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

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

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

(No relevant relationships reported)

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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95   **Chair:** Joseph Weir, FACSM. *University of Kansas, Lawrence, KS.*

(No relevant relationships reported)

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

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

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

PURPOSE: The relevance of biomarkers reflecting internal player load in intermittent sports such as football is questionable, so far. Increased levels of circulating DNA (cfDNA) have been demonstrated in a variety of exercise settings. Recently, it has been shown that cfDNA increased depending on intensity and duration during aerobic running. In this context, cfDNA was suggested to be applied in intermittent exercise, however the effects of short repeated sprinting as an essential feature of intermittent sports on cfDNA values are unknown. For the first time, we assessed both alterations of cfDNA due to repeated sprinting and due to a professional football game.
METHODS: First, nine participants were subjected to a standardized sprint training session in a cross-over design of five maximal sprints of 40 meters with either "short" (1 minute) or "long" pauses (5 minutes) in between. Capillary cfDNA and lactate were measured after every sprint and venous cfDNA before and after each series of sprints. In addition, capillary cfDNA and lactate values were monitored in 23 professional

football players during the course of a training week at rest (baseline) and in all 17 enrolled players following a regular season game. Game data in terms of total distance, sprints and intense runs was recorded for each player using the OPTA-System.
RESULTS: Venous cfDNA and lactate increased in "short" (2.8-fold, p<0.0001 and 5.6-fold, p<0.0001) and less pronounced during "long" (1.9-fold, p=0.0051 and 3.6-fold, p<0.0001). The season game increased cfDNA 22.7-fold (p<0.0001) and lactate 2.0-fold (p=0.09) compared to baseline. CfDNA increases correlated with distance covered during game (spearman's r=0.87, p=0.0012), while no correlation between lactate and the tracking data could be found.
CONCLUSIONS: Here we show for the first time that cfDNA could be an objective marker for player load in intermittent sports reflecting total distance covered during professional soccer.

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

Detection of Functional Overreaching in Endurance Athletes Using Proteomics

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

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

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

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

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

Memory T (T_M) cells function to provide long-lasting protection against re-exposure to pathogens. The recall response of T_M cells to foreign antigen is quicker and of a greater magnitude than a naïve T cell. How functional activation is altered in T_M cells following a bout of exercise is not well known. **PURPOSE:** To quantify exercise induced changes in surface markers of early, middle, and late stage activation in memory T cells (CD4⁺CD45RO⁺CD45RA⁻) obtained from human subjects. **METHODS:** Utilizing a cross over design, untrained subjects completed a control and exercise visit. The control visit consisted of 30 min of seated rest while the exercise session entailed 3 sets x 10 reps squat at 70% 1-RM, 3x10 leg press at 70% 1-RM, and 3x10 leg extensions at 70% 1-RM with 2 min rest between sets. Venous blood samples were obtained pre and post each visit. CD4⁺ T cell isolation from peripheral blood was conducted through negative selection using a Human CD4⁺ T cell enrichment kit. CD4⁺ T cells were plated at 1.5 x 10⁶ cells/ml in 200 μl of ImmunoCult T-cell expansion media directly after isolation and costimulated through CD3+CD28 or no stimulation. Cells were incubated for 1 and 3 d at 37°C in a humidified incubator with 5% CO_2 and then analyzed by flow cytometry. Early (CD69), middle (CD25),

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

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

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

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

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

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

Development Of A Consumer-Oriented Microbiome Tracker

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

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

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

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

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

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

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

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

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

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

(No relevant relationships reported)

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

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

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

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

Cognitive Reappraisal Improves Psychological State During Endurance Exercise

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(No relevant relationships reported)

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

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

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

(No relevant relationships reported)

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

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

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

* p≤0.05, ** p≤0.01

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

Chad R. Straight[1], John D. Chase[1], Philip A. Ades[2], Michael J. Toth[2], Mark S. Miller[1]. [1]*University of Massachusetts Amherst, Amherst, MA.* [2]*University of Vermont, Burlington, VT.*
(No relevant relationships reported)

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

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

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

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

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

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

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

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

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

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

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

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

(No relevant relationships reported)

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

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

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

(No relevant relationships reported)

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

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

Biomechanics of Walking in Healthy Adults at Different Gait Speeds

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

(No relevant relationships reported)

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

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

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

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

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

(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

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

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

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

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

(No relevant relationships reported)

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

Table 1. Spatiotemporal parameters for different loads and genders.

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

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

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

Relationship Between First Metatarsal Motion and Metatarsal Load Distribution During Walking

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

(No relevant relationships reported)

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

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

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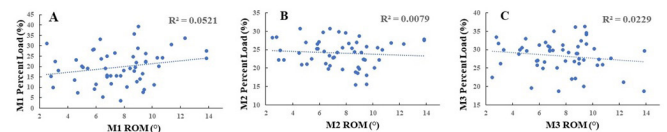
126 Board #7 May 30 9:30 AM - 11:30 AM

Gait Biomechanics at Different Time Periods Following Anterior Cruciate Ligament Reconstruction

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

(No relevant relationships reported)

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

(No relevant relationships reported)

130　　May 30 9:30 AM - 9:50 AM

Recurrent Hip Pain in a Preadolescent Soccer Athlete

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

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

131　　May 30 9:50 AM - 10:10 AM

Hip Pain Post Pregnancy

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

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

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

132　　May 30 10:10 AM - 10:30 AM

Pubic Pestilence-Cross Country

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

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

133　　May 30 10:30 AM - 10:50 AM

Novel Treatment of Anterolateral Thigh Pain-Triathlon

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

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

Abstracts were prepared by the authors and printed as submitted.

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

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

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

A-27   Clinical Case Slide - **Medical Issues I**

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

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

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

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

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

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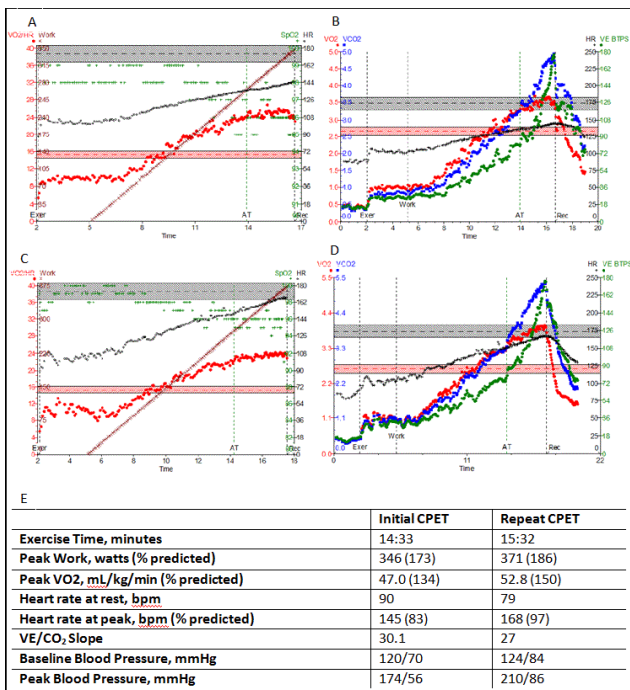
in atrial fibrillation. Given the increased risk of atrial fibrillation in his hyperthyroid state, he will be instructed to keep his heart rate target below 120bpm. Once his thyroid levels return to normal, he plans to undergo radioactive iodine ablation, likely after the football season.

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

Exercise Intolerance in an Endurance Athlete with Depression

Ankit B. Shah, Aaron L. Baggish, FACSM, Meagan M. Wasfy. *Massachusetts General Hospital, Boston, MA.*

(No relevant relationships reported)

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

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

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

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

Exercise Intolerance-cycling

Devon E. Hutton, Sean C. Robinson. *Oregon Health and Science University, Portland, OR.* (Sponsor: Diane L Elliot, FACSM)

(No relevant relationships reported)

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

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

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

Left Lower Quadrant Abdominal Pain in a Division 1 Discus Thrower

Alyssa M. Neph[1], Tracy Bras[2], Kentaro Onishi[1]. *[1]University of Pittsburgh Medical Center, Pittsburgh, PA. [2]Maine General Orthopedics/Evergreen Sports Medicine Fellowship, Augusta, ME.* (Sponsor: Brian A. Davis, FACSM)

(No relevant relationships reported)

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

Abstracts were prepared by the authors and printed as submitted.

142　　May 30 10:50 AM - 11:10 AM

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

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

(No relevant relationships reported)

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

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

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

Ethan C. Hill, Terry Housh, FACSM, Cory Smith, Joshua Keller, Richard Schmidt, Glen Johnson, FACSM. *University of Nebraska - Lincoln, Lincoln, NE.* (Sponsor: Terry Housh, FACSM)

(No relevant relationships reported)

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

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

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

Iván Chulvi-Medrano[1], Moisés Picón[1], Juan M. Cortell-Tormo[1], Diego A. Alonso-Aubin[1], Tamara Rial[2], José Fernández-Sáez[1], Daniel Alonso[3], Yasser Alakhdar[3]. *[1]University of Alicante, Alicante, Spain. [2]International Hypopressive and Physical Therapy Institute, Vigo, Spain. [3]University of Valencia, Valencia, Spain.*

(No relevant relationships reported)

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

(p=0.011) and 60min post-exercise (p=0.004) and also in AT muscle thickness after the fourth set (p=0.001), 60min (p=0.006) and 24 hours post-exercise (p<0.001). **CONCLUSION:** LI-BFR group showed the highest increase in muscle thickness of the G when compared to HI and LI groups. Only LI-BFR group was able to achieve significant increase of AT muscle thickness.

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

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

Moisés Picón[1], Iván Chulvi-Medrano[1], Juan M. Cortell-Tormo[1], Diego A. Alonso-Aubin[1], Tamara Rial[2], José Fernández-Sáez[1], Daniel Alonso[3]. *[1]University of Alicante, Alicante, Spain. [2]International Hypopressive and Physical Therapy Institute, Vigo, Spain. [3]University of Valencia, Valencia, Spain.*

(No relevant relationships reported)

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

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

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

Teresa Wiczynski, Joseph Badinger, Cody E. Morris, Ray VanWye, Scott Arnett, Lee J. Winchester. *Western Kentucky University, Bowling Green, KY.* (Sponsor: Scott Lyons, FACSM)

(No relevant relationships reported)

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

WEDNESDAY, MAY 30, 2018

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

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

A-39   Free Communication/Poster - Cardiovascular

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

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167   Board #8   May 30 9:30 AM - 11:00 AM

The Effect Of Different Exercises On Qt Dispersion In Sedentary Women.

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(No relevant relationships reported)

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

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

Heat Rate Variability:Meaningful Change and Reliability using a Heart Rate Sensor Chest Strap and an Android Phone Application

Nathan J. Hellyer, Sonya Blyakher, Sarah Costello, Kaitlin Wohnoutka. Mayo Clinic College of Medicine, Rochester, MN.

(No relevant relationships reported)

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

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

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169   Board #10   May 30 9:30 AM - 11:00 AM

Chronic Effects of an Elevation Training Mask on Aerobic Capacity, Anaerobic Endurance, and Pulmonary Function

Tyler Heimdal[1], Lavan Rajan[1], Justin Vickery[1], Ujalashah Dhanani[1], Joshua Harris[1], Michael Moreno[2], David Huston[3], Patrick McCulloch[1], Bradley Lambert[1]. [1]Houston Methodist Hospital, Houston, TX. [2]Texas A&M University, Houston, TX. [3]Texas A&M Health Science Center, Houston, TX.

(No relevant relationships reported)

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

	AEROBIC CAPACITY							
	VO2max (ml/kg/min)			Unmasked Time to Exhaustion			Masked Time to Exhaustion		
GROUPS	Pre-Train-ing	Post-Train-ing	% Change	Pre-Train-ing	Post-Train-ing	% Change	Pre-Train-ing	Post-Train-ing	% Change
TM	37.10 ± 3.23	42.35 ± 4.08†	14.12 ± 4.93*	628 ± 46.89	694 ± 46.89†	10.51 ± 1.44	534 ± 64.2	654 ± 44.08†	24.14 ± 5.88*
CON	40.03 ± 1.3	50.00 ± 0.49†	25.32 ± 4.28	671 ± 26.71	763 ± 17.62	13.93 ± 13.32	634 ± 28.02	704 ± 19.76†	11.50 ± 4.23

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

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

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

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

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

Exercise Mode Reduces Photoplethysmography Measured Heart Rate Validity

J. Luke Pryor, Jeremy Hudson, Alexis Zazueta, Reyoot Berry, Breanna Hernandez, Scott S. Sailor. *California State University, Fresno, Fresno, CA.*

(No relevant relationships reported)

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

modes with greater arm movement such as rowing (wrist r_c = 0.13, forearm r_c = 0.56, ear canal r_c = 0.18) and calisthenics (wrist r_c = 0.03, forearm r_c = 0.84, ear canal r_c = 0.01). Combining all exercise modes, mean bias was low in the forearm device (-5 bpm) and high for the wrist (15 bpm), and ear canal (-38 bpm) devices. The limits of agreement (device - ECG) fell between -35 to 25, -40 to 70, and -103 to 27 bpm for the forearm, wrist, and ear canal devices, respectively. In all three devices, HR data fell outside of these limits of agreement at all exercise intensities. **CONCLUSIONS**: Variable validity of PPG-HR devices was observed across all exercise intensities. Exercise modes with greater upper extremity movement (rowing, calisthenics) further diminished PPG-HR validity.

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

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

Peizhen Zhang[1], Xiangrong Shi, FACSM[2]. *[1]Beijing Sport University, Beijing, China. [2]UNT Health Science Center, Fort Worth, TX.*

(No relevant relationships reported)

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

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

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

Stephanie M. Otto, Riley Viner, Nathanael R. Otto, Mitchell Feske. *Gustavus Adolphus College, St. Peter, MN.*

(No relevant relationships reported)

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

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

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

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

Karen K. Dennis, Alex M. Wolfe, Samantha Ward. *Illinois State University, Normal, IL.* (Sponsor: Dale D. Brown, FACSM)
(No relevant relationships reported)

Previous research has established a relationship between physical activity (PA), sleep efficiency (S%) and heart rate variability (HRV). Our previous studies (Wolfe and Dennis, 2016) have further established this relationship, with significant findings when separating PA by intensity (Dennis and Wolfe, 2016). **Purpose:** The purpose of the current study was to further investigate the relationship between PA and HRV. Specifically the primary aim of the study was to investigate the difference between BMI, PA and HRV. **Methods:** Nineteen subjects (20±1 yr.) from a Division I University volunteered for the study. All subjects voluntarily signed an informed consent and completed anthropometric measures including height, weight and BMI. Subjects were then fitted with a BodyMedia SenseWear Armband to assess PA and sleep efficiency for the duration of one week (7days). Upon returning the device, each subject had HRV assessed (CardioSoft software), utilizing a 12-lead EKG by assessing standard deviation of the mean R-R intervals (SDANN). Subjects were classified as "Normal" or "Overweight" according to their BMI and t-tests were utilized to compare the two groups. **Results:** Our results show that the "Overweight" category (mean BMI = 26.6 kg/m^2) had fewer steps (79, 060) when compared to the "Normal" BMI category (mean BMI = 21.6 kg/m^2 , steps 81,212). Our results also show that the "Overweight" category had a lower HRV score when compared to the "Normal" category. However, the results of the t-tests showed no statistical difference ($p < .05$) between the two groups. **Conclusion:** While there was no statistically significant relationship between BMI and HRV, based on the results of the current study and by previous results (Wolfe & Dennis, 2016; Dennis & Wolfe, 2016) PA and PA intensity appear to have a larger impact on HRV rather than weight status. In terms of improving health, increasing PA should be the focus of college aged adults rather than reducing weight status.

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

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

Rohan C. Edmonds[1], Meaghan C. Wood[2], Patricia Fehling, FACSM[2], Sarah DiPasquale[2]. *[1]Creighton University, Omaha, NE. [2]Skidmore College, Saratoga Springs, NY.* (Sponsor: Patricia Fehling, FACSM)
(No relevant relationships reported)

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

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

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

Daily HRV Monitoring During Resistance Training Program in a Collegiate Athlete

Clifton J. Holmes, Michael R. Esco, FACSM. *University of Alabama, Tuscaloosa, AL.*
(No relevant relationships reported)

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

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

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

Christopher J. Lundstrom, Timothy J. Houghton, Kelsey Sutter, George R. Biltz. *University of Minnesota, Minneapolis, MN.* (Sponsor: Dr. Eric Snyder, FACSM)
(No relevant relationships reported)

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

177   Board #18   May 30 9:30 AM - 11:00 AM
Leukocyte and Lactate Responses to Different Modes of Exercise at the Same Target Heart Rate

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

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

178   Board #19   May 30 9:30 AM - 11:00 AM
Effects of Off-Season Training on In-Season Training Load and Time Spent in Heart Rate Zones

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

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

179   Board #20   May 30 9:30 AM - 11:00 AM
Resistive-based Walking Training For Individuals With Poststroke Hemiparesis

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

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

180   Board #21   May 30 9:30 AM - 11:00 AM
Cardiovascular Risk Markers in Firefighters: A Longitudinal Study

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

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

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

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

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

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

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

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

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

Indoor Cycling Energy Expenditure: Does Sequence Matter?

