAA (plus 200 mg/kg^{-1}/dia^{-1} of maltodextrin) or 500 mg/kg^{-1}/dia^{-1} of waxy maize (placebo), 3 times-a-day, for 8 weeks. During this period, SIT-PLA and SIT-BCAA groups did cycle ergometer training 3 days/wk (4-8 sets of 30-s "all-out" bouts, with 4.5 min. recovery between sets). Pre- and post-treatment CVD biomarkers variables were evaluated: VO$_{2peak}$, total cholesterol (TC) and their fractions (HDL and LDL), triglycerides, C-reactive protein (PCR), HbA1c, %BF, also respiratory exchange ratio (RER), blood glucose [Gl] and lactate [La] concentration, at rest and during exercise, as energy metabolism variables
RESULTS: Post-treatment VO$_{2peak}$ increased (p<0.05) significantly in the SIT-PLA (95% CI: 2 to 7.6 mL.kg^{-1}.min^{-1}, Cohen's *d*= 0.41) and SIT-BCAA (1 to 7.7, -0.50)

groups only, with no difference between them; There was no treatment effect (p> 0.05) in %BF, TC and PCR in any groups; However, in the SIT-BCAA group only, there was a decrease (p<0.05) in HbA1c (-5.03 to -0.88%, 0.85), LDL (-42.90 to -1.03 mg/dl, 0.51) and an increase in HDL (2.91 to 18.85 mg/dl, -1.24), while triglycerides decreased (p<0.01) in both S-BCAA (-185.96 to -7.95 mg/dl, 1.09) and SIT-BCAA (-119.68 to -28.74 mg/dl, 1.19) groups only; Treatment effect was observed on RER which decreased in SIT-BCAA group only (p<0.01, η= 0.218) and tend to decrease in SIT-PLA group only (p= 0.06, η= 0.069); [Gl] decreased in S-BCAA (p<0.01, η= 0.440), SIT-PLA (p<0.01, η= 0.287) and SIT-BCAA (p<0.001, η= 0.460) groups only, with no difference between them; [La] decreased in SIT-PLA group only (p= 0.02, η= 0.220).
CONCLUSIONS: BCAA supplementation associated with SIT promotes some synergistic changes on CVD biomarkers and energy metabolism.

3322   Board #191   June 2 9:30 AM - 11:00 AM

L-glutamine and L-alanine Improve Energy Status and Skeletal Muscle Cytoprotection in Rats Submitted to Heavy Resistance Exercise

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(No relevant relationships reported)

Strenuous exercise results in muscle damage and low cellular energy levels, which activates the AMP-activated protein kinase (AMPK), a sensor of energy status, as well as induces the expression of forkhead box O1 (FOXO1), linked to delayed skeletal muscle regeneration. Glutamine and alanine are the most important gluconeogenic and cytoprotection-related amino acids, and have been demonstrated to attenuate exercise-induced muscle damage and inflammation. However, whether these amino acids have a role in regulating energy status and muscle damage during heavy resistance exercise (HRE) remain largely unknown. **PURPOSE:** To evaluate the effects of chronic oral supplementation with L-glutamine and L-alanine in their free form (GLN+ALA, ALA) or as the dipeptide L-alanyl-L-glutamine (DIP) on energy status, muscle damage and cytoprotection markers in skeletal muscle of rats submitted to heavy resistance exercise (HRE). **METHODS:** Forty adult male Wistar rats (n 8/ group) were submitted to 8-week HRE, which consisted of climbing a ladder with progressive loads (25 to 100% of body weight), and to supplementation delivered in a 4% solution in drinking water, in the last 21 days of HRE. Phosphorylation of AMPK and FOXO1, as well as the expression of apoptosis-inducing factor (AIF) and the 27 kDa heat shock protein (HSP27) were assayed in tibialis anterior muscle by western blotting. **RESULTS:** HRE promoted skeletal muscle damage by increasing AIF and HSP27 contents in muscle of CTRL (by 85%) and ALA (by 158%) groups (p<0.05 vs sedentary). Conversely, GLN+ALA and DIP attenuated these effects. Additionally, supplements containing L-glutamine decreased the exercise-induced phosphorylation of AMPK by 24% (p<0.05 vs. CTRL and ALA groups) and of FOXO1 by 53% in muscle of rats treated with GLN+ALA and DIP (p<0.05 vs. SED, CTRL and ALA groups). **CONCLUSION:** Chronic oral supplementation with L-glutamine (given along with free L-alanine or as dipeptide) improved muscle energy status by decreasing AMPK phosphorylation and promoted muscle protection by decreasing FOXO1 phosphorylation and HSP27 and AIF contents in response to HRE.

3323   Board #192   June 2 9:30 AM - 11:00 AM

Effects Of A Liquid Breakfast With Varying Doses Of Whey And Soy On Appetite, Energy Intake And Hormone Response

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(No relevant relationships reported)

PURPOSE: The study examined the effects of a liquid breakfast meal containing varying doses of whey (WP) and soy protein (SP) on appetite, subsequent energy intake, and hormone response.
METHODS: Seventeen participants (age: 27 ± 7 y, body fat: 21.5 ± 6.9%, basal metabolic rate: 1741 ± 391 kcals/day) in randomized order consumed one of five isoenergetic liquid breakfast meals (~ 500kcals) including control (CHO), low WP (LWP; 21.5 g), high WP (HWP; 43 g), low SP (LSP; 25 g) and high SP (HSP; 50 g) followed by an *ad libitum* lunch 3 hours later. Appetite profile was measured before, immediately after and hourly during the 3 hour postprandial period. Plasma concentrations of leptin and insulin were measured before, at 30 and 180 minutes after the meal and were analyzed via ELISA. A 5 x 3 (meal x time) repeated measures ANOVA were used to analyze data. Significance was accepted at $p < 0.05$.
RESULTS: Energy intake at lunch per kilogram of body weight was significantly higher after CHO (11 ± 3.6 kcal/kg) compared to LWP (9.5 ± 2.9 kcal/kg), HWP (9.1 ± 3.0 kcal/kg), and HSP (9.1 ± 3.0 kcal/kg) but not compared to LSP (10.2 ± 2.7 kcal/kg). Participants hunger, desire to eat, and estimated amount of food to be consumed

were higher, whereas, satiety and fullness were lower after CHO ($p < 0.05$) compared to LWP, HWP and HSP but not compared to LSP. There were no significant differences ($p > 0.05$) observed in postprandial leptin or insulin responses between meals, however, a significant change over time was observed for insulin ($p = 0.02$) but not leptin ($p > 0.05$). Insulin increased by 293 ± 89 ng/ml at 30 min and decreased by -291 ± 92 ng/ml at 180 min post meal, whereas, leptin decreased by -37 ± 29 ng/ml and -10 ± 5 ng/ml at 30 and 180 min, respectively.
CONCLUSIONS: Liquid breakfast meals with higher doses of whey and soy protein reduced subsequent energy intake at lunch and were rated as more satiating compared to an isoenergetic CHO meal. In addition, postprandial levels of leptin and insulin did not differ between meals suggesting that acute changes in energy intake and satiety perception may not be influenced by circulating leptin levels.

3324　　　Board #193　　　　　　June 2 9:30 AM - 11:00 AM
Dietary Amino Acid Availability and Anabolic Signaling Molecule Phosphorylation is Blunted in Maintenance Hemodialysis Patients

Nicholas A. Burd, Stephan van Vliet, Sarah K. Skinner, Joseph W. Beals, Hsin-Yu Fang, Alexander V. Ulanov, Scott A. Paluska, FACSM, Kenneth R. Wilund. *University of Illinois at Urbana-Champaign, Urbana, IL.* (Sponsor: Scott A. Paluska, FACSM)
(No relevant relationships reported)

Skeletal muscle mass loss is a common feature in patients with renal failure receiving maintenance hemodialysis (MHD) therapy. Dietary protein (amino acids) is one of the main anabolic stimuli to skeletal muscle tissue in humans, and impairments to anabolic stimuli over time may lead to muscle mass loss. However, there are major gaps in our knowledge of how muscle mass is regulated by protein intake in MHD patients. **PURPOSE:** To compare dietary protein digestion and absorption kinetics and phosphorylation of anabolic signaling proteins after mixed meal ingestion in MHD patients and age- and BMI-matched controls. **METHODS:** 8 MHD patients (age: 56±5 y; BMI: 32±2 kg/m²) and 8 controls (age: 50±2 y; BMI: 31±1 kg/m²) received primed continuous infusions of L-[1-¹³C]leucine and ingested a mixed meal (546 kcal, 20 g protein, 59 g carbohydrate, 26 g fat) with protein provided as intrinsically L-[5,5,5-²H₃] leucine labeled eggs. Breath, blood, and muscle biopsies were collected to determine amino acid concentrations, leucine enrichments, and phosphorylation of mTORC1 on Ser2448 during a 5 postprandial period. **RESULTS:** Postprandial release of dietary leucine into circulation over 5 h was reduced in MHD patients (41±5%) vs. controls (61±4%; P=0.03). The feeding-mediated increase in mTORC1 phosphorylation was blunted in MHD patients (0.6-fold above basal) vs. controls (1.1-fold above basal; P=0.006) at 5 h of the postprandial period. **CONCLUSION:** Our data demonstrated impaired kinetics of digestion/absorption of dietary proteins and reduced postprandial plasma amino acid availability in circulation after mixed meal ingestion in MHD patients when compared to age- and BMI-matched controls. This diminished dietary amino acid availability may have partly contributed to the blunted anabolic signaling mechanisms in MHD patients.

G-44　　Free Communication/Poster - **Behavioral Aspects and Correlates of Concussions**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3325　　　Board #194　　　　　　June 2 9:30 AM - 11:00 AM
Concussion History Moderates Relationships Between Neural and Clinical Outcomes in Special Operations Forces Personnel

Cassie B. Ford[1], Michael J. Cools[1], Stephen M. DeLellis[2], Shawn F. Kane, FACSM[2], Robert H. Lutz[2], James H. Lynch, FACSM[2], Jason P. Mihalik[1]. *[1]The University of North Carolina at Chapel Hill, Chapel Hill, NC. [2]United States Army Special Operations Command, Fort Bragg, NC.*
Reported Relationships: C.B. Ford: *Contracted Research - Including Principle Investigator; UNC received funding from the United States Army Special Operations Command to conduct this work.*

Computerized neurocognitive tests such as Immediate Postconcussion Assessment and Cognitive Test (ImPACT) evaluate athletes at baseline and post injury in clinical and research settings. Visual and sensory performance (VSP) assessments evaluate and improve performance in both healthy and post-injury populations. These assessments are differentially sensitive to concussion history. The relationship among injury history, neurocognitive testing, VSP assessments and structural neuroimaging within the Special Operations Forces (SOF) population is unknown.

PURPOSE: To test whether cortical thickness (CT) mediates, and concussion history moderates, relationships among cognitive and visual-sensory tests. **METHODS**: SOF personnel completed the following: 3T high-resolution MRI, ImPACT, and VSP tests (Nike SPARQ or Senaptec Sensory Station). The SOF personnel were categorized by self-reported concussion history (none, 1+). We used FreeSurfer to reconstruct and segment the cerebral cortex. After examining bivariate correlations between all variables, path analyses tested whether CT mediated select relationships between ImPACT composites and VSP outcomes, with concussion history as a moderator. **RESULTS**: 155 SOF personnel (149 males; 54 self-reported concussion history) were imaged and completed ImPACT; 147 also completed VSP tests (127 Nike SPARQ; 20 Senaptec) during healthy baseline testing. There was a significant total effect of ImPACT Verbal Memory and CT (for regions associated with motor function and semantic responses) on Perception Span for those with a concussion history. Conversely, we found significant effects of ImPACT Motor Speed and CT on Go/No-Go, but only for those without concussion history. Although we found significant relationships between variables, there was no evidence that the effect of ImPACT composites on VSP outcomes was due to differences in CT. **CONCLUSIONS**: Concussion history differentially moderated the relationship among clinical outcome variables and neural structure, but neural structure did not mediate relationships between clinical outcomes. Understanding these relationships may help us better understand the effects of concussion and direct research towards tracking specific outcomes of clinical importance.

3326　　　Board #195　　　　　　June 2 9:30 AM - 11:00 AM
Concussion History Predicts Reduced Cortical Thickness in Special Operations Forces Personnel

Jason P. Mihalik[1], Cassie B. Ford[1], Michael J. Cools[1], Stephen M. DeLellis[2], Shawn F. Kane, FACSM[2], Robert H. Lutz[2], James H. Lynch, FACSM[2]. *[1]The University of North Carolina at Chapel Hill, Chapel Hill, NC. [2]United States Army Special Operations Command, Fort Bragg, NC.*
Reported Relationships: J.P. Mihalik: *Contracted Research - Including Principle Investigator; UNC received funding from the United States Army Special Operations Command to conduct this work.*

Special Operations Forces (SOF) personnel are at high risk for repetitive blast and head impact exposure. Non-invasive neuroimaging techniques, such as magnetic resonance imaging (MRI), have identified concussion-related structural differences even when observable behavioral and cognitive deficits are absent. The relationship between injury history, neuroimaging, and standard clinical tests has not previously been defined in the SOF population.
PURPOSE: To compare cortical morphology, symptom scores, and neurocognition in SOF personnel with and without concussion history. **METHODS**: SOF personnel completed an assessment battery including 3T high-resolution MRI and the Immediate Postconcussion Assessment and Cognitive Test (ImPACT). We examined symptom reporting and the ImPACT composite scores for verbal and visual memory, visual-motor processing speed, reaction time, and impulse control. The SOF personnel were categorized by self-reported concussion history (no history vs. 1+ concussions). We used FreeSurfer (v6) to reconstruct and segment the cerebral cortex. Cortical thickness was regressed on concussion history controlling for estimated total intracranial volume. The symptom reporting and ImPACT composite scores were regressed on concussion history. **RESULTS**: We imaged 166 SOF personnel (160 males; 65 self-reported concussion history) using MRI. Of these, 155 completed the ImPACT during a healthy baseline testing session. Two brain regions had reduced cortical thickness associated with concussion history, controlling for the total intracranial volume: left pericalcarine (t_{164}=2.00, p=0.04); and left parahippocampal (t_{164}=2.81, p=0.006). One region had larger cortical thickness in those with a concussion history: right transverse temporal (t_{164}=2.35, p=0.02). Concussion history did not predict symptom or ImPACT composite score differences (p>0.05). **CONCLUSIONS**: Concussion history predicted cortical thickness in brain regions associated with vision and memory, which are cognitive functions affected following concussive injury. The ImPACT composites were not sensitive to concussion history.

3327　　　Board #196　　　　　　June 2 9:30 AM - 11:00 AM
Predicting Concussion Incidence from Baseline Data in High School and Collegiate Football Athletes

Anna Klotz, Jana Ranson, Brain D. Stemper, Alok S. Shah, Michael A. McCrea, Lindsay D. Nelson. *Medical College of Wisconsin, Milwaukee, WI.*
(No relevant relationships reported)

PURPOSE: Sport-related concussions (SRCs) occur at an estimated rate of 300,000 per year with the highest number occurring in high school and collegiate football. It has been found that unsafe playing styles cause about 25% of football SRCs, making behavior—and the motives, attitudes, and personality traits that drive it—a credible

SRC risk factor that is largely overlooked. **METHODS:** The current study examined associations between self-report personality measures, head impact telemetry (HITS) data, and SRC incidence in a sample of high school and collegiate football players. Data were retrieved from Project Head-to-Head II, a large (*N=1,154*), prospective SRC study conducted between the 2015-2017 football seasons. Participants were categorized as either "concussed" (those who completed baseline testing and were concussed during the evaluation period) or "nonconcussed" (athletes from the same teams who did not get concussed). Cumulative risk metric (CRM) is a cumulative head impact severity estimate from the HITS data and was used to operationalize playing style. **RESULTS:** Results from binominal logistic regression showed that concussion group membership was significantly ($p \leq .05$) predicted by physically expressed anger, aggression, meanness, negative affect/emotionality psychoticism, detachment, and alienation, which corroborates related literature suggesting that such personality traits could lead to potentially hazardous playing styles. Nonconcussion group membership was significantly predicted by older age, more years of playing experience, communal positive emotionality, social closeness, and resilience. This suggests that maturity, playing experience, and having a pro-social personality may promote safer playing styles which could curtail the risk of concussion in football athletes. There was a great deal of uniformity among the personality traits that predicted concussion risk and the traits that predicted playing style (CRM). **CONCLUSIONS:** These findings highlight the potential role of personality in concussion risk and should be considered by coaches and athletic trainers to help develop prevention and intervention strategies that encourage on-field safety and reduce the risk of SRC.

3328   Board #197   June 2 9:30 AM - 11:00 AM

Collegiate Football Player Parents' Perceptions of Concussion Risk

Samuel J. Haag, Angela H. Nippert, Katie J. Fischer, Lana L. Huberty. *Concordia University, St. Paul, St. Paul, MN.*
(No relevant relationships reported)

Concussion is one of the most common sports-related injuries in the United States and is especially prevalent in youth sports such as football, ice hockey, and soccer. While all stakeholders are concerned about head trauma in youth sport, parents have an especially strong influence on their children's participation in organized sports. However, few studies have analyzed how parents' knowledge of concussion in sport may affect their decisions regarding youth sport participation. **PURPOSE**: To explore parental perceptions regarding concussion risk in football and how these perceptions influence subsequent advice offered to other parents contemplating their children's participation in football. **METHODS**: A mixed-methods approach was employed using an online questionnaire distributed to 100 parents of current NCAA Division II football players at a small Midwestern university. The questionnaire included items related to their son's football participation and concussion history as well as their own awareness and perception of concussion risk. Several items included open-ended follow-up questions to allow for qualitative responses, which were coded through inductive analysis and grouped into thematic categories. **RESULTS**: Thirty-four parents of collegiate football players completed the questionnaire (34% response rate). Thirteen (38%) respondents believed their son had experienced a concussion and nine (26%) reported their son had been diagnosed with at least one concussion while playing football. Fourteen (41%) reported the benefits of football participation outweighed the risks and 29 (85%) would still have allowed their son to play football. Only four (12%) parents reported they would discourage other parents from allowing their children to participate in football. Overall, qualitative analysis showed parents perceived the benefits of football participation outweighed the risks and would advise other parents to conduct their own risk-benefit analysis during the decision making process. **CONCLUSIONS**:
Parents of collegiate football players believe the benefits of football participation outweigh the risks and generally would not discourage other parents from allowing their children to participate in football.

3329   Board #198   June 2 9:30 AM - 11:00 AM

Adolescent and Collegiate Knowledge and Behavior Regarding Concussion

Brent Harper, Adrian Aron, Alex Siyufy. *Radford University, Roanoke, VA.* (Sponsor: A. Lynn Millar, FACSM)
(No relevant relationships reported)

PURPOSE: To compare adolescent concussion knowledge and behaviors regarding concussion to that of collegiate students using a modified Rosenbaum Concussion Knowledge and Attitudes Survey (RoCKAS) questionnaire.
METHODS: Two groups (n=222) completed the questionnaire. Group 1 (HSS) included female and male 9th and 10th grade high school students (n=190) with a mean age of 15.1 ± 0.8 years (64.7% female; 35.3% male) and group 2 (CS) included female and male collegiate students (n=32) with a mean age of 19.1 ± 1.1 years (78.1% female; 21.9% male). Of HSS, 59.4% reported belonging to a competitive sports team compared to 87.5% of CS (p=0.007). A sampling of questions from the RoCKAS

questionnaire was used to assess groups for: (1) general concussion knowledge and (2) the demonstration of safe behaviors in situational decision making ("safe" or "unsafe").
RESULTS:
Sample survey questions evaluated if the participants were actually reading and answering the questions thoughtfully. Scores were high in both groups with no statistically significant difference (HHS 88.5%; CS 93%; p=0.13). General concussion knowledge was correctly answered by 83.8% of the HSS compared to 93% of the CS (p=0.007). HSS not participating in athletics were less knowledgeable than those participating in sports (20.1% compared to 13.5%, p=0.01). HSS males not participating in sports answered incorrectly 23.4% of the time compared with HSS males in sports (12.2%, p=0.03). No statistical significance comparing HSS females in relation to sports participation. Responses to the four situational questions analyzed identified that HSS answered unsafely on the behavior questions in a higher proportion compared to CS (87.1 % vs. 17.1%, p=0.0001). In fact, actual age of the participants negatively correlated with the behavior answers (r=-0.4, p=0.0001). Although older college students have safer attitudes, there was a significant difference between females and males (89.2% compared to 64.3%, p=0.005).
CONCLUSIONS: HSS and CS are knowledgeable about concussion. Age is positively associated with increased knowledge. HSS participating on sporting teams are more knowledgeable, especially males. HS students make more unsafe situational decisions compared to their collegiate counterparts and female CS demonstrate the safest behavior.

3330   Board #199   June 2 9:30 AM - 11:00 AM

Sedentary Behavior Predicts Headache Pain Following Mild Traumatic Brain Injury: Mediating Role Of Pain Catastrophizing.

Christopher Carey[1], Kelly M. Naugle[1], Jonathan Saxe[2], Fletcher A. White[3]. *[1]IUPUI, Indianapolis, IN. [2]St. Vincent Health, Indianapolis, IN. [3]Indiana University School of Medicine, Indianapolis, IN.*
(No relevant relationships reported)

The acute management of mild traumatic brain injury (mTBI), particularly in athletes, typically includes a period of physical rest during symptom resolution. However, evidence for the use of rest versus physical activity to aid in mTBI recovery is mixed and may depend on symptom type and severity. Post-traumatic headaches (PTH) are one of the most common and long-lasting symptoms of mTBI. While physical activity is often used in the non-pharmacological management of primary headache disorders, the relationship between PTH's and physical activity behavior in the first month post-injury remains poorly understood. **PURPOSE**: To determine if self-reported physical activity behavior predicts headache pain in mTBI patients within 1 month of head injury, and whether psychological factors mediate this relationship. **METHODS**: Twenty-seven mTBI patients recruited from Emergency Departments completed study sessions at 1-2 weeks and 1-month post head injury. The McGill Pain Questionnaire (MPQ) provided a quantitative evaluation of the patient's headache pain experience. The International Physical Activity Questionnaire - short form assessed the amount of time in the past week participants spent on vigorous and moderate intensity activity, walking, and sitting. Participants also completed the Pain Catastrophizing Scale, which assesses negative mental responses to anticipated or actual pain. Simple and multiple linear regressions were used to test whether physical activity behavior and pain catastrophizing predicted headache pain at 1 month post injury, and whether pain catastrophizing mediated this relationship. **RESULTS**: Separate simple regression analyses indicated the following: 1) time sitting at 2 weeks post-injury predicted pain on the MPQ at 1 month ($B=.41$, $p=.035$), 2) time sitting at 2 weeks predicted pain catastrophizing at 1 month ($B=.38$, $p=.049$), 3) pain catastrophizing predicted pain on the MPQ at 1 month ($B=.53$, $p=.003$). When pain catastrophizing and time sitting were both entered as predictors into the same regression model, pain catastrophizing was the only significant predictor of pain on the MPQ. **CONCLUSIONS**: Results suggest that increased sitting in the acute stage of mTBI predicted greater headache pain in the subacute stage of injury, and this relationship was mediated by pain catastrophizing.

3331   Board #200   June 2 9:30 AM - 11:00 AM

Factors Associated with Intention to Disclose Concussive Symptoms among Service Academy Cadets: The BANK Study

Johna K. Register-Mihalik[1], Kenneth L. Cameron[2], Laura A. Linnan[1], Melissa C. Kay[1], Megan N. Houston[2], Karen Y. Peck[2], Heidi J. Hennink-Kaminski[1], Steven J. Svoboda[2], Paula Gildner[1], Zachary Y. Kerr[1], Kevin M. Guskiewicz, FACSM[1], Stephen W. Marshall[1]. *[1]University of North Carolina at Chapel Hill, Chapel Hill, NC. [2]Keller Army Hospital, West Point, NY.*
(No relevant relationships reported)

Intention to disclose concussive symptoms is a significant factor often associated with actual concussion disclosure behaviors. Understanding ItD is key to developing

culturally relevant concussion-related interventions in high risk populations. **PURPOSE**: The purpose of this study was to examine factors influencing intention to disclose (ItD) concussion symptoms among first-year service academy cadets. **METHODS**: First-year service academy cadets at the United States Military Academy completed a validated cross-sectional survey based on the Theory of Planned Behavior, including: demographics, medical history, concussion-related knowledge (scale=0-39), attitudes (scale=6-42), subjective norms (scale=7-49), perceived control (scale=1-7), and ItD (scale=1-7). All scales had a Cronbach's alpha >0.75. Multiple linear regression predicted mean differences (MD) in ItD. Independent variables included: gender (female vs. male), race (non-Caucasian vs. Caucasian), ethnicity (non-Hispanic vs. Hispanic), previous concussion history (no vs. yes), previous concussion education (no vs. yes), socioeconomic proxy (parent without college education vs. with), concussion-related knowledge, attitudes, perceived social pressures, and perceived control over disclosure. Alpha level was set to 0.05 *a priori*. **RESULTS**: A total of 972 first-year cadets (201 Females; 281 Division I student-athletes) completed the survey (85% response rate). Average ItD was 5.9 ± 1.2 (IQR: 6.0, 7.0). In the multivariable model, stronger ItD was associated with: being non-Hispanic (MD=0.22; p=0.042); no previous concussion education (MD=0.20 p=0.005); more favorable attitudes (MD=0.19; p<0.001) and perceived social pressures (MD=0.55; p<0.001), and more perceived control over concussion disclosure (MD=0.17; p<0.001). **CONCLUSIONS**: Our data suggest perceived social pressures strongly influence ItD. Clinicians and health educators should consider culturally and organizationally appropriate intervention strategies among service academy cadets and their key social referents including classmates, cadre, and commanding officers. In context with other factors, ethnicity and concussion education may also influence ItD.

Supported in part by a grant from the NCAA-DOD Mind Matters Research Challenge.

G-45   Free Communication/Poster - **Exercise Psychology- Pedagogy**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3332   Board #201   June 2 9:30 AM - 11:00 AM
Innovative Curricula Technology in the Exercise Science Classroom: Perceptions of Faculty and Students

Katherine E. Clark[1], Judith A. Juvancic-Heltzel[2], Laura A. Richardson[2]. *[1]University of Mount Union, Alliance, OH. [2]University of Akron, Akron, OH.*
(No relevant relationships reported)

BACKGROUND: Selecting appropriate pedagogies for meaningful engagement of today's college students can be challenging. Adequate preparation to meet the advances and challenges in our rapidly evolving profession requires mutual collaboration and open mindedness by both faculty and students alike. **PURPOSE:** The purpose of this study was to examine perceptions of faculty and students on the use of technology-based pedagogies in Exercise Science curricula. **METHODS:** A survey exploring perceptions of the integration and utilization of technology-based tools in the classroom was administered to participants (N = 51). Survey data was also collected regarding the types of technologies integrated into their respective classrooms. **RESULTS:** Respondent demographics included 43% faculty (N = 22) and 57% students (N = 29). Results revealed 72.5% of respondents prefer enrolling in courses which utilize technology; 72.5% believe technology helps with retention of information; 43% find it frustrating to learn new technologies; and 35% find technology to be a distraction from the intended content. Results also revealed 82% of respondents have used a recorded lecture technology; 41% have used a synchronous web-based lecture tool; and 23.5% have used an in-class app. **CONCLUSIONS:** As the student profile continually changes with our rapidly evolving technological society, it is paramount that educators keep abreast and adapt curricula by implementing innovative pedagogies. Understanding students' perceptions of classroom tools provides tangible evidence that educators must not remain stagnant with teaching styles. Additionally, understanding perceptions of faculty is equally imperative as many faculty still view modified teaching styles and the incorporation of technology as a barrier to the learning experience. Future investigations should further examine the benefits and barriers of technology as a potential tool to enhance learning experiences in a higher education setting.

3333   Board #202   June 2 9:30 AM - 11:00 AM
The Automated Wrist Blood Pressure Cuff as Teaching Tool

Marvin O. Boluyt, Carly Jones, Shannon Porterfield, Brad Spencer, Ann Brennan. *Washtenaw Community College, Ann Arbor, MI.*
(No relevant relationships reported)

PURPOSE: The teaching and learning potential of the wrist blood pressure cuff were explored. The hypothesis that physics (acceleration due to gravity) would explain the variance in blood pressure readings when the wrist was placed in different positions was tested.
METHODS: Subjects (n=27) were recruited from the student, staff, and faculty populations at Washtenaw Community College. In a seated position, systolic and diastolic blood pressures (BP) were obtained with a wrist cuff (Omron BP629) while the wrist was held in three different positions: above the heart (ear level) at the heart (chest level) and below the heart (thigh level). The differences in BP from chest level were plotted against the distance (cm) above or below the heart for each individual and compared to the theoretical slope calculated for the acceleration due to gravity.
RESULTS: While it was clear that gravity was the predominant factor involved in the changes in BP, the slope of the observed line was consistently less steep than that predicted. To explore potential physiological influences on the changes in blood pressure, heart rate (HR) and oxygen consumption (VO2) were measured in separate sets of experiments on 5 subjects each. Both HR and VO2 were significantly elevated when one or both arms were elevated (p < 0.05).
CONCLUSIONS: It was concluded that gravitational acceleration explains most, but not all of the variance in BP readings when the wrist is above or below the heart, and that physiological adjustments make a small but significant impact. he wrist BP cuff may provide opportunities for teachers and learners to experimentally explore physical and physiological factors that influence BP readings.

3334   Board #203   June 2 9:30 AM - 11:00 AM
Effects of Situated Learning with Cooperative Learning Strategies for Older Adults on Functional Fitness

Chin-Yun Huang[1], Hui-Chuan Wei[2], Lan-Yi Chang[3], Li Lan Cheng[2]. *[1]Nanhua University, Chia-Yi, Taiwan. [2]National Chung Cheng University, Chia-Yi, Taiwan. [3]Transworld University, Yun-Lin, Taiwan.*
(No relevant relationships reported)

Situated learning emphasizes that learning is an important social situation that occurs within everyday functional fitness and social interaction. Such learning interaction originates from social relations, cultural history, specific commodities, real life situations, and physical activity learning environment. Although cooperative learning strategies were found to improve positive effects of interactive learning, there is a lack of research on the impacts of their use in situated cognition teaching design on fitness and cognitive function improvement in older adults. **PURPOSE:** To examine the effects of situated learning and cooperative learning strategies for older adults on functional fitness. **METHODS:** A 2x3 factorial design for experimental study. 120 older adults aged > 65 years from purposive sampling classified as high and high, high and low, and low and low were randomly assigned to ability treatment. Participants were classified as high-or low-ability according to performance on the pretest of pre-existing functional fitness. For the purpose of creating heterogeneous group of older adults for situated learning with cooperative strategies, high and low ability participants were combined into the group. The instructional module utilized a macro context design. After participants completed 18 weeks of functional fitness program, a post-test was delivered. **Results:** On instructional factor, older adults working situated learning group with cooperative learning significantly outscored those older adults on traditional learning environment. On ability factor, older adults working group with high and high, high and low pair significantly outscored those older adults on low and low pair. However, the group with high and high comparing to high and low pair was not significantly different condition. On Interaction, one of crucial findings to emerge from the study was older adults in the low ability /situated learning with cooperative group outscored those older adults in the low ability /traditional learning group. **Conclusions:** The structuring situations cooperatively may result in older adults processing functional fitness more effective learning than traditional instructional model.

SATURDAY, JUNE 2, 2018

3335   Board #204   June 2 9:30 AM - 11:00 AM
Effects Of 8-week Physical Education Courses On Body Image, Anxiety, And Exercise Self-efficacy

Erica J. Roelofs, Sarah R. Du Bose. *Meredith College, Raleigh, NC.*

(No relevant relationships reported)

Exercise has been identified as a potential tool to mediate anxiety and improve self-efficacy and body image, however, the effectiveness of college physical education (PE) courses on psychological health needs further evaluation. **PURPOSE**: To examine the effects of 8-week PE courses on body image, anxiety, and exercise self-efficacy. **METHODS**: Seventy-five females (mean ± SD; Age: 20.8 ± 3.6 y; Height: 164.7 ± 7.0 cm; Weight: 68.5 ± 16.3 kg; Body fat percentage [BF%]: 27.3 ± 8.7 %) enrolled in college PE courses of Kickboxing (n=14), Beginning Jogging (n=8), Intermediate Jogging (n=22), Strength Training (n=14), and Conditioning (n=15) volunteered to participate in this study. Each course met 3 times a week for 50 minutes each class period during the 8-week long course. At the start and completion of each course, participants completed the Body Shape Questionnaire, Exercise Self-Efficacy (ESE), and Social Physique Scale, and height, weight, and BF%, measured by bioelectrical impedance analysis, were recorded.
RESULTS: There were no significant differences pre- to post-testing in weight or activity levels outside of PE in any of the 5 courses (p>0.05). BF% significantly decreased pre- to post-testing in Intermediate Jogging (p=0.03), but not in the other courses. Social physique anxiety decreased in Beginning Jogging (p=0.024) and Strength Training (p=0.05), but not in the other courses. All courses had a significant improvement in body image (p<0.05) and ESE (p<0.05). BF% had a significant negative correlation with body image (R= -0.53, p<0.05) and ESE (R= -0.24, p=0.02), and a positive correlation with anxiety (R=0.53, p<0.05). Individual heath rating had a significant positive correlation with body image (R=0.47, p<0.05) and ESE (R=0.44, p<0.05), and a negative correlation with BF% (R= -0.26, p<0.05) and anxiety (R= -0.42, p<0.05). ESE had a significant positive correlation with body image (R=0.40, p=0.003) and anxiety (R=0.32, p=0.033).
CONCLUSIONS: Lower BF% was associated with better body image, exercise self-efficacy, and lower anxiety. However, these results indicate regular exercise through 8-week PE college courses may aid in improving body image and exercise self-efficacy and decreasing anxiety even if there are no changes in weight or body fat percentage.

G-46   Free Communication/Poster - Endocrinology/ Immunology II

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3336   Board #205   June 2 9:30 AM - 11:00 AM
The Metabolic and Androgen Profiles of Exercising Women With Menstrual Disturbances

Kristen J. Koltun, Nancy I. Williams, FACSM, Mary Jane De Souza, FACSM. *Pennsylvania State University, University Park, PA.* (Sponsor: Mary Jane De Souza, FACSM)

(No relevant relationships reported)

Exercise associated menstrual disturbances (EAMD) are often attributed to hypothalamic inhibition of the reproductive axis secondary to energy deficiency. However, some exercising women with menstrual disturbances do not present with the traditional metabolic profile of suppressed resting energy expenditure (REE), decreased concentrations of total triiodothyronine (TT$_3$) and leptin, and elevated ghrelin concentration typical of energy deficiency. Hyperandrogenism may be an alternative or coexisting mechanism underlying menstrual dysfunction in a subset of exercising women. **Purpose:** To determine if there are differences between the metabolic profiles of exercising women with menstrual disturbances with and without hyperandrogenism (EAMD-HA, n=30; EAMD-NA, n=67). **Methods:** Fasting blood samples were collected to assess TT$_3$, leptin, ghrelin, sex hormone binding globulin (SHBG), and total testosterone (T) concentrations. Metabolic status was determined by TT$_3$, leptin, ghrelin, BMI, percent body fat (%BF, DXA-derived), and measured REE compared to Harris-Benedict predicted REE (mREE/pREE). Androgen status was determined by SHBG, total T, and calculated free T; hyperandrogenism was defined as a calculated free androgen index (FAI) value >2.92 [FAI=totalT/SHBG*100], which represented the upper bound of the 95% confidence interval for all subjects. Two-sided independent t-tests were used to compare differences between groups. **Results:** The EAMD-HA and EAMD-NA groups were similar with respect to age (22yrs), height (165.1cm), weight (57.19kg), and concentrations of ghrelin (1275.17pg/mL) and TT$_3$ (86.07ng/dL) (p>0.05). BMI (p=0.005), %BF (p=0.015), FAI (p<0.001), and leptin (p=0.025), total T (p<0.001) and cfree T concentrations (p<0.001) were all greater in EAMD-HA compared to EAMD-NA. SHBG concentrations (p<0.001) were lower in EAMD-HA compared to EAMD-NA. mREE/pREE was similar between groups and

below 0.90 (EAMD-HA: 0.87±0.01; EAMD-NA: 0.86±0.02, p>0.05). **Conclusion:** These findings support evidence that hyperandrogenism can coexist with an energy deficiency in exercising women and may contribute to menstrual disturbances. Proper screening must be conducted to ensure diagnosis and treatment of the appropriate etiology of menstrual disturbances.

3337   Board #206   June 2 9:30 AM - 11:00 AM
Influence of Body Fat on Bioactive and Immunoreactive Growth Hormone Exercise Responses in Women

Matthew K. Beeler[1], Emily M. Post[1], Lydia K. Caldwell[1], William H. DuPont[1], John P. Anders[1], Vincent H. Hardesty[1], Emily C. Barnhart[1], Emily C. Borden[1], Jeff S. Volek[1], Wesley C. Hymer[2], William J. Kraemer, FACSM[1]. [1]*The Ohio State University, Columbus, OH.* [2]*The Pennsylvania State University, University Park, PA.* (Sponsor: William J Kraemer, FACSM)

(No relevant relationships reported)

Body fat has been observed to influence bioactive growth hormone (BGH) and immunoreactive growth hormone (IGH) in men, but is unknown in women. The complexity of GH release from the anterior pituitary has increased with the discovery of two somatotrophs: band I molecular weight isoforms (< 30 kD) called immunoreactive GH (IGH) and band II large molecular weight isoforms (> 60 kD) called bioactive GH (BGH).
PURPOSE: To determine the differences between untrained women with low and high body fat percentages.
METHODS: Recreationally active women of low % body fat (LF) (N= 10), mean ± SD: 22 ± 3.4 yr, 168 ± 5.3 cm, 67.8 ± 5.3 kg, 17.3 ± 2.0 % body fat, and women of high % body fat (HF) (N= 10); 23 ± 1.9 yr, 167 ± 4.3 cm, 68.4 ± 5.3 kg, 34.3 ± 3.7% body fat consented to participate in the study. The women were familiarized with the squat test protocol which consisted of 6 sets of 10 repetitions at 75% of their 1 RM with 2 minutes rest between sets after they were tested for 1 repetition maximum strength (1 RM) in the squat. All exercise tests were performed between 0630 and 1100 after an 8- to 12-h fast. Pre-exercise samples were obtained during the early follicular phase 15 min before test via standard venipuncture and a post-exercise sample was obtained immediately after the test. Plasma was collected and assayed for IGH using a monoclonal assay. Total BGH was assayed using the rat tibial line *in vivo* bioassay. A two-way analysis of variance (2 X 2) for group and time were used to analyze the data. A $p \le 0.05$ was used to define significance.
RESULTS: No differences were observed between the groups for 1 RM strength in the squat. Both groups significantly increased their IGH concentrations pre to post-exercise: (LF: 4 ± 3.1 to 18 ± 3.6 μgŸL^{-1}, HF: 3.9 ± 3.5 to 17.2 ± 3.0 μgŸL^{-1}). BGH did not increase pre to post-exercise, but both IGH and BGH values were significantly higher in the LF group than the HF group. Pre to post-exercise responses were: LF (4900 ± 433 to 5200 ± 393 μgŸL^{-1}), HF (1900 ± 433 to 2200 ± 323 μgŸL^{-1}). BGH was significantly higher than IGH values at all time points.
CONCLUSION As previously observed in young men, body fat impacts the response of IGH to resistance exercise, even when BGH responses remain unchanged acutely. BGH in women with lower % body fat do not see the suppression that occurs in women with higher % body fat, which may be linked to GH binding protein activity.

3338   Board #207   June 2 9:30 AM - 11:00 AM
Associations Among Age, Physical Activity, and Serum Resistin and Adiponectin Levels

Caitlyn A. Thomas, Victoria E. Warren, Kaitlin M. Frindt, Keenan R. Herman, Jennifer L. Shine, Kevin D. Ballard, Kyle L. Timmerman. *Miami University, Oxford, OH.* (Sponsor: Helaine Alessio, FACSM)

(No relevant relationships reported)

Adipose tissue was considered a passive reservoir for energy storage, but now is viewed as an active endocrine organ secreting adipokines such as resistin and adiponectin. Resistin tends to be inflammatory in nature, while adiponectin tends to be anti-inflammatory, with both being related to insulin resistance. Few researchers have examined the impact of age and physical activity level on serum resistin and adiponectin within the same study. The **PURPOSE** of this study was to assess the relationships among age, physical activity level, and resistin and adiponectin levels in healthy young and older adults. **METHODS:** A convenience sample was used consisting of 20 young (10 M/10 F; age: 21.0±1.2y; BMI: 24.3±4.5 kg·m^{-2}) and 20 older (6 M/14 F; Age: 68.4±4.0y; BMI: 25.5±3.1 kg·m^{-2}) adults. Physical activity frequency and intensity were determined in young and older subjects using the International Physical Activity Questionnaire (IPAQ) and the Community Healthy Activities Model Plan for Seniors (CHAMPS), respectively. Enzyme-linked immunosorbent assays were used for the detection and quantification of serum resistin and adiponectin. **RESULTS:** Young and older subjects had average resistin levels of 3.49 ± 0.97 ng·mL^{-1} and 2.97 ± 0.69 ng·mL^{-1}; and adiponectin levels of 101.40 ± 61.65 ng·mL^{-1} and 106.03 ± 59.39 ng·mL^{-1}, respectively. Physical activity level

was not correlated with either resistin or adiponectin. Resistin tended to be lower in older compared to young subjects (p= 0.056). There was no significant difference in adiponectin levels between young and old subjects (p= 0.57). Adiponectin was correlated with BMI within both groups (old: r = -0.45, p = 0.034; young: r = -0.46, p = 0.043) and when old and young subject data were combined (r = -0.45, p = 0.004). **CONCLUSIONS:** Body composition appears to be more predictive of serum levels of the anti-inflammatory adipokine, adiponectin, than either age or physical activity level. Surprisingly, resistin, a pro-inflammatory adipokine, was lower in older compared to young adults. Future studies with larger sample sizes and objective measures of physical activity level are warranted to better understand the relationships among age, physical activity level, and the expression of these adipokines.

3339   Board #208   June 2 9:30 AM - 11:00 AM

Association Between Bone Mineral Density And Vitamin D Receptor Gene Polymorphisms In Female Athletes

Mizuki Yamada[1], Naoki Kikuchi[1], Kayoko Kamemoto[2], Tomoka Matsuda[2], Mikako Sakamaki-Sunaga[1]. *[1]Nippon Sports Science University, Tokyo, Japan. [2]Graduate School of Nippon Sports Science University, Tokyo, Japan.*

(No relevant relationships reported)

Osteoporosis is an important health care problem in female athletes. Previous studies have shown that vitamin D receptor (VDR) gene polymorphisms are related to osteoporosis in the general populations; however, associations in female athletes are not known.**PURPOSE**: To investigate the association between bone mineral density (BMD) and VDR gene polymorphisms in female athletes. **METHODS**: One hundred and eighty seven female athletes (age: 20.3±1.2 years, height: 161.6±6.3 cm, body weight: 58.3±9.8 kg, percent body fat: 24.8±3.7%) participated in the present study. BMD of the whole-body, lumbar spine (L2~L4), and femoral neck was measured using dual-energy X-ray absorptiometry. Analyses of VDR genes Fok1, Apa1, and Taq1 polymorphisms were performed using TaqMan Genotyping Assay. **RESULTS**: The genotype frequencies of VDR genes Fok1, Apa1, and Taq1 polymorphisms were in Hardy-Weinberg equilibrium. The VDR genotype for Fok1, FF was found in 44.9%, Ff in 41.7%, and ff in 13.4% of the subjects (p=0.31). For Apa1, AA was found in 12.3%, Aa in 42.5%, and aa in 45.2% (p=0.51). For Taq1, TT was found in 72 %, Tt in 26.4%, and tt in 1.6% (p=0.54). There was no significant difference in physical characteristics among the VDR Fok1, Apa1, and Taq1 genotypes. No significant difference was observed between whole body BMD, lumbar spine (L2~L4) BMD, and femoral neck BMD in association with the VDR gene Fok1, and Taq1 polymorphisms. However, the aa genotype of the VDR Apa1 polymorphism was significantly associated with lower whole-body BMD than the AA genotype (p<0.05). **CONCLUSIONS**: An association with the VDR gene Apa1 polymorphism was shown in this study only for whole-body BMD. In conclusion, the VDR gene Apa1 polymorphism aa genotype is associated with decreased whole-body BMD in female athletes.

3340   Board #209   June 2 9:30 AM - 11:00 AM

Influence Of The Difference Of Exercise Intensity On Salivary Nitric Oxide In Young Men

Sone Ryota[1], Hayashi Koichiro[2], Eda Nobuhiko[3], Watanabe Koichi[1]. *[1]University of Tsukuba, Tsukuba, Ibaraki, Japan, Japan. [2]Kokugakuin University, Yokohama, Kanagawa, Japan, Japan. [3]Waseda University, Tokorozawa, Saitama, Japan, Japan.*

(No relevant relationships reported)

High-intensity exercise is related to increase the oxidative stress by excessive production of reactive oxygen species (ROS). Salivary nitric oxide (sNO) has been known to be a factor influencing the production of ROS. Therefore, there is a possibility of noninvasively evaluating ROS during exercise by measuring sNO. However, the influence of the difference of exercise intensity on sNO secretion are not well known. **PURPOSE**: The purpose of this study was to investigate the influence of different exercise intensity on salivary nitric oxide in young men. **METHODS**: Male collegiate students (21.6 ± 0.4 y.o.) were recruited and participated in this study (N = 5). All subjects carried out two different intensity exercises with random crossover design. One is a high-intensity condition that performs ergometer exercise at 80%HR$_{reserve}$ for 30 min, and the other is a moderate condition that performs ergometer exercise at 50%HR$_{reserve}$ for 30 min. Saliva samples were collected before (pre), immediately after (post), 30 minutes after (30 min), and 60 minutes after (60 min) each intervention. sNO concentration (μmoL/L) were analyzed by using the Griess reaction. sNO secretion rate (μmoL/min) was calculated by multiplying the absolute sNO concentration (μmoL/L) by the saliva flow rate (mL/min). **RESULTS**: Since there was no significant difference in the values before both interventions, the results are shown as the change from pre to post, 30 min and 60 min in sNO concentration and sNO secretion rate. The change from pre of sNO concentration in the high-

intensity significantly increased (*P* = 0.021) in 60 min (362 ± 58 μmoL/L), whereas the change in sNO secretion rate in both conditions did not significantly change in time. In the comparison between the interventions, the change in sNO secretion rate in the high-intensity (0.22 ± 0.05 μmoL/min) was significantly higher (*P* = 0.040) than the moderate (-0.01 ± 0.05 μmoL/min) at 60 min, while the change in sNO concentration was not significantly different (*P* = 0.075) between the high-intensity (362 ± 58 μmoL/L) and moderate (64 ± 69 μmoL/L) at 60 min. **CONCLUSIONS**: In this study, sNO concentration significantly increased after the high-intensity exercise, although it did not change after the moderate exercise. It was suggested that the difference of exercise intensity may affect the response of sNO.

3341   Board #210   June 2 9:30 AM - 11:00 AM

Wearing Compression Garment During Prolonged Running Mitigated Tissue Vibration, Exercise-Induced Muscle Damage and Inflammation

Sahiro Mizuno[1], Tatsuhiro Maruyama[1], Akitoshi Makino[2], Mari Arai[3], Eri Yamada[3], Fumihiko Todoko[3], Masaki Ishikawa[2], Kazushige Goto[1]. *[1]Ritsumeikan University, Kusatsu, Japan. [2]Osaka University of Health and Sport Sciences, Osaka, Japan. [3]DESCENTE Ltd., Osaka, Japan.* (Sponsor: Robert R Kraemer, FACSM)

(No relevant relationships reported)

PURPOSE: To determine effect of wearing lower-body compression garment (CG) during prolonged running on tissue vibration and exercise-induced muscle damage and inflammatory responses. **METHODS:** Ten male subjects (170.5 ± 0.4cm, 62.6 ± 0.7kg, VO$_2$max; 50.6 ± 0.7mL/kg/min) performed 2 exercise trials in a random order. The exercise consisted of 120 min of uphill running (7% gradient) at 60 % of VO$_2$max. The exercise trials included 1) wearing lower-body CG with exerting 15 mmHg to thigh and calf [CG]; and 2) wearing lower-body garment with exerting below 5 mmHg to thigh and calf [CON]. During exercise, heart rate (HR), rating of perceived exertion (RPE), stride parameters (length and frequency) and tissue vibrations (3-axis acceleration of vastus lateralis, biceps femoris, tibia and gastrocnemius muscles) were evaluated. Jump performances and maximal voluntary contraction for knee extension (MVC) were evaluated before and immediately after, 60 min and 180 min after exercise. Blood variables were collected to determine blood glucose and lactate, serum myoglobin, and plasma IL-6, IL-1ra, IL-10, IL-8, TNF-α and MCP-1 concentrations. **RESULTS:** Average HR during 120 min of exercise was significantly lower in the CG trial than in the CON trial (163 ± 14 bpm vs. 167 ± 11 bpm, *P* = 0.042). Although stride parameters during exercise did not significantly differ between two trials, CG trials showed significantly lower tissue vibrations compared with the CON trial (*P* < 0.05). Jump performances and MVC were significantly decreased after exercise in both trials, whereas the CG trial showed significantly higher value of MVC at 180 min after exercise (92.4 ± 8.6 % vs. 85.0 ± 11.4 %, *P* = 0.044). There were significant increases in all of plasma cytokine concentrations after exercise in both trials (*P* < 0.05). Area under the curve (AUC) for IL-6 concentration during exercise and post-exercise period was significantly lower in the CG trial than in the CON trial (2,560 ± 1,686 pg/mL vs. 4,021 ± 3,234 pg/mL, *P* = 0.04). Furthermore, AUCs for plasma IL-1ra and IL-10 concentrations during post-exercise period tended to be lower in the CG trial. **CONCLUSION:** Wearing lower-body CG during 120 min of uphill running caused significantly lower exercise-induced increase in HR, tissue vibration, inflammation and faster recovery of muscular strength.