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

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

*=EE during Recovery significantly (p<0.005) lower than Random and Ascending Intervals
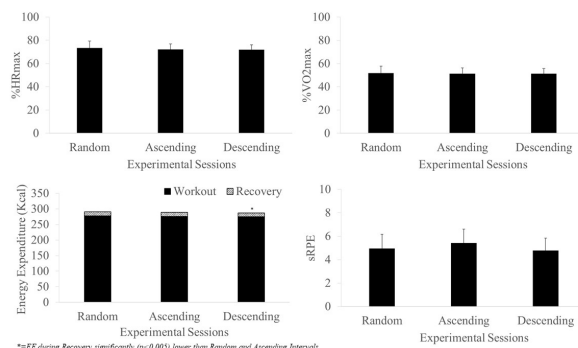
183   Board #24   May 30 9:30 AM - 11:00 AM

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

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

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

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

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

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(No relevant relationships reported)

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

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

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185   Board #26   May 30 9:30 AM - 11:00 AM
Validity and Reliability of the Lode Excalibur Sport Cycle Ergometer for the Wingate Anaerobic Test
William R. Lunn. *Southern Connecticut State University, New Haven, CT.* (Sponsor: Robert Axtell, FACSM)
(No relevant relationships reported)

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

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186   Board #27   May 30 9:30 AM - 11:00 AM
Evaluation of Asymmetry in Power Production During Cycling
John W. Farrell III, Daniel Blackwood, Brian Pribble, Rebecca Larson. *University of Oklahoma, Norman, OK.*
(No relevant relationships reported)

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

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

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187   Board #28   May 30 9:30 AM - 11:00 AM
Posture Influence on Recovery Intervals in Sprint Cycling
Deanna Emnott, Lorrie Brilla, FACSM, Harsh Buddhadev, Wren McLaughlin. *Western Washington University, Bellingham, WA.* (Sponsor: Lorrie Brilla, FACSM)
(No relevant relationships reported)

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

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188   Board #29   May 30 9:30 AM - 11:00 AM
Effects Of Cycling Cadence On Physiological Variables
Daniel J. Blackwood, John W. Farrell, III, Rebecca D. Larson. *University of Oklahoma, Norman, OK.* (Sponsor: Christopher Black, FACSM)
(No relevant relationships reported)

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

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

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

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

G. Alan Garvick, Edward K. Merritt, R. Andrew Shanely. *Appalachian State University, Boone, NC.*

(No relevant relationships reported)

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

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

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

Boe M. Burrus[1], Jessie Armendariz[1], Brian M. Moscicki[2]. *[1]Humboldt State University, Arcata, CA. [2]Indiana University, Bloomington, IN.* (Sponsor: Vincent J Paolone, FACSM)

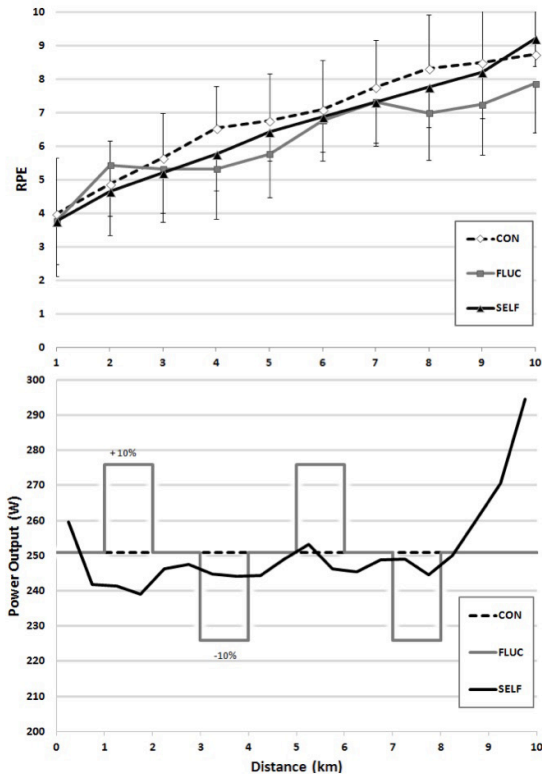*(No relevant relationships reported)*

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

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

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

Teun van Erp[1], Marco Hoozemans[1], Carl Foster, FACSM[2], Jos J. de Koning, FACSM[1]. *[1]Vrije Universiteit, Amsterdam, Netherlands. [2]University of Wisconsin, La crosse, WI.*

(No relevant relationships reported)

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

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

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

Jos J. de Koning, FACSM[1], Tim Veneman[1], Wouter Schallig[1], Maaike Eken[2], Carl Foster, FACSM[3]. *[1]Vrije Universiteit, Amsterdam, Netherlands. [2]Stellenbosch University, Tygerberg, South Africa. [3]University of Wisconsin - La Crosse, La Crosse, WI.*

(No relevant relationships reported)

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

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

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

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

Feasibility and Effectiveness of using Electromyography to Track Physical Activity

Joel Ramirez, Stefan Keslacy, Deborah Won, Dominic Defiesta, Christine Dy. *California State University Los Angeles, Los Angeles, CA.*
(No relevant relationships reported)

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

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193   Board #34   May 30 9:30 AM - 11:00 AM

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

Erica L. Salhus, James W. Smith, Anthony J. Bull. *Colorado College, Colorado Springs, CO.* (Sponsor: Joan M. Eckerson, FACSM)
(No relevant relationships reported)

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

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

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

Toshihiro Wakimoto[1], Tatsuya Saito[1], Tomomi Monri[1], Yoshiyuki Yamanaka[2], Sohachi Fujimoto[2], Toshihiro Takao[2]. *[1]Kawasaki University of Medical Welfare, Kurashiki, Japan. [2]Kawasaki Medical School, Kurashiki, Japan.*
(No relevant relationships reported)

PURPOSE: To clarify the electromyography (EMG) activity of various movement on aerobic exercise using Swiss-ball (SB exercise), we compared the EMG activity between walking and SB exercise.
METHODS: Nine healthy men performed walking and SB exercise. EMG activity, respiratory metabolism and hart rate was measured during SB exercise and walking. During walking subjects walked at 6 km/h on treadmill ergometer. During SB exercise, subjects were sitting on the Swiss-ball and bouncing with upper and lower limb movements. The movements consisted of four patterns of upper and lower limb movements.
RESULTS: The exercise intensity during SB exercise (4.8±0.6 Mets) was nearly identical with walking at 6 km/h (4.5±0.4 Mets). Compared with walking, the EMG activity in biceps fomoris (46±25%, p<0.001), gastrocnemius (78±37%, p<0.001) and gluteus maximus (70±29%, p<0.001) was significantly lower during SB exercise. On the other hand, the EMG activity in rectus abdominis during SB exercise (198±68%, p<0.001) significantly higher compared with walking. The EMG activity in vastus lateralis and latissimus dorsi during SB exercise were nearly identical with walking.
CONCLUSIONS: The exercise intensity was nearly identical during SB exercise and walking at 6km/h. However, the EMG activity during SB exercise was significantly lower in lower limb muscles and significantly higher in rectus abdominis muscle compared with walking.

196   Board #37   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

197   Board #38   May 30 9:30 AM - 11:00 AM

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

Alex Zykoff, Mike Aquino, Jacqueline Pellechia, John Petrizzo, John Wygand, FACSM, Robert M. Otto, FACSM. *Adelphi University, Garden City, NY.* (Sponsor: Robert M. Otto, FACSM)

(No relevant relationships reported)

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

198   Board #39   May 30 9:30 AM - 11:00 AM

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

Jacqueline Pellechia, John Petrizzo, Robert M. Otto, FACSM, John Wygand, FACSM. *Adelphi University, Garden City, NY.* (Sponsor: John Wygand, FACSM)

(No relevant relationships reported)

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

199   Board #40   May 30 9:30 AM - 11:00 AM

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

Heidi Nunnikhoven. *Montana State University, Bozeman, MT.*

(No relevant relationships reported)

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

200   Board #41   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

201   Board #42   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

202   Board #43   May 30 9:30 AM - 11:00 AM

Comparison Of Electromyographical Signal Analyses For Estimating Lactate Threshold

Ronald L. Snarr[1], Danilo V. Tolusso[2], Ashleigh V. Hallmark[3], Michael R. Esco, FACSM[2]. [1]*Georgia Southern University, Statesboro, GA.* [2]*The University of Alabama, Tuscaloosa, AL.* [3]*Cardiology Imaging Clinic, Birmingham, AL.* (Sponsor: Michael R. Esco, FACSM)
(No relevant relationships reported)

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

203   Board #44   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

204   Board #45   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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205   Board #46   May 30 9:30 AM - 11:00 AM

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

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

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

Table 2: Average Control Trial (Trial A) vs Average PAP Trial (Trial X) (mean ± SD)
Figure 3: Average control trial (trial A) vs average PAP trial (trial X)

A-42   Free Communication/Poster - **Cellular/Molecular**

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

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206   Board #47   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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

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207   Board #48   May 30 11:00 AM - 12:30 PM

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

Natalie ZM Eichner, Nicole M. Gilbertson, Emily M. Heiston, Julian M. Gaitan, Luca Musante, Sabrina LaSalvia, Eugene J. Barrett, Arthur L. Weltman, FACSM, Uta Erdbrügger, Steven K. Malin, FACSM. *University of Virginia, Charlottesville, VA.*
(Sponsor: Steven Malin, FACSM)
(No relevant relationships reported)

PURPOSE: Microparticles (MPs) derived from platelets, leukocytes and endothelial cells are important players in cardiovascular disease (CVD) risk. Exercise is established to reduce CVD risk, but no study has tested the effect of exercise intensity on various subtypes of MP in people with prediabetes. We tested the hypothesis that short-term interval (INT) training would reduce MP subtypes vs. continuous (CONT) exercise. **METHODS**: Eighteen obese adults (age: 63.8±1.5yrs BMI: 31.0±1.3 kg/m²) were screened for prediabetes using ADA criteria (75g OGTT and/or HbA$_{1c}$). Subjects were randomized to INT (n=10, 3 min intervals at 90% and 50% HR$_{peak}$) or CONT (n=8, 70% HR$_{peak}$) training for 12 supervised sessions over 2 wks for 60 min/d. Fitness (VO$_2$peak) and weight (kg) were assessed and arterial stiffness (augmentation index; AI) calculated using total AUC during a 75g OGTT. Total MPs, platelet MPs (CD31^{+}/CD41^{+}), endothelial MPs (CD105, CD31^{-}/ CD41^{+}) and leukocyte MPs (CD45^{+}/CD41^{-}) were analyzed from fresh plasma via imaging flow cytometry pre-/post- intervention. **RESULTS**: Our interventions had no effect on weight loss but INT exercise increased VO$_2$peak *(P*=0.04) and reduced fasted AI (trend: *P*=0.08) compared with CONT training. While our intervention had no effect on platelet or leukocyte MPs, INT exercise decreased Annexin V- endothelial MP CD105 (1.6±0.2 vs. 1.4±0.2 count) compared with CONT training (1.2±0.2 vs. 1.8±0.1 count; *P*=0.04). Increased VO$_2$peak correlated with decreased Annexin V+ CD105 endothelial MPs (r=-0.60, *P*=0.01). **CONCLUSION**: Exercise intensity decreases endothelial derived MPs through possibly a cardiovascular fitness related mechanism, independent of weight loss.

208   Board #49   May 30 11:00 AM - 12:30 PM

Differential Cardiac Protein Expression of Mice Exposed to Postnatal Undernutrition.

Joseph R. Visker[1], Larry J. Dangott[2], David P. Ferguson[1]. [1]Michigan State University, East Lansing, MI. [2]Texas A&M University, College Station, TX.
(No relevant relationships reported)

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

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

The Effects of Calcitonin Gene-Related Peptide on Heart Function

Gabriel Almeida Alves, John Spitsbergen, Cindy Linn. *Western Michigan University, Kalamazoo, MI.* (Sponsor: Dr. Timothy J. Michael, PhD, FACSM, ACSM-CEP, FACSM)
(No relevant relationships reported)

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

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

Quantitative Analysis of Mitochondrial Morphology Under Different Fluid Shear Stress Conditions

Soon-Gook Hong, Malik Sylla, Junchul Shin, Jamie Seo, Jacqueline Sayoc, Soo-Young Choi, Joon-Young Park. *Temple University, Philadelphia, PA.*
(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

WEDNESDAY, MAY 30, 2018

212 Board #53 May 30 11:00 AM - 12:30 PM
The Effects Of Prohibitin1 On The Content And Synthesis Activity Of F0f1-atpase And Mitochondrial Function In C2c12 Cells

Wen Fang[1], Hong Fong[2], Li Li Ji, FACSM[3]. [1]Tsinghua University, Beijing, China. [2]Tianjin University of Sport, Tianjin, China. [3]University of Minnesota, Minnesota, MN.
(No relevant relationships reported)

In the eukaryotic cells ATP synthesis is closely related to the structural and functional integrity of mitochondria. F0F1-ATP synthase participates in oxidative phosphorylation and ATP production.The effect of Prohibitin1(PHB1) on mitochondrial function and F0F1-ATP synthase expression and activity is largely unclear.**PURPOSE:**To investigate the effect of PHB1 on the Oxygen Consumption Rate(OCR),oxidative stress(ROS) and ATP production in C2C12 cells.The influence of PHB1 on the content and activity of F0F1-ATPase was also examined.**METHODS:**The PHB1 overexpression and the RNA-interfered vector are inserted into the adenoviral vector by the phb1 overexpression sequence and the interfering sequence.Intracellular fluorescence distribution was detected by fluorescence inverse phase microscope.The efficiency of PHB1 transfection was determined by flow cytometry. The content of PHB1 was determined by Western blot.The expression of F0F1-ATPase was measured by qPCR.F0F1-ATPase activity was detected using a mitochondrial respiratory chain complex V activity kit.ATP content was detected by a kit.The changes of OCR was assessed by a XF cell mitochondrial stress detection kit.**RESULTS:**The complex V activity and the mRNA level of FOF1-ATPase were significantly increased in the PHB1 over-expression C2C12 cells.Compared with the control group, the activity of complex V in PHB1 overexpression group increased by 226%(p<0.01),whereas it was significantly decreased in PHB1 RNA-interfered cells. Cells with low PHB1 activity showed lower complex V activity(-193%, p<0.01),whereas ATP content,OCR were significantly increased in PHB1 over-expression cells.Compared with the control group,the ATP content of PHB1 over-expression group was increased by 80%(p<0.01),but it was decreased in the low-PHB1 RNA group(-21%, p<0.01).ROS production was lowered in PHB1 over-expression cells(-74%, p<0.01) compared with control,but it was increased in the low-pHB1 RNA cells(104%, p<0.01). **CONCLUSION:**The over-expression of PHB1 can increase the content and activity of F0F1-ATP synthase,ATP production and improve energy metabolism in C2C12 cells. Over-expression of PHB1 can also reduce ROS production,suggesting that PHB1 may be involved in stabilizing mitochondrial structure.
Supported by NSFC(No. 31470061).

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

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

213 Board #54 May 30 11:00 AM - 12:30 PM
Identifying the Onset of Frailty

Dongmin Kwak[1], Cory W. Baumann[2], LaDora V. Thompson[1]. [1]Boston University, Boston, MA. [2]University of Minnesota, Minneapolis, MN.
(No relevant relationships reported)

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

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

214 Board #55 May 30 11:00 AM - 12:30 PM
Dynapenia And Low Skeletal Muscle Mass In Older-aged Women

Roberto Gabriel Gonzalez-Mendoza, Francisco Torres-Naranjo, Alejandro Gaytan-Gonzalez, Juan R. Lopez-Taylor, Noe Gonzalez-Gallegos, Isabel Valadez. Universidad de Guadalajara, Guadalajara, Mexico.
(No relevant relationships reported)

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

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

215 Board #56 May 30 11:00 AM - 12:30 PM
Comparison of Growth in Children Undergoing Three Different ACL Reconstructions

Dustin J. Richter, Roger Lyon, Scott Van Valin, Xue-Cheng Liu. Medical College of Wisconsin, Milwaukee, WI.
(No relevant relationships reported)

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

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

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

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

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

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

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217   Board #58   May 30 11:00 AM - 12:30 PM

Fatigue Resistance To Eccentric Contractions In Older Adults

Caitlin Skousen, Jacob R. Sorensen, Kyle Williams, Robert D. Hyldahl. *Brigham Young University, Provo, UT.*
(No relevant relationships reported)

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

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

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

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

Jefferson M. Spicher, Amy L. Silva-Smith, Melissa J. Benton, FACSM. *University of Colorado, Colorado Springs, CO.*
(No relevant relationships reported)

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

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

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

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

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

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

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

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

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

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220   Board #61   May 30 11:00 AM - 12:30 PM
Circulating Irisin Levels And Bone Strength In Korean Adults

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

(No relevant relationships reported)

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

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221   Board #62   May 30 11:00 AM - 12:30 PM
Bone Health Among Female Collegiate Athletes Participating in Loading and Active Loading Sports

Alexandra Sirois, Jessica A. Insogna, Ryan ER Reid, Nathan Chiarliti, Meghan McGillivray, Ross E. Andersen, FACSM. *McGill University, Montreal, QC, Canada.* (Sponsor: Ross Andersen, FACSM)

(No relevant relationships reported)

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

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

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222   Board #63   May 30 11:00 AM - 12:30 PM
Weight Gain, not Simple Resumption of Menses, Improves Bone Metabolism in Amenorrheic Exercising Women

Emily A. Southmayd, Rebecca J. Mallinson, Nancy I. Williams, FACSM, Mary Jane De Souza, FACSM. *Penn State University, University Park, PA.* (Sponsor: Mary Jane De Souza, FACSM)

(No relevant relationships reported)

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

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223   Board #64   May 30 11:00 AM - 12:30 PM
The Effects Of A Single Bout Exercise On Rankl Pathway, Cytokines And Bone Turnover Markers In College Women

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

(No relevant relationships reported)

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

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

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224   Board #65   May 30 11:00 AM - 12:30 PM
Influences Of Alcohol Consumption, Physical Activity, And Body Composition On Areal Bone Mineral Density In Korean College-aged Female Students

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(No relevant relationships reported)

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

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225   Board #66   May 30 11:00 AM - 12:30 PM
Sex-specific Mediation Of Physical Activity's Effects On The Muscle-bone Unit In Active Young Adults.

Simon Higgins[1], Chester M. Sokolowski[2], Megha Vishwanathan[2], Jessica G. Anderson[2], Michael D. Schmidt[2], Ellen M. Evans, FACSM[2], Richard D. Lewis, FACSM[2]. [1]Elon University, Elon, NC. [2]University of Georgia, Athens, GA.
(No relevant relationships reported)

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

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

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226   Board #67   May 30 11:00 AM - 12:30 PM
Bone Mineral Content/Density And Muscle Strength In Young Women From Different Racial/Ethnic Backgrounds - A Pilot Study

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

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

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227   Board #68   May 30 11:00 AM - 12:30 PM
Gender Differences in Mechanical Properties of the Achilles Tendon: Longitudinal Response to Heavy Loading Exercise

Jessica E. Digiacomo, Emily Rock, Nathan R. Daigle, Samuel B. Rosier, Parth B. Sureja, Adam S. Lepley. *University of Connecticut, Storrs, CT.*
(No relevant relationships reported)

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

WEDNESDAY, MAY 30, 2018

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

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

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

228   Board #69   May 30 11:00 AM - 12:30 PM

Neuromuscular Changes During Return To Play After ACL Surgery In Elite Soccer Players

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

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

229   Board #70   May 30 11:00 AM - 12:30 PM

Quadriceps Function Does Not Differ Between Subjects With ACL Reconstruction With Impulsive Vs. Normal Loading

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

Individuals with anterior cruciate ligament reconstruction (ACLR) are at a significant greater risk of knee osteoarthritis (OA). The heelstrike transient (HST) during gait is indicative of impulsive/high-rate loading, which has been implicated in cartilage degradation and knee OA development. The quadriceps attenuates loading during gait, and quadriceps dysfunction following ACLR may contribute to impulsive loading and knee OA risk. **Purpose:** To determine the differences in quadriceps function between impulsive loaders and non-impulsive loaders during walking gait.
Methods: Forty-five volunteers with unilateral ACLR participated in this study (32F, 20±3 years old, 71±19 kg, 1.7±0.1 m, 23±15 [range 7-58] months post-ACLR). Quadriceps function in the ACLR limb was quantified during maximal isometric contraction at 90° of knee flexion via the peak torque, rate of torque development (RTD) from 20% to 80% of the interval from onset to peak torque, RTD from onset to 100 ms, and RTD from 100ms to 200ms. All values were normalized to body mass. Gait biomechanics were assessed during overground walking at a self-selected pace. A trial was classified as possessing a HST if the ratio of the vertical ground reaction force peak immediately following heelstrike to the impending local minimum exceeded 1.2. Subjects were classified as "Impulsive" loaders if a HST was identified in at least 3 of 5 of trials. Independent t-tests and correlations were utilized for the analysis.
Results: 31% of the subjects were identified as Impulsive loaders. However, there were no significant differences between Impulsive and Normal loaders for $RTD_{20-80\%}$ (0.41±0.46 vs. 0.42±0.44, p=.96), $RTD_{0-100ms}$ (2.9±1.9 vs. 3.5±2.6, p=0.41), $RTD_{100-200ms}$ (2.5±1.4 vs. 2.3±1.5, p=0.62), or peak torque (2.2±0.7vs. 2.3±0.7, p=0.45). There were no significant correlations between the %trials with HST and the quadriceps function indices (r=-0.043-0.172, p=0.258-0.952).
Conclusion: Roughly 1/3 of our subjects were identified as Impulsive loaders. This statistic mirrors the risk of knee OA development (~30%) in the first decade following ACLR. Our data suggest that this relationship is not associated with quadriceps function. Future research is necessary to determine the role of the HST in knee OA development and the factors that contribute to its presence.