G-47   Free Communication/Poster - **Clinical Exercise Physiology - Other**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3342   Board #211   June 2 9:30 AM - 11:00 AM

Hamstrings Muscle Activation During Different Strengthening Exercises

Darren Z. Nin[1], Pui W. Kong[1], Matthew T G Pain[2], Jonathan P. Folland, FACSM[2]. *[1]Nanyang Technological University, Singapore, Singapore. [2]Loughborough University, Loughborough, United Kingdom.*

(No relevant relationships reported)

Hamstring strain injuries (HSIs) occur when there is excessive strain on the muscle during eccentric contraction, with the biceps femoris (BF) being the most common injury site. The characterisation of muscle activation during different hamstring strengthening exercises may enable evidence-based prescription of preventative/rehabilitation exercises consistent with the aetiology of injury.

Abstracts were prepared by the authors and printed as submitted.

SATURDAY, JUNE 2, 2018

PURPOSE: To identify the hamstring strengthening exercise which elicits the highest muscle activation of the BF during eccentric contraction at longer muscle lengths. **METHODS:** Eleven resistance-trained males (age 22.1 ± 4.3 years) participated in this cross-sectional study. BF and semitendinosus (ST) electromyographic (EMG) amplitude was measured during the eccentric phase (three consecutive 15° sectors preceding the end range-of-motion (ROM)) of six different hamstring strengthening exercises (3 repetitions, 3RM load). Common and lengthened-state variants of hamstrings resistance training exercises were compared, specifically, knee- (conventional Nordics (CN); assisted Nordics (AN); seated leg-curl with hip flexed (SLC)) and hip- (inclined hip-extension (IHE); "good morning" (GM); straight-leg hip-extension (SHE)) exercises. EMG recordings of each exercise was normalised to EMG during maximal isovelocity (60°/s) eccentric contractions (highest of 4 efforts) measured on an isokinetic dynamometer (Con-Trex, CMV AG, Switzerland) at exercise specific knee- (KJA) and hip-joint angle (HJA) configurations. 2D sagittal plane video was used to analyse ROM of exercises. **RESULTS:** EMG amplitude was progressively higher towards the end of the eccentric phase for each exercise ($p < 0.001$). During the last 15° sector preceding end ROM, BF activity was highest in the CN (75.2 ± 8.2%), followed by GM (69.9 ± 6.6%) and SLC (67.8 ± 7.4%); BF/ST ratio was different between exercises ($p = 0.024$; CN < IHE & SHE; SLC < IHE & SHE). Muscle elongation (KJA-HJA) during end ROM was highest in the SLC (88.6°) and lowest during CN (-54.1°).
CONCLUSION: Differences in EMG amp with ROM sector suggest that besides contraction type, joint angle also influences muscle activation during these exercises. The high BF activity and muscle elongation of the SLC during end-ROM suggest that it may be an effective hamstring strengthening exercise.

3343   Board #212   June 2 9:30 AM - 11:00 AM
Home-Based Exercise with Blood Flow Restriction to Restore Limb Symmetry Long After Knee Surgery

Matthew A. Kilgas, Lydia Lytle, Steven J. Elmer. *Michigan Technological University, Houghton, MI.* (Sponsor: Scott Drum, FACSM)
(No relevant relationships reported)

Rehabilitation following knee surgery (e.g., ACL reconstruction) is prolonged and many individuals do not completely regain their quadriceps size and strength. These persistent impairments give rise to limb asymmetry which increases risks for re-injury and osteoarthritis. **PURPOSE**: To establish exercise with blood flow restriction (BFR) as a home-based program to overcome persistent quadriceps size and strength impairments and restore limb symmetry long after knee surgery. **METHODS:** Five adults with an ACL reconstruction and/or meniscus repair (4.4 ± 2.5 years post-surgery) volunteered. Participants had at least 10% asymmetry in quadriceps size and/or strength. Participants exercised at home 4x/week for 4 weeks. Exercises included body weight squats, single-leg knee extension with resistance bands, and walking. Blood flow to the affected limb was restricted using a 15cm pressurized cuff inflated to 50% of limb occlusion pressure. Vastus lateralis and rectus femoris thickness along with knee extensor strength were measured before and after training. Percent difference between affected and contralateral limbs was used as an index of limb asymmetry. Post-training asymmetry indices were compared to healthy uninjured controls (n = 5). **RESULTS:** Following training, asymmetry in muscle thickness decreased for the vastus lateralis (9.9 ± 7.2 vs. 2.9 ± 4.0%, p = 0.04) and rectus femoris (11.9 ± 7.8 vs. 2.6 ± 3.5%, p = 0.03). Knee extension strength asymmetry decreased from 10.9 ± 2.6% to 2.6 ± 2.7% (p = 0.02). Post-training quadriceps size and strength asymmetry indices were not different from controls (<5%, all p > 0.05). **CONCLUSION:** These results extend upon early post-operative application of exercise with BFR and demonstrate that this modality can also be used to overcome persistent quadriceps impairments long after knee surgery. Exercise with BFR could serve as a cost-effective home option for improving function after supervised rehabilitation ends. Supported by Blue Cross Blue Shield of Michigan Foundation.

3344   Board #213   June 2 9:30 AM - 11:00 AM
Body Composition Measures Associate with Physical Performance but not Disability in Individuals with Knee Osteoarthritis

Hope C. Davis[1], Malia N. Blue[1], Katie R. Hirsch[1], Brittney A. Luc-Harkey[2], Kara C. Anderson[1], Abbie E. Smith-Ryan, FACSM[1], Brian Pietrosimone, FACSM[1]. *[1]UNC Chapel Hill, Chapel Hill, NC. [2]Brigham and Women's Hospital, Boston, MA.*
(No relevant relationships reported)

Higher body mass index (BMI) is associated with more disability in individuals with knee osteoarthritis (KOA); however, BMI does not always provide accurate information about body composition, which may be a better predictor of disability in these patients. **PURPOSE**: Determine the associations between body composition and self-reported disability (Western Ontario and McMaster Universities Osteoarthritis Index [WOMAC] function) and physical performance (20m fast-paced walk, chair-stand, stair-climb) after accounting for BMI in individuals with KOA. **METHODS**:

Body mass and height were objectively measured, and percent fat (%FM) and lean mass (%LM) were determined using dual energy x-ray absorptiometry on 47 adults with radiographically defined KOA (Kellgren-Lawrence grade 2-4; 30% male; 60.2±8.3 yrs; BMI = 29.5±3.8 kg/m²). The WOMAC function subscale, 20m fast-paced walk (WALK), chair-stand (CHAIR), and stair-climb (STAIR) were completed on the same day. Separate linear regression analyses were conducted to determine the unique variance in WOMAC and each physical performance test explained individually by %FM and %LM after accounting for BMI (ΔR^2). Regression models accounted for sex and K-L grade, as both have been reported to associate with disability or body composition in individuals with KOA. **RESULTS**: Higher %FM significantly associated with better physical performance after accounting for BMI (WALK: $\Delta R^2 = 0.10$, p = 0.03; CHAIR: $\Delta R^2 = 0.16$, p = 0.01; STAIR: $\Delta R^2 = 0.13$, p = 0.02). Higher %LM significantly associated with better chair-stand performance but not 20m fast-paced walk or stair-climb tests (WALK: $\Delta R^2 = 0.04$, p = 0.17; CHAIR: $\Delta R^2 = 0.09$, p = 0.04; STAIR: $\Delta R^2 = 0.08$, p = 0.07). Neither %FM ($\Delta R^2 = 0.004$, p = 0.70) nor %LM ($\Delta R^2 = 0.001$, p = 0.84) associated with WOMAC after accounting for BMI. BMI did not explain a significant amount of variance in WOMAC or physical performance outcomes (R^2 range = 0.004 - 0.07, p > 0.05) as part of any regression model.
CONCLUSIONS: Lower %FM and higher %LM associated with better physical performance but not WOMAC. BMI did not significantly associate with WOMAC or physical performance. Future interventions should seek to increase %LM and decrease %FM, rather than focusing on overall reduction in BMI to improve physical performance. Supported by: NIH NIAMS 1R21AR067560-01.

3345   Board #214   June 2 9:30 AM - 11:00 AM
Effects Of Whole Body Vibration On Neuromuscular Performance In Patients With Osteoarthrosis Of The Knee

Javier H. Carreño, Daniel D. Cohen, Rodrigo Argothy. *Universidad del Rosario, Bogotá, Colombia.*
(No relevant relationships reported)

Effects of whole body vibration on neuromuscular performance in patients with osteoarthrosis of the knee
Abstract
Background: The effect of whole body vibration on strength, power and force differences (asymmetries) during the sit to stand (STS) test and isometric strength test assessed with uniaxial force platforms in patients with osteoarthrosis of the knee.
Objective: To evaluate the effects of whole body vibration on neuromuscular performance and asymmetries in lower limbs in patients with or at risk of knee osteoarthrosis.
Methods: Randomized-Controlled trial with 60 subjects (mean age of 48 years ± 14.2) with diagnosis or at risk of knee osteoarthrosis (OA) but physically active, were randomly assigned to training program for 12 weeks: with vibration (WBV) and without vibration (CON). The force platforms was used for the strength measurements (Pasco fsample = 500Hz).
Results: The data was analiyzed with the software ForceDecks. Statistically significant differences were found for the CON group between Peak Vertical Force (PVF) pre-training: 655N and POST training: 837N (p = 0.00); the rate of force development (RFD) PRE= 935Ns, POST= 1634Ns (p = 0.05), while in the WBV group there was a non-significant increase: PVF (pre-training: 628N and POST training: 685N) (p = 0.29); the RFD (pre-training: 1280Ns and POST training: 1354Ns) (p = 0.57). In the WBV group there was a significant decrease of pain according to the Visual Analogue Scale (VAS). Significant differences were found between the groups being much greater in the group CON, in the isometric leg press test in RFD-200ms (P= 0.03) and relative peak force (P= 0.04).
Conclusion: In individuals with knee OA 12 weeks of strength training performed with whole body vibration led to lower neuromuscular performance gains than the same training performed without vibration, however pain intensity decreases at knee, hip and lower back level according to the (VAS).
Key words: Resistance training, acceleration training, Osteoarthrititis knee, Reflex startle, Muscle strength.

3346   Board #215   June 2 9:30 AM - 11:00 AM
Does Blood Flow Restricted Training Improve Quadriceps Strength Following an ACL Injury?

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(No relevant relationships reported)

PURPOSE: Anterior cruciate ligament (ACL) injuries result in significant quadriceps weakness, causing pain and compensations in gait. High resistance strengthening is often not well tolerated after an ACL injury. Blood flow restricted training (BFRT), which uses partial occlusion of blood flow through applied cuffs, maybe an effective technique to maximize strength at low intensities. While BFRT has been well

studied in healthy populations, its effectiveness in an injured population has not been established. We hypothesized that a 4-week blood flow restricted quadriceps strengthening protocol will significantly improve quadriceps strength and the limb symmetry index of the quadriceps.
METHODS: Nine subjects status-post ACL injury participated in this study. After determining the subjects' preoperative isometric quadriceps strength on a Biodex and their 1 repetition maximum on each piece of exercise equipment, they then performed a 4-week BFRT protocol. Training was performed at 30% of the subject's 1 rep maximum with BFRT optimal pressure determined per manufacturer instructions. Four quadriceps strengthening exercises were performed at each session. Three sets of 10-30 repetitions were performed for each exercise. At the end of 4 weeks, quadriceps strength was reassessed. A paired t-test was used to compare pre and post intervention quadriceps strength normalized to body weight, and limb symmetry indexes were calculated.
RESULTS: Quadriceps strength of the involved side significantly increased (p<0.000) from 2.24 ± 0.67 Nm/kg to 2.82 ± 0.71 Nm/kg. The limb symmetry index improved from 0.70 pre-BFRT to 0.88 post-BFRT.
CONCLUSIONS: A four-week blood flow restricted training protocol significantly increases quadriceps strength in a preoperative ACL reconstruction population. By training at 30% of the individual's 1RM, the risk of further injury or pain is minimized. Restoring quadriceps strength before surgery may result in a faster recovery and better long term outcomes. Further research should investigate if blood flow restrictive training is appropriate for other injured populations and for postoperative care of patients who have had an ACL reconstruction.

3347   Board #216   June 2 9:30 AM - 11:00 AM

Effect of Fatigue on The Neuromuscular Transmission of Hamstrings During Eccentric Muscle Action

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(No relevant relationships reported)

Electromechanical delay (EMD) is a key to evaluate the ability of neuromuscular transmission, and fatigue is believed to be associated with altered neuromuscular transmission of hamstrings, which may increase the risk of non-contact anterior cruciate ligament (ACL) injury. However, experiment evidence supporting this relationship is insufficient.
PURPOSE: The purpose of this study is to investigate the effect of fatigue on electromechanical delay times of hamstrings during eccentric muscle action.
METHODS: Twenty female (20±2 yrs) volunteers participated in the study and EMD of semitendinosus (ST), semimembranosus (SM) and biceps femoris (BF) were determined before and after fatigue during eccentric muscle action at 120 and 240°/s. All subjects followed an isokinetic fatigue protocol until flexion torque fell below 50% of initial torque for three consecutive repetitions. A 2*2*3 ANOVA was used to calculate the effect of fatigue, movement velocity, type of muscle and their interaction on EMD. **RESULTS**: There was no significant difference in the EMD of the 3 muscles examined (BF: 119.0±25.3ms vs. SM: 118.9±24.0ms vs. ST: 12 0.3±24.9ms, P>0.05), irrespective of fatigue status or movement velocity. Fatigue caused a significant increase on EMD of 3 muscles examined (non-fatigue: 98.4±11.5ms vs. fatigue: 140±13.8ms, P<0.001). Irrespective of fatigue, EMD of the 3 muscles significantly increased with increasing movement velocity (low angular velocity: 107.8±20.9ms vs. high angular velocity: 131.0±22.5ms, P<0.001).**CONCLUSIONS**: Our findings suggest that fatigue decrease the ability of neuromuscular transmission of hamstrings during eccentric muscle action, irrespective of movement velocity. This would suggest that improving resistance to fatigue of hamstrings may be an effective prevention tool of non-contact ACL injury.

3348   Board #217   June 2 9:30 AM - 11:00 AM

Differences In The Mitochondrial Capacity Of The Right And Left Biceps Brachii Muscle

Elizabeth Pryor, Katie Luquire, Kevin McCully, FACSM. *University of Georgia, Athens, GA.* (Sponsor: Dr. Kevin McCully, FACSM)

(No relevant relationships reported)

PURPOSE: Near infrared spectroscopy (NIRS) has been used to measure mitochondrial capacity of various muscles, but not specifically the biceps brachii. PURPOSE: Measure mitochondrial capacity using NIRS in the dominant and non-dominant arms of young healthy adults. **METHODS**: Five untrained subjects (mean age 20.4±0.7 years) were tested in the supine position with a NIRS device (Artinis, Ltd) placed in the middle of the biceps brachii muscle. Electrical stimulation (6 Hz, 25-40 mAmps) was used to activate the muscle. A 5 cm blood pressure cuff was placed proximal to the NIRS device and used for arterial occlusion (225 mmHg). The protocol consisted of 30 seconds of resting metabolism, 30 seconds of post stimulation metabolism, three minutes of ischemia followed by reperfusion to measure the rate of reoxygenation, and two mitochondrial capacity tests. The mitochondrial capacity test consisted of electrical stimulation followed by a series of 22 ischemic cuffs

lasting from 5-10 seconds, each allowing muscle reoxygenation. **RESULTS**: There was no difference in mitochondrial capacity between the dominant and non-dominant arms of the untrained subjects (Lf Tc=43.8 ± 6.8 s, Rt Tc=43.4 ± 10 s, P = 0.93). **CONCLUSIONS**: The biceps brachii muscle had mitochondrial capacity values similar to the forearm values from previous studies, and slower than values for the gastrocnemius and quadriceps muscles. We found no evidence for differences between the dominant versus non-dominant biceps brachii muscles. Supported in part by CURO Assistantship.

3349   Board #218   June 2 9:30 AM - 11:00 AM

Impact of Discipline and Gender on Hamstring and Quadriceps Strength in Elite Alpine Skiers

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(No relevant relationships reported)

PURPOSE: Examine the influence of discipline and gender on hamstring and quadriceps strength of elite alpine skiers. **METHODS:** Twenty-eight French national team skiers (14 male) undertook isokinetic dynamometry evaluation. Skiers were split by discipline into technical (Slalom and Giant Slalom, GpT, n=14) or speed (Super Giant and Downhill, GpS, n=14). Maximal conventional ratios (i.e. concentric) at $60°.s^{-1}$ and $180°.s^{-1}$ and maximal functional ratios at $60°.s^{-1}$ and $90°.s^{-1}$ were calculated for Hamstring-to-Quadriceps (HQ) ratio, together with isoangular HQ ratios between 30° and 90° (0° representing full extension). **RESULTS:** No gender difference in HQ peak torque ratios was apparent, yet females demonstrated a delayed quadriceps Angle of Maximal Torque (AMT). Statistical parametric mapping demonstrated lower hamstring torque and a low HQ ratio near full knee extension in female skiers regardless of velocity. A greater hamstring AMT in GpT skiers compared to GpS was observed, along with greater dynamic quadriceps strength after 72° of knee flexion in GpT skiers. **CONCLUSION:** Discipline and gender both influence the HQ strength profile of elite alpine skiers, which are further modified according to the joint angle and angular velocity employed. The data provide normative values based on gender and discipline which may be of use during pre-season isokinetic screening, which is common in practice and often used to inform subsequent knee injury prevention intervention.

3350   Board #219   June 2 9:30 AM - 11:00 AM

EMG Analysis of Lower Limb Muscle Activation During 6-Minute Treadmill Walking Following Novel Over-Ground Locomotor Training in Incomplete Spinal Cord Injury

Donal Murray, Andrew A. Guccione, Kerry J. Bollen, Brian T. Neville, Caitlin A. Bryson, Randall E. Keyser, FACSM. *George Mason University, Fairfax, VA.* (Sponsor: Randall E. Keyser, FACSM)

(No relevant relationships reported)

Physiological impairments in incomplete spinal cord injury (iSCI) can include muscle weakness and altered skeletal muscle activation. Reduced voluntary muscle activation in iSCI can cause inadequate fibre recruitment and in turn the muscle may undergo adverse morphological adaptations.
PURPOSE: The study aimed to characterize, the level of lower limb muscle activation using surface electromyography (EMG) during 6 minutes of treadmill walking in iSCI following 12 weeks of a novel overground locomotor training (OLT) program.
METHODS: A convenience sample of 3 individuals with iSCI (Age: 39±15.5 years, AIS C or D, >6months post-SCI) completed 12 weeks of OLT, which consisted of two 90-minute sessions per week. The principles of OLT included the motor learning concepts of task specificity, practice variability and progressive overload. Sessions were broken down into 5 segments: joint mobilization, muscle activation, task isolation, task integration and task rehearsal. Each session catered to a specific component of the gait cycle. Pre- and post-assessment included 6 minutes of treadmill walking, performed at participant's self-selected speed (0.5-1.4mph). Two sets of bipolar electrodes were placed on the muscle belly of the left lateral gastrocnemius (GA), left tibialis anterior (TA) and left bicep femoris (BF). EMG data was continuously collected over the 6 minutes. The root mean square (RMS) and peak activation of EMG during the last 10 seconds of minute 1, 3 and 6 was calculated using Matlab programming code. The values for each minute were normalized to the RMS

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and peak value of the first 10 seconds of the walking bout. Cohen's d was calculated to determine effect size (ES) of EMG signal pre- and post-OLT, as well as comparing minute 1 to minute 6 of walking.
RESULTS:Following OLT the RMS during minute 6 of the GA and BF increased, difference of 37.522mV with strong ES >0.8. Comparing pre-OLT minute 1 to minute 6 shows a trend of reduced activity in the GA, TA and BF (Δ-29.11mV, Δ-8.71mV, Δ-28.7mV, ES>0.63, ES>0.88 ES>0.75), yet post-OLT the trend is positive (Δ-=48.73mV, Δ-10.49mV, Δ26.51mV, ES>0.74, ES>0.13 ES>0.44).
CONCLUSIONS:Higher RMS of the EMG during minute 6 of the walking trail could indicate greater activation of measured muscles in iSCI following OLT.

3351   Board #220   June 2 9:30 AM - 11:00 AM

Relationships Between Quadriceps Femoris Quality And Locomotor Functions In Disabled Patients

Hisashi Maeda[1], Ken Imada[2], Koji Ishida[1], Hiroshi Akima[1]. [1]Nagoya University, Nagoya, Japan. [2]Kinkai Rehabilitation Hospital, Tottori, Japan. (Sponsor: Katsumi Asano, FACSM)
(No relevant relationships reported)

The patients often suffer from impairments of their lower limbs and disability of locomotion. Quadriceps femoris (QF) is one of the key muscles contributing to locomotor functions and it has been established that QF quantity is associated with locomotor functions in disabled patients. Muscle quality is defined as ratio of adipose tissue to muscle tissue. QF quality of patients could become worse by increased ratio of adipose tissue to muscle tissue. As far as we know, there were no studies showing that QF quality has a relationship with locomotor functions in disabled patients. **PURPOSE**: The purpose of this study was to assess the relationships between QF quality and locomotor functions in disabled patients. **METHODS**: Fourteen hospitalized patients (11 patients with stroke and 3 patients with lower extremity fracture; age, 71.2 ± 16.3 years; height, 157.1 ± 9.6 cm; weight, 55.2 ± 14.7 kg; body mass index, 22.1 ± 3.7 kg/m^2) participated in this study. The QF muscle quality based on echo intensity and muscle thickness as an index of muscle quantity at the mid-thigh were assessed using ultrasonography. Timed up and go (TUG) test, berg balance scale (BBS) and functional independence measure (FIM) stairs scale were assessed as locomotor functions. **RESULTS**: TUG time was significantly correlated with QF thickness (r= -0.68, P<0.05). BBS and FIM stairs scale were significantly correlated with QF echo intensity and thickness, respectively (r= -0.57, P<0.05; r= 0.83, P<0.05; r= -0.57, P<0.05; r= 0.69, P<0.05). **CONCLUSIONS**: These results suggest that not only QF quantity but also quality are associated with locomotor functions in disabled patients. Furthermore, QF quality may be essential factor to influence on locomotor functions in disabled patients.

3352   Board #221   June 2 9:30 AM - 11:00 AM

Long-term Electrically Induced Muscle Exercise Duration Modulates Distinct Gene Signaling Pathways In People With Spinal Cord Injury

Michael A. Petrie, Manish Suneja, Richard K. Shields. *The University of Iowa, Iowa City, IA.*
(No relevant relationships reported)

Exercise as a form of medicine attenuates the development of chronic non-communicable diseases (CNCDs) in people with intact nervous systems as they age. However, there is a knowledge gap regarding the influence of electrically induced skeletal muscle exercise on CNCDs in people with spinal cord injury (SCI). Gene signaling pathway analysis offers an opportunity to understand the long term effects of electrically induced exercise on people with chronic and complete paralysis from SCI; providing a basis for interventions to be studied in future clinical trials. **Purpose:** To determine if long term electrically induced skeletal muscle exercise regulates complex network signaling pathways associated with improved health in people with SCI. **Methods:** 17 males with a complete SCI participated in this study. Participants completed 3, 6, or 12 months of a unilateral exercise training program using electrical muscle stimulation. After exercise training, participants underwent muscle biopsies of the trained and untrained limbs. RNA was extracted and hybridized to an exon microarray. Resulting gene expression signals were analyzed using a geneset enrichment analysis and applied to a network connectivity map. **Results:** We analyzed over 17,000 genes and 1,900 genesets curated from the Reactome database. We found that the genesets significantly increased (<25% FDR; p<0.05) depended on the duration of training. 52, 44, and 242 genesets were upregulated in the trained limb at 3, 6, and 12 months of training. Of the 242 genesets upregulated in the trained limbs at 12 months, 21% were directly associated with hypertrophy and metabolism/oxidative phosphorylation. Among the genes with the highest expression levels in trained muscles were MYH7(4.87±6.7) and MYH6(2.65±3.11); while MSTN(0.66±0.31) and ACTN3(0.68±0.53) were among those genes with the greatest suppression in the trained limbs. **Conclusions:** Overall health is dependent, in part, on skeletal muscle size and metabolic capacity. 6 months of chronic electrically induced exercise was sufficient to reverse hypertrophy gene pathways and improve metabolic signaling to a

more oxidative state. Future studies are underway to ascertain if electrically induced exercise attenuates the development of CNCDs in people with SCI. Supported by NIH Grants R01HD084645 and R01HD082109

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Low Frequency Electrically Induced Muscle Exercise Modulates Glucose Tolerance In People With SCI

Richard K. Shields, Michael A. Petrie, Jinhyun Lee, Jessica R. Woelfel. *The University of Iowa, Iowa City, IA.*
(No relevant relationships reported)

Regular exercise is an important strategy to prevent the development of several chronic non-communicable diseases (NCDs), including metabolic inflexibility and diabetes. Skeletal muscle increases glucose uptake through two distinct pathways: Insulin receptor sensitivity pathway and the exercise induced AMPK pathway. Because people with paralysis are unable to move, they never reap the benefits of muscle exercise/activity following a meal. **Purpose:** To determine if electrically induced exercise regulates the glycemic response after an oral glucose load in people with and without a SCI. **Methods:** 8 and 14 people with and without a SCI participated in this study. Participants completed 2 sessions of a 2 hour oral glucose tolerance test at least 7 days apart. 15 minutes after ingesting 75g glucose beverage, participants sat passively (control) or were given a dose of electrically induced muscle stimulation delivered at a 3Hz frequency for 1-hour, then rested for the next hour. Glucose and insulin were measured from venous blood draws at baseline and 120 minutes. Capillary glucose measurements were performed at baseline, 30, 60, 90, and 120 minutes. A mixed design analysis of variance was used for all comparisons with pairwise comparisons where appropriate. **Results:** At baseline, neither glucose (85.5±9.4 and 93.1±6.8 mg/dL, p>0.62) or insulin (13.2±8.8 and 7.8±1.4 μI/mL, p>0.84) was significantly higher for people with a SCI compared to those without. During the oral glucose tolerance test, there was a significant decrease in the glucose AUC during the electrically induced exercise session for people with a SCI (7,763±3,670 (STIM) and 8,904±4,039 (CTL),p=0.003), but no difference for people without a SCI (5,205±2,487 (STIM) and 5,500±2,355 (CTL), p=0.58). Significantly less insulin was needed during the exercise as compared to the control session (124.1±34.8 and 190.2±40.8, p=0.013). **Conclusions:** A dose of low frequency electrically induced muscle exercise attenuated the severe glycemic response in people with SCI after a meal. These findings offer a unique strategy for people who are paralyzed to improve their glucose tolerance after a meal. Supported by NIH Grants R01HD084645 and R01HD082109

3354   Board #223   June 2 9:30 AM - 11:00 AM

Muscle-tendon Elasticity: Friend or Foe When Measuring Activity-related Energy Expenditure following Exercise Training

Stephen J. Carter[1], Laura Q. Rogers, FACSM[1], Heather R. Bowles[2], Gary R. Hunter, FACSM[1]. [1]University of Alabama at Birmingham, Birmingham, AL. [2]National Cancer Institute, Bethesda, MD. (Sponsor: Gary R. Hunter, FACSM)
(No relevant relationships reported)

PURPOSE We examined how exercise training-induced changes in the energetic cost of walking affected accelerometer-based metrics during a standardized walking task coupled with indirect calorimetry. **METHODS** 29 breast cancer survivors were evaluated at baseline (M0) and following a 3 month physical activity intervention (M3). Participants were outfitted with a heart rate monitor and hip worn triaxial accelerometer while treadmill walking (0.89 m/s, 0% grade) for 4 minutes. Indirect calorimetry was used to measure steady state oxygen uptake (VO$_2$) and carbon dioxide production, to objectively quantify EE. The highest VO$_2$ and corresponding heart rate over a 30 sec period were used for analyses. Percent of age predicted heart rate max (HRmax) was calculated by dividing steady state HR by the difference of 220-age. Vector magnitude, a composite of three orthogonal planes [mediolateral(x), vertical(y), & anteroposterior(z)] was used to estimate EE. Accelerations from each axis were collected during the walking task. **RESULTS** Consistent with improved fitness, percent of HRmax was decreased by -6.7% ($p<0.01$) during the walking task at M3. The energetic cost of walking, represented by VO$_2$ (mL·kg^{-1}·min^{-1}) was significantly decreased (M0, 10.0±1.4 *vs.* M3, 9.3±1.1; $p<0.01$), which corresponded with a concurrent -6.5% reduction in measured EE. Alternatively, vector magnitude (au) exhibited a significant increase (M0, 40.4±10.3 *vs.* M3, 45.2±13.9; $p<0.05$), that reflected larger (+24%) estimates of EE. Individual axis accelerations revealed there were no differences ($p>0.05$) in the mediolateral (x) or anteroposterior (z) planes of movement at M3. However, indicative of an altered gait, vertical (y) accelerations were significantly increased (M0, 17.8±9.1 *vs.* M3, 23.3±10.2; $p<0.01$). **CONCLUSION** These data suggest accelerometer-based estimates of activity related EE are not sensitive to the improvements in fitness or energetic cost of treadmill walking. Research is needed to determine if changes in muscle-tendon elasticity occurring with exercise training account for the decreased energetic cost of walking and simultaneous

increase in vertical accelerations. The divergence between actual EE and accelerometer based estimates of EE may contribute to erroneous inferences concerning free-living physical activity.

3355   Board #224   June 2 9:30 AM - 11:00 AM

The Test-retest Reliability And Exercise-driven Changes Of UCH-L1 In Healthy, Recreationally Active College Students

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(No relevant relationships reported)

Concussions are common in sports, yet remain difficult to diagnose since truly objective assessments are lacking. Blood biomarkers are a potential solution to this problem. A biomarker must be sensitive and specific to head injury before it can be further studied as a clinically useful diagnostic for sport-related concussion (SRC). It must be stable over time, and remain unchanged by other factors including acute exercise. **PURPOSE:** To investigate the test-retest reliability and acute exercise effect on a novel head injury biomarker, Ubiquitin C-Terminal Hydrolase-L1 (UCH-L1) in healthy subjects such that findings could assist with interpretation of findings in acutely injured athletes. **METHODS:** Recreationally active (>30 min activity 3 days/week) college students (n=27, males=14, age=21± 2.3 yrs) completed a maximal cycle ergometer exercise test during two assessment sessions 10-14 days apart. Blood samples were collected within 10 minutes before and after each test. UCH-L1 values were determined through sandwich enzyme linked immunosorbent assays (ELISA) run in triplicate. Intraclass correlation coefficients (ICC) and 80% reliable change indices (RCI) examined the test-retest reliability of UCH-L1. A 2 (sex) x 2 (pre/post) mixed model ANOVA analyzed the acute exercise effect on UCH-L1 levels. **RESULTS:** UCH-L1 was moderately reliable in the entire cohort (ICC$_{2,k}$=0.505, 80% RCI=107.0 pg/ml). Males had excellent reliability (ICC$_{2,k}$=0.895, 80% RCI=44.4 pg/ml), while females had poor reliability (ICC$_{2,k}$=0.094, 80% RCI=138.8 pg/ml). No significant effects of acute exercise (F$_{1,25}$=0.002, p=0.966), sex (F$_{1,25}$=3.981, p=0.057), or sex by exercise interaction (F$_{1,25}$=1.108, p=0.303) on UCH-L1 values were found. **CONCLUSIONS:** UCH-L1 may have potential to be clinically useful in males. The high reliability and negligible effect of exercise suggest the biomarker remains stable in healthy males and is unaffected by acute exercise. Thus, changes may be attributed to external factors known to affect the biomarker such as head trauma. Conversely, the low reliability and wide RCI suggests UCH-L1 use in females should be limited. Further investigation of sex differences in reliability of UCH-L1 and feasible methods of sideline biomarker analysis are needed in hopes of improving SRC detection and identification.

3356   Board #225   June 2 9:30 AM - 11:00 AM

Effects of Body Position and Electrode Type on the Reliability of Bioimpedance Spectroscopy

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Reported Relationships: M. Lane: Contracted Research - Including Principle Investigator; I am conducting funded research by a manufacturer of BIS technology..

PURPOSE: To compare multiple BIS measurements taken using the traditional approach (gel-backed wet electrodes and subject supine) to BIS measurements taken when subjects are standing or seated using fixed metal electrodes and determine the reliability of each method. **METHODS**: Twenty-five subjects (m=10/f=15) participated in the study (22 +/- 3 years, 171.5 +/- 12.0 cm, 70.9 +/- 13.6 kg). Four (whole body right side) measurements each were taken for sitting with metal electrodes (SiM), standing with metal electrodes (StM), and supine with gel-backed electrodes (SuG). Data was analyzed comparing the two back-to-back measurements both before and after repositioning as well as measurements taken before repositioning to measurements taken after repositioning (pre-to-post). **RESULTS**: Both back-to-back and pre-to-post analysis revealed all methods to be highly reliable (ICC > 0.98, %CV < 2.32). Back-to-back measurements resulted in more reliable R0 and Rinf data compared to pre-to-post repositioning data for SiM, StM, and SuG (ICC > 0.87, SEM < 6.72 Ohms), compared to pre-to-post data for SiM, StM, and SuG (ICC > 0.987, %CV < 2.32, SEM < 13.33 Ohms). SuG produced the most reliable back-to-back measurements (SuG: ICC =1.00, %CV < 0.34, SEM < 1.48 Ohms, SiM/StM: ICC > 0.995, %CV < 0.97, SEM < 6.72 Ohms) but had the largest reliability errors from pre-to-post compared to SiM and StM (SuG: ICC > 0.986, %CV < 2.32, SEM < 13.33 Ohms, SiM/StM: ICC > 0.991, %CV < 1.51, SEM < 10.29 Ohms). Similar results were observed when comparing SiM to StM for both back-to-back and pre-to-post measurements. **CONCLUSIONS**: Sitting with metal electrodes, standing with metal electrodes, and lying supine with gel-backed electrodes all appear to produce

reliable and repeatable BIS measurements (R0 and Rinf). Gel-backed electrodes appear to produce greater variability when measurements are taken after re-applying the electrodes compared to re-positioning with metal electrodes. Yet, back-to-back measurements have slightly greater variability with metal electrodes compared to gel-backed electrodes. BIS measurements that require tracking of changes over time appear to be more reliable when using metal electrodes over gel-backed electrodes.

3357   Board #226   June 2 9:30 AM - 11:00 AM

Pulmonary Testing and Exercise-Induced Bronchoconstriction in Collegiate Baseball Players

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(No relevant relationships reported)

Testing for pulmonary conditions such as asthma and exercise-induced bronchoconstriction (EIB) is often overlooked in collegiate athletes, despite the fact that they may have profound effects on performance and health. Asthma is a chronic condition, while EIB is a transient narrowing of the airways activated by strenuous exercise. **PURPOSE**: The purpose of this analysis was to investigate the prevalence of asthma, undiagnosed asthma, and EIB in collegiate baseball players. **METHODS**: Participants with asthma were noted and removed from the EIB provocation protocol. The protocol commenced with maximal forced spirometry. Participants were encouraged to achieve a six-second plateau, and spirometry values were collected in duplicate. Participants failing to achieve a baseline forced expiratory volume (FEV)1 of at least 70% of the predicted value were removed from ongoing testing. Those passing the baseline spirometry screening proceeded to a single bout of exercise on a treadmill. In stepped fashion, participants progressed to an intensity matching 80-90% of age-predicted maximal heart rate. Exercise intensity was confirmed with ventilation (35*FEV1*0.5 and 35*FEV1*0.6). Participants maintained target intensity for four minutes. Immediately post-exercise, participants resumed a seated position. Maximal forced spirometry efforts were repeated at 2, 5, 10, 15, and 20-min time points. A fall in FEV1 >10% from baseline was considered positive for EIB. **RESULTS**: Thirty athletes (age: 20.3+1.9 yr, height: 184.2+6.4 cm, and weight 86.5+8.8 kg) volunteered for testing. One (3.33%) had been previously diagnosed with asthma. At baseline, two participants (6.67%) failed to obtain 70% of predicted FEV1 values (labeled as potentially undiagnosed asthma and removed from ongoing testing). A total of 27 participants completed the EIB provocation protocol. Five (16.7% of cohort) failed to obtain 90% of their pre-exercise FEV1 value (an indication of EIB) at one of the post-test time points. The mean drop among those failing was 30.5% with all values being reviewed by a registered respiratory therapist. **CONCLUSIONS**: The prevalence of pulmonary conditions in athletes may be masked by a lack of testing. It would seem prudent to test athletes for these conditions and create treatment plans.

3358   Board #227   June 2 9:30 AM - 11:00 AM

Decreased Aerobic Efficiency in Pediatric and Young Patients with Sickle Cell Disease : Race Comparison

Sandra K. Knecht, Wayne A. Mays, Malloree C. Rice, Andrea L. Grzeszczak, Adam W. Powell, Clifford Chin, Punam Malik, Tarek Alsaied. Cincinnati Children's Hospital, Cincinnati, OH.
(No relevant relationships reported)

PURPOSE: To compare the differences in aerobic efficiency between pediatric and young Sickle Cell patients (SS) and African American (NAA) and Caucasian (NC) controls. **METHODS:** We evaluated 14 SS patients, NAA and NC age, gender and size matched using a Ramp Cycle Ergometry protocol. Oxygen consumption (absolute and indexed), carbon dioxide production, expiratory minute volume (VE), respiratory exchange ratio (RER), systolic blood pressure (SBP) and heart rate (HR) were obtained at all stages. The VE/VO$_2$ (VO2Eq) and VE/VCO$_2$ (VCO2Eq) equivalents, oxygen consumption uptake efficiency slope (OUES), VE/VCO2 slope (Slope) and oxygen pulse (O2Pulse) were calculated at anaerobic threshold (AT) and maximal exercise (Max). **RESULTS:** There was no difference in SBP between SS, NAA and NC groups. Max RER was significantly elevated in SS. Indexed Max oxygen consumption (IMVO2) was significantly deceased in SS. O2Pulse and OUES were significantly decreased in SS at AT and Max. Slope, VO2Eq and VCO2Eq at Max were significantly elevated in SS. The HR at AT was significantly elevated in NAA compared to SS at AT.

SATURDAY, JUNE 2, 2018

	SS AT	SS Max	NAA AT	NAA Max	NC AT	NC Max
HR (BPM)	149 ± 19	186 ± 10	162 ± 14*	186 ± 11	157 ± 20	186 ± 14
O2Pulse (cc/bpm)	6.7 ± 2.4	7.4 ± 2.7	9.0 ± 2.4**	10.5 ± 2.9**	9.8 ± 3.3**	11.4 ± 3.9**
OUES	1653 ± 497	1455 ± 487	2186 ± 647*	2204 ± 534**	2416 ± 673**	2334 ± 626**
Slope	24 ± 6	29 ± 6	22 ± 4	25 ± 3*	21 ± 4	25 ± 3*
VO2Eq	27 ± 5	40 ± 6	26 ± 5	31 ± 5**	24 ± 3	31 ± 5**
VCO2Eq	27 ± 5	30 ± 5	25 ± 5	27 ± 3*	24 ± 3	27 ± 3*
RER		1.33 ± 0.18		1.17 ± 0.05**		1.18 ± 0.08**
IMVO2 (cc/min/kg)	18 ± 4	24 ± 6	24 ± 6**	32 ± 7**	25 ± 5**	35 ± 8**
SS vs NAA, SS vs NC: *p<0.05, ** p<0.01						

DISCUSSION: The SS showed similar responses in SBP and HR compared to control groups. The SS group showed decreased aerobic efficiency reflected by an increased VE/VO2Eq, VE/VCO2Eq and Slope with a decrease in OUES and O2Pulse. The effect was a decreased aerobic capacity reflected in the decreased IMVO2 in SS.
CONCLUSION: These data suggest a major determinant for the decreased aerobic capacity in sickle cell is related to a decreased aerobic efficiency and decrease oxygen carrying capacity. The data does not support significant racial differences.

G-48   Free Communication/Poster - **Exercise-Children**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3359   Board #228   June 2 9:30 AM - 11:00 AM

Comparison Of Estimated And Achieved Metabolic Equivalents In Children With Severe Burns

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(No relevant relationships reported)

We measure peak oxygen consumption (VO_2 peak) in children with severe burns via indirect calorimetry. When we can't measure VO_2 peak, we estimate it using the Cooper equation (CEq). In addition, a pharmacological agent sometimes used in burns to decrease hypermetabolism is propranolol.
PURPOSE: It is unknown, how propranolol affects the prediction of VO_2 peak using CEq. Therefore, we compare predictive and measured VO_2 peak and metabolic equivalents (METS) in children with severe burns.
METHODS: Children with severe burns were randomly assigned to receive propranolol or no drug during their hospital stay. At discharge, patients underwent a treadmill exercise test using the Bruce protocol. VO_2 peak and METS were measured and compared to predicted values using CEq (male: VO_2 peak = (43.6 x height (cm) - 4547.1)/weight (kg)); female: VO_2 peak = (22.5 x height (cm) - 1837.8)/weight (kg)). Values are means +/- SD.
RESULTS: We studied 99 children with burns with admit dates between March 1990 and November 2015; with 46 children receiving propranolol and 53 receiving no drug. Mean age at burn was 12±4 years in the propranolol group and 12±3 years in the control group (p = 0.512). Height was 150±18 cm and 148±17 cm (p = 0.571); total body surface area burned was 44±12 % and 49±12 %, respectively (p = 0.072). Measured VO_2 peak (25.1 ± 5.6 mL/min/kg vs. 22.1 ± 4.9 mL/min/kg, p = 0.005) and METS (7.2 ± 1.6 vs. 6.3 ± 1.4, p = 0.004) were significantly higher in the propranolol group. However, the actual values were lower than the predicted values, with the propranolol group being closer to predicted values (R^2 propranolol: 0.24, R^2 control: 0.13).
CONCLUSIONS: This study indicates that patients receiving propranolol can achieve higher VO_2 peak and METS at discharge. However, estimated VO_2 peak and METS using CEq may need to be re-evaluated considering additional factors such as age, gender and body mass index.
This study was supported in part by: The National Institute on Disability, Independent Living, and Rehabilitation Research 90DPBU0003, 90DP0043; the National Institutes

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3360   Board #229   June 2 9:30 AM - 11:00 AM

Correlation Between Self-reported Physical Activity And Objective Measurement In Children With Cardiac Disease

Jessica S. Hall, Chaitanya Panchangam, Kelli M. Teson, Suma Goudar, Brian Birnbaum, Lindsey Malloy-Walton, Jami Gross-Toalson, Girish Shirali, Anitha Parthiban, David A. White. *Children's Mercy Hospital, Kansas City, MO.*
(No relevant relationships reported)

Children with significant cardiac disease (SCD) have lower levels of physical activity compared to population norms. Few studies have compared objective measures of physical activity (O-PA) to subjective measures of physical activity (S-PA) in children and adolescents with and without SCD.**PURPOSE**: To examine the relationship between S-PA and O-PA in children and adolescents with and without SCD. **METHODS**: Children and adolescents with SCD (n=22; 70% single ventricle physiology, 12% pulmonary hypertension, 27% heart failure) and age and gender matched healthy controls were recruited (Total n=56; mean age 12.5 ± 2.6 years old; 39.3% female). All subjects wore a tri-axial accelerometer over their non-dominant hip for 7 days. The Evenson cutpoints for moderate-to-vigorous PA (MVPA) were applied. A minimum of 3 days with 10 hours of wear time was necessary to be included in the analysis (1 subject excluded due to inadequate wear time). Past year S-PA, in hours/week and MET hours/week, was assessed using the interviewer administered Modifiable Activity Questionnaire for Children or Adolescents (MAQ-C or MAQ-A, respectively). Past 7-day physical activity was assessed with the Physical Activity Questionnaire for Children or Adolescents (PAQ-C or PAQ-A, respectively). Relationships between the MAQ-C/A, PAQ-C/A, and the accelerometer results were assessed using Partial correlations controlled for accelerometer wear time. **RESULTS**: Significant positive relationships were found between the self-reported PAQ-C/A and O- PA in SCD within all intensities of PA (Sedentary r=-0.516, p=0.004; Light r=0.552, p=0.002; Moderate r=0.615, p<0.001; Vigorous r=0.368, p=0.046; MVPA r=0.598, p<0.001). Significant positive relationships were also found between the PAQ-C/A and O-PA in the control group with moderate PA (r=0.503; p=0.024) and MVPA (r=0.493; p=0.027). In the SCD group, there were no significant relationship of O-PA with MAQ hours/week or MAQ MET hours/week. In the control group, youth had significant positive relationships in sedentary PA and MAQ hours/week (r= -0.435, p=0.049) and MAQ MET hours/week (r= -0.450, p=0.041). **CONCLUSIONS**: The self-reported PAQ-C/A had the strongest relationship with O-PA in the SCD group. The PAQ-C/A may be a reliable tool to assess PA in children and adolescents with SCD.

3361   Board #230   June 2 9:30 AM - 11:00 AM

Effects Of A Therapeutic Exercise Program In Children With Non-cf Bronchiectasis: A Randomised Controlled Trial

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(No relevant relationships reported)

Non-cystic fibrosis (non-CF) bronchiectasis is a major contributor to respiratory morbidity in children and youth. Current guidelines for this patient group recommend regular exercise to improve clinical outcomes including cardiovascular fitness and quality of life. However, no study has yet evaluated the effects of exercise therapy in children with non-CF bronchiectasis. **PURPOSE:** To evaluate the effect of a 7-week movement program on fundamental movement skill (FMS) proficiency, cardiorespiratory fitness, perceived movement competence, and health-related quality of life (HR-QoL) in children with non-CF bronchiectasis. **METHODS:** Children (n = 21) investigated, mean age 7.1 ± SD 2.3 years with non-CF bronchiectasis were randomly allocated to an exercise or control group. The program consisted of 7 weekly sessions plus home exercises. Each 60-minute session consisted of 6 different developmentally appropriate games, each targeting a specific FMS. The TGMD 2 was used to assess FMS; cardiovascular fitness was assessed measuring % change in exercising heart rate (HR); perceived competence was evaluated by the athletic competence subscale from Harter's Self-Perception Profile for children. HR-QoL was assessed with the PedsQL and parental cough-specific quality of life (PCQOL). A two-way ANOVA was used to assess the effects of the program. Data were analysed according to the intention to treat principle. **RESULTS:** Average HR during sessions was 137 ± 12 bpm. There was a significant group x time interaction for both FMS subgroups, locomotor ($F_{(1,19)}$ = 7.6, p = 0.01) and object control skills ($F_{(1,19)}$ = 8.3, p = 0.01). The exercise group exhibited improvements in both locomotor (pre 29 ± 2.0,

post 35.2 ± 2.2) and object control (pre 27.0 ± 2.0, post 35.5 ± 2.2), while the control group showed minimal changes. The associated effect sizes (Cohen's d = 1.2 and 1.3, respectively) indicated a large effect on FMS. The program improved cardiovascular fitness (5.9% decline in Delta HR) with an effect size commensurate with that reported for asthmatic children completing exercise training (d = 0.5). There were no significant changes in perceived competence and HR-QoL. **CONCLUSION:** A 7-week movement program increases FMS proficiency in children with non-CF bronchiectasis and has a moderate positive effect on cardiovascular fitness.

3362   Board #231   June 2 9:30 AM - 11:00 AM

Predictors Of Insulin Resistance In Obese Adolescents

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(No relevant relationships reported)

Obesity is a widespread issue that affects people regardless of age, socioeconomic status, culture, or ethnicity. This issue is commonly associated with metabolic risk factors, inherited genes and family history, as well as with unhealthy behavior such as tobacco or alcohol use. Furthermore, obesity is one of the main causes of early manifestation of chronic diseases, which account for about 70% of yearly mortality indexes worldwide. Insulin resistance (IR) is a key element in the chain of events that lead from early obesity to chronic diseases; therefore, IR screening in high-risk individuals must be under constant screening. The Homeostatic Model Assessment (HOMA) constitutes a reliable indirect method for detecting initial signs of IR presence; however, it requires the use of instruments not always available in areas of low income, where accessibility to medical equipment is limited. For this reason, finding reliable, external predictors of IR may be useful to trigger prompt interventions, or to prevent IR raise, while avoiding the need of special tools. PURPOSE: to evaluate a predictive model of IR in adolescents with obesity. METHODS: Blood samples, anthropometric information, and family history were collected from a sample of 216 obese adolescents, patients at the Children Hospital of the State of Sonora, Mexico. Hierarchical Regressions were performed to establish the predictive power of the parameters of the Metabolic Syndrome, hereditary and family history, as well as of Acanthosis Nigricans. HOMA indexes were calculated from blood glucose and insulin. RESULTS. After controlling age and gender, HOMA was significantly predicted through a model ($F = 12.033$; $R2 = .371$; $p < .001$) that included only Acanthosis Nigricans ($b = .142$; $p = .019$). CONCLUSIONS: Acanthosis Nigricans, which can be easily detected through skin exams, may represent an early indicator of risk of high HOMA, and consequently it can be used as a powerful and relatively easy assessment tool for conditions of insulin resistance in patients with obesity.