230   Board #71   May 30 11:00 AM - 12:30 PM

Interlimb Asymmetries Post ACL Reconstruction During Sprints

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

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

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

Quadriceps Strength and Landing Symmetry Following ACL Reconstruction

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(No relevant relationships reported)

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

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

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

Clara Amat Fernandez, Anthony S. Kulas, Zachary J. Domire. *East Carolina University, Greenville, NC.*
(No relevant relationships reported)

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

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

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

Brian Pietrosimone, FACSM[1], Christopher Johnston[2], Brittney Luc-Harkey[3], Matthew Harkey[4], Laura Stanley, FACSM[1], Jonathan Goodwin[1], Hope Davis[1], Jeffrey Spang[1], J Troy Blackburn[1]. *[1]University of North Carolina, Chapel Hill, NC. [2]University of North Carolina at Chapel Hill, Chapel Hill, NC. [3]Brigham and Women's Hospital, Boston, MA. [4]Tufts Medical Center, Boston, MA.*
(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

and decreased peak pressure ($F_{1,34}$ = 20.98, p < 0.001). Also, a significant main effect for group (regardless of landing) for gastrocnemius muscle was found showing that the ACL group landed with reduced gastrocnemius activity ($F_{1,34}$ = 11.27, p = 0.002).
CONCLUSION: Unplanned landing showed greater injury predisposing factors compared with planned landing. The ACL group showed nearly similar landing biomechanics to the control group during both landing tasks. However, the ACL group used a protective landing strategy by reducing gastrocnemius activity.

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

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

Steven J. Pfeiffer[1], Jeffrey Spang[1], Daniel Nissman[1], David Lalush[1], Kyle Wallace[1], Matthew Harkey[2], Laura Stanley[1], Randy Schmitz[3], Troy Blackburn[1], Brian Pietrosimone, FACSM[1]. [1]*University of North Carolina, Chapel Hill, NC.* [2]*Tufts Medical Center, Boston, MA.* [3]*University of North Carolina at Greensboro, Greensboro, NC.*
(No relevant relationships reported)

Optimal mechanical loading is necessary to decrease the risk of posttraumatic osteoarthritis (PTOA) following anterior cruciate ligament reconstruction (ACLR) and lesser mechanical loading early following ACLR may increase the risk for PTOA onset. T1ρ magnetic resonance imaging (MRI) has been used to measure cartilage composition at early time points following ACLR.
PURPOSE: To determine the association between proteoglycan density of femoral cartilage derived from T1ρ MRI relaxation times and peak vertical ground reaction force (vGRF) and instantaneous vGRF loading rate (vGRF-LR) during walking gait 6 months following ACLR.
METHODS: Twenty-nine individuals (52% female, BMI = 24 ± 3 kg/m^2) with a unilateral patellar-tendon autograft ACLR participated in this study. Five trials of walking gait at self-selected speed were performed 6 months following ACLR. Peak vGRF and instantaneous vGRF-LR were extracted from the first 50% of the stance phase in both limbs. T1ρ relaxation times were calculated for articular cartilage in the medial and lateral condyles (MFC & LFC) by fitting a monoexponential model. The weight bearing MFC and LFC cartilage was manually segmented into posterior, central, and anterior regions of interest (ROI) based on the location of the meniscus in the sagittal plane. Affine and deformable registration techniques were used to register the ACLR limb to the uninjured limb. Inter-limb mean T1ρ relaxation time ratios (RTR = ACLR limb / uninjured limb) were calculated for each ROI. Separate, stepwise linear regressions were used to determine the unique associations between vGRF outcomes and T1ρ RTR in each ROI after accounting for walking speed and meniscal injury (ΔR^2; P$\leq$ 0.05).
RESULTS: In the ACLR limb, lesser vGRF during gait was associated with lesser proteoglycan density in the posterior (ΔR^2=0.22, P=0.02) and central LFC (ΔR^2=0.22, P=0.02), as well as the posterior (ΔR^2=0.12, P=0.05) and central MFC (ΔR^2=0.21, P=0.01). vGRF-LR in the ACLR limb and all vGRF outcomes in the contralateral limb did not significantly associate with T1ρ RTR for any ROI.
CONCLUSIONS: Individuals with lesser vGRF in the ACLR limb presented with T1ρ MRI findings consistent with deteriorating cartilage health. Understanding how loading affects joint health is critical to developing interventions to delay PTOA onset.

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

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

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(No relevant relationships reported)

Purpose: To determine torsional knee stiffness in individuals with anterior cruciate ligament reconstruction (ACLR) during running, which has previously been speculated upon but not yet assessed.
Methods: 17 individuals with ACLR (19 ± 5.2 years, 16 F, 22.6 ± 2.4 kg/m^2, 6.4 ± 0.5 months post-surgery) and 17 control subjects (23 ± 1.5 years, 16 F, 22.7 ± 2.1 kg/m^2) participated. Instrumented gait analysis was used to obtain knee angles and moments during running. Stiffness was calculated as the ratio of change in knee extensor moment to knee flexion angle over the period of initial contact (IC) to peak knee flexion angle (P1) as well as the first 60 ms after IC (P2). Isometric knee extension strength was also tested. An independent two-sample t-test ($\alpha = 0.05$) was used to compare stiffness between groups. The Pearson correlation coefficient (r) was used to quantify the relationship between stiffness and peak knee extensor torque (KET), and between stiffness and knee extensor rate of torque development (RTD).

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

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

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

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

Alex Spencer, Cale Jacobs, Kylie Davis, Darren Johnson, Mary L. Ireland, FACSM, Brian Noehren, FACSM. *University of Kentucky, Lexington, KY.* (Sponsor: Brian Noehren, FACSM)
(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

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

Dynamic Knee Orthosis System for Females with Anterior Cruciate Ligament Injuries

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(No relevant relationships reported)

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

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

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

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

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

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(Sponsor: D.S. Blaise Williams III, FACSM)
(No relevant relationships reported)

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

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

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

Sex and Speed Influence Joint Moment Impulses During Running

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(No relevant relationships reported)

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

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243   Board #84   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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

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

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244   Board #85   May 30 11:00 AM - 12:30 PM

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

Richard Robinson, Teresa Rose, Hannah Jones. *University of Indianapolis, Indianapolis, IN.*

(No relevant relationships reported)

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

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245   Board #86   May 30 11:00 AM - 12:30 PM

Dynamic Hip Strength and Footfall Patterns in Competitive Distance Runners

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(No relevant relationships reported)

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

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246   Board #87   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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

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

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247   Board #88   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

Abstract

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

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

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248   Board #89   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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

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

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

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249   Board #90   May 30 11:00 AM - 12:30 PM

Increased Resisted Sprinting Load Decreases Bilateral Asymmetry in Sprinting Kinetics

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(No relevant relationships reported)

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

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

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250   Board #91   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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

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251   Board #92   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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

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

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252   Board #93   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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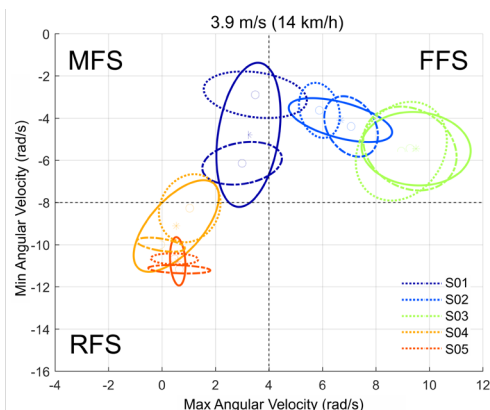

Figure 1 *The minimum and maximum sagittal angular velocity of the foot at initial contact for five runners with a rear foot (red), mid foot (blue) and fore foot (green) strike for their left (. . .) and right (---) foot and the grouped average of both feet (solid). Circles indicate the 95% confidence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

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253   Board #94   May 30 11:00 AM - 12:30 PM

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

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(No relevant relationships reported)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

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

(No relevant relationships reported)

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

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

Effects of Exercise Referral Schemes on Physical Activity Levels

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(No relevant relationships reported)

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

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

A Worksite Intervention Program for Obese Sedentary Women

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

Exercise Intervention with Lifestyle Improves Mental Health and Decreases Morbid Thoughts

Francisco E. Ramirez[1], Neil Nedley[1], Daniel Peterson[2], Monica Fukuda[2], Johanna Emerson[2]. [1]*Nedley Clinic, Weimar, CA.* [2]*Weimar Institute, Weimar, CA.*

(No relevant relationships reported)

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

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

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

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

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

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

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

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

Nicole L. Rogers[1], Javier Gene[2], Alvaro Juesas[2], Pedro Gargallo[2], Andres Gene[2], Rosario Salvador[2], Juan C. Colado[2], Michael E. Rogers, FACSM[1]. [1]*Wichita State University, Wichita, KS.* [2]*University of Valencia, Valencia, Spain.* (Sponsor: Michael E. Rogers, FACSM)
(No relevant relationships reported)

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

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267   Board #108   May 30 9:30 AM - 11:00 AM

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

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

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268   Board #109   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

269　　Board #110　　　　　May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

270　　Board #111　　　　　May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

271　　Board #112　　　　　May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

272　　Board #113　　　　　May 30 9:30 AM - 11:00 AM

Cardiometabolic Effects of a Randomized Workplace Cycling Intervention

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(No relevant relationships reported)

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

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273   Board #114   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

274   Board #115   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

275   Board #116   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

276   Board #117   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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277   Board #118   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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278   Board #119   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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279   Board #120   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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280   Board #121   May 30 9:30 AM - 11:00 AM

Effects Of A 12-week Structured Exercise Intervention On Cholesterol

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

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

WEDNESDAY, MAY 30, 2018

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

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

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

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

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(No relevant relationships reported)

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

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

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

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

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282   Board #123   May 30 9:30 AM - 11:00 AM

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

Kelly E. Johnson[1], Michelle K. Alencar[2], Kathryn E. Coakley[3], Damon L. Swift[4], Christine M. Mermier[3], Len Kravitz[3], Fabiano T. Amorim[3], Ann L. Gibson, FACSM[3]. [1]University of Saint Mary, Leavenworth, KS. [2]California State University Long Beach, Long Beach, CA. [3]University of New Mexico, Albuquerque, NM. [4]East Carolina University, Greenville, NC. (Sponsor: Ann Gibson, FACSM)
(No relevant relationships reported)

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

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

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283   Board #124   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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284   Board #125   May 30 9:30 AM - 11:00 AM

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

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

A weekly structured physical activity program enhances short-term retention of middle-aged adult fitness centre users
Lopez-Fernandez, J., Staniland, B., Sanchez, I., Iturriaga, T., Ayuso, M., Horton, E., Mann, S., Liguori, G., Atkinson, L., Jimenez, A.

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

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

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

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

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

285　　　Board #126　　　　　　May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

286　　　Board #127　　　　　　May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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

287　　　Board #128　　　　　　May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

288   Board #129   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

289   Board #130   May 30 9:30 AM - 11:00 AM

The Wearable Technological Device as a Means of Physical Activity Monitoring

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

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

290   Board #131   May 30 9:30 AM - 11:00 AM

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

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

Physical activity (PA) is widely regarded as an essential component for maintaining health, yet there are subsets of the population that remain insufficiently active. This issue can be exacerbated in the winter due to decreased daylight hours, high precipitation and low temperature, thus some individuals are less likely to engage in PA. In cold climates, snowmobiling is a popular recreational activity, and could offer a potential solution for increasing PA time to the recommended ACSM standards; predicated on the fact that it is an activity that is sufficiently intense to stimulate health benefit. **PURPOSE:** To measure the physical demands and activity patterns of a typical snowmobile ride in habitual snowmobile riders (n=44). **METHODS:** The physical demand of an average ride, and requisite tasks, were quantified using ambulatory oxygen consumption and pre/post strength and power assessments. Aerobic demand was compared to a graded exercise test (GXT) on a cycle ergometer to determine exercise intensity. **RESULTS:** A "representative" ride (30 ±17 min) involved a mean aerobic demand of 17.5 ± 6.6 ml/kg/min or 49 ± 20 % of VO_2max (5 METS), which compares to traditional forms of physical activity. During the ride, the VO_2 values ranged from a mean minimum of 7.1 ± 3.0 ml/kg/min to a mean maximum of 32.5 ± 12.4 ml/kg/min. Muscular strength decreased 6% for maximal hand grip (p<0.001) and a similar magnitude for vertical jump, but the latter change was not significant. This immediate decrement in strength demonstrates snowmobiling to be an activity that requires significant upper body work. The mean VO_2 while specifically freeing a stuck snowmobile was 27± 9.7 ml/kg/min (7-8 METS), indicating that riders were working at 77 ± 28% of their VO_2max. **CONCLUSIONS:** Snowmobiling is an activity which falls into the moderate to vigorous intensity activity range that is typically associated with health benefits. A typical ride involves both aerobically based and muscular strength components as shown by a moderately demanding riding VO_2 and strength decrements Based on the observed values, snowmobiling is of a sufficient PA intensity to stimulate changes in health and fitness. Funding support from Mitacs and The Canadian Council of Snowmobile Organizations.

291   Board #132   May 30 9:30 AM - 11:00 AM

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

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

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

292   Board #133   May 30 9:30 AM - 11:00 AM

Validity Of Adhesive Worn Actigraph GT3X+ Accelerrometer

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(No relevant relationships reported)

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

293   Board #134   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

294   Board #135   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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

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

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

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

295   Board #136   May 30 9:30 AM - 11:00 AM

Understanding Patient Experiences with Healthcare Providers and Exercise Promotion

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(No relevant relationships reported)

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

296   Board #137   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

297   Board #138   May 30 9:30 AM - 11:00 AM

Feasibility of Progressive Resistance Training in Retired Mexican Women with Ostearthritis

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(No relevant relationships reported)

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

298   Board #139   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

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

300   Board #141   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

301   Board #142   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

302   Board #143   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

WEDNESDAY, MAY 30, 2018

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303   Board #144   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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304   Board #145   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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305   Board #146   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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306   Board #147   May 30 9:30 AM - 11:00 AM

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

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(Sponsor: Arlette C. Perry, FACSM)

(No relevant relationships reported)

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

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307   Board #148   May 30 9:30 AM - 11:00 AM

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

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

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

308   Board #149   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

trained subjects had higher lean mass, bone mineral content and lower fat mass than obese insulin resistant subjects. These findings support the limitations of using BMI to predict body composition, especially in trained subjects.

309   Board #150   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

310   Board #151   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

WEDNESDAY, MAY 30, 2018

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

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

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(No relevant relationships reported)

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

312   Board #153   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

313   Board #154   May 30 9:30 AM - 11:00 AM

Promoting Physical Activity Via Cooperative Extension

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(No relevant relationships reported)

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

314   Board #155   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

315 Board #156 May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

316 Board #157 May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

317 Board #158 May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

318 Board #159 May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

Abstracts were prepared by the authors and printed as submitted.

WEDNESDAY, MAY 30, 2018

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

Performance In Square Stepping Exercise Is Associated With Working Memory

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

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

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

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

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

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

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

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

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

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(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

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

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

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

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

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

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

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

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

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

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

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(No relevant relationships reported)

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

326   Board #167   May 30 9:30 AM - 11:00 AM

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

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

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

WEDNESDAY, MAY 30, 2018

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327   Board #168   May 30 9:30 AM - 11:00 AM

Does Music-Based Cadence Entrainment Alter Metabolic Intensity?

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

(No relevant relationships reported)

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

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328   Board #169   May 30 9:30 AM - 11:00 AM

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

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

(No relevant relationships reported)

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

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

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

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

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

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

(No relevant relationships reported)

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

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

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

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

(No relevant relationships reported)

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

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

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

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

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(No relevant relationships reported)

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

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

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

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(Sponsor: Kiyoji Tanaka, FACSM)
(No relevant relationships reported)

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

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

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

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

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(No relevant relationships reported)

Chronic disease risk and poor health behaviors, including physical inactivity, are increasing among college students. African American (AA) college students are a vulnerable population given the disproportionate manifestation of chronic disease in AA adults. AA women are particularly high risk given the higher prevalence of chronic diseases among women compared with men.**PURPOSE**: To examine differences in chronic disease risk among AA college students by attainment of physical activity (PA) guidelines and gender. **METHODS**: AA college students (N=63; 43 female, 20 male; aged 18.2 ± 1.3 yrs) were recruited for a study examining and intervening on cardiovascular disease risk. Physical assessments and blood marker investigation were collected. Participants also completed self-report surveys: International PA Questionnaire (IPAQ), Perceived Stress Scale (PSS), and Pittsburgh Sleep Quality Index (PSQI). Students were categorized by meeting or not meeting PA guidelines ($\geq$ 150 min/wk). Descriptive statistics, frequencies, and independent samples t-tests were used to describe overall and stratified chronic disease risk profiles. **RESULTS**: Overall, students were overweight/obese (54%), had optimal blood profiles, did not attain the PA guidelines for health (54%), were moderately stressed (PSS: 15.1 ± 6.5), had poor sleep quality (PSQI: 5.7 ± 3.1), and failed to meet sleep recommendations (6.5 ± 1.2 hrs/night). Females reported higher perceived stress than males (PSS score 16.7 ± 5.6 vs. 11.5 ± 7.2, p<.01); no other gender-specific differences in physical or blood biomarkers were detected. More males (85%) than females (28%) met PA guidelines. Females who met PA guidelines had significantly lower waist circumference (74.1 vs. 85.7 cm), BMI (23.1 vs. 28.6), and LDL cholesterol (65.1 vs. 74.3 mg/dL), and higher sleep quality (4.8 vs. 6.0) compared with females not meeting PA guidelines (all p <.05). There were no significant differences between males by PA guideline attainment. **CONCLUSIONS**:We identified linkages between PA guideline attainment and chronic disease risk in AA college students, which was more meaningful among females. Given the low PA rates among females, additional work is needed to understand strategies for increasing PA among female AA college students.
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334   Board #175   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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

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

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(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

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

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

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

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(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

Physical Activity (PAL) Steps/day

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

P <.05

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

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

Robert Buresh, FACSM[1], Yuri Feito, FACSM[1], Cassie Williamson[1], Brian Kliszczewicz[1], Corrine Ellis[2], Leah Tsui[2], Anna Schlupp[2], Kelsey Shepard[2], Stella Volpe, FACSM[2]. [1]Kennesaw State University, Kennesaw, GA. [2]Drexel University, Philadelphia, PA.

(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

most extreme values were either included or excluded. **CONCLUSIONS:** The lack of observed publication bias and *p*-hacking provide evidential support for the benefits of exercise on anxiety in adults with AORD.
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341   Board #182   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

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

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

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

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(No relevant relationships reported)

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

Abstracts were prepared by the authors and printed as submitted.