3363   Board #232   June 2 9:30 AM - 11:00 AM

Comparison of Body Composition in Severely Burned Children Undergoing Community Based Exercise versus Hospital Based Exercise

Evan Ross[1], Shauna Glover[1], Ashley Ewald[2], David Herndon[1], Oscar E. Suman, FACSM[1]. *[1]UTMB, Galveston, TX. [2]University of Tennessee, Chattanooga, TN.* (Sponsor: Oscar Suman, FACSM)

(No relevant relationships reported)

PURPOSE: Severe burns cause long-term bone and muscle loss. Severely burned children (total body surface area burned = TBSA ≥ 30%) enrolled in either hospital based exercise (HBEx) or community based exercise (CBEx) have been shown to preserve their lean body mass, but the effect of these programs on bone density and fat mass are unknown. **METHODS:** Severely burned children were randomly assigned at admit to HBEx or CBEx for 12 weeks to begin after hospital discharge. Dual energy X-ray absorptiometry (DEXA) scans were performed at the start and end of 12 weeks. Body mass index (BMI), lean mass index (LMI), fat mass index (FMI), percent body fat (%BF), and total body bone mineral density (BMD) were recorded. For BMI, LMI, FMI and BMD, normative percentiles for age and gender were determined. Exercise involved aerobic and progressive resistance exercises. Within and between group comparisons were performed using paired and unpaired Student's t-tests, significance was set at p < 0.05. Values are expressed as mean +/- SD. **RESULTS:** 22 patients received HBEx (14.3 ± 3.1 years, 77% male, TBSA = 55 ± 12%) and 12 patients received CBEx (14.0 ± 3.5 years, 83% male, 52 ± 19% TBSA). For HBEx, mean BMI percentile rose from 51 to 63 (p=0.004), LMI percentile rose from 40 to 54 (p=0.005), and BMD percentile fell from 45 to 32 (p=0.003); FMI percentile rose from 34 to 38 (p=0.36) and %BF did not change (p=0.8). For CBEx, mean LMI percentile rose from 54 to 66 (p=0.002); BMI percentile rose from 67 to 71 (p=0.31), FMI percentile rose from 57 to 63 (p=0.11), BMD percentile fell from 57 to 50 (p=0.22) and %BF fell from 29% to 28% (p=0.72). No between group comparisons were significant. **CONCLUSION:** Participation in CBEx resulted in improvements in LMI percentile

for age and gender without changes in %BF or percentile for BMI, FMI, or BMD. HBEx resulted in percentile improvements in LMI, but a decrease in BMD percentile. These results suggest that HBEx and CBEx are equivalent for maintaining lean mass, but their differential effect on BMD deserves further study. This study was supported in part by the National Institute on Disability, Independent Living, and Rehabilitation Research 90DPBU0003, 90DP0043; the National Institutes of Health R01-HD49071, P50-GM060338, T32-GM8256; the Department of Defense W81XWH-09-2-0194, W81XWH-14-2-0160; and Shriners Hospitals 84080.

3364   Board #233   June 2 9:30 AM - 11:00 AM

BMI versus Body Composition as Measures of Success in a Clinical Pediatric Weight Management Program

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(No relevant relationships reported)

PURPOSE: To determine the proportion of patients that achieve favorable changes in body composition in the absence of improvements in body mass index. **METHODS:** Data from 52 months of clinical visits to a pediatric weight management program were extracted from electronic medical records. Body mass index (BMI) and body composition measurements were collected during clinical care. Height and weight were used to calculate BMI. BMI percentile (BMI%ile) for age and gender was determined. Bioelectrical impedance analyzers were used to measure body fat percentage (PBF). Data were analyzed to determine what proportion of patients had a favorable decrease in PBF despite an increased or unchanged BMI. **RESULTS:** Data were obtained for 1741 patients (943 females, 798 males), ages 4-21 years old, with at least two clinical visits. Initial age (±SD) was 12.2 ± 3.1 years. Initial BMI was 32.8 ± 7.0 kg/m^{2}. Initial BMI%ile was 98.6 ± 1.7. Initial PBF was 44.0 ± 6.4%. At follow-up, BMI increased or remained unchanged in 1148 patients (66%). PBF decreased in 928 patients (53%). There was an overall increase in BMI (1.20 ± 3.03 kg/m^{2}, p<0.0001). However, BMI%ile and PBF decreased (-0.31 ± 1.73, p<0.0001 and -0.66 ± 3.94%, p<0.0001). In patients whose BMI increased or remained unchanged, overall BMI%ile and PBF increased (0.15 ± 0.89, p<0.0001 and 0.55 ± 3.15%, p<0.0001). In males, the increase in PBF was small (1.90 ± 0.06, p=0.7). Of the 779 patients whose BMI increased by 1.0 kg/m^{2} or more, 239 (30.1%) had a decrease in PBF. **CONCLUSION:** Results suggest that including body fat percentage as a measure of success may be beneficial in a pediatric clinical weight management program. While patients with stable or increasing BMIs did not improve body composition overall, males demonstrated stabilized body fat percentages. In addition, of those patients whose BMI increased by 1.0 kg/m^{2} or more, 30% still demonstrated an improvement in body composition. While this may not be clinically significant for the patient population as a whole, it is a measure of success for a specific subset of patients who otherwise may believe they had done poorly. This may act as a motivator for patients to continue with healthier lifestyle changes. Future research in this area may include examining age cut-offs and gender differences for the usefulness of body composition assessment.

3365   Board #234   June 2 9:30 AM - 11:00 AM

Enhanced Erythrocyte Antioxidant Status Following an 8-Week Aerobic Exercise Training Program in Heavy Drinkers

Athanasios Z. Jamurtas[1], Kalliopi Georgakouli[1], Eirini Manthou[1], Panagiotis Georgoulias[2], Chariklia Deli[1], Yiannis Koutedakis[1], Yannis Theodorakis[1], Ioannis Fatouros[1]. *[1]university Of Thessaly, Department Of Physical Education & Sport Science, Trikala, Greece. [2]university Of Thessaly, Department Of Nuclear Medicine, Trikala, Greece.*

(No relevant relationships reported)

Alcohol-induced oxidative stress is involved in the development and progression of various pathological conditions and diseases whereas exercise training has been shown to improve redox status, thus attenuating oxidative stress-associated disease processes. **PURPOSE:** to evaluate the effect of an exercise training program on blood redox status in heavy drinkers. **METHODS:** Eleven sedentary, heavy drinking men participated in an intervention where they completed an 8-week supervised aerobic training program of moderate intensity. Blood samples were collected before, during (week 4) and after intervention and analyzed for total antioxidant capacity (TAC), thiobarbituric acid reactive substances (TBARS), protein carbonyls (PC), uric acid (UA), bilirubin, reduced glutathione (GSH) and catalase activity. **RESULTS:** Catalase activity increased ($p<0.05$) after 8 weeks (340.7±13.3 U mg/Hb) of intervention compared to week 4 (299.5±18.7 U mg/Hb). GSH increased ($p<0.05$) after 8 weeks of intervention (1.22±0.16 μmol/g Hb) compared to the control condition (1.11 ± 0.17 μmol/g Hb) and to week 4 (1.11 ± 0.15 μmol/g Hb). TAC, UA, bilirubin, TBARS and PC did not significantly change at any time point. **CONCLUSION:** An 8-week aerobic

training program enhanced erythrocyte antioxidant status in heavy drinkers, indicating that aerobic training may attenuate pathological processes caused by alcohol-induced oxidative stress.

G-48b Free Communication/Poster - **Late-Breaking Abstracts**

Saturday, June 2, 2018, 7:30 AM - 11:00 AM
Room: CC-Hall B

3366   Board #: 235   June 2 9:30 AM - 11:00 AM
Does Habituation To High Protein Intake Affect Amino Acid Handling?

Grith Højfeldt[1], Jacob Bülow[1], Lene Rørdam[2], Peter Schjerling[1], Jens Bülow[2], Gerrit van Hall[3], Lars Holm[4]. [1]*Institute of Sports Meidicine, Bispebjerg Hospital, Copenhagen, Denmark.* [2]*Department of Clinical Physiology and Nuclear Medicine, Frederiksberg and Bispebjerg Hospital, Copenhagen, Denmark.* [3]*Clinical Metabolomics Core Facility, Clinical Biochemistry, Rigshospitalet and Department of Biomedical Sciences, University of Copenhagen, Copenhagen, Denmark.* [4]*School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, United Kingdom.*

(No relevant relationships reported)

Background: An age related loss of muscle mass is frequent among older adults, a phenomenon termed sarcopenia. In order to circumvent this age related phenomenon, nutritional strategies of increased protein intake has been proposed, however studies investigating the effect of long-term habituation to divergent protein intakes are scarce. In this study we wish to examine if divergent levels of protein intake, is reflected in postprandial whole body protein kinetics in older male subjects.
Method: 12 male subjects ages 65-70 were included in a double blinded cross-over study, where each intervention consisted of a 21-day habituation period to either low or high protein intake (0.6-0.8 g/kg body weight (BW) or above 1.5 g/kg BW, respectively) interspersed by at least 60 days. At the end of each habituation period, subjects met in to an experimental trial with a primed, constant infusion of D_8-PHE. A baseline blood sample was taken 90 min after infusion start. Hereafter, intrinsically labeled milk proteins, ^{15}N-phenylalanine (PHE) caseinate and D_5-PHE whey were ingested in a breakfast meal. In the postprandial period blood sample were taken at 30, 60, 90, 120, 150, 180 and 240 min. All blood samples were analyzed for amino acid concentrations and PHE tracer enrichments on LCMSMS system. The gastro-intestinal (GI) absorption rate of the milk-protein derived amino acids was estimated from the appearance rate of the milk protein bound PHE tracers. The whole body protein degradation rate was calculated by subtracting the exogenous PHE appearance from the total PHE rate of appearance.
Results: The absorption rate of PHE from casein protein was elevated in the late postprandial period after being habituated to low protein intake (interaction: P=0.01, N=6). The absorption rate of whey protein and the endogenous rate of PHE appearance (whole body degradation rate) were not affected in the postprandial period by the habituated level of protein intake.
Conclusion: When habituated to a low protein diet preliminary results reveal that the absorption rate of slow digestible dietary protein is enhanced while the whole body protein degradation is not affected in the postprandial phase.
Funding: Supported by the Danish Dairy Research Foundation and the University of Copenhagen Excellence Programme 2016 (the CALM project).

3367   Board #: 236   June 2 9:30 AM - 11:00 AM
Effect Of An Unhealthy Lipoprotein Distribution On Muscle Protein Synthesis Response To Whey Protein Feeding

Jakob Agergaard[1], Mie C F Zillmer[1], Kenneth Mertz[1], Grith Højfeldt[1], Peter Schjerling[1], Lars Holm[2]. [1]*Institute of Sports Meidicine, Bispebjerg Hospital, Copenhagen, Denmark.* [2]*School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, United Kingdom.*

(No relevant relationships reported)

Introduction: Sarcopenia can be linked to dyslipidemia. The present study investigated how an unhealthy lipoprotein distribution (LPD) affects the sensing of hyperaminoacidemia and determines causality between LPD and development of resistance towards muscle anabolic stimuli such as whey-protein feeding.
METHODS: APOE-/- mice (n=12 per time-point) that develop an unhealthy LPD were compared to WT-mice (n=12 per time-point). Change in body composition was accessed from 10-20 weeks of age. At 20 weeks of age an acute trial was conducted to compare; muscle protein synthesis (MPS) measured by Puromycin labeling at post-

absorptive basal state and two post-prandial periods; 0-0.5h, and 1.5-2h post whey-protein feeding, and underlying anabolic mechanisms were accessed by RT-qPCR.
RESULTS: From 10-20 weeks of age, the body weight of the APOE-/- mice increased less than the WT-mice (p<0.05), whereas the lean body mass increased equally for the APOE-/- and WT-mice. Surprisingly, whey-protein did not significantly affect MPS in the post-prandial period. At 20 weeks of age, APOE-/- mice had a greater mRNA-expression for SNAT2, CD98, ATF4 and GCN2 compared to WT-mice (P<0.05). The mRNA-expression of Beclin1 was lower in APOE-/- mice compared to WT-mice (P<0.05). SLC38A9 responded to whey-protein feeding with a greater mRNA-expression at 0.5h post-feeding compared to post-absorptive state and 2h post-feeding (P<0.05).
CONCLUSIONS: In contrary to our hypothesis, no difference was seen between WT and APOE-/- mice in the post-prandial MPS. mRNA-expression of targets involved in amino acid sensing, and anabolic and catabolic pathways, indicated that APOE-/- mice were metabolic challenged and possibly amino acid deprived.
Funding: Innovation Foundation Denmark

3368   Board #: 237   June 2 9:30 AM - 11:00 AM
The Effects of Protein Type and Added Leucine on Myofibrillar Protein Synthesis Following Concurrent Exercise

Tyler A. Churchward-Venne[1], Philippe J.M. Pinckaers[1], Joey S.J. Smeets[1], Wouter M. Peeters[1], Ian Rollo[2], Luc J.C. van Loon[1]. [1]*Maastricht University, Maastricht, Netherlands.* [2]*Gatorade Sports Science Institute, Leicester, United Kingdom.*

Reported Relationships: T.A. Churchward-Venne: *Contracted Research - Including Principle Investigator; This study was externally funded by GSSI, a division of PepsiCo Inc. Any opinions or scientific interpretations expressed in this manuscript are those of the author and do not necessarily reflect the, position or policy of PepsiCo Inc.*

Protein ingestion increases skeletal muscle protein synthesis (MPS) rates. The effect of protein on MPS rates is enhanced by prior exercise. However, the effect of different types of protein on MPS is unclear and has not been evaluated following concurrent exercise. **PURPOSE:** The objective of this study was to determine the capacity of total milk protein (MILK), whey (WHEY), micellar casein (CASEIN), and soy protein, without (SOY) and with additional leucine (SOY+LEU) to support postprandial myofibrillar protein synthesis (MyoPS) following concurrent exercise. **METHODS:** 72 young recreationally active males participated in this parallel group, double-blind, randomized controlled trial consisting of two arms. In arm #1, 48 subjects (23±0.3 y) ingested 45 g of carbohydrate with either 0 g protein (CHO), or 20 g MILK, WHEY, or CASEIN protein. In arm #2, 36 subjects (23±0.5 y) ingested 45 g of carbohydrate with 20 g WHEY, SOY, or SOY+LEU. A primed continuous infusion of L-[ring-$^{13}C_6$]-phenylalanine with blood and muscle biopsies was applied to evaluate postprandial MyoPS over 360 minutes after exercise. **RESULTS:** In arm #1, MyoPS did not differ between treatments (*P*=0.12) during the postprandial period after exercise (FSR: CHO=0.051±0.003; MILK=0.061±0.003; WHEY=0.056±0.002; CASEIN=0.062±0.005 %/h). When MILK, WHEY, and CASEIN were collapsed into a single group (PROTEIN), protein-carbohydrate co-ingestion resulted in greater MyoPS rates than carbohydrate alone (FSR: PROTEIN=0.060±0.002; CHO=0.051±0.003 %/h; *P*=0.042). In arm #2 MyoPS did not differ between treatments (*P*=0.85) after exercise (FSR: WHEY=0.056±0.002; SOY=0.056±0.004; SOY+LEU=0.058±0.004 %/h). **CONCLUSION:** Total milk protein, whey, and micellar casein (arm #1) do not differ in their capacity to support postprandial MyoPS rates when co-ingested with carbohydrate following concurrent exercise in young males. Similarly, whey and soy protein, irrespective of leucine enrichment of soy (arm #2), do not differ in their capacity to support postprandial MyoPS after concurrent exercise. Co-ingestion of protein with carbohydrate results in greater postprandial MyoPS rates than carbohydrate alone, and may therefore represent a nutritional strategy to support skeletal muscle remodeling following concurrent exercise.

3369   Board #: 238   June 2 9:30 AM - 11:00 AM
The Effect of Whey Protein Supplementation on the Recovery of Contractile Function following Resistance Training

Robert W. Davies[1], Joseph J. Bass[1], Brian P. Carson[1], Catherine Norton[1], Marta Kozior[1], Matthew S. Brook[2], Daniel J. Wilkinson[2], Philip J. Atherton[2], Ken Smith[2], Philip M. Jakeman[1]. [1]*University of Limerick, Limerick, Ireland.* [2]*University of Nottingham, Nottingham, United Kingdom.*

Reported Relationships: R.W. Davies: *Contracted Research - Including Principle Investigator; Food for Health Ireland, Prof. Philip Jakeman.*

PURPOSE: This study investigated the effect of supplemental whey protein (WP) on acute measures of muscle protein fractional synthetic rate (FSR) and the recovery of skeletal muscle contractile function during repeated bouts of resistance training (RT).
METHODS: Sixteen resistance-trained men (80 [13] kg body mass; 23 [4] y; 2.6 [1.2] y RT experience; mean [SD]) completed the 7-day dietary supplement

intervention study. Subjects were randomly assigned to consume each morning in a double-blind manner either a WP supplement (WP; 0.33 g/kg; n = 8) or an isocaloric, isonitrogenous, non-essential amino acid control (CON; 0.33 g/kg n = 8) with a timed and standardised diet (35 kcal/kg/day; 2 g/kg/day protein). Peak isometric squat force (ISQ) and countermovement jump displacement (CMJ) were used to assess baseline contractile function. Subjects then completed three RT bouts (0.7 1RM back squat; 10 repetitions per set; 0.25 duty cycle; point of exhaustion = 8 [2] sets), every other day. Other activities of daily living did not exceed 3 metabolic equivalents. Repeat measurement of ISQ, CMJ, muscle pain and serum creatine kinase (CK) activity (an index of muscle damage) was taken pre-RT, +24h and +48h post-RT, each bout. Muscle protein FSR was measured between muscle biopsies taken from the vastus lateralis pre- and 5 h post- the first RT intervention using the D(2)O stable isotope tracer technique. The observed changes are reported as the mean [low, high] 90% CI, p-value (P).
RESULTS: A 1.0 [0.7, 1.3] fold increase (P < 0.008) in CK and muscle pain (20 [10, 30] %; P = 0.011) was observed +24h the first RT bout only, confirming an absence of overt muscle damage. An acute loss of ISQ was observed following all RT bouts +24h (-19 [-21, -17] %; P < 0.001) and +48h for ISQ (-19 [-21, -17] %; P < 0.001), and +24h for the CMJ (-7 [-9, -5] %; P < 0.05). Whilst acute FSR was increased for WP over and above the CON (+ 0.275 [0.148, 0.403] %/day; P = 0.07), no discernible difference between WP and CON was observed for any measure of contractile function, pain, or CK (P > 0.493).
CONCLUSIONS: We conclude that, whilst peri-RT supplementation with WP augments muscle protein FSR, further inference of this pro-anabolic effect should not extend to acute (0 to 48 h) recovery of peri-RT muscle contractile function.

3370   Board #: 239   June 2 9:30 AM - 11:00 AM
Dietary Sodium Restriction Changed Calcitonin, T3, T4, and Urinary Mineral Excretion in Healthy Women

Naho Serizawa[1], Mamoru Nishimuta[1], Naoko Kodama[2], Mieko Shimada[3], Yutaka Yoshitake[4], Nobuko (kay) Hongu, FACSM[5]. [1]Graduate School of Toyo University, Gunma, Japan. [2]Tokyo Shokuryo Dietitian Academy, Tokyo, Japan. [3]Chiba prefecture University of Health Sciences, Chiba, Japan. [4]National Institute of Fitness and Sports in Kanoya, Kagoshima, Japan. [5]University of Arizona, Tucson, AZ.
(No relevant relationships reported)

PURPOSE: The purpose of this study was to examine the relationship between dietary sodium (Na) restriction and levels in hormone and urinary mineral excretion.
METHODS: We used a part of the metabolic balance study (the duration: 21 days) data carried out in 2004. Subjects were 11 healthy women, aged 19-23 yrs. They were divided into two levels of dietary Na groups (G), *i.e.* Na restricted (R) G (n = 5) (NaCl: 6 g/d) and the Control G (n = 6) (NaCl: 12 g/d). Aldosterone (ALD), calcitonin (CT), parathyroid hormone, triiodothyronine (T3) and thyroxine (T4) were measured from the blood samples collected in the fasting morning. The second voided early morning urine (EMU) minerals {Na, potassium (K), calcium (Ca), magnesium (Mg), phosphorus (P) and zinc (Zn)} were also measured.
RESULTS: ALD and CT levels were significantly higher in the Na RG than in the Control G (ALD: 16.5 ± 5.2 *vs.* 11.2 ± 3.4 ng/dL p<0.001, CT: 34.6 ± 14.1 *vs.* 21.7 ± 10.0 pg/mL, p<0.05). T3 and T4 levels were significantly lower in the Na RG than in the Control G (T3: 99.1 ± 22.8 *vs.* 111.1 ± 14.9 ng/dL p<0.05, T4: 6.2 ± 1.3 vs. 6.9 ± 1.1 µg/dL p<0.01). EMU-Na, Ca, Mg, P and Zn of the Na RG concentrations were significantly lower than those of the Control G (Na: 0.7 ± 0.4 *vs.* 1.5 ± 0.8 µmol/kg body weight (BW)/min p<0.001, Ca: 19.3 ± 11.3 *vs.* 33.0 ± 16.6 nmol/kg BW/min p<0.001, Mg: 33.6 ± 10.2 *vs.* 38.9 ± 9.5 nmol/kg BW/min p<0.001, P: 165.0 ± 55.9 *vs.* 193.7 ± 57.4 nmol/kg BW/min p<0.05, Zn: 50.1 ± 12.4 *vs.* 64.1 ± 20.0 pmol/kg BW/min p<0.01), respectively.
CONCLUSION: Our data showed that dietary Na restriction increased calcitonin and decreased both T3 and T4, and decreased minerals in the EMU. It was revealed that dietary Na restriction affects most of EMU-minerals as well as Na. This suggests that Na affected to the metabolism of the other minerals. Further studies are required to confirm the effects of Na restriction on the hormones.

3371   Board #: 240   June 2 9:30 AM - 11:00 AM
Effects of Olive Oil Phytochemicals and Exercise on Circulatory Leukocytes and Inflammation in Atherosclerotic Rats

Tianou Zhang[1], Tao Liu[1], Yuzi Zhang[1], Jose Amerigo[2], Jing Shao[1], Dongwook Yeo[1], Li Li Ji, FACSM[1]. [1]University of Minnesota-Twin Cities, Minneapolis, MN. [2]International Society for Oleocanthal, Malaga, Spain.
(No relevant relationships reported)

Oleocanthal (Oleo) and Oleacein (Olea) are natural phenolic compounds found in extra-virgin olive oil (EVOO), exerting anti-inflammatory and antioxidant effects. Atherosclerosis, led by arterial plaque deposition, involves increased chronic

inflammation and oxidative stress. **PURPOSE:** The purpose of the study is to evaluate the immuno-regulatory and anti-inflammatory effects of Oleo/Olea supplementation and exercise training in the atherosclerotic rats. **METHODS:** Female Sprague-Dawley rats (age 4-week, n=48) were randomly divided into 4 groups fed an atherogenic diet (C) with added cholesterol (1.25%) and cholic acid (0.5%) for 12 wks. Half of the rats were supplemented with high Oleo/Olea (1000 mg/kg, HO, n=24); the other half with low Oleo/Olea (100 mg/kg, LO, n=24). In each dietary group, half group was trained (T) on treadmill for 12 wks (25m/min, 10% grade for 60 min/day, 5 days/wk), while the other half remained sedentary (S). Two separate groups of rats were fed a chow diet (n=6) and atherogenic diet (n=12), respectively without EVOO or T. Total leukocytes and differential were measured using flow cytometry. Total nitrate/nitrite (NOx) contents were determined by colorimetric assay kit. Data were shown as mean ± SEM and analyzed using two-way ANOVA. **RESULTS:** Leukocytes percentage was higher in HO vs. LO rats (P<0.05), but lowered 32% by T (P<0.05). LO and HO rats showed higher granulocytes percentage than C rats (P<0.05), whereas T suppressed granulocytes in HO by 27% (P<0.05). Neutrophils percentage was increased in HO vs. C and LO rats (P<0.05), but declined by 41% with T (P<0.01). Lymphocytes percentage was decreased in LO and HO rats (P<0.05) and elevated in HO+T by 23% (P<0.05). In addition, T tended to increase monocytes levels in LO rats (0.05<P<0.1). Total NOx levels in EVOO-fed rats were decreased compared to C rats (P<0.05), whereas it was higher in HO-fed vs. LO-fed rats (P<0.05). T tended to decrease NOx in LO but increase NOx in HO rats (P=0.052, interaction effect). **CONCLUSION:** High Oleo/Olea diet increased leukocytes, granulocytes and neutrophils percentage but decreased lymphocytes in sedentary rats, whereas exercise training significantly reversed these trends of immune markers.

3372   Board #: 241   June 2 9:30 AM - 11:00 AM
Effects Of A Novel Probiotic On Exercise-Induced Gut Permeability and Microbiota in Endurance Athletes

Connery J. Brennan, Christopher L. Axelrod, Deborah Paul, Michaela Hull, John P. Kirwan, FACSM. Cleveland Clinic Lerner Research Institute, Cleveland, OH.
(No relevant relationships reported)

Exercise-induced hyperpermeability of the gastrointestinal (GI) tract contributes to abdominal pain, bloating, and fatigue; symptoms commonly expressed in Inflammatory Bowel Disease, Celiac's Disease, and Type 1 Diabetes. Therapies that can ameliorate the symptoms and conditions are lacking. **Purpose:** To assess the efficacy and feasibility of *Lactobacillus Salivarius* (UCC118) supplementation on GI permeability in healthy humans. **Methods**: In a randomized, double blind crossover study, 7 highly-trained endurance athletes (31 ± 6.11 y, VO$_{2max}$ ≥ 57.3 ± 9.3 ml/kg/min) received 4 weeks of daily probiotic or placebo supplementation. The initial 4 week period was followed by a 4 week washout, followed by an additional 4 weeks of placebo or probiotic supplementation. GI permeability, blood chemistry, and fecal microbiota were assessed before and after each 4 week intervention period. GI permeability was challenged using 2 hours of continuous treadmill running at 60% VO$_{2max}$. After 20 minutes of running, subjects ingested 5 grams of L-rhamnose, sucrose, and lactulose. Urine was collected before, immediately after, and every hour for 5 hours after exercise. GI permeability was measured as sugar recovered in urine as determined by LC-MS/MS. Metagenomic sequencing was performed on fecal samples with Illumina HiSeq 4000 utilizing a 2 x 150 configuration for an average of 120-130M paired end reads per sample. Beta diversity was estimated using Bray-Curtis method to reveal the microbial diversity between pre and post intervention samples. **Results:** Compared to placebo, UCC118 treatment reduced area under the curve for urine (N=5) sucrose (P=0.081) and rhamnose recovery (P=.100). Gut taxonomy sequencing revealed significant changes in 60 bacterial species (P<0.05) after UCC118 supplementation. Additionally, there was an increase in microbial diversity after probiotic use.
Conclusion: The results described herein provide proof of principle that 4 weeks of UCC118 supplementation attenuates exercise-induced intestinal hyperpermeability. Molecular processes are ill-defined, so further investigation is needed to determine associated pathways, protein interactions, and impact of specific bacterial taxa. Study supported by external sponsor.

3373   Board #: 242   June 2 9:30 AM - 11:00 AM
The Caloric Costs and Metabolic Benefits of Wilderness Hunting in Alaska

Robert H. Coker, FACSM[1], Melynda S. Coker[1], Larry Bartlett[2], Carl J. Murphy[1], Karolina Priebe[1], Timothy Shriver[3], Dale A. Schoeller[3], Brent C. Ruby, FACSM[4]. [1]University of Alaska Fairbanks, Fairbanks, AK. [2]Pristine Ventures, LLC, Fairbanks, AK. [3]University of Wisconsin, Madison, Madison, WI. [4]University of Montana, Missoula, MT.
(No relevant relationships reported)

Epidemiological investigations have supported the healthy benefits of subsistence foods. Surprisingly, the health benefits derived from the nomadic nature of humans during the Paleolithic era have been understudied. Hunting and gathering activity that occurs far from the conveniences of civilization on public land most likely represent

the closest example of this ancient lifestyle that thrived for thousands of years. **PURPOSE:** To determine the energy demands, and changes in body composition and metabolic risk factors in humans during a 12-day wilderness hunting immersion. **METHODS:** Four healthy men (age: 42±1 yr, BMI: 27±2 kg/m²) without any known cardiovascular, neurolological, pulmonary or metabolic pathology were recruited for participation in the study. Total energy expenditure (TEE) was measured using the doubly labeled water method and a written food diary was utilized to estimate total energy intake (TEI). Body composition was measured using dual energy x-ray absorptiometry; cross sectional area of the upper thigh (XT) and intrahepatic lipid (IHL) was measured using magnetic resonance imaging/spectroscopy. Fasted blood samples were collected for the measurement of total cholesterol (TC), high (HDL) and low-density lipoproteins (LDL). Results were analyzed using paired t-tests, presented as means±SEM and considered significant at P<0.05. **RESULTS:** TEE and TEI were 4226±219 kcal/day and 2499±422 kcal/day, respectively, and resulted in a caloric deficit of 1726 kcal/day. There was a decrease in body weight (-3.2±0.2 kg), total fat mass (-3.1±0.1 kg) and visceral fat volume (-261±47 cm³). In contrast, total, leg and arm lean tissue mass and XT were preserved. There was a decrease in IHL (-0.5±0.1 % water peak). Beneficial trends were noted in blood lipids, but two of the four participants did not have their blood samples collected due to conflicts with weather and bush flight schedules. **CONCLUSION:** In the context of a chronic caloric deficit, adipose tissue and IHL decreased without any reduction in lean tissue mass or muscle mass. These alterations may reflect the interactive influence of movement constancy and caloric deficit on the health benefits of the hunter-gatherer lifestyle. Supported by NIH grant UL1GM118991, TL4GM118992, or RL5GM118990 and by a grant from the University of Montana.

3374   Board #: 243   June 2 9:30 AM - 11:00 AM
The Effects Of Acute Exercise On Npy/AgRP And POMC Neuron Activity In The Mouse Hypothalamus
Wyatt P. Bunner, Brenton T. Laing, Hu Huang. *East Carolina University, Greenville, NC.*
(No relevant relationships reported)

NeuroPeptide Y/Agouti-related peptide (NPY/AgRP) and pro-opiomelanocortin (POMC) neurons are key components of the neuronal circuits that respond to various physiological condition to regulate food intake and energy homeostasis. However, far less is known about how these neurons respond to acute exercise. **PURPOSE:** To determine effects of acute exercise on the activity of AgRP/NPY and POMC neurons in the mouse hypothalamus. **Methods:** NPY-GFP reporter mice were utilized in 3 separate experiments. We randomly assigned cohort 1 (N=6) mice to a treadmill exercise with a speed of 13 M/min and an 8.75% grade for a duration of an hour group or a sedentary group, blood glucose was measured immediately post-exercise. Mice were then intracardially perfused, and their brains were isolated to examine the colocalization of the neuronal activation marker c-FOS and the signaling marker for phosphorylation of extracellular signal-regulated kinases (p-ERK) in NPY-GFP and POMC neurons. In cohort 2 (N=7) food intake was assessed following the same treadmill conditions over a 24-hour period. In the final cohort, (N=5) patch-clamp electrophysiological recordings were used to quantify changes in NPY-GFP neuron firing rate induced by exercise. **Results:** Despite normal glucose levels and food intake after the acute treadmill exercise, c-FOS and p-ERK in NPY/AgRP neurons are significantly increased (p<.05) in the exercised mice compared to the control mice. This result was further confirmed by electrophysiological recording shows that the firing rate was increased in the NPY/AGRP neurons of exercised mice. In contrast, exercise induced c-FOS expression was decreased in the POMC neurons of exercised mice. **Conclusion:** Acute treadmill exercise increases NPY/AgRP neuron activation, whereas POMC neuron activation is decreased. The responsiveness of these neurons to acute exercise is independent from food intake and glucose regulation but might associate with exercise-induced phosphorylation of ERK in the mouse hypothalamus. Supported by East Carolina University start-up fund.

3375   Board #: 244   June 2 9:30 AM - 11:00 AM
Markers of Non-Functional Overreaching Syndrome During the Race Across America (RAAM): A Case Study
Edward K. Merritt[1], David C. Nieman, FACSM[2], Brian E. Barnett[3], Lauren E. Parrish[4], Kathryn Cardwell[5], Brian R. Toone[6], Arnoud Groen[7], Artyom Pugachev[7]. *[1]Southwestern University, Georgetown, TX. [2]Appalachian State University, North Carolina Research Campus, Kannapolis, NC. [3]Delta State University, Cleveland, MS. [4]University of Kansas, Lawrence, KS. [5]University, Shell Lake, WI. [6]Samford University, Homewood, AL. [7]ProteiQ Biosciences GmbH, Berlin, Germany.*
(No relevant relationships reported)

In a previous study, global proteomics procedures identified blood proteins as potential overreaching and overtraining biomarkers, and a targeted proteomics panel of 21 proteins was developed. **PURPOSE:** To measure targeted blood protein changes in

an athlete competing in RAAM. **METHODS:** The 40-y old male athlete underwent fitness testing 4-wks pre-RAAM and 4-d post-RAAM to determine body composition and aerobic cycling capacity. During RAAM training distress score (TDS) and body mass were measured one and 2 times per day. Power output and heart rate (HR) were continuously measured during cycling. Fingerprick samples for dried blood spot samples (DBS) were obtained 4 wks, 24-h, and 2-h before the start of the race, twice per day of the race (morning/evening), and after 1 and 4 d recovery. Proteins were resolubilized from the DBS and digested with trypsin before targeted proteomics measurements (Multiple Reaction Monitoring) on an Agilent 6400 QqQ LC-MS/MS. Data was processed and analysed using Skyline. **RESULTS:** The athlete completed the 4941-km race in 10.1 d at an average moving speed of 24.5 km/h. He cycled for 20.0 h/d, with 20 h sleep for the duration of the race. Power output was 102.6 ± 8.9 watts with the highest 24-h power in the first and last 24 h (108 vs. 120 watts). TDS was 1 before the start and increased to 30 by the finish. Post-RAAM maximal aerobic capacity was 6.3% lower (61.6 vs. 57.5 mL·kg⁻¹· min⁻¹), and maximal HR declined 5.7% (192 vs. 181 beats/min). No changes in body mass or composition occurred. The % change in blood proteins was calculated using the average of the 2 pre-race samples and 5 samples collected on days 8, 9, and the first day of recovery. The 5 blood proteins from the DBS samples that increased the most during RAAM included complement component C7 (359%), complement C4-B (231%), serum amyloid A-4 protein (210%), inter-alpha-trypsin inhibitor heavy chain H4 (191%), and alpha-1-antitrypsin (188%). **CONCLUSION:** This case study of an ultra-endurance athlete competing in the 2017 RAAM event (4th overall) showed the typical decrease in maximal exercise performance associated with non-functional overreaching. Targeted proteomics procedures from DBS samples showed that the largest increases were measured for immune-related proteins that are involved with complement activation and the acute phase response.

3376   Board #: 245   June 2 9:30 AM - 11:00 AM
Safety Of Sub-maximal Aerobic Exercise During The Sub-acute Phase Of Recovery Following Sport-related Concussion
Phillip R. Worts[1], Scott O. Burkhart[2], S. Daniel Petty[3], Lynn B. Panton, FACSM[1], Michael J. Ormsbee, FACSM[1], Cathy W. Levenson, FACSM[1], Jeong-Su Kim, FACSM[1]. *[1]Florida State University, Tallahassee, FL. [2]Children's Health Andrews Institue, Plano, TX. [3]Centre Pointe Health and Rehabilitation, Tallahassee, FL.*
(No relevant relationships reported)

Previous research suggests that strict rest for 5 days following a concussion may prolong symptom presentation. Sub-maximal aerobic exercise is an efficacious treatment for post-concussion syndrome but therapeutic aerobic exercise is not well described in sub-acutely concussed patients. **PURPOSE**: To determine if sub-maximal aerobic exercise could be safely performed in the days following a sport-related concussion. **METHODS**: Fifteen participants (16 ± 1.5 years; 9 males; 6 females) were assigned using a randomized block design to a 40% Age-Predicted heart rate (HR)$_{MAX}$ (40HR), 60% Age-Predicted HR$_{MAX}$ (60HR), or seated rest control (CON) group. Participants exercised after their initial evaluation between Day 3 and Day 7 (4 ± 1.2 days) following their concussion. Participants' HR and symptoms were monitored during the treatment. Descriptive statistics and a two-way mixed ANOVA were performed using SPSS 22. **RESULTS**: Fourteen (93%) participants were able to complete the treatment session. There was a significant interaction between group and time on heart rate $F(3.690, 20.297) = 5.163$, $P = 0.006$, partial n² = 0.484. HR was significantly higher in the 60HR group versus the 40HR and CON groups throughout the 20-minute treatment. The range of symptoms provoked during the treatment were: Balance problems +4 to -2; Dizziness 0 to -4; Headache 0 to -3; Fatigue 0 to -2; and Fogginess 0 to -5. **CONCLUSIONS**: To our knowledge, this is the first study to examine aerobic exercise as a therapeutic modality during the sub-acute phase of concussion recovery. The majority of our participants were able to tolerate aerobic exercise within the first 3-7 days following a concussion and also reported a reduction in symptom severity.

3377   Board #: 246   June 2 9:30 AM - 11:00 AM
Is More Physical Activity Always Better? Constrained vs Additive Total Energy Expenditure Models.
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(No relevant relationships reported)

PURPOSE: Strategies for the prevention and treatment of obesity require a better understanding of the association between physical activity (PA) and total energy expenditure (TEE). Current strategies are based on an additive model, where TEE and PA increases in a dose-dependent manner. However, recent evidence suggests a constrained TEE model, where increases TEE plateaus at higher levels of PA as the body adjusts to maintain an equilibrium of TEE through metabolic adaptations. Our aims were to examine the shape of the relationship between PA and TEE and to

assess the role of energy balance status (negative, stable, positive) in this association. **METHODS**: Participants were 642 older adults (50-74 yrs.) participating in the Interactive Diet and Activity Tracking in AARP study. TEE was assessed by doubly labeled water. PA, assessed by accelerometer, was estimated using three methods to calculate total PA: Vertical Axis counts per minute (CPM), Vector Magnitude CPM, and MET-hrs./d (using a machine learning algorithm [Sojourn-3x]). TEE for each subject was adjusted for anthropometric and demographic factors using linear regression. The relationshop between PA and TEE was assessed using linear (i.e., correlations) and non-linear parameters (e.g., nonparametric LOESS regression curves). Percent weight change over a six month period of assessment was calculated as a proxy measurement of energy balance status. **RESULTS**: The difference in TEE between the top and bottom deciles of PA was +376(SD=341) kcal/d in the total sample, +499(SD=347) kcal/d in men, and +229(SD=318.4) kcal/d in women. TEE was positively associated with PA levels estimated by Vertical Axis (r= 0.36; <0.0001), Vector Magnitude (r= 0.39; <0.0001), and MET-hrs./d (r= 0.40; <0.0001). There was no evidence of a plateau in TEE as demonstrated by the LOESS curves or the change in median TEE over PA deciles. Individuals who lost ≥3% of their body weight showed evidence of a plateau in TEE at higher levels of PA. **CONCLUSIONS**: Overall, PA was associated with TEE in a linear dose-dependent manner. For individual who lost weight, TEE was positively correlated with physical activity, but the relationship was stronger over the lower ranges of TEE. This study provides evidence to adopt a dynamic model for estimating energy expenditure as it pertains to obesity.

3378   Board #: 247   June 2 9:30 AM - 11:00 AM

Associations Of Skeletal Muscle And Appendicular Lean Body Mass With Blood Pressure And Hypertension

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(No relevant relationships reported)

PURPOSE: Previous studies have shown the negative effects of body fat on blood pressure (BP). However, the associations between skeletal muscle and BP remain unclear. The present study was aimed to investigate the associations of total skeletal muscle (TSM) and appendicular lean body mass (LBM) including leg and arm, with BP and hypertension.
METHODS: Data from 3,130 participants aged 18 to 80 years old were analyzed. Appendicular LBM including leg and arm were obtained from dual-energy X-ray absorptiometry. TSM was calculated based on appendicular LBM. Other LBM indices included TSM, and appendicular, leg and arm LBM divided either by weight, or by squared height. Adjusted multivariate linear or logistic regression models were used to analyze the associations of TSM and appendicular, leg, and arm LBM with BP or hypertension, respectively. To further investigate the associations of regional LBM with BP, arm and leg LBM were put in the linear regression models together, and the Wald test was used to compare the standardized parameter coefficients of arm and leg LBM.
RESULTS: TSM, and appendicular, leg and arm LBM indices were all positively associated with elevated systolic or diastolic BP after controlling for potential confounders including body fat percent and android to gynoid fat ratio, except for appendicular and leg LBM/weight. In addition, higher odds of having hypertension were observed in all TSM and appendicular LBM indices, except for leg LBM/weight. The standardized beta coefficients of arm LBM indices on systolic and diastolic BP were significantly higher than relevant indices of leg LBM, except for arm LBM/height^2 on systolic BP.
CONCLUSIONS: Total skeletal muscle and appendicular LBM especially in arms were positively associated with elevated blood pressure and hypertension, after controlling of potential confounding factors including body fat and fat distribution. Our results suggested that excess skeletal muscle especially in upper extremities may have a negative impact on BP and hypertension. Future longitudinal studies are warranted to confirm our findings.

3379   Board #: 248   June 2 9:30 AM - 11:00 AM

Optimal Level of Objectively Measured Physical Activity for Long-Term Weight Loss

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(No relevant relationships reported)

Purpose: Existing physical activity (PA) guidelines for weight management have relied heavily on self-reported PA measures, which are typically overestimated. Our purpose was to determine the optimal level of *objectively* measured PA for sustaining long-term weight loss.
Methods: We conducted a secondary analysis of an 18 month behavioral weight loss trial, which included an exercise prescription of 300 min/wk of moderate-intensity PA. Participants received 6 months of supervised exercise during either months 0-6 or 7-12,

followed by 6 months of unsupervised exercise during either months 7-12 or 12-18. PA was objectively measured with the SenseWear armband; Participants with valid wear time (≥12 hr/d awake time on ≥3 weekdays and ≥1 weekend day) upon completing unsupervised exercise were included in analyses. Sustained bouts (≥10 min) of activity ≥3 METS were converted to moderate-to-vigorous intensity PA (MVPA). Receiver-operating characteristic curve analyses determined the optimal duration of bout MVPA to achieve ≥5% or ≥10% weight loss at 18 months. To identify the optimal cutoff, the Youden index (sensitivity + specificity - 1) and 95% bootstrap percentile confidence intervals were calculated using RStudio (pROC package). A linear mixed effects model examined the association between bout MVPA and weight loss.
Results: Participants included 143 adults (age 39.6±9.4 years, BMI 34.2±4.0 kg/m^2, 87% female); 102 provided an 18-month weight and of these, 82 had valid SenseWear data after completion of unsupervised exercise. The optimal level of bout MVPA upon completion of unsupervised exercise was (median (95% bootstrap CI)) 209 (144-301) min/wk to achieve ≥5% weight loss at 18 months or 267 (108-449) min/wk to achieve ≥10% weight loss at 18 months. There was a dose response relationship between bout MVPA and weight loss. Participants who met 5-9.9% or ≥10% weight loss at 18 months were at mean±SD 270±143 or 316±256 min/wk of bout MVPA upon completion of unsupervised exercise.
Conclusions: Results confirm the importance of high PA levels for sustaining clinically meaningful weight loss. These data validate existing guidelines with objective PA measures and suggest that ~200-300 min/wk of bout MVPA is the optimal duration of PA required to achieve successful long-term weight loss (≥5-10% weight loss at 18 months).

3380   Board #: 249   June 2 9:30 AM - 11:00 AM

Prevalence Of Rash Suspicious For Tinea Among Minnesota High School Wrestlers -2017-18 Season

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(No relevant relationships reported)

PURPOSE: Transmittable skin infections in sport are a concern, especially for wrestlers. We followed a geographically defined group of Minnesota high school wrestlers over the 12-week 2017-18 season to determine the prevalence of rash suspicious for tinea (RST).
METHODS: Nineteen high school wrestling programs in the St Paul area were contacted; 17 agreed to participate. Wrestlers undergo skin inspections prior to each competition throughout the season. Wrestlers identified during skin checks with an RST (raised, red, >5mm diameter, and with dry flaky scale) were recruited.
RESULTS: 39 of 510 wrestlers (7%) developed RST. 34 wrestlers consented to enter the study and had a total of 38 RST's meeting inclusion criteria (2 wrestlers developed 2 separate RST and 1 wrestler developed 3 RST). RST occurred throughout the season, with slightly more at the beginning and near the end. Slightly more RST occurred in middle competition weight categories. The most common site for RST was on the extremities(23 RST), followed by trunk(10), neck(2), face(1), and scalp(1). Empiric topical antifungal treatment had been started by 47% of the wrestlers.
CONCLUSIONS: RST prevalence of 7% was less frequent than found in previously reported wrestling populations. This may be the result of routine skin inspections prior to competition. Empiric topical antifungal treatment is commonly employed. Empiric antifungal treatment may be a prevention strategy that deserves further study.

3381   Board #: 250   June 2 9:30 AM - 11:00 AM

Current Practices of Concussion Management in Primary Care: A Survey

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(No relevant relationships reported)

PURPOSE: Best practices for sports-related concussions (SRC) are evolving rapidly. We aim to describe the knowledge of standardized diagnostic tools and the current practices in SRC management by primary care providers (PCPs) in Northern New England.
METHODS: We designed an 'action' survey, using REDCap, to query current SRC management by pediatric and family physicians in ME, NH, and VT branches of the Academy of Pediatrics (AP) and Academy of Family Physicians (AFP). An email was sent to providers with a link to a deidentified survey which included questions about demographics and clinical practices. The questions covered: frequency seeing SRC, comfort level managing SRC, awareness of current guidelines and resources, use of imaging, return to school/play, and referral patterns. At the conclusion of the survey, the respondents could view their responses compared with others, and were sent links to current guidelines.
RESULTS: Initial response rate is 16% (preliminary) (111 responses of 688 MEAFP and MEAP members surveyed). Demographics: 43 male, 68 female; mean age: 49.2 years; mean years in practice:18.7. 90% (100/111) have seen a patient with SRC in the past 2 years; however, 79% (88/111) see ≤1 per month. 56% work with ATCs to

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manage SRC. 61% report moderate or extreme comfort managing SRC. 91% (101/111) are aware at least 1 guideline for SRC, but only 18% (20/111) are aware of the 2016 Berlin consensus statement. 87% appropriately do not order imaging when no focal findings are found initially; but 46% (51/111) are likely to order imaging at 3 weeks even without valid indication. 70% (76/109) generally do not prescribe medications for concussion symptoms. 41% (43/106) appropriately recommend staying out of school for 2 or less days after SRC. 86% (94/109) are aware of return to play (RTP) guidelines and 90% (85/94) demonstrate appropriate management when an athlete fails a step. **CONCLUSIONS**: Clinicians responded well to a survey of current SRC practices, which provided updated clinical guideline tools. Most PCPs manage SRC; however, a majority report seeing ≤1 a month. A large proportion of PCPs do not follow current recommendations for imaging or return to school. Results could help guide future CME for SRC management.

3382   Board #: 251   June 2 9:30 AM - 11:00 AM
Effects of 6 Months Endurance Training on Quality of Life and Work Ability

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(No relevant relationships reported)

Purpose: In this prospective, randomized controlled study we assessed effects of moderate-intense supervised endurance training on quality of life and work ability in middle-aged sedentary women. **Methods:** We randomized 291 healthy, non-smoking sedentary women (45-65 years) to a 6 months endurance training (EG, 210 min/week) or a wait-list-control (CG, no change of inactive life-style). At baseline and 6-month follow-up we assessed peak oxygen uptake (VO_{2peak}) by cardiopulmonary exercise testing, Work Ability Index (WAI) and quality of life (SF36), both by questionnaires. The metabolic syndrome score (MSS) was calculated using the siMS score. **Results:** At baseline, groups were well matched for anthropometric and cardiovascular parameters. Adherence to endurance training was 207±17 min/ week (98±5%). After intervention, the exercise group improved significantly compared to controls in VO_{2peak} (mean difference: 2.11 ml/min/kg, CI [1.41;2.79], p<0.001) and MSS (mean difference: 0.11 points, CI [0.053;0.175], p<0.001). VO_{2peak} and WAI changes correlated significantly (R=0.201; p=0.002). SF36 improved significantly in the EG compared to the CG for the subscales "Physical Role Functioning" (EG: baseline 83.7±26.5, follow-up 88.1±25.2, CG: 92.4±19.4, 89.7±22.1 respectively; p=0.016), "General Health Perceptions" (EG: baseline 69.3±14.8, 73.6±14.3, CG: 72.5±13.6, 71.8±14.3; p=0.002) and the "Sum Scale Physical" (EG: baseline 50.8±6.5, 52.2±6.3, CG: 52.7±5.7, 52.3±6.4; p=0.040) after exercise training. WAI changed significantly in the EG compared to the CG for "Work Ability In Relation To Demands" (EG: baseline 7.8±1.3, 8.2±1.2, CG: 8.2±1.3, 8.1±1.3, p=0.003), "Number of Current Diseases" (EG: baseline 2.2±1.7, 1.9±1.6, CG: 2.1±1.7, 2.2±1.9, p=0.014) and total score of WAI (EG: baseline 38.3±5.0, 39.8±4.9, CG: 39.4±4.7, 39.3±4.9, p=0.001). **Conclusion:** Our results show that a moderate personalized 6-month endurance training in middle-aged previously sedentary women improved established parameters of cardiovascular function, prevented metabolic syndrome progression, work ability and quality of life.

3383   Board #: 252   June 2 9:30 AM - 11:00 AM
From the Perspective of Mitophagy: Study the Mechanism of Sustained Aerobic Exercises Alleviate Brain Aging

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(No relevant relationships reported)

Our previous work has demonstrated that sustained aerobic exercise could affect the morphology and function of mitochondria, and mitigate the mental functions decline of rats caused by D-gal.
PURPOSE: To investigate whether sustained aerobic exercise could alleviate aged rats' brain aging by influencing mitophagy. This project will aslo study the role of mitophagy in brain aging of aged rats.
METHODS: Twenty-four male Sprague-Dawley rats were randomly assigned into a control group (C, n=12), and a sustained aerobic exercise group (E, n=12). Groups C received conventional feeding for four weeks, and group E received feeding and swimming training for four weeks, 60 min/day, 6 days/week. Firstly, we would analysis the effect of sustained aerobic exercise on spatial learning and memory ability of aged rats. Then, transmission electron microscope were used to observe the mitophagy in loubus fromatis;Some indicators of mitophagy were detected by immunofluorescence, such as HSP60 and LC3-II,HSP60 and LAMP1;at last, index related to the mitophagy (Beclin1, P62 and LC3) were detected by western blotting. The experimental data were reported as means±SE, and *P* values<0.05 were considered significant.
RESULTS: Firstly, sustained aerobic exercise could alleviate rats' brain aging in spatial learning and memory ability. Mitophagy was significantly increasing in loubus fromatis detected by transmission electron microscope and immunofluorescence. According to the western blotting test, Beclin1 (C:0.08±0.02; E:0.63±0.09;

respectively, *P*<0.05) and P62 (C:0.05±0.01; E:0.74±0.11; respectively, *P*<0.05) were significantly elevated after sustained aerobic exercise; LC3-II/ LC3-I (C:0.12±0.03; E:1.25±0.17; respectively, *P*<0.05) was aslo significantly increased. These indicators indicated that mitophagy was increasing after sustained aerobic exercise.
CONCLUSIONS: Results from this study suggest that four weeks of sustained aerobic exercise can improve spatial learning and memory ability of aged rats, by increasing mitophagy in rats' loubus fromatis. Mitophagy is playing a very important role in brain aging of aged rats.