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

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

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(No relevant relationships reported)

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

344   Board #185   May 30 9:30 AM - 11:00 AM
Mean Combined Relative Grip Strength and Metabolic Syndrome: 2011-2014 NHANES

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

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

345   Board #186   May 30 9:30 AM - 11:00 AM
Body Composition and Aerobic Capacity in Mexican Police officers

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(No relevant relationships reported)

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

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

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

346   Board #187   May 30 9:30 AM - 11:00 AM

Trajectories of Stair Climbing Performance for Black and White Midlife Women

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(No relevant relationships reported)

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

347   Board #188   May 30 9:30 AM - 11:00 AM

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

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(No relevant relationships reported)

College-age women exhibit particular susceptibility to establishing health behaviors resulting in unwanted weight gain or chronic dieting. Understanding the relative contribution of health behaviors to body composition could inform targeted interventions to correct unhealthy weight gain or loss. **PURPOSE:** To create a model describing relationships among physical activity (PA), aerobic fitness (VO_{2max}), eating behavior traits and their association with body composition in female college students. **METHODS:** Female students (n = 98) were recruited from a freshmen-level university nutrition class. Percentage body fat (PBF) was assessed by bioimpedance following an overnight-fast. VO_{2max} was estimated from 1.5-mile time trial performance. Dietary energy intake (EI) was determined using 24-hour dietary recalls and PA was assessed by accelerometry. The eating behavior traits drive for thinness (DT), body dissatisfaction (BD) and cognitive dietary restraint (CRD) were assessed using online surveys. Participants were divided into high fitness (HF) and low fitness (LF) groups by median split and path analyses were conducted. **RESULTS:** HF and LF women differed significantly (p < .05) in EI [36.0 ± 11.7 vs 40.2 ± 9.7 kcal/kg FFM], PA [196.4 ± 42.1 vs 173.7 ± 31.6 axial counts], PBF [$23.2\pm5.7\%$ vs $29.3\pm6.2\%$], BMI [21.7 ± 2.1 vs 23.2 ± 3.0 kg/m²] and VO_{2max} [41.9 ± 2.5 vs 32.8 ± 5.1 mL/kg/min]. Chi-Square [41.94 with 36 df, p value = 0.23] and CFI [0.85] indicate the models provide a reasonable representation of the data. In both groups, PBF positively correlated with BD [HF: 0.355; LF: 0.406] and negatively correlated with VO_{2max} [HF: -0.487; LF: -0.539]. PBF negatively correlated with DT [-0.252] and positively correlated with EI [0.236] in HF only. PA did not correlate significantly with any variables in the models. **CONCLUSION:** In college-age women, aerobic fitness appears to be the strongest predictor of body composition, even after adjusting for low and high fitness. HF individuals demonstrated expected relationships between DT, EI and PBF which were not seen in LF individuals. Although PA differed between HF and LF, it

was not associated with other variables, particularly PBF. These results emphasize the importance of fitness and physical activity in producing favorable body composition among college-age women.

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

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

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(No relevant relationships reported)

Skipping breakfast has been reported to decrease daily energy and nutrient intakes. Therefore, skipping breakfast and subsequent negative energy balance can be one of risk factors associated with reduced muscle mass.
PURPOSE: To investigate whether breakfast frequency is associated with lean body mass (LBM) in Japanese collegiate students.
METHODS: A total of 270 healthy young subjects (152 men, 118 women) participated in this study. We collected information on lifestyle (living condition, breakfast frequency, smoking and drinking habits), eating behavior with the Dutch Eating Behavior Questionnaire (DEBQ), sleep quality with the Pittsburgh Sleep Quality Index (PSQI), circadian rhythm type with the Morningness-Eveningness Questionnaire (MEQ), mental state with the Center for Epidemiologic Studies for Depression Scale (CES-D), and physical activity with the International Physical Activity Questionnaire (IPAQ). According to Dietary Reference Intakes for Japanese, the subjects were asked the breakfast frequency in the past one month (excluding consumption of tablets, energy drinks, confectionary, fruits, dairy products, or sweetened beverage alone). LBM in each part of body was assessed using dual-energy X-ray absorptiometry, and then calculated for appendicular LBM (ALBM). We classified the breakfast frequency into 2 categories (1: 0-6 times, 2: everyday) to clarify the importance of daily breakfast consumption for LBM.
RESULTS: Multiple regression analysis showed that having breakfast everyday was positively related to total LBM ($\beta = 0.065$, $P = 0.028$, $R^2_{adj} = 0.816$) and ALBM ($\beta = 0.075$, $P = 0.012$, $R^2_{adj} = 0.809$) after adjusting for age, sex, living condition, BMI, DEBQ, PSQI, MEQ, CES-D, and IPAQ scores as variables.
CONCLUSIONS: We demonstrated that breakfast frequency was associated with total LBM and ALBM regardless of possible confounders, such as sex, BMI, and physical activity. This result suggests that skipping breakfast is one of risk factors for lower muscle mass in healthy young population.
This work was supported by the Japanese Council for Science, Technology and Innovation (SIP, Project ID 14533567), and the grant "Technologies for creating next-generation agriculture, forestry and fisheries" (funding agency: Bio-oriented Technology Research Advancement Institution, NARO).

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

High Intensity Interval Training and Dietary Supplement Use in the Army

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(No relevant relationships reported)

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

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

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

The "Fit But Fat" Concept: A Re-evaluation Of National Health Data

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(No relevant relationships reported)

Data from the National Health and Nutrition Examination Survey (NHANES) have been used to estimate the proportion of US adults who have high, moderate, and low fitness levels by body mass index (BMI) category. These data have also been used to construct categories for fitness. However, these categories are often weighted unevenly to be more inclusive in the moderate and high-fitness categories. **PURPOSE**: To cross-classify adults in the US population by fitness level and BMI, as well as fitness level and body composition, and to calculate the percentage of the population that can be classified as "fit but fat" using tertiles.
METHODS: Three NHANES datasets covering six years (1999-2004) were included in this study, with a total of 6,648 records meeting the eligibility criteria. Fitness and body composition gender and age-specific percentile ranks were determined from norms published by the Cooper Clinic. A pair of matrices were created to report counts, means and standard errors by body composition level versus fitness level and BMI group versus fitness level.
RESULTS: The BMI matrix showed that $32.9 \pm 1.0\%$ of the population was classified as overweight, and $24.9 \pm 0.9\%$ was classified as obese. Further, $9.9 \pm 0.7\%$ and $6.7 \pm 0.5\%$ of the overweight and obese groups respectively, were classified in the top one-third for fitness. The body composition matrix (based on percent body fat) showed that $18.1 \pm 1.0\%$ were categorized in the middle third, and $68.4 \pm 1.3\%$ were categorized in the lowest tertile (high percent body fat). Additionally, $6.6 \pm 0.6\%$ and $21.0 \pm 0.9\%$ of the overweight and obese groups respectively, were classified in the fittest tertile.
CONCLUSIONS: These data support the notion that one can be "fit but fat," but most are not. Further, there is a large discrepancy in defining "fat". Two-thirds of the population was ranked below the 35th percentile in body composition (compared to 57.8% of the population qualifying as overweight or obese), and more of these individuals are of low fitness than in any other fitness category. These data further support the notion that BMI is a misleading classification and utilizing a more robust measure to qualify fatness may be necessary.

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

The Impact of Cardiovascular Disease Diagnosis on Physical Activity Behavior

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(No relevant relationships reported)

Meeting physical activity (PA) guidelines (≥ 675 MET-min/wk) is recommended by WHO in order to attenuate disease progression and incidence of events in patients with cardiovascular disease (CVD) and cardiovascular risk factors (CVRF).
PURPOSE: To investigate whether patients change their PA behavior after the first diagnosis of CVD/CVRF.
METHODS: This study used cross-sectional and prospective study data from the Nijmegen Exercise Study. Participants' PA and cardiovascular health information were collected from baseline and follow-up questionnaires. CVD was defined as myocardial infarction, stroke, heart failure, or angina. CVRF was defined as a diagnosis of hypertension, hypercholesterolemia, diabetes type 2, thrombosis, or atrial fibrillation. Average PA dose (MET-min/wk) was calculated before and after CVD/CVRF diagnosis. PA was categorized based on baseline PA levels; inactive (<675 MET-min/wk), moderately active (675-1350 MET-min/wk), or highly active (>1350 MET-min/wk) groups.
RESULTS: In the cross-sectional study, 432 CVD patients (86% males) and 1541 CVRF patients (68% males) were included. An increase in PA was observed after CVD/CVRF diagnosis for inactive (289 [93-510] to 540 [157-810] MET-min/wk, P<.01) and moderately active groups (975 [810-1155] to 1080 [795-1350] MET-min/wk, P<.01). In contrast, the highly active group decreased their PA from 2147 [1702-2939] to 1620 [1011-2273] MET-min/wk (P<.01). In the prospective study, 53 new cases (76% males) of CVD and 253 (61% males) of CVRF were observed during a 5-year follow-up. After CVD/CVRF diagnosis, the inactive group increased their PA (450 [270-540] to 1020 [405-1689] MET-min/wk, P<.01); the moderately active

group maintained their PA (1013 [810-1215] to 990 [731-1530] MET-min/wk, P=.09); whereas the highly active group decreased their PA (1978 [1620-2625] to 1650 [1080-2430] MET-min/wk, P<.01).
CONCLUSION: Changes in PA behavior appears to be dependent on initial PA dose. Inactive patients may be more motivated to increase their PA dose after CVD/CVRF diagnosis, whereas no changes were found for moderately active patients and a significant decrease in PA dose is observed in highly active patients. These findings demonstrate that personalized exercise prescription may be needed to optimize PA behavior in CVD/CVRF patients.

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352   Board #193   May 30 9:30 AM - 11:00 AM

Weight Status, Physical Fitness & Health-related Quality Of Life Among Chinese Adolescents

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(No relevant relationships reported)

PURPOSE: The physical fitness on adolescents' health–related quality of life (HRQOL) is an important health issue in China. The purpose of this study was to examine associations between body mass index (BMI), cardiorespiratory fitness (CRF), musculoskeletal fitness (MSF) and HRQOL among Chinese adolescents. **METHODS:** Participants were 10,007 students (boys: 14.14 years±1.79; girls: 14.22 years±1.81) selected from 30 secondary schools in Shandong, China. Weight, height, 1000 m/800 m runs and the standing-long jump were measured to present BMI, CRF and MSF, respectively. HRQOL was measured by the Quality of Life Scale for Children and Adolescents (QLSCA). ANCOVA and multiple regression were employed to analyze the relationships among BMI, CRF and MSF and HRQOL **RESULTS:** BMI and physical fitness variables were partially associated with HRQOL in Chinese adolescents. Only several dimensions in ANCOVA showed a significant difference by BMI in this test. For boys, significant differences were found in physical sense, living convenience, self-satisfaction. For girls, the significant differences were observed only in social activity opportunity. For both boys and girls, the results also showed the higher MSF scores, the higher student partnership scores; the higher CRF scores, the lower scores in teacher and student relationship , and parent and children relationship. The multiple regression analysis demonstrated that BMI was significantly associated with social activity opportunities. For boys, CRF was associated with teacher and student relationship, self-satisfaction . whereas MSF was only associated with physical sense. For girls, CRF was significantly linked with parent and children relationship, learning capacity and attitudes and self-perception, while MSF was associated with self-perception and other factors. **CONCLUSION:** physical activity and physical fitness will be a crucial pathway in enhancing adolescents' HRQOL in China.

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

Leisure-time Physical Activity Throughout Adulthood: Implications For All-cause, And Cause-specific Mortality

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(No relevant relationships reported)

PURPOSE: Limited evidence documents the benefits of leisure-time physical activity (LTPA) throughout adulthood on mortality risk. This study modelled LTPA patterns from adolescence into middle-age and their associations with all-cause, CVD, and cancer mortality. **METHODS**: In 1994-96, 315,059 adults (58% males) aged 50-71 yrs enrolled in the NIH-AARP Diet and Health study retrospectively described their participation in LTPA (hours/week) for approximate ages 15, 25, 35 yrs, and 50 yrs. LTPA patterns over these age-periods were modelled using semi-parametric group-based mixture models and 10 LTPA patterns throughout adulthood were identified. Participants were followed for mortality through 2011. Associations between life-course LTPA patterns and mortality were modelled using Cox proportional hazard models [(Hazard Ratios (HR) and 95% CI)] adjusting for age, sex, race, education, smoking, body mass index, and diet. The least active LTPA pattern (0 hrs/wk throughout all age-periods) was used as the referent group.
RESULTS: Over 13.6 yrs of follow-up. a total of 71,377 deaths from all-causes, 22,219 deaths from CVD, and 16,388 deaths from cancer occurred. Compared to those who were consistently inactive throughout adulthood, participants who maintained LTPA participation over time were at lower risk for all-cause, CVD, and cancer mortality. For example, maintaining 7+ hrs/wk resulted in risk reduction of 29% for all-cause [HR: 0.71 (0.68, 0.73)], 24% for CVD [HR: 0.66 (0.62, 0.70)], and 10% for cancer mortality [HR: 0.90 (0.83, 0.97)]. Adults who were inactive at ages 15-35

(~1hr/week) but increased LTPA over time also had consistent reductions in risk for all-cause [HR: 0.65 (0.62, 0.68)], CVD [HR: 0.57 (0.53, 0.61)], and cancer mortality [HR: 0.84 (0.77, 0.92)]. In contrast, adults who reduced LTPA in adulthood had the lowest mortality benefits for all-cause and CVD mortality, and no benefits for cancer mortality.

CONCLUSIONS: Participants who maintained or increased LTPA by their ~50's had the lowest risk for mortality, independent of previous LTPA. LTPA during midlife (i.e., ~50yrs) rather than LTPA early in adulthood (i.e., 15's through 35's) seems to be most important for both all- and cause-specific mortality.

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

Physical Activity Declines At Significant Life Events In Young Adults

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(No relevant relationships reported)

Purpose: Predictable life events like marriage, birth of a child or gaining employment may be opportunities to intervene on health behaviors like physical activity. The purpose of this study was to determine which life events during the transition from adolescence to adulthood are associated with the greatest changes in moderate to vigorous physical activity (MVPA). **Methods**: Adolescent participants in Project EAT (ages 11 to 18 at baseline and 25 to 36 at EAT-IV) were surveyed at four time points, roughly 5 years apart, on whether they had married or divorced, had children, begun or lost employment, begun or ended post-secondary education or left or returned to their parent's home between each wave. Linear regression was used to model the effect of each of these life events on change in self-reported MVPA. Post-hoc four-way decomposition mediation analysis was conducted to examine whether the effect of having a child mediated the effect of getting married on change in MVPA. **Results**: Average reported MVPA declined from 6.5 hours per week at baseline to 4.3 hours per week at EAT-IV. Having a child was associated with a significant decrease in MVPA between waves 2 and 3 (-0.84 hours per week, 95% CI: -1.39 to -0.30) and between waves 3 and 4 (-1.02 hours per week, 95% CI: -1.52 to -0.53). Getting married (-0.99 hours per week, 95% CI: -1.58 to -0.41), moving back in with parents (-1.06 hours per week, 95% CI: -2.06 to -0.07), and leaving parents' home (-1.07 hours per week, 95% CI: -1.97 to -0.17) were associated with significant decreases in MVPA between waves 3 and 4. The proportion of the total effect of getting married on physical activity that was mediated by having a child (proportion mediated: 0.42, 95% CI 0.16 to 0.69) was similar to the proportion of the total effect that was due to interaction with having a child (proportion attributable to interaction: 0.54, 95% CI -0.12 to 1.20). **Conclusion**: There is evidence in this study that physical activity declines both after getting married and after having a child. Interventions to maintain or increase physical activity should be targeted at couples planning to get married or have a child. Pre-marital counselling and pre-natal clinics would be efficient targets for interventions like financial incentives for gym or fitness group memberships.

355　　Board #196　　　　　May 30 9:30 AM - 11:00 AM

Why Do Girls Play? Strength And Competitiveness But Not 2d:4d Ratio Are Predictive Of Retrospective Sport Participation In University Aged Women

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(No relevant relationships reported)

Women continue to participate in sport at a lower rate than males at all ages. Girls who participate in sport gain many advantages (e.g. better bone health, greater cardio-respiratory fitness, better mental health). However, even with programs designed to emphasize participation, some women choose to continue sport participation, while others do not. Given the potential advantages and controversies currently surrounding testosterone and female sport participation, it is possible that this hormone may predispose women toward sport participation.
PURPOSE: To determine if the 2nd to 4th digit ratio (2DR) correlates with sport participation throughout adolescence and young adulthood in women. **METHODS:** A cross-sectional analysis of indirect prenatal androgen concentrations (i.e. 2DR) was obtained from 92 females (aged 18-30y). Participant demographic, anthropometric, behavioural, and retrospective sport participation information were collected on one occasion. **RESULTS:** 2DR was not significantly correlated with total sport participation (r = -0.650, p = 0.538). Secondary analysis revealed significant correlations between sport participation and max hand grip (r=.406, p = 0.000), sport competitiveness (Sport Orientation Questionnaire) (r = 0.475, p = 0.000) and Sport Aggression (Scale of Children's Action Tendencies in Sport) (r = 0.240, p = 0.021). **CONCLUSION:** While 2DR does not, strength and the sport specific behavioural traits of competitiveness and aggression are able to predict retrospective sport participation. However, causality of these relationships could not be determined because some traits are likely strengthened through sport participation and androgens

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have been linked to strength, competitiveness, and aggression. Given that females participate in sport at lower rates than males, and that sport provides multiple social and health advantages, continuing to determine what factors influence female sport participation is necessary.

356　　Board #197　　　　　May 30 9:30 AM - 11:00 AM

Demographic, Health Behavior, And Cardiometabolic Risk Factor Profiles In Yoga And Non-yoga Participants: Nhanes 1999-2006

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(No relevant relationships reported)

BACKGROUND: Previous studies have described the demographic and limited disease status characteristics of yoga participants using nationally representative data. However, there is a paucity of population-based data describing the cardiometabolic risk factors of yoga participants in the U.S. PURPOSE: To examine the demographic, health behavior, and cardiometabolic risk factor characteristics of participants who report participating in yoga verses not participating yoga using a nationally representative sample of U.S. adults. METHODS: Study participants were from the 1999-2006 National Health and Nutrition Examination Survey (NHANES) who self-reported participation in yoga (n=171) or no-yoga (n=8,817). Demographic variables included: age, gender, race/ethnicity, and education. Health behaviors included: smoking status, alcohol consumption, and the healthy eating index. Cardiometabolic risk factors included: HbA1c, blood pressures (BP), BMI, waist circumferences, cholesterol, homeostatic model assessment of insulin resistance (HOMA), glucose, and insulin. SAS survey procedures were used for all analyses. RESULTS: Yoga participants were primarily female (82.6%), were college educated (57.6%), were mostly non-smokers (61.7%), and reported moderate alcohol consumption (75.1%). Yoga participants, compared to their non-yoga counterparts, had a healthier cardiometabolic risk profile: HbA1c (5.2 vs 5.4%), BP (114/69 vs 121/72mmHg), BMI (24.7 vs 27.7 kg/m²), waist circumferences (85.9 vs 95.3 cm), HOMA (1.2 vs 2.0mIU/L), glucose (91.8 vs 100.0 mg/dl), and insulin (7.8 vs 10.8 uU/mL), respectively. CONCLUSION: These results are the first to examine the cardiometabolic risk factor profiles of yoga users using a nationally representative sample of U.S. adults. Given the emergence of yoga as a common form of physical activity, it is imperative to understand the characteristics of those who participate in yoga to further understand its relationship with cardiovascular risk.