3384   Board #: 253   June 2 9:30 AM - 11:00 AM
Nurse Amie (Addressing Metastatic Individuals Everyday)

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(No relevant relationships reported)

About 1 in 8 US women will develop invasive breast cancer in her lifetime. Complications with symptoms include inability to deliver chemotherapy, hospitalizations and survival outcomes. For patients to benefit from pharmacologic interventions, clinicians must be made aware. At present, there is no standard of care system to ensure clinicians are made aware of symptoms.
Purpose: To investigate the feasibility and acceptance of a symptom assessment and management platform for metastatic breast cancer (MBrCa) patients, including exercise.
Methods: Our team developed an interactive symptom assessment and management platform, Nurse AMIE. Patients were provided with a tablet, pedometer, and resistance bands. Nurse AMIE asked a daily question on sleep, fatigue, pain, or distress. Data from the pedometer and daily symptom questions were applied to an algorithm that resulted in a self-management intervention. Interventions included guided relaxation, social support forum, exercise, and music. Systematic symptom assessment and self-management interventions, along with weekly supportive phone calls determined whether self-management could continue or if there was a need to schedule an appointment with the clinician.
Results: 31 MBrCa patients had been consented to use Nurse AMIE. The initial patient adherence rate was 76%. Qualitatively, patient interviews suggest that Nurse AMIE is 'surprisingly easy to use' and the most valued interventions have been the social support forum, exercises, and music. Additionally, patients noted an improvement in fatigue while using the walking intervention. One patient who was only able to ambulate painfully with a walker at baseline now walks over 10,000 steps a day. Thus far, all initial patients have been able to self-manage with no interval visits with clinicians while using Nurse AMIE.
Conclusion: Nurse AMIE is an interactive platform that allows MBrCa patients to successfully self-manage symptoms while providing critical feedback. Overall, the physical activity component of this intervention is particularly well received. Qualitative feedback suggests that clinicians and patients are pleased by this comprehensive and standardized approach to assessing and managing symptoms. Further evaluation will allow us to better understand symptom assessment and management.

3385   Board #: 254   June 2 9:30 AM - 11:00 AM
Interindividual Variability and Adverse Responses to Body Composition with Exercise Training in Adolescents with Obesity

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(No relevant relationships reported)

Improved body composition (BC) is an expected outcome in adults undergoing exercise training. However, significant interindividual variability (IIV) has been observed in this response. Further, while some individuals fail to accrue training benefits, others demonstrate adverse responses, which can have implications for clinical exercise prescription. It is unknown if exercise training increases IIV and if it affects adverse response rates beyond what would be expected following a diet-only intervention in adolescents with obesity.
PURPOSE: To examine if exercise training increases IIV in the observed response of BC, and to quantify adverse response rates to training compared to diet-only control in adolescents with obesity. **METHODS**: Post-pubertal boys and girls (n = 143; age 15.5 ±1.4 yrs; BMI = 34.8 ±4.6 kg/m²) were randomly assigned to either a diet-only control group (n = 56), aerobic (n = 35), resistance (n = 23), or combined aerobic/resistance training (n = 29). Supervised exercise training was performed 4 x/week for 6 months. All groups received diet counseling to reduce caloric intake by 250 kcal/day. BC

outcomes were body fat % and lean body mass (LBM) measured via MRI, and waist circumference (WC). IIV was assessed by comparing the standard deviation of the observed change for each variable across control and pooled exercise groups (SD_{IR}). A positive SD_{IR} indicates increased IIV with training. An effect size (ES) was used when the SD_{IR} was positive to characterize the magnitude of effect. Adverse responses were evaluated using a measure of typical error to establish response thresholds and expressed as an aggregated score for all BC outcomes.
RESULTS: All exercise groups displayed a systematic increase in IIV following training for body fat % (SD_{IR} = 1.77, ES = 0.32 [0.06, 0.89]), but not for LBM or WC (SD_{IR} = no effect). Exercise significantly decreased the rate of adverse responses for aggregated measures of BC relative to control (7.4% vs. 20.4%, p<0.05), regardless of training modality.
CONCLUSIONS: Regardless of modality, exercise training does not systematically increase IIV across most BC measures in previously sedentary adolescents with obesity. Rather, exercise creates a positive, uniform shift in BC outcomes, thereby decreasing the rate of adverse responses and increasing positive responses.

3386   Board #: 255   June 2 9:30 AM - 11:00 AM
Effects of Resistance Training and Doxorubicin on Creatine Transporter and Creatine Kinase Expression in Fast Muscle

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(No relevant relationships reported)

Doxorubicin (DOX) is a potent chemotherapy drug used to treat numerous cancers, but its use is limited due to its toxicities. DOX treatment may lead to skeletal muscle dysfunction which compromises quality of life for cancer patients. It is suggested that DOX inhibits creatine transporter (CreaT) and creatine kinase (CK) expression in cardiac muscle, but little is known as to how it affects CreaT and CK expression in skeletal muscle. Additionally, resistance training has been shown to alleviate DOX-induced skeletal muscle dysfunction (weakness and fatigue), but the effects of resistance training on CreaT and CK expression in DOX-treated skeletal muscle is currently unknown. **PURPOSE**: To investigate the effects of resistance training prior to and during DOX treatment on CreaT and CK expression in the primarily type II, or fast, extensor digitorum longus (EDL) muscle. **METHODS**: Thirty-six male, Sprague- Dawley rats were randomly assigned to one of four groups: sedentary+saline (SSS), sedentary+DOX (SSD), resistance training+saline (RRS), and resistance training+DOX (RRD). The resistance training protocol incorporated a raised cage model where food and water were elevated progressively which provided hindlimb loading 10 weeks prior to DOX injection and during the course of DOX treatment. Animals receiving DOX received 3 mg/kg DOX administered i.p. weekly for 4 weeks (12 mg/kg cumulative) and animals receiving saline received equivalent volumes of 0.9% NaCl as a placebo. Five days following the final DOX or saline injection, EDL muscles were excised, and Western blotting was performed to quantify CreaT and CK expression. **RESULTS**: No significant drug effect or activity x drug interaction was observed for CreaT expression, but a significant activity effect was observed for CreaT expression (p=0.0479). No significant main effects or interaction was observed for CK expression. **CONCLUSIONS**: Resistance training prior to and during weekly DOX administration promoted an increase in CreaT expression suggesting that resistance training may play a role in alleviating DOX-induced skeletal muscle dysfunction by enhancing substrate availability for phosphocreatine synthesis.

3387   Board #: 256   June 2 9:30 AM - 11:00 AM
Exercise In All Chemotherapy (EnACT) Study: Implementation Of Exercise Oncology In A Clinical Setting

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(No relevant relationships reported)

Purpose: Despite exercise recommendations for cancer patients, exercise counseling is not standard of care in cancer centers across the U.S. Challenges in the field of exercise oncology persist and require strategic approaches to ensure that exercise programming is approached in a manner that is widely acceptable to patients and their clinicians. Therefore, we have conducted an implementation study to assess feasibility, adherence to exercise during chemotherapy, and logistics of operating an exercise intervention program in the infusion suite of a cancer institute.
Methods: The Exercise Medicine Unit at the Penn State Cancer Institute (PSCI) is located in the infusion suite of the PSCI and was opened in the Fall of 2017. Staff screened all patient visits to the PSCI infusion suite for study eligibility criteria: ECOG ≤ 2, absence of absolute contraindications for exercise, solid tumor malignancy, and scheduled to receive chemotherapy. Participants completed surveys (physical activity, barriers to exercise, nutrition, work impairment, and quality of life) and physical function testing at baseline and follow up. An ACSM certified cancer exercise trainer

prescribed a personalized exercise program that has 5 components: aerobic, strength, balance, stretching, and relaxation.
Results: Of 317 patients screened, 42% were eligible (135), and 104 consented (77%) to the EnACT study. Characteristics of the study population include an average age of 59 years, 62% female, and 40% with metastatic disease. The top 3 cancer sites in the study were breast (23%), colorectal (17%), and pancreatic (16%). Adherence to prescribed exercise programming was 82%, n=39 completers. Overall, barriers to being active were decreased, with fewer participants reporting lack of willpower to exercise (42%, baseline; 19% follow up; p=0.02), and fewer citing influence from others as a barrier to exercise (19%, baseline; 3% follow up; p=0.06).
Conclusion: We report our mid-point analysis of the EnACT study. Thus far, the study is clinically feasible with 77% of eligible participants providing consent and an 82% adherence rate. Qualitative assessment with participants and health care professionals are ongoing. Collectively this study will aid in moving evidence based exercise-oncology practice into routine clinical usage.

3388   Board #: 257   June 2 9:30 AM - 11:00 AM
Effect Of 10 Weeks Of Low-load High-repetition Resistance Exercise Training On Human Skeletal Muscle

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(No relevant relationships reported)

Generally, high-load resistance exercise is recommended for increasing muscle mass. However, for the physically weak individuals encountering difficulties in performing high load resistance exercise, such as the elderly, women, and patients in rehabilitation, such exercise may not be effective. Recent research suggests that low-load high-repetition resistance exercise can increase muscle mass effectively, and can also contribute by facilitating mitochondrial metabolism or an adaptive phenomenon of endurance exercise.
PURPOSE: We aimed to investigate skeletal muscle functions, hypertrophy, and mitochondrial metabolism according to load and total work volume of exercise training based on molecular biology and physiological factors.
Methods: We recruited 21 men in their 20s and divided them into three groups, 80FAIL (80%RM set to failure, n=7), 30WM (30%RM and work matched to 80FAIL), and 30FAIL (30%RM set to failure), to perform resistance exercise three times a week for 10 weeks. Isokinetic muscle function test and Wingate test were conducted to assess their muscle function before and 72 hours after the last session. A biopsy of quadriceps femoris was performed to determinate changes in muscle cross-sectional area (CSA), satellite cell activation and mitochondrial metabolism.
Results: After 10 weeks of exercise training, 30FAIL and 80FAIL showed an increase in peak torque, CSA, and satellite cell activation (p<.05). In terms of endurance strength, 30FAIL was the only group that presented a significant increase after the training (p<.001). Furthermore, 30FAIL recorded a significant rise in expression of mitochondrial biosynthesis indicators of COXIV and cytochrome c, fusion proteins (Mfn2, Opa1), fission proteins (Drp1, Fis1), and mitophagy factors (PINK1, Parkin) after the exercise training (p<.05). Overall, 10 weeks of low-load resistance exercise training (set to failure) can activate satellite cells, thereby contributing to increase in CSA and improvement of muscle function.
Conclusion: Low-load high-repetition exercise training can be suggested as an effective method of muscle exercise training to enhance skeletal muscle function and aerobic metabolism at the same time by facilitating mitochondrial metabolism of the skeletal muscle.

3389   Board #: 258   June 2 9:30 AM - 11:00 AM
Expression Of Markers Of Browning In White Adipose Tissue In Life-long Endurance Trained Athletes

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(No relevant relationships reported)

Physical exercise and training results in adaptations in adipose tissue. Such adaptations may in part be mediated through "cross-talk" with skeletal muscle. One of these adaptations potentially relevant to energy metabolism in endurance athletes is the beiging of white adipose tissue (WAT). Beiging is the process by which WAT shows characteristics of brown adipose tissue (BAT), possibly increasing basal metabolic rate. While the process of beiging in rodents and the existence of BAT in humans has been shown previously, it is unknown if and how life-long endurance exercise influences beiging of WAT depots. **Purpose:** To study the influence of life-long training on adipose tissue markers of beiging and metabolic performance, the uncoupling protein 1 (UCP-1), CIDEA and PPAR-γ in white adipose tissue (WAT) in sub-elite athletes. **Methods:** Periumbilical subcutaneous adipose tissue biopsies were collected from 14 life-long trained sub-elite endurance athletes (8 male, 6 female; VO₂max performance over 90th percentile for their age group) and 13 age-matched controls (6 male 7 female). Gene expression was analyzed on extracted RNA. Fold induction

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was statistically analyzed by Student's-test. **Results:** UCP-1 gene expression was significantly higher in trained women compared with the control group (p=0.046). No significant difference was found in men when comparing UCP-1 expression (p=0.257). Expression of CIDEA was, again, significantly higher compared with controls (p=0.049), but also in men (p=0.024). Finally, expression of PPAR-γ was significantly higher in trained women (p=0.005). Again no differences were found in men (p=0.924). **Conclusion:** Life-long endurance training results in a higher expression of brown adipose tissue markers in periumbilical WAT in women, in men only in expression of CIDEA, a factory closely associated with metabolic health. Previous results in rodents show a higher susceptibility of females to upregulate BAT markers following β-adrenergic signaling. A similar mechanism might be possible in humans. This effect might also be caused by differences in body fat distribution and functionality, with women having a higher prevalence for BAT.

3390   Board #: 259   June 2 9:30 AM - 11:00 AM
In-vivo Measurement Of Strain In The Iliotibial Band In Motion
Kuntal Chowdhary. *Oakland University William Beaumont School of Medicine, Rochester, MI.*
(No relevant relationships reported)

PURPOSE: Iliotibial band syndrome (ITBS) is one of the most common overuse leg injuries. Two current theories - friction and compression - attempt to correlate the cause of lateral knee pain to the inflammation of the iliotibial band (ITB). Despite lack of consensus, both theories suggest that strain plays a key role in all potential mechanisms of injury. The purpose of this study is to measure strain in the ITB non-invasively over the skin, as a basis for further evaluation of ITBS as correlated to changing strain rates.
METHODS: Strain was measured using a 'strain measurement apparatus' consisting of strain gauges in a carbon fiber casing. The strain measurement apparatus was placed on biomimetic skin overlying a tendon to obtain an estimated measure of strain upon manipulation of the cords to known forces. The output generated by the apparatus was correlated to the actual strain measured by a load cell placed directly on the tendon. The 'strain measurement apparatus' was manipulated to maximize precision throughout the experimental process. In the second phase of the project, the 'strain measurement apparatus' will be used to measure strain in a porcine leg as a closer approximation of the human ITB.
RESULTS: The first phase of this study demonstrated a correlation between the strain measured by the apparatus and the force applied to the biomimetic tendon, as measured by the load cell. Four trials were run, with the strongest correlations in trials 2 and 3 with correlation coefficients of 0.97 (P<0.0001) and 0.99 (P<0.0001), respectively.
CONCLUSIONS: The results thus far support the hypothesis that strain can be measured in the ITB directly using strain gauges. The efficacy of the strain measurement apparatus will provide a basis for further non-invasive evaluation of the ITB as correlated to ITBS in human models.

3391   Board #: 260   June 2 9:30 AM - 11:00 AM
Applied Assessment and Interventional Energy And It's Effects In A Clinical Setting
Gerardo Hizon, FACSM, Niluk Senewiratne. *University of California Riverside, Riverside, CA.*
(No relevant relationships reported)

PURPOSE:The purpose of this study is to evaluate interventional electron energy's ability to reduce inflammation and related symptoms such as pain. Inflammation is the underlying factor in many conditions. The origin of inflammation is the cells accumulation of waste product caused by ion channel dysfunction. The performance of neuronal ion channels are regulated by voltage or ligand. Voltage disruption in the membrane affect channel gate function. Minute changes in channel gate function leads to cell dysfunction caused by molecular structure abnormality, the result of free radical based electron instability. Free radicals are active in inflammatory processes in vitro and in vivo. Interventional electron energy modifies ionic flow across cell membranes and may correct cell function. Interventional electron energy is used to reduce cell dysfunction and inflammation by neutralizing free radicals. METHODS:The application of interventional electron energy is used to counteract free radical related molecular, sub-molecular and cell dysfunction causing inflammation. This method includes free radical assessment and interventional electron energy application to affected tissue. Free radical neutralization can be achieved via correction of impaired movements and pathways of affected electrons. This may result in correction to molecular structure leading to ion channel function correction within the cell membrane. This can result in the decrease of inflammation and related conditions. RESULTS:Out of 144 interventional electron applications on inflammation and related pain in in knees, cervical, backs, shoulder, hands and heads, the mean deviation improvement was 4.52. The Average improvement Percentage [(652.699213 (Sum total VAS pain scale pre-treatment)/63.9810606 (Sum total VAS pain scale post-treatment) = 10.20 (Difference in sum totals)] [100 - 10.20 = **89.80% (Average pain reduction)**]
CONCLUSIONS: By integrating analytic and interventional processes , the benefit to the patient is a new accelerated assessment and treatment for rapid reduction of

inflammation and related conditions. The pain reduction %'s in this large population pilot study exceed the pain reduction %'s achieved with standard conservative therapeutic options. These results warrant further study and investigation.

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Forced PGC1a1 Expression Improves Oxidative Capacity And Partially Rescues Strength Following Volumetric Muscle Loss Injury
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(No relevant relationships reported)

Volumetric muscle loss (VML) is characterized by a large volume of muscle tissue being removed from the body due to surgery or severe trauma. The remaining muscle after VML has poor function and unknown adaptive potential during physical rehabilitation. **PURPOSE:** To investigate the metabolic plasticity of the remaining skeletal muscle after VML injury. **METHODS:** VML injury was performed on the gastrocnemius muscle of 8-week old C57BL/6 mice. Study 1: Unilaterally injured VML mice performed voluntary wheel running (WR). Study 2: PGC1a1 (CMV promoter) transfection was performed on control (CON) and bilaterally injured VML mice (VML). Mice were divided into three groups: CON+PGC1a1 overexpression, VML alone, and VML+PGC1a1 overexpression. Four weeks after onset of wheel running (Study 1) or transfection interventions (Study 2), muscle strength and mitochondrial respiratory function (mitoFx) were assessed. **RESULTS:** MitoFx was ~23% greater in the uninjured limb of VML+WR mice compared to VML alone, but mitoFx in the injured limb of VML+WR mice was not different from VML alone, suggesting VML injury prevents metabolic adaptations to exercise (ANOVA P<0.001). To determine if a faulty metabolic signaling cascade (i.e., PGC1a1) was responsible for impaired metabolic adaptation in the VML-injured muscle, direct muscle activation via sciatic nerve electrical stimulation was used to initiate oxidative gene transcription in CON and VML mice. The stimulated muscle in CON mice had ~4 fold greater PGC1a1 gene expression than the unstimulated muscle; however, there was no effect of stimulation on PGC1a1 expression in VML mice (Interaction: P<0.001) suggesting VML injury attenuates oxidative gene regulation. Endogenous PGC1α1 activation pathways were bypassed via forced expression of PGC1a1 in Study 2. Forced expression of PGC1a1 resulted in ~33% and ~31% greater mitoFx in CON+PGC1a1 and VML+PGC1a1 mice, respectively, compared to VML alone (P<0.001), and VML+PGC1a1 mice had 47% greater muscle strength than VML alone (P<0.001). **CONCLUSION:** PGC1a1 activation is the limiting factor impairing metabolic plasticity in VML-injured muscle; and improving oxidative capacity of the remaining muscle after VML injury improves recovery of strength.

3393   Board #: 262   June 2 9:30 AM - 11:00 AM
Myonuclear Transcriptional Rate Differs in Young versus Mature Mice
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(No relevant relationships reported)

Skeletal muscle fiber hypertrophy occurs in mature mice (>4 months old) in response to synergist ablation overload in the absence of satellite cell-mediated myonuclear accretion, whereas young mice (2 months old) are not able to hypertrophy without satellite cells. We hypothesize that young mice have higher myonuclear transcriptional activity at rest than mature mice due to the demands of developmental muscle fiber growth. Age-related differences in transcriptional rate may in part explain why young mice cannot mount the robust myonuclear transcriptional response required for overload-induced hypertrophy without satellite cells. **Purpose:** To determine whether baseline myonuclear transcription differs between young (2 months) versus mature (5 months) mice. **Methods:** Young and mature mice (n=4 males/group) were pulsed with 5-ethynyl uridine (EU), a modified uridine that incorporates into nascent RNA, via intraperitoneal injection then sacrificed after a 1-hour chase. Myonuclei were defined as DAPI-positive nuclei within the myofiber, delineated by dystrophin immunostaining. EU-labeled nascent RNA was detected histochemically on frozen muscle cross-sections, and myonuclear EU intensity was quantified with semi-automated thresholding software. Muscle fiber cross sectional area (CSA) was quantified via the detection of fiber borders using automated software. **Results:** The number of EU+ myonuclei did not differ between young and mature mice. Mean transcriptional intensity per myonucleus was 10% higher in young versus mature mice, and muscle fiber CSA was 18% smaller (P<0.05). Myonuclear transcriptional rate normalized to muscle fiber size appeared 30% higher in young versus mature mice, but did not reach statistical significance (P=0.07).
Conclusion: Likely due to lower normalized myonuclear transcription relative to young mice, mature mice may possess a transcriptional reserve that allows for hypertrophy in the absence of myonuclear accretion, as previously shown by our

laboratory. The current data indicate that murine developmental age could be an important consideration for hypertrophy experiments. These results will be verified in a larger cohort of mice that will also include females.

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Relationships Between Muscular Strength And Body Composition In Adults With Cerebral Palsy

Pooja Pal, Cory E. Low, Rachel L. Christensen, Stephanie V. Rosales, Areum K. Jensen. *San Jose State University, San Jose, CA.*

(No relevant relationships reported)

Cerebral palsy (CP) is a non-progressive and permanent neurological disorder that is characterized by muscular weakness and soft tissue contracture or deformation. Adults with CP develop health risk factors and diseases, such as obesity and cardiovascular diseases, significantly more than the general population. Majority of the research focuses on interventions for children and adolescents with CP, and little is known about long-term health issues among adult CP population. Currently, limited information is available to identify the level of muscular strength in relation to the level of obesity in adults with CP.
Purpose: To determine relationships between muscular strength and body composition in adult individuals with and without CP.
Methods: We studied thirteen adults with and without CP. Leg muscular strength and power at 90, 150, and 210 degrees/sec were measured using Humac Norm isokinetic dynamometer. The range of motion at the knee joint was measured. Forearm muscular strength was measured using a handgrip dynamometer. Body mass index (BMI) from weight and height was calculated to identify the level of obesity.
Results: Compared to healthy control, individuals with CP had significantly lower knee extensor peak torque (11.8±2.3 CP vs. 68±12.5 control, ft-lbs, P<0.05) at 90 degrees/sec, (7.5±0.6 CP vs. 53.2±11.7 control, ft-lbs, P<0.05) at 150 degrees/sec, (7.3±1.1 CP vs. 49.2±9.7 control, ft-lbs, P<0.05) at 210 degrees/sec, lower knee flexor peak torque (6.3±1.6 CP vs. 43.8±7.9 control, ft-lbs, P<0.05) at 90 degrees/sec, (6.00±1.13CP vs. 35.83±6.88 control, ft-lbs, P<0.05) at 150 degrees/sec, (7.33±1.89 CP vs. 35.17±6.47 control, ft-lbs, P<0.05) at 210 degrees/sec. In control group, there was no relationship between BMI and extensor/flexor peak torque. However, there was a significant inverse relationship between BMI and torque in CP group.
Conclusion: These findings suggest that the level of obesity does not appear to influence muscular strength in healthy population. However, individuals with CP exhibit an inverse relationship between muscular strength and the level of obesity.

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Alterations in Musculoskeletal Function and Functional Mobility in Adults with Cerebral Palsy

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(No relevant relationships reported)

Cerebral Palsy (CP) is a type of neurological disorder marked by impaired muscle coordination and related physical disabilities due to damage in the brain before or at birth. Adult individuals with CP are more exposed to higher risk of fall and fracture mainly because of their musculoskeletal abnormalities and dysfunction. The lower state of balance and functional mobility is also related to the higher risk of fall and fracture in the general public, and is improved by gaining muscular strength and power as well as bone mineral density (BMD). To date, no studies have examined the relationship between leg muscular strength, BMD, and balance as a detector of functional mobility in the adult CP population.
Purpose: To determine if there is a relationship between leg muscular strength, BMD, and seated balance in adults with CP.
Methods: We studied 7 adults with CP, and 6 without CP as a control. Dual energy X-ray Absorptiometry (DXA) was used to measure bone mineral content and BMD at the lumbar spine region (L1-4). Muscular strength was assessed by using the Human Norm isokinetic dynamometer to measure peak torque, work, and power of the left leg. The Biodex was used to identify the state of seated balance by performing a limited stability test.
Results: There were no significant differences in BMD of the L1-L4 region between adults with CP and the healthy controls. The CP participants had a significantly lower forward (28.6±5.5 CP vs. 69.5±8.1 control, P<0.05), backward (29.0±10.3 CP vs. 77.5±5.6 control, P<0.05), left (20.8±5.6 CP vs. 72.0±7.7 control, P<0.05), right (28.0±5.6 CP vs. 65.5±5.8 control, P<0.05), and overall (17.2±3.1 CP vs. 61.7±6.3 control, P<0.05) score values in comparison to the control group on the limited stability test. The CP group had a significantly lower knee extensor peak torque (7.3±1.1 CP vs. 49.2±9.7 control, foot-pounds, P<0.05) and knee flexion peak torque (7.3±1.9 CP vs. 35.2±6.5 control, foot-pounds, P<0.05) at 210 degrees/sec. There was a linear relationship between torque and balance for both the CP and control.
Conclusion: Our findings suggest that leg muscular strength appears to influence

seated balance in individuals with CP even though bone strength in the lumbar region is not significantly different compared to controls.

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Alterations in Skeletal Architecture, Bone Mineral Density, and Muscular Strength in Adults with Cerebral Palsy

Cory E. Low, Pooja Pal, Rachel L. Christensen, Areum K. Jensen. *San Jose State University, San Jose, CA.*

(No relevant relationships reported)

Cerebral Palsy (CP) is a neurological disorder caused by lesions in the brain that affect motor development. It is characterized by impaired motor function and atypical development of musculoskeletal structures and muscular weakness. Individuals with CP develop osteoporosis earlier in their age compared to the general population. Bone weakness has a detrimental effect on the muscular system, which causes the CP population to be more prone to bone fracture and further immobility. To date, it is still uncertain whether structural alterations in the skeletal system in CP population have an influence on bone mineral density (BMD) and muscular strength.
Purpose: To determine relationships between skeletal architecture, BMD, and muscular strength in adults with and without CP.
Methods: We studied 14 participants with and without CP. Dual energy X-ray absorptiometry was used to measure regional BMD and bone mineral content (BMC) at the lumbar spine, proximal femur, and forearm regions. Architectural differences were measured as angles from a center line through the femoral neck to top and bottom of greater trochanter, and lesser trochanter. Leg and forearm muscular strength was assessed by using Humac Norm isokinetic dynamometer, and handgrip dynamometer, respectively, to measure peak torque of the left leg.
Results: Individuals with CP had significantly different skeletal architectural angles presented by the top and bottom of greater trochanter (e.g., top, 56±4 CP vs. 72±3 control, degrees, p<0.05). BMC, BMD, T-scores, and Z-scores were all significantly different in the left femoral neck (e.g., T-score, -2.96 ±0.92 CP vs. -0.89±0.49 control, p<0.05) as well as in the forearm regions (e.g., radius 33%, T-score, 0.48±0.31 CP vs. -0.30±0.18 control, p<0.05). Individuals with CP had significantly lower knee extensor peak torque (e.g., at 90 degree/sec; 11.8±2.3 CP vs. 68.0±12.5 control, foot-pounds, p<0.05). Architectural angles of the femur were closely related to the level of BMD on femoral neck regions and leg muscular strength (p<0.05).
Conclusion: These findings suggest that femoral skeletal architecture (via reduced angles of top and bottom of greater trochanter) has an influence on BMD and muscular strength in adults who have CP.

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The Effect Comparison of Foam Rolling with Passive Stretching After High Intensity Training

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(No relevant relationships reported)

PURPOSE: Objectives: To compare the effect of foam rolling (FR) and passive stretching (ST) after high intensity training.
METHODS: 63 male were conclude from college students,which divided into three groups: control group, FR group and ST group. And each group included 21 subjects. All subjects finished a high intensity training session of weight-bearing squat exercise.After the training session, FR group practiced a 6-min foam rolling and ST groups practiced passive stretching. Isometric Peak torque (IPT) were measured with isokinetic system at pre-training, immediately post-training and 24h, 48h after training.
RESULTS:After training, IPT was significantly decreased in all three groups (p<.01**), and there were no significant differences immediately after training. At 24h after training, IPT was significantly increased in FR and ST groups, although there were no significant differences compared with the pre-training result. At 48h after training , compare with the control group, FR and ST group's IPT was significantly increased in the (p<.01**), while there were no significant differences between these two groups; Compared pre-training and 48h post-training, no significant differences were observed in FR group, while there were still significant difference in ST group(p<.01**).
CONCLUSIONS: (1) Foam rolling and passive stretching can relax muscle after high intensity training; (2) Foam rolling practice and passive stretching had possible beneficial effects at 24h and significant improvement at 48h after training; (3) Under the same condition, the effects of foam rolling practice were greater than passive stretching.

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The Changes of IPT pre- and post-training (N*M)			
	Control Group	FR group	ST group
Pre- training	207.10±12.78	213.52±8.38	212.51±10.51
Immediately post-training	152.41±9.25**	157.31±7.14**	158.02±9.13**
24h post-training	153.94±9.84**	165.57±8.49**	163.25±8.81**
48h post-training	159.97±10.26**	193.71±7.57**	182.19±9.95****

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A Novel Application of Altitude Training Masks and High-Intensity Interval Training to Improve Exercise Performance

Eric M. Hultquist, Haley N. Yohn, Carlo F. Tirso, Mary A. Dunyak, Jacqueline Denning, Erin L. Blaser, Brycen J. Moore, Rachel Beckmann, Joshua G. Woolstenhulme. *The George Washington University, Washington, DC.*
(No relevant relationships reported)

PURPOSE: This study seeks to examine the effects of altitude training masks (ATM, also known as respiratory fitness masks) used solely during recovery periods (low intensity intervals) during high-intensity interval training (HIIT).
METHODS: Participants underwent six weeks of HIIT (3 sessions per week) with each exercise bout consisting of eight, 60-second high-intensity intervals interspersed with eight, 90-second low-intensity recovery intervals. Workloads for the high-intensity intervals were individualized to elicit heart rates within 10 bpm of each participant's maximal heart rate as assessed during a baseline graded exercise test. The low-intensity recovery intervals were prescribed at a fixed workload corresponding to approximately 10% of each participants' baseline maximal oxygen consumption ($\dot{V}O_{2max}$). Participants were assigned via block randomization to either a control group (CG) or a training mask group (TMG) that only wore the ATM during the low-intensity recovery bouts of the HIIT intervention. Participants performed a graded exercise test to volitional exhaustion at both baseline and following the HIIT intervention as well as a vascular occlusion test to assess the tissue saturation index nadir (TSIN) of the gastrocnemius. Outcomes were $\dot{V}O_{2max}$, oxygen consumption at anaerobic threshold (AT), and TSIN.
RESULTS: Twelve participants (7 women; 25.5±4.5 years; BMI: 23.6±1.5 kg/m²) have completed the study to date. $\dot{V}O_{2max}$ increased significantly in the TMG group (40.5±3.6 to 44.5±5.4 ml/kg/min, p=0.03) but not in the CG. TSI was significantly greater in the TMG group (-17.8±7.3 to -28.3±7.3% from baseline, p=0.05) with no significant change in the CG. No change in AT was observed in either group.
CONCLUSIONS: Implementing ATMs only during the low-intensity recovery intervals of HIIT training appears to improve key components of cardiorespiratory function not observed in our standard HIIT training group. These findings demonstrate a novel use of ATMs that has potential to change how ATMs are used by recreational and professional athletes. These results also have implications for the use of ATMs as potential adjunctive modalities for enhancing training effects in rehabilitative settings where improvements in short time periods are desirable.

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Novel Use of Respiratory Conditioning Masks during High-Intensity Interval Training to Improve Respiratory Function in Healthy Adults

Brycen J. Moore, Erin L. Blaser, Mary A. Dunyak, Carli F. Tirso, Jacqueline Denning, Haley N. Yohn, Eric M. Hultquist, Alison Rieck, Joshua G. Woolstenhulme. *The George Washington University, Washington, D.C.*
(No relevant relationships reported)

PURPOSE : The purpose of this study was to examine the effects of respiratory conditioning masks (RCMs, also known as altitude masks) on lung function when used only during the low-intensity recovery intervals of high-intensity interval training (HIIT).
METHODS : A group of recreationally active healthy adults performed a 6-week HIIT protocol where half of the participants were randomly assigned to wear an RCM during the low-intensity rest intervals (Mask Group), or no mask (Control). Participants performed three HIIT bouts per week, where each bout included eight high-intensity intervals of 60s exercise performed within 10 beats of maximal heart rate for each subject obtained from a baseline graded exercise test to volitional exhaustion. Each high-intensity interval was immediately followed by a 90s low-intensity recovery interval at a work rate corresponding to 10% $\dot{V}O_{2max}$ for each participant at baseline. Pulmonary function testing was also performed at baseline and following a six week intervention period.

RESULTS : 12 subjects (7 women, ages: 25.5±4.55 yrs, BMI: 23.6±1.5 kg/m²) to date completed the study. Expiratory reserve volume was significantly larger in the mask group compared to the control group after training (1.5 ±0.5 vs. 0.8±0.4L, p=0.02). Resting VE/VO₂ (41.8 ±6.9 vs. 28.3±2.7, p=0.001) and VE/VCO₂ (47.3 ±11.6 vs. 35.8±3.9, p=0.04) increased in the mask group compared to controls. In the mask group alone, at peak exercise VE/VCO₂ significantly increased at isowork rates (31.5 ±2.3 to 34.3±3.6, p=0.02) while the respiratory exchange ratio decreased (1.22±0.11 vs. 1.14±0.08, p=0.02). Resting PETO₂ significantly increased in the mask group alone after exercise training (111.7 ±6.5 vs. 115.5±6.1 mmHg, p=0.02). No other changes were observed in forced vital capacity, total lung volume, or maximal inspiratory/expiratory pressures for both groups.
CONCLUSIONS : RCMs worn only during the low-intensity recovery intervals in a 6 week HIIT protocol appear to have a significant effect on select measures of respiratory and ventilatory function. VE/VCO₂ is an indicator of ventilatory drive, and changes in VE/VCO₂ have been shown to have prognostic significance for several clinical populations. Using RCMs is this novel fashion may play a role in modifying ventilatory drive.

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Feasibly Measuring Sitting And Physical Activity In The Office Using Bluetooth Sensing

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(No relevant relationships reported)

PURPOSE: The office is a key setting where sitting occurs and is intervened upon. Office-specific behaviour measures may help evaluate workplace intervention components, such as activity-permissive workstations. We tested whether a feasible Bluetooth sensing method can provide valid measures of office time and office-specific activities.
METHODS: Workers from one building (n=29, 72% female, age 23-68 years) wore, for one workday, the activPAL3 on the thigh and the Bluetooth-enabled ActiGraph Link on the wrist and thigh. Location (office/not) was estimated by signal presence/absence at two beacons in the wearer's office, with chest-worn video cameras (MeCam) as the criterion. Accuracy in location classification was assessed (F-scores) and compared (generalized estimating equations) between 60 s and 10s sampling options (i.e., feasible versus high resolution, requiring daily recharging). The validity of 60 s Bluetooth-derived measures of total time spent in the office and in office-specific activities was assessed.
RESULTS: For both the wrist and thigh-worn Link, accurate classification of location (office/not) was obtained, with a significant (p<0.05) but negligible difference between the two sampling options (F-scores were all 0.98). Agreement with the criterion in daily totals showed only small mean differences (-0.2 to +6.1 min) and moderate individual differences (95% agreement limits ±30 min or ±10 min for stepping). Mean absolute percent error was very small for office time and office sitting time (<5%), moderate for standing (17-23%), and high for incidental stepping (30-49%) and purposeful walking (57-86%) due to how little of these occurred.
CONCLUSIONS: The ActiGraph Link worn on the thigh or wrist can be used to validly measure office time and office activity (provided activity is measured validly) with a 60 s Bluetooth setting that facilitates multi-day measurement without recharging. Higher resolution improves accuracy but not to a meaningful degree.

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Absence of Functional Left Ventricular Adaption With Short-Term Resistance Exercise Training in Young Men

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(No relevant relationships reported)

Resistance exercise training (RET) is recognized as a health-positive stimulus, but the significance of remodelling of the left ventricle (LV) evoked by RET remains unclear, in part due to the lack of data on LV functional adaptation that accompanies the structural remodelling. **PURPOSE**: To examine the effects of 12 weeks of RET on LV twist mechanics in healthy men. **METHODS**: Forty, non-athlete men (age: 23±3 years) were randomized into 12 weeks of whole-body higher-repetition RET (20-25 repetitions/set to failure at ~30-50% 1RM; n=13), lower-repetition RET (8-12 repetitions/set to failure at ~75-90% 1RM; n=13), or an active control period (n=14). Standard, and speckle tracking echocardiography were performed at baseline, and following the intervention period. **RESULTS**: Neither 12-week program of RET altered end-diastolic volume, end-systolic volume, or ejection fraction (*P*>0.05). Similarly, RET did not change total LV twist, untwisting rate, twist-to-shortening ratio, untwisting-to-twist ratio, or longitudinal strain (*P*>0.05). **CONCLUSION**: This is the first longitudinal study to assess both LV structure and mechanics after RET in healthy men, suggesting a maintenance of LV structure and mechanics irrespective of loading

condition. These results contrast those reported from endurance exercise training and therefore present important insight into the specific contributions of RET to cardiac adaptation, even with strenuous training efforts. Future studies should directly compare the effects of RET and endurance exercise on the structure and function of the heart, and determine whether combined training regimes exceed a health threshold in patient populations.

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Impaired Exercise Capacity In cTnT-delta160E Mice Validates Pre-clinical Model To Assess Exercise Interventions For HCM

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(No relevant relationships reported)

Reduced peak VO_2 in patients with hypertrophic cardiomyopathy (HCM) is a powerful predictor of adverse outcomes, including all-cause mortality and heart transplant. The risk of death or transplant is reduced by 21% for each 1mL/kg/min increase in peak VO_2. A randomized clinical trial conducted by our group demonstrated 16 weeks of moderate intensity exercise training increased peak VO_2 in HCM patients by 6% compared to usual activity. Whether exercise attenuates disease progression is unknown but is a critical question given the lack of disease modifying therapy. This is challenging to address in patients because disease typically progresses slowly and non-linearly over many years. Therefore, we propose a pre-clinical HCM model to determine the effects of exercise on phenotypic emergence and progression. **PURPOSE**: To determine exercise capacity in a cardiac troponin T mutant (cTnT) mouse model of HCM through a graded exercise text (GXT) protocol. **METHODS**: C57Bl/6 non-transgenic (NTG) (n=6 female, n=5 male) and Δ160E cTnT (n=4 female, n=8 male) mice (age 10-12 months) were subjected to a human parallel mouse GXT w/staged increases in inclination (0°-15°) and speed (6m/min up to 30 m/min). Mice were acclimated (4 days, 30 min day) and tested on a metabolic treadmill in a randomized and blinded fashion at UM Nutrition Obesity Research Center. Test was terminated when mouse remained in contact w/shock grid at treadmill rear for 5 sec. Two sample t-tests were used for data analysis. **RESULTS**: Baseline and peak VO_2 were significantly lower in cTnT compared to NTG mice (baseline: 83.12 mL/kg/min ± 2.07 vs 95.58 mL/kg/min ± 3.61; peak: 102.35 mL/kg/min ± 2.04 vs 119.20 mL/kg/min ± 5.57; p<0.01 in both comparisons). Compared to NTG mice, cTnT ran a shorter distance (201.33m ± 6.40 vs 253.81m ± 8.78; p< 0.0001) and for less time (13.25min ± 0.25 vs 15.22min ± 0.31; p< 0.0001). Respiratory exchange ratio and mean body weights were not different between cTnT and NTG mice. **CONCLUSION**: This is the first report of reduced peak VO_2 in a pre-clinical HCM model. These findings mirror reductions in peak VO_2 observed in HCM patients, the magnitude of which is a strong predictor of adverse outcomes. Our observation validates the model as one in which the effects of an exercise intervention on phenotypic conversion and progression can be assessed. Support by UM

3403   Board #: 272   June 2 9:30 AM - 11:00 AM

The Influence of EMG-based Maximal Voluntary Contraction (MVC_{EMG}) Intensity on Middle Cerebral Artery Velocity

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(No relevant relationships reported)

It has been established that cerebral blood flow velocity (CBFV) might elevate due to the increase of exercise intensity determined by %VO_2max during a cardiorespiratory exercise test. But, the response of CBFV to EMG-based maximal voluntary contraction (MVC_{EMG}) during Isometric muscle contraction remains unclear. **PURPOSE**: To evaluate the influence and adaptability as the intensity index of MVC_{EMG} on middle cerebral artery velocity (MCA V_{mean}) during isometric strength type exercise. **METHODS**: Fourteen healthy male (24.1±1.4yrs) were asked to perform the 45° knee extension isometric contraction during 60 seconds. All participants performed three times in random order the isometric exercise of 100%, 80% and 60% MVC determined by root mean square (RMS) of EMG at right rectus femoris m. with a week interval. Each participant was asked to conduct and maintain the predetermined exact intensity of %MVC confirming the figures on a monitor. MCA V_{mean} was measured at rest, during exercise, immediately after exercise, 30 seconds recovery, 60 seconds recovery and 2 minutes recovery using transcranial-Doppler sonography. All data were analyzed using two-way ANOVA (3 intensities x 6 times) with repeated measures. **RESULTS**: MCA V_{mean} in 80% MVC_{EMG} was significantly higher than MCA V_{mean} in 60% MVC_{EMG} (110±19 vs. 89±19 cm/s, p<0.05) immediately after exercise. MCA V_{mean} in 100% MVC_{EMG} was significantly higher than MCA V_{mean} at 60% MVC_{EMG} in 30 second recovery (97±14 vs. 77±10 cm/s, p<0.05) and 60 seconds recovery (97±16 vs. 73±12 cm/s, p<0.05). Heart rate in 100% MVC_{EMG} was significantly higher than in 80%, 60% MVC_{EMG} at immediately after exercise (128±26 vs. 106±15, 97±10 beats/

min, p<0.01) and at 30 seconds recovery (102±18 vs. 87±12, 80±9 beats/min, p<0.05). **CONCLUSIONS**: These results suggest that the increase of isometric exercise intensity up to ~ 80% of MVC_{EMG} might induce the elevation of MCA V_{mean}.

3404   Board #: 273   June 2 9:30 AM - 11:00 AM

Muscle Afferent Blockade Improves Endurance Exercise Performance When O_2 Transport To Locomotor Muscles Is Preserved

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(No relevant relationships reported)

PURPOSE: During high intensity whole body endurance exercise, feedback from group III/IV locomotor muscle afferents restricts neural drive to the legs while, simultaneously, optimizing peripheral O_2 transport. We attenuated feedback from these sensory neurons to investigate their limiting effects on endurance exercise performance while controlling for locomotor muscle O_2 transport. **METHODS**: Eight healthy men (VO_{2max}: 55±6 ml/min/kg) performed 5 km cycling time trials (TT) under control conditions and with lumbar intrathecal fentanyl impairing neural feedback from the lower limbs. To assure similar arterial oxygenation, O_2 content (C_aO_2) was raised by breathing 100% O_2 during the control (HYP_C) and the fentanyl (HYP_F) TT. The TT was also performed in normoxia with intact afferent feedback (NORM). After each TT, subjects performed a short, constant-load cycling bout at the mean power output achieved during the preceding TT while common femoral artery blood flow (Q_L) was quantified using Doppler ultrasound. Leg O_2 transport was calculated as the product of C_aO_2 and Q_L. Using supramaximal electrical femoral nerve stimulation, peripheral and central fatigue were quantified via pre- to post-exercise changes in quadriceps twitch force (ΔQ_{tw}) and voluntary activation (ΔVA). **RESULTS**: Both Q_L (~16 ml/W/min) and C_aO_2 (~24 ml O_2/dl) were similar at the mean power output achieved during HYP_C and HYP_F ($P > 0.6$), but significantly different from NORM (18 ± 4 ml/W/min and 22 ± 1 ml O_2/dl). Importantly, leg O_2 transport was similar between HYP_C and HYP_F (~0.36 ml O_2/W/min; $P = 0.6$) and significantly greater than NORM (0.33 ± 0.05 ml O_2/W/min). Although mean power output was augmented during HYP_C compared to NORM (287 ± 57 W and 261 ± 38 W, $P < 0.05$), ΔQ_{tw} was similar between trials (~40%). Interestingly, HYP_F further increased mean power output (309 ± 17 W) and improved time trial performance (3.3 ± 0.9%) compared to HYP_C ($P < 0.05$). This was associated with a greater ΔQ_{tw} (54 ± 9%), but a similar ΔVA (~4%) in HYP_F compared to HYP_C. **CONCLUSIONS**: Group III/IV muscle afferent feedback restricts endurance exercise performance and limits the development of peripheral fatigue. However, to expose the performance limiting aspect of these sensory neurons during whole body exercise, their impact on convective O_2 transport needs to be controlled.

3405   Board #: 274   June 2 9:30 AM - 11:00 AM

Highly Cushioned Shoes Increase Leg Stiffness And Amplify Impact Loads During Running

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(No relevant relationships reported)

Shoe cushioning represents a standard way to manage impact loading and consequent injuries due to running. However, although modern shoes have become increasingly cushioned, running injuries have not decreased. The probable, but poorly understood explanation for this counterintuitive is that shoes with additional cushion have only limited ability to attenuate impacts during running, even though they can significantly reduce impact loads *in vitro* mechanical tests. **PURPOSE**: The aim of this study was to investigate why shoes with additional cushion provide little or no reduction to the impact loads during running. **METHODS**: Ground reaction forces (GRF) and the spring-like leg mechanics were examined among 12 healthy men while running at 4.0 m/s with a rearfoot striking pattern using normal (NORM, Brooks Ghost 6) and maximalist (MAX) cushion shoes (Hoka One One). We determined and compared vertical GRF impact peak (VIP) and average vertical loading rate (AVLR), as well as leg stiffness and leg compression between shoe conditions. **RESULTS**: GRF parameters illustrating the hardness of the impact showed significantly greater values when running with MAX shoes, as compared to running with NORM shoes (VIP (p = 0.001) and AVLR (p = 0.038) were 10.7% and 12.3% greater in the MAX shoe, respectively). The analysis of the spring-like leg function revealed that during running with MAX shoes runner's leg became stiffer (p = 0.012) and compresses less (p = 0.006) when compared to running with NORM shoes. **CONCLUSIONS**: The present findings suggest that increased landing stiffness may

be responsible for opposing the impact attenuation effect of extra shoe cushioning during running. In fact, highly cushioned MAX shoes can even amplify impact loading during running, which thus may increase the risk of impact-related running injuries.

Mean (SD) data for the normal (NORM) and maximalist (MAX) shoe.

	NORM shoe	MAX shoe	*t*-test
Spring-like leg mechanics			
Leg stiffness (kN/m^{-1})	26.1 (7.1)	27.9 (8.2)	0.012*
Leg compression (cm)	8.3 (1.3)	8.0 (1.4)	0.006**
Impact loading			
Vertical GRF impact peak (BW)	2.01 (0.32)	2.25 (0.32)	0.001***
Vertical GRF loading rate (BW/s)	59.0 (15.2)	67.3 (14.6)	0.038*

3406   Board #: 275   June 2 9:30 AM - 11:00 AM

Quantifying Head Impact Dynamics In Community Level Australian Rules Football

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Research from elite contact sports is suggesting an athlete may incur hundreds of repetitive head impacts over one season. However, the majority of studies to date have focused on elite level athletes. To date, little investigation has focussed on non-elite sports, particularly in Australia where the majority of sport is played at the community level where little attention is given to those players who may experience significant head trauma. This is the first study to present head impact data in community level football. **PURPOSE**: To quantify head impact data over a season of Australian Rules football (ARF) played at the community club level. **METHODS**: Twenty-five male players (mean age 24.9 ± 5.2 years) from one ARF club participated in 20 home and away matches in the regular season. During matches, head impact data was collected using individually fitted instrumented mouth guards (Nexus A9, Impact Technologies, Australia). Data was sampled at 1000 Hz, with a 500 Hz bandwidth. If the mouthguard exceeded the pre-determined 10 g linear acceleration threshold 100 milliseconds (ms) of data (10 ms pre-trigger and 90 ms post-trigger) were recorded to the on-board memory for later downloading. Outcome measures included mean impact number, mean peak linear and peak rotational acceleration, and injury severity profiles for linear (ISP$_{linear}$) and rotational (ISP$_{rotational}$) accelerations. **RESULTS**: A total of 2810 impacts were recorded. Individual players experienced an average of 162 ± 40.5 impacts over the course of the season resulting in mean of 8 ± 11 impacts per-player per match. Linear accelerations ranged from 10 g to a peak of 176 g; with a mean, media and 95th percentile value of 33 g, 25 g, and 76 g respectively. Rotational accelerations ranged from 87 rad/s^2 to a peak of 19831 rad/s^{2,} with a mean, median, and 95th percentile value of 4004 rad/s^2 , 3109 rad/s^2 , and 9593 rad/s^2 respectively. The ISP$_{linear}$ profiles showed 86.6% were mild severity, 12.7% were moderate severity, and 0.7% were severe. The ISP$_{rotational}$ profiles showed 69%, 19.8%, and 11.2% were mild, moderate and severe respectively. **CONCLUSIONS**: This novel study provides data to better inform medical personnel in the identification and evaluation of at-risk players for concussion at non-elite community level ARF.

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