357　　Board #198　　　　　May 30 9:30 AM - 11:00 AM

Determination of Health Status Using SelfRated health and Physiological Markers of Fisherfolks in Ghana Central Region

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(No relevant relationships reported)

PURPOSE: Occupational lifestyle is ascertained to influence one's health. Studies have shown that 10 bpm increases in resting heart rate especially when compared with 45bpm is a significant risk cause for all mortality with increasing heart rate (HR) in linear relation. Self-rated health has been accepted as a predictor of health and mortality as well as HR and blood pressure. There is the need to ascertain the self-rated health through objective measures using physiological markers (systolic blood pressure (SBP), diastolic blood pressure (DBP), HR, Body mass index) in determining health status of fisherfolks in Central Region of Ghana. **METHODS**: The research designs were survey and quasi experimental. Purposive and convenient sampling methods were used to select the two urban fishing communities and 361 participants (64.3% (n=233males and 35.7% (n=129females) with ages ranging from 15-100 (M = 37.5, SD = 1.399) for the study. Institutional approval and informed consent were obtained. Deluxe auto Digital Blood Pressure Monitor (Model MS-752), stadiometre and body fat/hydration scale (Model 7032497) were used to collect the physiological data and a standardized self-rated health questionnaire. Descriptive statistics and multiple regression analyses were the statistical tools used.**RESULTS**: SRH of fair or poor was reported by 49% (n = 177) of the participants. However, 7.8% (n = 28) had low HR while 30% (n = 108) had high or very high HR; 36.3% (n = 131) had SBP stage one and two hypertension while 47.1% (n = 170) were pre-hypertensive; 44.6% (n = 161) had stage one or two DBP hypertension, with 23% (n = 83) being pre-diastolic hypertensive. Multiple regression analysis indicated that the general model was statistically significant in predicting the health status of the fisherfolks, F (8,352) = 3.582, p = 0.001, $adj.R^2$ = 0.005. However, gender (p = 0.021) and age (p = 0.002) were the only significant independent predictors of the health status of the fisherfolks. **CONCLUSIONS**: The fair and poor health of 49% SRH correlated with the objective measures of 30% high HR as well as 36.3% and 44.4% high SBP and DBP

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predicting health status of the fisherfolks. This revealed high mortality and all-cause of cardiovascular disease risks among fisherfolks signaling the need for multilevel interventions considering age and gender.

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358   Board #199   May 30 9:30 AM - 11:00 AM

The Association Between Muscle Strength and Hyperuricemia in the Healthy Adults

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(No relevant relationships reported)

PURPOSE: This study aimed to examine the prevalence of hyperuricemia in association with relative grip strength and leg strength in Korean Elderly.
METHODS: We studied cross-sectional analysis with 1,896 rural adults(40-88 year-old), who were surveyed for 7 years from 2007 to 2014. grip strength was measured by using Takei grip strength dynamometer. Leg strength was measured by using Takei leg strength dynamometer. hyperuricemia was defined by examining serum uric acid(SUA) concentration(Male=SUA$\geq$7mg/dL, Female=SUA$\geq$6mg/dL). Logistic regression was conducted to evaluate the association of grip strength and Leg strength with hyperuricemia (p<0.05)
RESULTS: When age, sex and other risk factor of the hyperuricemia are adjusted, subjects who reported high level of relative grip strength had a significantly lower odds ratio (OR) of hyperuricemia than subjects who reported low level of relative grip strength (OR: 0.36, 95% CI: 0.16-0.82). When it comes to gender, subjects both high relative muscle strength(are significantly lower Multivariate-adjusted OR of hyperuricemia than subjects both low relative muscle strength in man (OR: 0.56, 95%CI: 0.31-0.99) and women (OR: 0.50, 95%CI: 0.28-0.90). But, subjects who have high relative grip strength and low relative leg strength are significantly lower Multivariate-adjusted OR of hyperuricemia than subjects both low relative muscle strength only in women (OR: 0.38, 95%CI: 0.17-0.84)
CONCLUSIONS: The relationship between hyperuricemia and relative grip strength may be mediated through decreased estimated glomerular filtration ratio (eGFR). Therefore, muscle strength is important factor in prevention of renal vascular dysfunction which is a risk factor of hyperuricemia, and resistance exercise is needed to improve muscle strength.

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359   Board #200   May 30 9:30 AM - 11:00 AM

Separate Associations of Intrinsic and Acquired Cardiorespiratory Fitness on All-Cause Mortality

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(No relevant relationships reported)

Cardiorespiratory fitness (CRF) is a strong and independent predictor of mortality risk, however, it is unclear whether the association between CRF and mortality is mediated by the adoption of physical activity (PA; acquired CRF) or by underlying intrinsic CRF. In response we examined the association of intrinsic and acquired CRF on risk of all-cause mortality in men and women using follow-up CRF data from the Aerobics Centre Longitudinal Study cohort.
PURPOSE: To determine whether all-cause mortality risk differs between individuals who achieve high CRF through the adoption of PA compared to those who have intrinsically high CRF.
METHODS: A prospective study with at least two clinical visits (mean follow-up time: 14.0 (8.6) years) between 1974 and 2002 to assess CRF mortality risk in individuals who became active vs those who remained inactive at follow-up. Participants were 2,337 inactive men and women at baseline. Acquired CRF was defined as CRF of individuals who became active and improved CRF at follow-up, intrinsic CRF was defined as CRF of individuals who remained inactive at follow-up. The range of follow-up CRF values for both groups was set to 8-12 METs to achieve high (~10 METs) follow-up CRF values.
RESULTS: Individuals who had intrinsically high CRF at follow-up had a 20% reduced mortality risk for every 1 MET increase in CRF after adjusting for age, sex, follow-up weight (p<0.05). Hazard ratios were not materially different after further adjusting for change in systolic blood pressure, smoking, alcohol intake, diabetes mellitus, total cholesterol, abnormal ECG, family history of CVD (HR: 0.82 (0.68, 0.98); p<0.05). Individuals who had acquired a high CRF at follow-up had a 32% reduced mortality risk for every 1 MET increase in CRF after adjusting for age, sex, follow-up weight (p<0.05). Hazard ratios were not materially different after further adjusting for common risk factors associated with premature mortality (HR: 0.72 (0.59, 0.87); p<0.05).
CONCLUSION: While both intrinsic and acquired CRF were associated with a reduction in all-cause mortality risk, individuals who became active and improved CRF had a lower risk of all-cause mortality than those with intrinsically high CRF. This is the first analysis to show that the way in which CRF is achieved influences its association with mortality.

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360   Board #201   May 30 9:30 AM - 11:00 AM

Flourishing in Overweight and Obese Adolescents of Varying Physical Activity Levels

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(No relevant relationships reported)

Adolescents, who are overweight or obese, are less likely to flourish, and more likely to bully others and experience emotional difficulties. However, it is unknown whether engagement in regular physical activity (PA) is associated with these measures among overweight and obese adolescents. **PURPOSE:** To examine associations between body mass index (BMI) and PA levels with measures of flourishing, bullying and emotional difficulties. **METHODS:** Analyses included 12,592 adolescents, ages 10-17 years, from the 2011-12 National Survey of Children's Health. Adolescents were grouped into categories based on BMI (overweight or obese) and PA (0-2, 3-4, or 5-7 d/wk). Outcomes included measures of flourishing (finishing tasks, staying calm when faced with a challenge, and showing interest in learning new things), emotional difficulties (excessive arguing and unhappiness) and bullying. Logistic regression models, adjusted for age, sex, gender, household income, and education assessed the odds of each outcome comparing BMI classification and PA groupings. **RESULTS:** Compared to overweight adolescents who engaged in 0-2 d/wk of PA, those who engaged in PA 3-4 d/wk were 44% more likely to finish tasks, 58% more likely to stay calm, 72% more likely to show interest in learning new things, 30% less likely to argue excessively, and 42% less likely to be unhappy (*p's*<0.01). Compared to obese adolescents who engaged in 0-2 d/wk of PA, those who engaged in PA 3-4 d/wk were 41% more likely to finish tasks, 37% more likely to stay calm, 73% more likely to show interest in learning new things, 27% less likely to argue excessively, 58% less likely to be unhappy, and 47% less likely to bully others (*p's*<0.001). Furthermore, for adolescents who engaged in PA 5-7 d/wk, the odds of flourishing were significantly higher, and the odds of emotional difficulties and bullying were significantly lower (*p's*<0.001). **CONCLUSIONS:** Overweight and obese adolescents that engaged in greater amounts of PA ($\geq$3 d/wk) were significantly more likely to flourish, and less likely to experience emotional difficulties and bully others compared to adolescents that engaged in >3 d/wk of PA. This suggests that increasing engagement in physical activity may increase flourishing and decrease emotional difficulties and bulling behaviors among overweight and obese adolescents.

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361   Board #202   May 30 9:30 AM - 11:00 AM

Combined Association of Cardiorespiratory Fitness and Family History of Hypertension on the Incidence of Hypertension

Yuko Gando[1], Susumu S. Sawada, FACSM[1], Ryoko Kawakami[2], Haruki Momma[3], Kazunori Shimada[4], Yasushi Fukunaka[5], Takashi Okamoto[5], Koji Tsukamoto[5], Motohiko Miyachi[1], I-Min Lee, FACSM[6], Steven N. Blair, FACSM[7]. [1]*National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan.* [2]*Waseda University, Saitama, Japan.* [3]*Tohoku University Graduate School of Biomedical Engineering, Sendai, Japan.* [4]*Juntendo University Graduate School of Medicine, Tokyo, Japan.* [5]*Tokyo Gas Co., Ltd., Tokyo, Japan.* [6]*Harvard Medical School, Boston, MA.* [7]*University of South Carolina, Columbia, SC.*

(No relevant relationships reported)

Family history of hypertension (FH) is a non-modifiable risk factor of hypertension. However, cardiorespiratory fitness (CRF) is a modifiable risk factor and may be important for preventing hypertension for both people with and without FH.
PURPOSE: The purpose of this study was to investigate the combined association of CRF and FH on the incidence of hypertension in male Japanese workers. **METHODS**: A total of 6890 male workers, who were free from hypertension, were included in this study. CRF was determined using a submaximal exercise test, with a cycle ergometer. A self-reported questionnaire was used to determine FH. Six groups were established, combining the 2 groups with and without FH (Yes, No) and the 3 groups based on age-specific tertiles of CRF (Low, Moderate, High). The incidence of hypertension, defined as systolic blood pressure of $\geq$140 mmHg or diastolic blood pressure of $\geq$90 mmHg, or self-reported physician-diagnosed hypertension, was evaluated. Cox proportional hazards regression analysis was performed with incidence of hypertension as the dependent variable and the 6 groups as independent variables. Hazard ratios (HRs) and 95% confidence intervals (CIs) were calculated after adjustment for age and potential confounding factors (BMI, cigarette smoking, and alcohol intake). **RESULTS**: During the observation period of 101,212 man-years of observation (median 17 years, minimum 1 year, maximum 23 years), 2210 workers developed hypertension. There were 3860 participants who had a FH (56%). As compared with the Yes-Low group, the HRs for hypertension were 66% lower in No-High (HR 0.34 [95%CI, 0.28-0.40]),

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47% lower in No-Low (HR 0.53 [95%CI, 0.46-0.61]), and 24% lower in Yes-High (HR 0.76 [95%CI, 0.67-0.86]). FH and CRF did not show a significant interaction (*p* for interaction = 0.181).
CONCLUSIONS: The combination of FH and CRF showed a clear association with the risk of hypertension, and even participants with FH showed a lower risk of hypertension when the level of CRF was high. FH and CRF did not show a significant interaction. Therefore, these findings suggest that CRF might be equally beneficial for preventing hypertension in both people with and without FH.

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362   Board #203   May 30 9:30 AM - 11:00 AM
Impact of Air Pollution on Physical Activity: A Cohort Study of Beijing College Students

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(No relevant relationships reported)

Purpose: Air pollution has become a substantial environmental issue affecting human health and health-related behavior worldwide, especially in Beijing, China. Physical activity (PA) has been well demonstrated as a means to promote people's health and well-being and is potentially being influenced by the air pollution. Yet, the effects of air pollution on PA behavior have not been well investigated. This study examined of the impacts of air pollution on moderate to vigorous PA(MVPA) among college students in Beijing, China. **Methods:** We conducted the follow-up health surveys on 9,095 freshmen from Tsinghua University in Beijing during 2013-2015, and their PA was measured by the "International Physical Activity Questionnaire" (IPAQ) questionnaire. Air pollution data included average hourly air quality index (AQI), $PM_{2.5}$, PM_{10}, SO_2 and NO_2 ($\mu g/m^3$) were measured by Ministry of Environmental Protection of the People's Republic of China. The data were analyzed using the linear fixed-effect regressions. **Results:** An one standard deviation (SD) increase in air pollution concentration in AQI, $PM_{2.5}$, PM_{10}, SO_2 and NO_2 was associated with a reduction in weekly total minutes of vigorous PA by 61.18, 43.14, 71.37, 20.73 and 19.66, respectively; a reduction in weekly total minutes of moderate PA by 80.10, 56.62, 93.52, 27.47 and 25.88, respectively; a reduction in weekly total minutes of MVPA by 147.17, 104.15, 171.90, 50.57 and 47.64, respectively. **Conclusions:** Air pollution discouraged MVPA among college students. Future studies are warranted to replicate study findings in other subpopulations and China cities, and policy interventions are urgently called to reduce air pollution level in China.

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363   Board #204   May 30 9:30 AM - 11:00 AM
Cardiorespiratory Fitness and Incidence of Dyslipidemia: A Cohort Study Among Japanese Women

Takahisa Ohta[1], Susumu S. Sawada, FACSM[2], Kana Takagi[3], Junzo Nagashima[3], Takeshi Yoshihisa[3], Yasunori Imagawa[3], Nobuyoshi Ono[3], Wataru Fukuda[3], Reno Koyanagi[3], Yuko Gando[2], Motohiko Miyachi[2], Hiroyuki Sasai[1], I-Min Lee, FACSM[4], Steven N. Blair, FACSM[5], Naokata Ishii[1]. [1]*The University of Tokyo, Tokyo, Japan.* [2]*National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan.* [3]*Yokohama City Sports Medical Center, Yokohama, Japan.* [4]*Harvard Medical School, Boston, MA.* [5]*University of South Carolina, Columbia, SC.*
(No relevant relationships reported)

Low cardiorespiratory fitness (CRF) and overweight/obesity are independent risk factors for dyslipidemia. However, the relationship between the combination of CRF and body mass index (BMI) on incidence of dyslipidemia is not clear among Asian women.**PURPOSE:** To investigate the joint effects of CRF and BMI on the incidence of dyslipidemia among Japanese women. **METHODS:** This cohort study was conducted in 927 normolipidemic Japanese (median [interquartile range] age 49 [37-63] years). Participants completed a submaximal exercise test, a medical examination, and questionnaires on their smoking and drinking habits. BMI was calculated from measured weight and height. CRF, physical work capacity at 75% of maximum heart rate, was measured using a cycle ergometer. We determined the incidence of dyslipidemia, defined as having at least one of the following criteria; fasting plasma high-density lipoprotein cholesterol <40 mg/dL, low-density lipoprotein cholesterol ≥140 mg/dL, fasting triglyceride ≥150 mg/dL, or self-reported physician-diagnosed dyslipidemia. Multivariable odds ratios and 95% confidence intervals for the incidence of dyslipidemia were obtained using logistic regression models after adjustment for age, systolic blood pressure, smoking, and drinking habit. **RESULTS:** During the mean follow-up period of 10.0 years, 196 (21.1%) women developed dyslipidemia. There was an interaction between CRF and BMI (p for interaction = 0.006). Using the 1st tertile of CRF and high BMI (≥25kg/m²) as reference, the multivariable odds ratios and 95% confidence intervals were 0.52 (0.31-0.86) for 1st tertile of CRF and low BMI (<25kg/m²), 1.92 (0.73-5.03) for 3rd tertile of CRF and high BMI, and 0.30 (0.17-0.52) for 3rd tertile of CRF and low BMI, respectively. **CONCLUSION:** This result

suggests that there is a strong interaction effect of CRF and BMI on the incidence of dyslipidemia among Japanese women, such that CRF was inversely related to lower incidence of dyslipidemia only among those with low, but not high, BMI.

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364   Board #205   May 30 9:30 AM - 11:00 AM
Cardiorespiratory Fitness Measured from Cardiopulmonary Exercise Testing for Mortality Risk Prediction in Apparently Healthy Men and Women

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(No relevant relationships reported)

Over the past three decades numerous studies have illustrated the inverse relationship between cardiorespiratory fitness (CRF) and mortality. However, this relationship has almost exclusively been studied using estimated CRF (CRF_e), with known error of ± 3 to 7 ml/kg/min, with no studies assessing this association using directly measured CRF in both men and women that were apparently healthy at baseline testing. **PURPOSE**: To assess the association of CRF, obtained using cardiopulmonary exercise testing (CPX) on all-cause mortality in a large cohort of apparently healthy men and women at baseline. **METHODS**:Participants included 4,137 participants (2,326 M, 1,811 W; mean age: 42.8 ± 12.2 y) free from cardiovascular disease and cancer at baseline, who underwent a maximal CPX to determine CRF. Participants were followed for 24.2 ± 11.7 years (1.1 to 49.3 y) for mortality outcomes using data from the National Death Index. Participants were categorized into CRF tertiles (low, moderate, and high) based on age and sex-specific percentiles, from the Fitness Registry and the Importance of Exercise National Database (FRIEND). Cox-proportional hazard models adjusted for age were performed to determine the relationship of CRF with all-cause mortality. **RESULTS**: After a mean follow-up of 24.2 years, 727 participants were deceased. CRF was inversely related to all-cause mortality, where low CRF was associated with a 31% increased risk for all-cause mortality compared to high CRF (Hazard ratio (HR) 1.31; p<0.01). The inverse relationship between CRF and all-cause mortality was also present for men and women when examined independently. Specifically, Low fit men and women had a 54% and 28% higher risk of dying from all-causes compared to high fit men and women (Men HR 1.54, p<0.01; Women HR 1.28, p<0.01), respectively. **CONCLUSIONS**: These data demonstrate that CPX measured CRF is a strong predictor of all-cause mortality. This coupled with the known diagnostic and prognostic value of CPX measures in clinical populations and the recent support for CRF as a vital sign suggest it should be considered in clinical practice, as it may help to improve the efficacy of the risk assessment and guide clinical decisions.

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365   Board #206   May 30 9:30 AM - 11:00 AM
Obesity And Health-related Physical Activity Behavior In Selected European Countries: Needs Assessment for the Eubohealth-consortium

Lina Hermeling, Marion Flechtner-Mors, Romy Lauer, Jürgen M. Steinacker, FACSM, Susanne Kobel. *Ulm University, Ulm, Germany.* (Sponsor: Prof. Jürgen M. Steinacker, FACSM)
(No relevant relationships reported)

The global burden of overweight and obesity is constantly rising for several decades. Physical activity (PA) is an essential determinant for health, prevention and treatment of many chronic diseases that are related to overweight and obesity. **PURPOSE**: In 2017, he EUBOHEALTH-Consortium was founded with the intention to promote health and normal weight for citizens in Central, Eastern and South Eastern Europe. In order to prepare a large-scale scientific study proposal, a needs assessment in form of a meta-analysis of the initiating countries is being conducted. **METHODS**: A comparison of obesity prevalence and PA behavior between the countries of Croatia, Hungary, Estonia, Germany and the (estimated) European Union average is conduced based on the European Health Interview Survey (EHIS), wave 2 (Eurostat, 2014). Data on non-work-related PA and effort involved in performing work-related PA were used. In addition, the time spent in health-enhancing aerobic PA was assessed and subdivided into four categories: zero, one to 149, 150 to 200 and above 300 minutes per week. All subjects were aged 15 years or over. **RESULTS**: In all four observed countries, the obesity prevalence was higher than the European Union average of 15.4% (Croatia: 18.0%, Hungary: 20.6%, Estonia: 19.9%, Germany: 16.4%). On average, 48.8% of the population of the European Union are not engaged into health-enhancing aerobic PA (Croatia: 58.6%, Hungary: 43.4%, Estonia: 52.3%, Germany: 28.8%). The most severe heterogeneity can be observed in performing muscle strengthening activities (EU-average: 24.2%, Croatia: 9.6%, Hungary: 23.7%, Estonia: 15.4%, Germany: 44.1%). **CONCLUSIONS**: There is a substantial need for the promotion of health-enhancing PA to stop the rising burden of obesity associated disease in several (European) countries. No comparable data from the fifth member state (Serbia) were available. The EUBOHEALTH-Project is funded by the German Federal Ministry of Education and Research.

Abstracts were prepared by the authors and printed as submitted.

WEDNESDAY, MAY 30, 2018

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366   Board #207   May 30 9:30 AM - 11:00 AM

The Association of Physical Activity and Body Mass Index with Myocardial Infarction: The Tromsø Study

Marius Renninger[1], Maja-Lisa Løchen[1], Ulf Ekelund, FACSM[2], Laila A. Hopstock[1], Lone Jørgensen[1], Ellisiv B. Mathiesen[1], Inger Njølstad[1], Henrik Schirmer[1], Tom Wilsgaard[1], Bente Morseth[1]. [1]UiT - The Arctic University of Norway, Tromsø, Norway. [2]Norwegian School of Sport Sciences, Oslo, Norway. [3]University Hospital of North Norway, Tromsø, Norway.
(No relevant relationships reported)

PURPOSE: Physical activity and overweight are both associated with myocardial infarction (MI). However, their joint association with MI remains unclear. Our objective was to examine the independent and joint association between physical activity, body mass index (BMI) and MI. **METHODS**: This prospective cohort study included 16572 men and women aged 20-54 years who took part in the second Tromsø Study survey. At baseline in 1979-80 physical activity was assessed by questionnaire. Data on MI was collected through hospital registries between 1979 and 2013. Cox proportional hazards models were used to examine the independent and joint associations between physical activity, BMI and MI. **RESULTS**: After exclusions, the final sample used in the analysis included 16104 individuals. During a median follow up of 34 years, 1613 incident cases of MI were documented. Physical activity and BMI were both independently associated with MI. Hazard ratio (HR) (95% confidence interval) for moderately active compared to inactive individuals was 0.87 (0.77-0.98), for overweight compared to normal weight individuals HR was 1.54 (1.39-1.72), and HR for obese compared to normal weight individuals was 2.70 (2.24-3.26). In joint analysis, normal weight inactive individuals had a 20% higher risk of MI compared to their active counterparts (HR 1.20 (1.02-1.41)). The highest risk of MI was seen in obese inactive individuals with a 3-fold increased risk compared to active normal weight individuals (HR 3.20 (2.30-4.44)). The risk of MI increased with increasing BMI regardless of the activity level. Nevertheless, HRs were lower for active compared to inactive individuals within the same weight category. **CONCLUSIONS**: The findings suggest that physical activity and BMI are independently associated with risk of MI in young and middle-aged men and women. Physical activity seems to attenuate but not eliminate the risk of being overweight or obese with MI.
Acknowledgements: None
Disclosures: None

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367   Board #208   May 30 9:30 AM - 11:00 AM

Cardiorespiratory Fitness, Alcohol Consumption And The Incidence Of Hyper Non-hdl Cholesterolemia: A Cohort Study

Natsumi Watanabe[1], Kazunori Shimada[2], Susumu S. Sawada, FACSM[3], I-Min Lee, FACSM[4], Yuko Gando[3], Haruki Momma[5], Ryoko Kawakami[6], Motohiko Miyachi[3], Yumiko Hagi[7], Chihiro Kinugawa[8], Takashi Okamoto[8], Koji Tsukamoto[8], Steven N. Blair, FACSM[9]. [1]Juntendo University, Chiba, Japan. [2]Juntendo University Graduate School of Medicine, Tokyo, Japan. [3]National Institutes of Biomedical Innovation, Health and Nutrition, Tokyo, Japan. [4]Harvard Medical School, Boson, MA. [5]Tohoku University, Sendai, Japan. [6]Waseda University, Saitama, Japan. [7]Tokai University, Kanagawa, Japan. [8]Tokyo Gas Co., Ltd., Tokyo, Japan. [9]University of South Carolina, Columbia, SC.
(No relevant relationships reported)

Physical inactivity is a risk factor of non-high-density lipoprotein (HDL) cholesterolemia, and also high alcohol consumption increases HDL cholesterol. However, the interaction between cardiorespiratory fitness (CRF), an objective marker of physical activity, and alcohol consumption on the incidence of hyper non-HDL cholesterolemia is not clear. **PURPOSE**: To investigate the joint effect of CRF and alcohol consumption on the incidence of hyper non-HDL cholesterolemia among Japanese men. **METHODS**: We evaluated CRF and the incidence of hyper non-HDL cholesterolemia in 4,067 Japanese men [median (IQR) age 36 (30-44) years] who were free from hyper non-HDL cholesterolemia. Participants underwent a submaximal exercise test, a medical examination, and questionnaires on their health habits including alcohol consumption (less than 1g/day, 1-22g/day, ≥23 g/day) in 1986. CRF was measured using a cycle ergometer and maximal oxygen uptake was estimated. The incidence of high levels of non-HDL cholesterolemia (≥ 170 mg/dL) from 1986 to 2006 was ascertained based on fasting blood levels. Hazard ratios and 95% confidence intervals for the incidence of hyper non-HDL cholesterolemia were calculated using Cox proportional hazard models after adjustment for age, body mass index, systolic blood pressure, smoking, and family history of dyslipidemia. **RESULTS**: Hyper non-

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HDL cholesterolemia was observed in 1,482 participants during the follow-up period. Using the Low CRF & less than 1g/day alcohol consumption group as reference, the hazard ratios and 95% confidence intervals were 0.88 (0.73 - 1.06) for Low CRF & ≥23 g/day alcohol consumption group, 0.77 (0.64 - 0.93) for the High CRF & less than 1g/day alcohol consumption group, and 0.70 (0.57 - 0.87) for the High CRF & ≥23 g/day alcohol consumption group, respectively. **CONCLUSIONS**: Japanese men with a high CRF and a high alcohol consumption have a lower the incidence of hyper non-HDL cholesterolemia.

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368   Board #209   May 30 9:30 AM - 11:00 AM

Overturning the Hypothesis that Cigarettes Can Enhance Hematocrit and Improve Aerobic Capacity

Grace L. Naylor[1], Jennica Harrison[1], J. Mark VanNess[1], Michelle M. Amaral[1], Jonathan M. Saxe[2], Lewis E. Jacobson[2], Courtney D. Jensen[1]. [1]University of the Pacific, Stockton, CA. [2]St. Vincent Hospital, Indianapolis, IN.
(No relevant relationships reported)

Some athletes are willing to try any supplement or drug to enhance performance. Recent reports suggest cigarette smoking may improve endurance performance by inducing oxidative stress which would, in turn, stimulate an increase in hemoglobin and thus increase oxygen-carrying capacity. It is important to validate these claims, given the hazardous side effects of cigarette smoking. **PURPOSE:** Examine the influence of cigarette smoking on blood hemoglobin levels to determine if smoking stimulates training-like conditions for aerobic enhancement. **METHODS:** Hemoglobin and oximetry levels were measured in 594 smokers and 1,626 non-smokers across a wide age-range (ages 15 to 98). Independent variables were age, sex, obesity, smoking status, and presence of diabetes, COPD, or other respiratory diseases. Dependent variables were hemoglobin and oximetry. Independent-samples t tests and chi-square tests were used to detect group differences between smokers and non-smokers. Multiple linear regressions were used to isolate the effect of smoking on hemoglobin and oximetry. **RESULTS:** Subjects were 52.5 ± 22.5 years of age, 55.7% were male, 16.5% were obese, average hemoglobin was 13.5 ± 1.9 g/dL, and oximetry was $97.0 \pm 2.9\%$. Independent-samples t tests revealed cigarette smokers' hemoglobin levels to be 4.6% higher (p<0.001) and oxygen saturation to be 0.3 percentage points higher (p=0.042). Cigarette smokers were also 13.5 years older (p<0.001) and more likely to be male (p<0.001). Age (p<0.001) and sex (p<0.001) were strongly correlated with hemoglobin. When controlling for all significant confounders, multiple linear regression did not demonstrate a significant effect of cigarette smoking on hemoglobin (p=0.317) but it found a reduction of 0.4 percentage points on oximetry (p=0.005). **CONCLUSIONS:** Simple t-tests indicated cigarettes might confer an ergogenic advantage via elevations in hemoglobin and oximetry. This, left alone, could suggest inadequate oxygen saturation of the blood (owing to smoking) may simulate training-like conditions. However, the predominant explanatory variables were age and sex. It is not the smoking, but other subject factors of the person who smokes that influences hemoglobin levels. Controlling for confounders, smoking has no effect on hemoglobin and reduced oxygen saturation.

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369   Board #210   May 30 9:30 AM - 11:00 AM

The Association Between Physical Activity, Sleep, and Cardiovascular Risk Factors in College Students

Heather H. Betz, Julie M. Cousins. *Albion College, Albion, MI.* (Sponsor: Jonathan Myers, FACSM)
(No relevant relationships reported)

Physical activity can help improve traditional cardiovascular risk factors, including blood pressure and body composition (Archer and Blair, 2011). In addition to the traditional cardiovascular risk factors, sleep has started to emerge as an important component to overall and cardiovascular health (Grandner et al., 2014). Low levels of sleep have been shown to negatively impact a host of cardiovascular risk factors, including blood pressure, blood lipids, markers of inflammation, and body fatness. (Carnethon et al., 2016) **PURPOSE:** The purpose of this study was to examine the associations between physical activity and sleep with blood pressure and waist circumference in college-age adults. **METHODS:** A total of 57 Albion College students (23 males, 34 females) participated. Height, weight, waist circumference, and blood pressure were measured. Physical activity was self-reported and sleep was assessed with The Pittsburgh Sleep Quality Index. Multiple regression was used to assess the purpose. **RESULTS:** 47.4% of participants were physically active five or more days per week, while 38.5% of participants averaged eight or more hours of sleep per night. 8.8% had a waist circumference categorized as high and 5.2% of participants were pre-hypertensive. 52.6% of the total participants were athletes, with 48% of those currently in-season. There was a significant interaction between physical activity and total hours of sleep on systolic blood pressure (p=0.035, $R^2 = 0.117$) and waist circumference (p=0.023, R^2=0.13). Total hours of sleep had a significant unique contribution to the model (β=-0.364, p=0.007) when examining waist circumference, while physical activity had a significant unique contribution to the model (β=-0.264, p=0.050) when examining systolic blood pressure. **CONCLUSIONS:** The importance

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of being physically active and getting the proper amount of sleep should to be stressed to college students as this can impact their cardiovascular health at a young age. Additionally, discussing the development of cardiovascular risk factors needs to start with this age group, as some participants were noted as being pre-hypertensive or having a high waist circumference. Since this was a very active sample, additional studies need to examine these relationships with a wider variety of college students.

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370 Board #211 May 30 9:30 AM - 11:00 AM
The Association of Body Composition with Cardiometabolic Risk Factors in Apparently Healthy Young Adult Females

Samantha C. Orr, Mary A. Elsesser, Ryan T. Tyler, Timothy A. Rengers, Evan Eschker, Tamara Hew-Butler, FACSM, Charles RC Marks, Kristin R. Landis-Piwowar, Myung D. Choi, Elise C. Brown. *Oakland University, Rochester, MI.*
(No relevant relationships reported)

Although risk factors associated with cardiometabolic diseases (CMD) such as excess adiposity are oftentimes detected in young adults, most of the research examining these relationships has focused on middle-aged and older adults and those "at-risk" for chronic diseases. Given the U.S. trend of increased obesity prevalence with age and the high prevalence of metabolic abnormalities in normal-weight young adult females, understanding the link between body composition and CMD risk in healthy young females is important for developing intervention strategies for primary prevention of obesity and CMD diseases. **PURPOSE:** Therefore, the purpose of this study was to examine the associations of body composition with CMD risk factors in apparently healthy young adult females. **METHODS:** Twenty-five non-obese [body mass index (BMI) < 30 kg/m^2] apparently healthy females (22.6 ± 4.2 years) took part in this cross-sectional study. All participants had height, weight, waist circumference (WC), body composition using Dual-energy X-ray Absorptiometry, resting heart rate (HR), blood pressure, and fasting biomarkers assessed. Bivariate correlations using Spearman's rho were used to examine the relationships of CMD risk factors with anthropometric obesity indices and body composition. Significance was set a priori at P≤0.05. **RESULTS:** Significant associations were found between waist-to-height ratio (WHtR) and resting HR (Spearman's ρ = 0.436, P = 0.03), cholesterol (ρ = 0.404, P = 0.04), low-density lipoprotein cholesterol (LDL-C) (ρ = 0.475, P = 0.02), and glucose (ρ = 0.485, P = 0.01); BMI and resting HR (ρ = 0.41, P = 0.04), cholesterol (ρ = 0.437, P = 0.03), and LDL-C (ρ = 0.477, P = 0.02); total body fat percentage and resting HR (ρ = 0.636, P = 0.001); bone mineral content and glucose (ρ = -0.536, P = 0.007); and lean mass and glucose (ρ = -0.461, P = 0.02). WC was not significantly associated with any of the CMD risk factors. **CONCLUSION:** While WHtR was correlated with more CMD risk factors than other measures of body composition, the strongest correlation was found between total body fat percentage and resting heart rate. These data suggests that body composition may play an important role in cardiometabolic health in young adult females even when classified as apparently healthy and non-obese.

A-49 Free Communication/Poster - **Nutrition Interventions**

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

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371 Board #212 May 30 11:00 AM - 12:30 PM
Lifelong Ketogenic Diet Feeding Increases Longevity, But Does Not Alter Oxidative Stress Markers in Rats

Hailey A. Parry, Wesley C. Kephart, Petey Mumford, Matthew Romero, Cody Hann, C. Brooks Mobley, Yufeng Zhang, Michael D. Roberts, Andreas N. Kavazis, FACSM. *Auburn University, Auburn, AL.* (Sponsor: Andreas N. Kavazis, FACSM)
(No relevant relationships reported)

Purpose: Ketogenic Diets (KD) consist of high fat, moderate protein and low carbohydrate. KD have been used as a weight loss tool and as a therapeutic tool for neurological disorders. It has been suggested that KD increase longevity, but to date only two studies in mice have been performed with equivocal results. Therefore, we determined the effects of KD on longevity and multi-organ oxidative stress markers in rats. **Methods:** Ten month-old male Sprague-Dawley rats (n=8 per group) were provided with one of two isocaloric diets: standard chow (SC; 24% (% kcal) protein, 58% CHO, 18% fat; 20 g/day) or KD (23% protein, 10% carbohydrate, 67% fat; 16 g/day). Rats were euthanized if: a) vitality scores (range = 4 (good health) to 20 (poor health)) exceeded a score of 16 per the recommendations of Phillips et al. (J Am Assoc Lab Anim Sci, 2010, 49(6): 792-799), b) rapid weight loss accompanied by changes in food and water consumption, or c) the rat suffered from a condition to which a university veterinarian deemed euthanasia necessary for humane purposes.

Upon euthanasia, the gastrocnemius muscle, liver, and brain were removed and stored at -80ºC and analyzed for markers of oxidative damage (4-hydroxynonenal (4HNE) and protein carbonyls (Oxyblot)) and protein levels of the antioxidants superoxide dismutase 1/2 (SOD1/2), catalase (CAT), and glutathione peroxidase (GPX). **Results:** The survivability log-rank test indicates that KD increased the lifespan of rats (p=0.009) when compared to SC. No significant difference in body mass was observed at the beginning (SC=425.7±13.2, KD=435.9±5.8) or end (SC=428.0±25.4, KD=417.1±22.6) of the experiment, and liver and gastrocnemius mass at sacrifice was not significantly different between groups (p>0.05). Liver CAT protein levels were about 30% higher in KD, albeit not significant (p=0.062). Additionally, liver SOD1 protein levels were about 20% higher in KD, but again, this was not significant (p=0.094). No other significant differences in protein levels of antioxidants, 4HNE, or Oxyblot were observed in either the gastrocnemius, liver, or brain. **Conclusions:** Lifelong KD improves longevity in rats without altering body mass and our data show that the longevity benefits of KD come without altering oxidative damage or antioxidant protein levels in the gastrocnemius, liver, or brain.

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372 Board #213 May 30 11:00 AM - 12:30 PM
The Effects of Choline Intake and Resistance Exercise Training on Strength Gains in Older Adults

Chang Woock Lee[1], Elfego Galvan[2], Teak V. Lee[3], Vincent CW Chen[4], Steve Bui[5], Stephen F. Crouse, FACSM[6], James D. Fluckey[6], Stephen B. Smith[6], Steven E. Riechman, FACSM[6]. [1]*University of Houston-Victoria, Victoria, TX.* [2]*University of Texas Medical Branch, Galveston, TX.* [3]*Pierce College, Woodland Hills, CA.* [4]*Georgian Court University, Lakewood, NJ.* [5]*Dixie State University, St. George, UT.* [6]*Texas A&M University, College Station, TX.*
(No relevant relationships reported)

PURPOSE: The micronutrient choline plays a major role in neurotransmission and skeletal muscle contraction. We conducted a randomized controlled trial to examine the effects of choline intake on skeletal muscle responses to resistance exercise training (RET) in older adults.
METHODS: Three groups of 50 to 69-year-old generally healthy men and women (n=37, age=59.8 ± 6 y, height=168.4 ± 9 cm, weight=79.5 ± 16 kg, body fat=30.3 ± 10 kg, male/female=15/22) underwent 12 weeks of RET (3x/week, 3 sets, 8-12 reps, 70% of maximum strength [1RM]) and submitted >1,776 diet logs (>4x/week for 12 weeks, 37 subjects). Participants' diets (mean choline intake: 5.9 mg/kg lean/d) were supplemented with 0.7 mg/kg lean/d (Low, n=13), 2.8 mg/kg lean/d (Med, n=11), or 7.5 mg/kg lean/d (High, n=13) of choline in the form of egg yolk. Body composition, 1RM, and blood tests were performed before and after training.
RESULTS: ANCOVA tests showed Low choline intake, compared with Med or High choline intakes, resulted in significantly diminished gains in composite strength (leg press + chest press 1RM; Low: 19.4 ± 8.2%, Med: 46.8 ± 8.9%, High: 47.4 ± 8.1%, p=0.034) and thigh muscle quality (leg press 1RM / thigh lean mass; Low: 12.3 ± 9.6%, Med/High: 46.4 ± 7.0%, p=0.010) after controlling for lean mass, protein, betaine, and vitamin B$_{12}$. No differences were observed in lean mass gains, clinical markers of liver/muscle damage, or blood lipid profiles.
CONCLUSION: These data indicate that low supplemental choline intake negatively affects strength gains with RET in older adults.

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373 Board #214 May 30 11:00 AM - 12:30 PM
Utilization And Efficacy Of The "Run Fueled" Smart-phone Application Among Collegiate Endurance Runners

Michelle Barrack[1], Michael Fredericson, FACSM[2], Emily Kraus[2], Brian Kim[3], Sonal Singh[4], Kristen Gravani[2], Beth Miller[5], Aurelia Nativ, FACSM[4]. [1]*California State University, Long Beach, Long Beach, CA.* [2]*Stanford University, Stanford, CA.* [3]*University of California, Irvine, Irvine, CA.* [4]*University of California, Los Angeles, Los Angeles, CA.* [5]*Duke University, Durham, NC.* (Sponsor: Aurelia Nattiv, FACSM)
(No relevant relationships reported)

PURPOSE: We evaluated the use and efficacy of an interactive, goal-specific, nutrition education intervention aimed at optimizing energy availability and the intake of bone-building nutrients among collegiate endurance runners. **METHODS**: In Spring 2016, 77 male and female NCAA Division I runners were invited to complete the 8-week nutrition education curriculum, administered through "Run Fueled", a smart-phone application. The curriculum, delivered through two, 4-week modules, provided content through daily nutrition tips and electronic handouts, videos, recipes on a weekly topic. Athletes were assessed during a one-on-one meeting with a registered sports dietitian prior to completing Module 2, which provided tips and resources specific to their nutrition goals. Each week, runners were invited to complete assessments regarding the

weekly resources and/or dietary behavior change. **RESULTS**: Forty-eight (62.3%) of the 77 runners utilized one or more components of the 8-week curriculum. For Module 1, 39.6% (n= 19) of the 48 runners engaging with the curriculum exhibited use of ≥80% of components, i.e. "high-use". Twenty-three (47.9%) of the 48 application users completed one or more components of Module 2, four runners exhibited "high-use" of Module 2. Built-in assessments indicated that 75.8% (n= 25) of 33 runners reported the Module 1 daily tips as "engaging and effective", while 70.6% (n = 24) of 34 runners rated that the tips could assist with dietary change. Among 11 runners completing the Module 2 assessments, 54.5% (n= 6) reported making changes consistent with the nutrition goals. Runners indicating "Yes" the tips were "engaging and effective", compared to "No", "Unsure", or those not completing the assessment exhibited higher use of Module 1 (i.e. 54.8 ± 2.5 vs. 34.8 ± 4.3 vs. 7.3 ± 3.2, p<0.001) and Module 2 (6.8 ± 1.2 vs. 3.6 ± 2.2 vs. 0.0 ± 0.0) components. All runners (n= 4) exhibiting "high use" of Module 1 and Module 2 reported dietary change. **CONCLUSIONS**: A majority of runners (62.3%) engaged with one or more components of the "Run-Fueled" application, with over 70% of runners that completed the assessments rating the tips and resources as engaging, effective, and able to facilitate dietary change. Runners' reporting dietary change consistent with their nutrition goals exhibited higher application use.

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

Effect Of Pre-sleep Whole-food Or Protein Beverage On Morning Metabolism In Active Women

Samantha M. Leyh, Brandon D. Willingham, Daniel A. Baur, Lynn B. Panton, FACSM, Michael J. Ormsbee, FACSM. *Florida State University, Tallahassee, FL.*
(No relevant relationships reported)

Dietary protein consumed as a liquid supplement pre-sleep has been shown to increase next-morning resting metabolism without blunting fat oxidation. However, the influence of whole-food protein consumed pre-sleep on metabolism is unknown. **PURPOSE:** To determine the effect of a whole-food protein (cottage cheese, CC) consumed pre-sleep on next-morning resting energy expenditure (REE), respiratory exchange ratio (RER) and appetite compared to an isocaloric/isonitrogenous liquid casein protein (CP) supplement and a placebo (PL) in active women. **METHODS:** In a beverage-blinded, randomized, cross-over design, ten active (physical activity ≥4 days/wk for at least 12 m) women (age, 23.1 ± 1.9 yrs; body fat, $22 \pm 4.6\%$; means ± SD) consumed pre-sleep CC (160 kcals, 30g protein, 10g carbohydrate, 0g fat), calorie and nitrogen matched liquid CP, or PL (0 kcals) 30-60 min pre-sleep. Participants arrived at 1800 h for an overnight stay in the lab. 30-60 min prior to participants' normal bed time and 2 h after a standardized meal, participants consumed CC, CP, or PL and then immediately underwent measurements of REE and RER for 30 min. Upon waking the next morning (0500-0800 h) measurements of REE and RER were repeated and subjective measures of appetite (visual analog scale) were recorded. Testing occurred during the follicular phase of menstrual cycle. Statistical analyses were conducted using repeated measures ANOVA. Significance was accepted at p ≤ 0.05. **RESULTS:** There were no significant differences in acute REE (CC, 1725±327; CP, 1718±214; PL, 1691±265 kcal/d, p=0.95) or acute RER (p=0.56) or morning REE (CC,1396±293; CP, 1361±175; PL, 1432±216, kcals/d, p=0.79) or morning RER (p=0.52). Subjective measures of appetite were not different between groups. **CONCLUSION:** In active women, pre-sleep consumption of CC does not alter REE or RER more than a CP or PL beverage. These data suggest the form of the nutrient does not alter the metabolic response.
Supported by Florida State University and Dymatize Nutrition, Inc.

A-50   Free Communication/Poster - **Cognition and Emotion**

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

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

The Acute Effects Of A 30-min Moderate Aerobic Exercise On Autonomic And Inhibitory Control

Yiu-Man LEE, Stanley Sai-chuen HUI, FACSM. *The Chinese University of Hong Kong, Hong Kong, Hong Kong.* (Sponsor: Prof. Stanley Sai-chuen HUI, FACSM)
(No relevant relationships reported)

High frequency component of heart rate variability (HF-HRV) is a promising biomarker of the autonomic nervous system to reflect the brain-heart integration and control of behavior that can inform research and clinical applications.
PURPOSE: The current study aims at exploring whether inhibitory control will be changed after a 20-min bout of moderate cycling exercise plus 5-min warm-up and

5-min cool-down. The study hypothesizes that subjects who demonstrate greater HF-HRV reactivity (i.e. larger HF-HRV decrease) under a mental stress evoked by a Stroop color-word test, will perform better on the Stroop tasks.
METHODS: Thirty-two healthy Chinese young male adults (mean age: 21.2 years old) participated in two separate testing sessions. The first session involved baseline VO2max test; and in the second session, participants were randomly assigned to either an exercise intervention or no exercise (control) condition. For the exercise intervention group of participants, computerized Stroop color-word test was conducted before and after the intervention to examine the acute effects of aerobic exercise on inhibitory control. HRV was measured during the Stroop tasks by using the Electrocardiogram (ECG), which was recorded via two bipolar electrodes that were placed on the left and right chest of the participants. ECG was sampled continuously with a rate of 1000 Hz.
RESULTS: Two-way repeated measures MANOVA showed significant Intervention X Time interaction on Response Time (RT) of the Stroop tasks ($p < 0.01$). Furthermore, significant Intervention X Time interaction on HF-HRV differences was revealed between the exercise intervention and control groups on the Stroop tasks ($p < 0.01$). Exercise group performed significantly faster RT on Stroop tasks at post-test than the Control group ($p < 0.05$). Larger decrease of HF-HRV during mental stress had a positive relationship with RT of the Stroop tasks.
CONCLUSION: A 30-min acute moderate aerobic exercise could elicit inhibitory control for young adults. The studies manifested the potential physiological mechanism between central nervous system and autonomic nervous system which were reflected by HRV index, likely being influenced by acute aerobic exercise in enhancing an individual's inhibitory control.

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376   Board #217   May 30 11:00 AM - 12:30 PM

Physical Fitness and Cognitive Performance in Women

Julia R. Rebellon, Meir Magal, FACSM, Daniel Henderson, Christina Huber, Abigail Leonard, Lyndsay Wolfe, Andrea Tobar, Sierra Hayden, Shannon K. Crowley. *North Carolina Wesleyan College, Rocky Mount, NC.*
(No relevant relationships reported)

PURPOSE: Cognitive impairment (including dementia and Alzeimer's disease) affects approximately 1/3 of women over the age of 75. Studies suggest that increased levels of physical activity are associated with preserved cognitive function, however, the mechanisms by which physical activity may prevent or delay cognitive decline remain elusive. Chronic psychosocial stress has been proposed as a potential contributor to cognitive decline, and research suggests that exercise training may help to buffer the negative effects of stress. However, to date, there has been limited investigation of the stress-related mechanisms underlying the relationship between physical fitness and cognitive performance in women. This study aimed to investigate relationships among physical fitness, cognitive performance, and physiological responses to mental stress in women, while experimentally controlling for ovarian cycle phase effects on the stress response. **METHODS:** Following a two-tiered screening process, healthy women (18-45y) who were medication-free and had regular menstrual cycles completed: (1) an enrollment visit, (including assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise), and (2) a mental arithmetic stressor [(the Paced Auditory Serial Addition Task (PASAT)], where hemodynamic stress responses were recorded. Mental stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which can profoundly influence the physiological response to stress. **RESULTS:** Results from this study (n = 28) showed that higher levels of physical fitness were associated with greater cognitive performance on fast (r = 0.42, p = 0.02), and moderate (r = 0.33, p = 0.08; trend) stimulus presentation rates of the PASAT. Consequently, higher levels of physical fitness were also associated with lower HR during the PASAT (r = -0.41, p = 0.03). **CONCLUSIONS:** Our results suggest that physical fitness is associated with improved cognitive performance in women, which may be explained by improved sympathetic nervous system (e.g., HR) activity during mental stress. Whether exercise training may help to delay cognitive decline via its impact on physiological stress responding will require further investigation.

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

The Acute Effect Of Endurance Exercise On An Executive Function Task In Middle-age And Older Adults

Brandon A. Yates[1], Ariela R. Orkaby[2], Ekow Dadzie, Jr.[3], Elaine C. Lee[3], Lawrence E. Armstrong, FACSM[3]. [1]*Spaulding Rehabilitation Hospital, Cambridge, MA.* [2]*VA Boston Healthcare System, Boston, MA.* [3]*University of Connecticut, Storrs, CT.* (Sponsor: Lawrence Armstrong, PhD, FACSM, FACSM)
(No relevant relationships reported)

Middle-age and older adults are encouraged to participate in regular physical activity to counteract age-related declines of cognitive function. Acute aerobic exercise bouts of 10-60 minutes have been reported to improve key domains of cognition such

as executive function within this population. However, it is unknown if prolonged exercise bouts, which induce great cardiovascular stress and fatigue, elicit similar improvements in cognition. **PURPOSE:** To investigate the acute effects of prolonged endurance exercise on executive function in middle-age and older adult recreational cyclists. **METHODS:** This field study was conducted at the Hotter'N Hell Hundred cycling event (HHH) in Wichita Falls, Texas (ambient temperature, 26°C mean, 30°C maximum; relative humidity, 75% mean, 93% maximum). Sixty recreational cyclists (52±9 y) were enrolled following informed consent. All cyclists were screened for mild cognitive impairment via Mini-Cog assessment (4±1). Physical function was assessed utilizing a 3-meter usual gait speed measurement (1.08±0.16 m/s). At baseline (i.e., 1 day before HHH), participants were familiarized with the executive function pencil-paper test (Trail Making A and B Tests, TMT) and anthropometric measurements were recorded (14±5 % body fat, 28.4±5.1 kg body mass). Cyclists completed TMT prior to and immediately following the HHH event. Ratings of perceived exertion (RPE) were collected at 0, 98, and 164 km and total exercise time was determined at the finish line. Pre- and post TMT scores were compared via paired T-test and all data are presented as mean±SD. **RESULTS:** After the HHH 164-km endurance cycling event, there was a significant improvement (i.e., faster completion time; p<0.001) of executive function (pre vs post, 83±26 vs 75±21 s). The mean RPE at cessation of exercise was 16±2 and mean total event time was 6.15 ±1.25 h. **CONCLUSION:** An acute bout of prolonged, moderate intensity endurance exercise (> 6h) increased performance of an executive function task in a cohort of middle-age and older adults. This suggests that such exercise may provide chronic improvements in attention, working memory, and cognitive flexibility which counteract age-related declines of cognitive function.

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

Experimental Effects of Acute Exercise on Episodic Memory Acquisition: Decomposition of Multi-Trial Gains and Losses

Eveleen Sng, Emily Frith, Paul Loprinzi. *University of Mississippi, Oxford, MS.*

(No relevant relationships reported)

PURPOSE: Research demonstrates that acute exercise may enhance retention of multi-trial episodic memories. This work has examined the effects of exercise on the mean level of memory recall. However, no study has examined whether exercise can influence the acquisition of new items, which was the purpose of this experiment. **METHODS**: Using a randomized controlled trial design, participants completed either a high-intensity bout of treadmill exercise for 15-min (n=22) or sat for 15-min (n=22) prior to completing a multi-trial episodic memory task (RAVLT). This task involved recalling 15 words for 6 successive trials, as well as after a 20-min delay (Trial 7). The performance on the multiple trials was categorized into gains (items not recalled on Trial n that were recalled on Trial $n+1$) and losses (items recalled on Trial n that were not recalled on Trial $n+1$). **RESULTS**: The exercise group recalled more words on Trial 6 (11.4 vs. 9.7; P=.009) and after the 20-min delay (10.9 vs. 9.4; P=.01). The exercise group (vs. control) had a smaller proportion of losses from Trial 3-4 (10.4% vs. 20.3%; P=.04) and had a greater proportion of gains from Trial 5-6 (38.5% vs. 14.8%; P=.01). **CONCLUSIONS**: The exercise-induced multi-trial memory effect may be influenced by greater item gains and fewer item losses from exercise.

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

EMF Stimulation As Passive Exercise Improves Cognition And Psychomotor Activity In Senescent Rats

Timea Teglas[1], Gabriella Dörnyei[2], Karoly Bretz[1], Csaba Nyakas[1]. *[1]University of Physical Education, Budapest, Hungary. [2]Semmelweis University, Budapest, Hungary.*

(No relevant relationships reported)

PURPOSE: During advanced aging passive exercise (PE) is becoming a valuable therapeutic intervention to improve physical and mental performances. In the present study chronic PE (electromagnetic field stimulation, EMF-S) was introduced to rats reaching the senescent age of 32 months in order to develop a translational model for supporting healthy aging, attenuating cognitive decline and to clarify the mechanism of action of EMF-S on brain and muscle tissues during advanced aging. **METHODS:** Male Wistar rats were treated with EMF-S for six weeks, 3 times per week, 24 min per sessions prior to the age of 32 months. The doses of stimulation were: 45, 95 and 1250μT (Santerra MCR System, Pinding, Germany). Psychomotility (horizontal and vertical ambulation in novel environment) was estimated in open field (OF), the attention ability in novel object recognition (NOR) test, and spatial learning, reference and working memories, in Morris water maze (MWM) tests. **RESULTS:** OF: EMF stimulation enhanced novelty-induced motility, especially that of vertical type after both the middle and high doses (p<0.05 at both doses). NOR: EMF-S increased attention after middle and high doses (p<0.001 and p<0.01, respectively) reflecting an enhanced attentional capability based on memory enhancement. MWM: passive exercise facilitated the working memory type spatial learning in this test and the

highest dose of 1250μT was clearly effective (ANOVA, p=0.024). **CONCLUSION:** The results obtained on cognitive tasks showed that EMF stimulation as PE is effective in senescent age to improve cognitive and psychomotor function in rats. In the age of 32 months rodents showed rather deteriorated cognitive functions in our earlier studies. Furthermore, it may be added that the highest dose of 1250μT did not uncover undesirable side effects on the brain, which is promising for a wider therapeutic window. The results support the notion that PE may complete dementia prevention program in elderlies. These animal studies can provide options to study the cellular and molecular mechanisms behind this treatment helping human interventions. Supported by OTKA Grant K116511 in Hungary

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

Effects of Acute Exercise on Stress-Induced Memory Function

Pamela Ponce, Dylan Delancey, Emily Frith, Paul D. Loprinzi. *University of Mississippi, University, MS.*

(No relevant relationships reported)

PURPOSE: Acute exercise during the memory consolidation stage can enhance memory, whereas acute psychological stress post-memory encoding has been shown to impair episodic memory function. However, no study has evaluated whether acute exercise during memory consolidation can attenuate the detrimental effects of psychological stress-induction on memory retrieval, which was the purpose of this experiment. We also evaluate potential gender-specific effects, which has yet to be explored in this context. **METHODS:** Forty-four university students completed a between-group randomized control trial. Participants completed the WMS-III Logical Memory sub-test prior to moderate-intensity walking for 15 minutes, or sitting for 15 minutes. After walking or sitting, participants completed an oral presentation per the Trier Social Stress Test (TSST) method, and then re-completed the memory assessment. **RESULTS:** There was no group x time x gender interaction effect (F=1.52; P=0.22), but there was evidence of a group x gender interaction (F=4.11; P=0.04). In both groups, men had a greater decline in memory function from the TSST. From pre- to post-assessment, respectively, male participants' Logical Memory scores decreased from 16.31 (3.4) to 14.54 (3.7), whereas female participants' scores remained more stable 17.89 (2.9) to 17.28 (3.1). **CONCLUSIONS:** These findings suggest gender effects extend to paragraph and logic-based memory performance, as men experienced a larger decline in memory function following a social stressor, irrespective of an acute exercise response.

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381   Board #222   May 30 11:00 AM - 12:30 PM

The Effects of Acute Exercise on Working Memory and Delay Discounting

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(No relevant relationships reported)

Given the choice, people tend to prefer immediate rewards over delayed rewards. This tendency to devalue rewards with increasing delays to their receipt is referred to as delay discounting. Previous research has demonstrated an inverse relationship between working memory capacity and delay discounting. Furthermore, an acute bout of moderate intensity exercise has been shown to improve working memory and thus could potentially alter discounting. Increased delay discounting has been associated with a variety of unhealthy behaviors, such as smoking, drug abuse and obesity. Therefore, intervention strategies aimed at reducing such impulsive decision-making would be advantageous across a variety of domains. To date, research has focused on the effects of prolonged exercise interventions on reducing discounting, but the effects of acute bouts of exercise remain unexplored. **PURPOSE:** To examine whether an acute bout of moderate intensity exercise improves working memory and subsequently decreases delay discounting. **METHODS:** Twenty-four healthy young adults (13 men, 11 women, age 18-35) participated. A repeated measures design was utilized in which participants first completed questionnaires assessing physical activity and impulsiveness. They then completed a 30-minute treadmill run at 65% Heart Rate Reserve or rest period. Following exercise, participants completed an intertemporal choice task, measures of working memory (*n*-back) and mood (PANAS). **RESULTS:** Preliminary results revealed exercise related changes in mood, specifically increases is positive affect and decreases in negative affect following exercise compared to rest. However, no differences in working memory performance or delay discount rates were observed between conditions. Future directions examining the influences of individual differences and acute vs. prolonged exercise interventions are discussed. **CONCLUSION:** These preliminary data suggest that although prolonged exercise interventions may effectively reduce delay discounting, an acute bout of moderate intensity exercise does not. These findings inform strategies for eliciting exercise-induced changes in decision-making and highlight the importance of intervention duration.

382   Board #223   May 30 11:00 AM - 12:30 PM

The Effects Of Pilates On Cognitive Functions In Middle-aged Women

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(No relevant relationships reported)

Pilates is a popular form of exercise for women, and previous studies have shown its effectiveness for improving physical and psychological health. Pilates is a mindful approach to exercise, stimulating awareness of body structure, muscle recruitment, and body alignment during movement. Thus, Pilates requires concentration on the body. However, the effects of Pilates on cognitive functions remain unknown.
PURPOSE: This study aimed to investigate the effects of Pilates on cognitive functions in middle-aged women through a randomized clinical trial.
METHODS: Forty-four middle-aged women (average age: 56.4 ± 7.3 yrs) were randomly divided into Pilates (n = 22) and control groups (n = 22). Pilates classes were performed for 60 minutes twice per week for 10 consecutive weeks. The control group underwent health education sessions three times during the intervention. Prior to the intervention and 10 weeks afterwards, cognitive functions were assessed by the Trail Making Test A/B and Stroop Color-word test. Repeated-measures analysis of variance was performed to compare between-group changes.
RESULTS: There were no significant differences between the Pilates and control groups for any measured variables (P > 0.05) despite Trail-Making Test B significantly improving from pre- to post-Pilates classes (61.5 ± 22.0 to 52.2 ± 9.6 sec; P = 0.02; Cohen's d = 0.55) without significant changes during the control phase (64.9 ± 16.3 to 62.4 ± 12.3 sec; P = 0.53). There were no changes in Trail-Making Test A. Stroop interference time significantly weakened in both groups (Pilates: 154.6 ± 124.6 to 216.7 ± 95.6 msec; P < 0.01, control: 166.0 ± 133.0 to 258.0 ± 88.3 msec; P < 0.01) because only the neutral task significantly improved (Pilates: 1016.5 ± 159.2 to 918.0 ± 134.7 msec; P < 0.01, control: 1014.8 ± 163.2 to 887.5 ± 168.1 msec; P < 0.01).
CONCLUSIONS: Although there were no significant between-group differences, the Pilates group showed improvement in Trail-Making Test B. Further large clinical trials are warranted to determine the effectiveness of Pilates for improving cognitive functions.

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

Trade-off Between 30-minute Physical Activity And 1-hour Revision Time

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(No relevant relationships reported)

One of the major barriers for promoting physical activity (PA) in children is the general belief about the negative impact of PA on academic achievement. PA was then being scarified for extra study time and/or replaced by sedentary activity.**PURPOSE**: To explore the relationship between PA, revision time, and mathematics achievement among Chinese adolescents.
METHODS: A total of 16 secondary schools were randomly invited in Hong Kong. Within an academic year, 781 grade 9th Chinese students' PA level, revision time afterschool, and mathematics achievement were measured twice with 9 months apart (start: T0; end: T1). Comparing the responses from a self-reported questionnaire (PAQ-A) between the two time-points, participants were categorized into Increasing-PA (IPA), Decreasing-PA (DPA), and Unchanged-PA groups. The longitudinal changes of mathematics test scores were examined between IPA and DPA groups using two-way repeated measures ANCOVA, adjusted for gender, family income, and revision time. PA-group and revision time were put into the regression analysis to investigate the explained variance of academic performance change.
RESULTS: Significant Time x PA-group interaction effect on mathematics score (F=4.36, p=0.04) was observed. Significant improvement was found in IPA participants. In the multiple linear stepwise regression model, mathematics score change was significantly regressed on revision time (B=0.05, t=2.64, p=0.01) and PA-group (B=3.35, t=2.27, p=0.03) with R-square at 5.09%.
CONCLUSIONS: Both revision time and PA level statistically predicted the change in mathematics achievement. Spending more time on PA did not necessarily deteriorate academic performance. More importantly, compared to the positive impact of increasing revision time (about 1 hour per day) on mathematics, an increment of relatively little time in PA (about 30 minutes daily) may bring similar effect in addition to physical fitness enhancement. However, other learning areas have not yet been examined.

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

Does False Feedback Alter Performance in an Anaerobic Maximal Test Among Healthy Young Adults?

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(No relevant relationships reported)

It has been observed that extrinsic factors, such as music or verbal encouragement, can influence performance while exercising. It has yet to be determined if this effect is present in supra-maximal efforts. **PURPOSE**: to determine whether positive feedback (PF) or negative feedback (NF) prior to a maximal anaerobic exercise test improves or degrades performance. **METHODS**: 23 college aged adults were recruited for a two-day exercise protocol and were randomly divided into a PF or NF group. Day one: participants were oriented with the Wattbike Pro cycle ergometer and underwent a 30-second anaerobic test of power (in line with a Wingate test of power). Day two: Participants had a 24 hour-2 week window in which they could perform the second trial. Prior to the second trial participants were informed they performed better (PF) or worse (NF) than a hypothetical average prior to their second 30-second anaerobic test of power. **RESULTS**: Both PF and NF groups observed a significant improvement in peak power (p=0.03, p=0.02 respectively), and average power (p=0.042, p=0.035 respectively). Additionally, there was a significant improvement in power/mass ratio among the NF group (p=0.026). There was no difference in peak or average power between groups among the day 2 trial (p=0.95, p=0.18, respectively). **CONCLUSIONS**: PF or NF prior to a maximal anaerobic test of power improved peak and average power. It is theorized that the improvement among the PF group corresponded to an increase in self-efficacy; while the improvement among the NF group was related to a desire to perform at or above the fabricated average.

385   Board #226   May 30 11:00 AM - 12:30 PM

Increased Exercise Activity In An Enriched Environment Improves Anxiety-like Behavior And Cognition.

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(No relevant relationships reported)

An enriched environment consists of complex housing with increased space and a variety of toys, which results in enhanced exercise activity and social interactions. Housing rodents in the enriched environment are known to improve both anxiety-like behavior and cognition. However, the contribution of increased exercise activity to such a functional plasticity are less clear. **[Aim]** The aim of the present study was to examine effects of increased exercise activity in the enrich environment on anxiety-like behavior and cognition. **[Methods]** Wistar rats were housed in the two different housing groups [standard environment (SE) group (N = 22); enriched environment (EE) group (N = 22)]. EE contained a slope, a small hut, three tunnels, and a running wheel such that exercise activity was increased. Exercise activity was continuously recorded using three-axis accelerometers for 6 weeks. The accelerometers were embedded in the back. The animals were submitted to the elevated plus maze (EPM) and Morris Water Maze (MWM) tests to assess anxiety-like behavior and spatial learning and memory. The muscle hypertrophy was evaluated from immunostained (MHC IIa) cross-section area (CSA). All experimental data were expressed as mean ± standard deviation. Comparisons were performed using a t-test. The level of significance was set at p < 0.05. **[Results]** Exercise activity was higher in the EE group compared with the SE group in light period. All hindlimb muscle wet weights per BW were greater in the EE group compared with the SE group. Moreover, the CSA of MHC IIa in the soleus muscle increased in the EE group (EE: 1729 ± 224 μm², SE: 1589 ± 144 μm², p < 0.05). In the EPM test, time spent in open/closed arms was significantly increased in the EE group ($39.4 \pm 15.8\%$, p < 0.05) than the SE group ($24.0 \pm 15.1\%$). This result suggests that anxiety-like behavior was reduced in the EE groups. On the third day of the MWM test, escape latency was reduced in the EE group (11.50 ± 1.87 sec) than the SE group (17.93 ± 3.40 sec, p < 0.05), which indicates that spatial learning and memory was improved in the EE group. **[Conclusions]** Increased exercise activity in the enriched environment improves anxiety-like behavior and spatial learning and memory.

386   Board #227   May 30 11:00 AM - 12:30 PM

The Role of Low Frequency Power in the Relationship Between Exercise and Memory

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(No relevant relationships reported)

PURPOSE: Acute exercise (AE) has been shown to have a positive effect on memory performance, however these results are not always observed. Although some studies control for factors such as age and gender, there may be physiological factors that affect memory and the relationship between AE and memory and that may help explain inconsistent results. Low-frequency power (LF) has been suggested as a marker of baroreflex sensitivity (BRS), which is associated with memory performance. We aimed to investigate the influence of LF in the relationship between AE and memory. METHODS: 68 active adults (M=21.9, SD=3.9 yrs) were randomly assigned to 4 groups in relation to a memory task: 20-min AE prior (n=17), 20-min AE after (n=15), 10-min AE prior and 10-min AE after (n=19), and no exercise control (n=17). Baseline heart rate (HR) was collected for 5-min in the seated position, and R-R intervals were reduced to LF. AE consisted of cycling at 55-65% HR reserve and the memory measure was the Rey Auditory Verbal Learning Test 24-hr recall. RESULTS: A significant group x LF interaction was found ($F(3,60)=2.79$, $p=.048$); LF was associated with 24-hr recall for the control group ($r(15)=.637$, $p=.006$), but not for the exercising groups (p>.05). Post-hoc tests revealed benefits to 24-hr recall only for the groups that exercised before (M=10.295, SE=0.59) or both before and after (M=10.10, SE=0.57) memory tasks compared to control (M=7.72, SE=0.60, $p=.002$, $p=.004$, respectively). CONCLUSION: Evidence supports that baseline LF, as a marker of BRS, is associated with memory. Importantly, activating the sympathetic nervous system, through AE, prior to encoding appears to disrupt this relationship and improved memory performance.

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387   Board #228   May 30 11:00 AM - 12:30 PM

The Effect of Acute Aerobic Exercise on Attention and Affect in Middle-Aged Women

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(No relevant relationships reported)

PURPOSE: To explore the effect of one bout of moderate intensity aerobic exercise on attention and affect in healthy middle-aged women. **METHODS**: Five healthy women, age 55.2 ± 8.9 years, BMI 30.2 ± 4.4 kg/m2, and percent body fat 35.5 ± 5.7% completed a 30-minute session of aerobic exercise on the cycle ergometer at a workload corresponding to 60% of VO2peak. Subjects also completed a 30-minute control session on the cycle ergometer at 0 Watts. Before and after both 30-minute sessions, participants completed two computerized tests of attention: The Digit Span Test and the Flanker Task. Performance on the Digit Span was assessed by examining the mean forward digit span and mean backward digit span achieved. Performance on the Flanker Task was assessed by examining the error proportion and mean reaction times for incongruent and congruent trials. Participants also completed the Activation Deactivation Adjective Checklist (AD-ACL) to assess affect (i.e. energy, tiredness, calmness, and tension) before and after both 30-minute sessions. **RESULTS**: Repeated-measures ANOVAs indicated that participants achieved a significantly higher forward vs. backward mean digit span (mean difference: 0.7 ± 0.2, p = 0.046) and that mean digit span performance significantly improved from pre- to post-session (mean difference: 0.5 ± 0.2, p = 0.033). Participants displayed a larger decrease in error proportion from pre- to post-session for the incongruent vs. the congruent trials of the Flanker Task (p = 0.058), as well as a significant decrease in mean reaction time pre- to post-session (mean difference: -23.0 ± 6.8 ms, p = 0.028) that was more pronounced for the congruent vs. the incongruent trials (p = 0.08). Participants also reported feeling significantly more energetic and less tired from pre- to post-session on AD-ACL subscale scores (mean differences: 3.5 ± 0.9, p = 0.013 and -4.7 ± 1.8, p = 0.052, respectively). **CONCLUSIONS**: Exploratory results suggest that 30 minutes of aerobic exercise may positively impact some aspects of attention in middle aged women. Participants reported feeling more energized and less tired after 30 minutes of activity. Additional ongoing investigation is needed to more clearly understand the impact of acute aerobic exercise on cognitive function in this population.

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388   Board #229   May 30 11:00 AM - 12:30 PM

Exercise Training Related Changes in Verbal Fluency in Healthy Older Adults and Mild Cognitive Impairment

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(No relevant relationships reported)

We have previously reported that exercise training (ET) in older adults diagnosed with mild cognitive impairment (MCI) is associated with increased functional connectivity of the default mode network (Chirles et al., 2017), increased cortical thickness (Reiter et al., 2015), decreased cortical activation during semantic memory retrieval and increased episodic memory performance, but no change in verbal fluency (Smith et al., 2013). Verbal fluency, which refers to producing words from a specific category (e.g., starts with F), involves selecting words by inhibiting competing alternatives (e.g., phone). It is not known if the ET influences the total score or the complexity of the words produced. **PURPOSE**: The purpose of this study was to examine the effects of a 12-week walking ET intervention on the frequency and complexity of words produced during a phonemic fluency task. **METHODS**: Seventeen MCI participants and 18 cognitively intact controls completed a 12-week ET intervention consisting of supervised treadmill walking at a moderate intensity. Before and after ET, participants completed a phonemic verbal fluency task as part of a larger neuropsychological battery. Total word count and complexity of responses, measured by word frequencies and syllable length, were examined. **RESULTS**: There was no change in total word count. However, both groups produced words with greater frequency after ET (p = .016, partial eta-squared = .163). In addition, participants diagnosed with MCI produced words with fewer syllables after ET, an effect not observed in healthy controls (interaction p = .034, partial eta-squared = .129). **CONCLUSIONS**: These findings suggest 12-weeks of walking exercise training may modify lexical retrieval strategies, with a greater reliance on more frequently appearing words, and in the case of MCI, words that have fewer syllables. Our past finding of reduced semantic memory activation after ET suggests improved neural efficiency. These results could be interpreted similarly if producing more frequent and shorter words is adaptive and more efficient in the face of demands to quickly produce words under a time constraint. It is plausible ET is related to enhanced cognitive control by inhibiting competing words and facilitating a search for easier words to speak.

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389   Board #230   May 30 11:00 AM - 12:30 PM

Effects Of An Acute Bout Of Resistance Exercise On Cognitive Performance In Young Adults

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(No relevant relationships reported)

There is overwhelming support for enhanced cognitive performance (CP) as a result of an acute bout of aerobic exercise. However, there is less research, and the research is less clear regarding the effects of an acute bout of resistance exercise (RE) on cognitive performance. **PURPOSE:** To investigate the effect of an acute bout of high-intensity RE on reaction time (RT), working memory (WM) & inhibition (IC) - parameters of CP. To determine if there were sex differences for RE & CP, & to examine the relationship between CP & RE-Total Load (TL). **METHODS:** 23 healthy males (9) & females (Age = 21.7±1.8 yrs) volunteered. Day 1: body composition (Bodpod) and VO_2 max were assessed (HRmax = 189.6 +/-5.4 b/min, VO_2max = 49.0+/-7.3 ml/kg/min, BF% = 18.1+/-6.5). Day 2: Ss completed an initial battery of CP tests (imPACT) & then completed 1-repitition maximums (1-RM) for 7 Res that made-up the RE routine. Days 3&4: Ss underwent either 30 minutes of semi-reclined Rest (R) or the RE routine. The RE routine consisted of 2 consecutive sets (12 reps) of each RE at 75% 1-RM, followed by 1min of R. R & RE routine order was counter-balanced. Days 2, 3&4 were separated by 1wk. Prior to (PreR & PreEx) & following R & RE routine (PostR & PostEx) Ss performed the imPACT assessment for CP. 4(Conditions) X 2(Sex) ANOVAs with Repeated Measures & *a priori* contrasts were used to test for significant main effects & interactions for the CP variables. **RESULTS:** T-Tests confirmed Males (M) exhibited higher VO_2max, TL, RE-VO_2 & lower BF%. PreEx-PostEx RT (526+/-60ms - 510+/-58ms) was significantly reduced (p<0.02), whereas PreR-PostR RT (525+/-53ms - 532+/-67ms) & PreR-PreEx RT (525+/-53ms - 526+/-60ms) did not differ significantly. None of the CP variables differed by Sex. RT-change (PreEx-PostEx) & TL & RE-VO_2 were not significantly correlated. **CONCLUSION:** Following a single-bout of a high-intensity RE routine, RT was significantly reduced for M & F. However, WM & IC did not differ significantly following RE or R for M or F. M exhibited greater VO_2 & VCO_2 in response to greater TL, however the change in RT (PreEx-PostEx) was not related to TL the entire group or for M or F.

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

The Impact of Music and Attentional Focus on Muscular Activation

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(No relevant relationships reported)

Neuromuscular efficiency is improved during exercise when attention is focused externally on the effects of movement, rather than internally on the generation of movement. Music is a form of external attentional focus which may yield additional psychological benefits during exercise. The impact of music on neuromuscular efficiency remains to be fully investigated. **PURPOSE:** To determine the effects of music and other attentional focus conditions on muscular activation and psychological response to single-joint isometric exercise. **METHODS:** Apparently healthy subjects (N = 23; 12 men) completed an isometric elbow flexion task (40% of predetermined 3RM) for 1 min in three randomized, counterbalanced conditions: internal focus (INT), external focus with a simple distraction task (EXT), and external focus listening to music (MUS). Muscle activation of the biceps (BI) and triceps (TRI) brachii were recorded at 15 s intervals using a 4 channel Delsys EMG system, and were used to compute cocontraction ratio (CCN). Heart rate (HR) was measured throughout the exercise tasks and recorded at 15 s intervals. Psychological characteristics of perceived exertion (RPE), affective valence, task-motivation, and attentional focus were measured at the end of each trial using single-item scales. Repeated measures 3 (condition) x 4 (time) ANOVAs were used to analyze the physiological variables (BI, TRI, CCN, and HR). Psychological variables were compared across conditions using a series of one-way repeated measures ANOVAs. **RESULTS:** No significant interaction effect or main effect for condition was found for any of the physiological variables (p > .05), though there was a trend (p = .071, η2 = .12) for decreased HR with MUS (91.41 bpm) compared to INT (93.87 bpm). There was a significant main effect of condition on RPE (p = .002, η2 = .25), with a greater RPE in INT (13.87) compared to EXT (12.39) and MUS (12.61). **CONCLUSIONS:** The primary finding from the current study was that external focus, through both music and a distraction task, reduced the perception of effort during brief single-joint isometric exercise, despite the fact that muscle activation and physiological demand were unchanged.

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

The Influence Of Self-generated Emotions On Aerobic Physical Performance: An Investigation Of Happiness, Anger, And Sadness

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to test the influence of self-generated emotions on exercise performance during an aerobic workout on a cycle ergometer. **METHODS:** Sixteen males (Mean ± STDEV age = 23.1 ± 2.7 years; height = 162.7 ± 26.2 cm; weight = 82.6 ± 16.1 kg) performed 4 sessions of aerobic exercise on a cycle ergometer. A randomized within-subjects experimental design was used to test the hypotheses. The four randomized testing sessions included: the control (No-Emotion), sadness (SAD), happiness (HAPPY), and anger (ANGRY). Cycle ergometer seat heights for subjects were measured and used for each session. Subjects performed a 3-min warm-up, a 15-min workout on the cycle ergometer at a 2.5 kg resistance, and a 3-min cool-down. Subjects were instructed to stop pedaling on the cycle after the warm-up and take 1-2 min to begin self-generating the emotion being tested. Subjects alerted testers when ready to begin workout. Flexibility was measured and recorded before and after testing. Heart rate (HR) was observed and recorded before testing, every 3 min during exercise, and immediately after exercise. Blood pressure (BP) measurements were taken before and immediately after each testing session, and at the 5 min, 10 min, and 15 min mark following cycling exercise. **RESULTS:** No significant condition main effect for systolic and diastolic BP was observed, but there was a significant time main effect (p < .05). HR values were significantly higher during the ANGRY session compared to the values recorded during the No-Emotion and SAD sessions (p < .05). Participants covered significantly longer distance during the ANGRY condition compared to all other conditions (p < .05). **CONCLUSIONS:** Self-generation of angry emotion during aerobic exercise resulted in significant increases in heart rate and distance traveled compared to all other emotions tested. Increased performance during the ANGRY session could be due to increased sympathetic nervous system activity and/or hormonal changes such as epinephrine, norepinephrine, and cortisol leading to a temporarily altered state of consciousness similar to a situation that is perceived as a threat or danger. Further studies should investigate the effects of emotion on hormonal changes, performance, and hemodynamic responses during long-distance events such as a 10K and marathon.

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

Assessment Of Knee And Ankle Proprioception In Young And Old Adults Using The AMEDA

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(No relevant relationships reported)

Proprioception is often associated with neuromuscular abilities and injury prevention in older persons. While several methods exist for testing proprioception, most instruments are impractical and assess joint position sense (JPS) in an artificial environment. The Active Movement Extent Discrimination Apparatus (AMEDA) offers a low-cost alternative to evaluate JPS in a natural standing environment. **Purpose:** To compare the active proprioception of the lower limbs and ankles in healthy young (YG) and older individuals (OG) using the AMEDA. **Methods:** Forty-four persons (YG: n=22, OG: n=22) participated in the study. During lower limb (hip, knee) testing, participants were asked to touch a rear bar before kicking forward to strike a stop board placed at one of three positions (11cm, 16cm, 22cm). For the ankle, the foot was inverted to one of three angles (1=12o; 2=14o; 3=16o). Our testing included 3 conditions: condition 1 (C1=no difference between sequential positions), condition 2 (C2=minimal differences between sequential positions), and condition 3 (C3=maximal difference between sequential conditions). Participants were asked to identify all positions while blindfolded over the course of 50 trials. Two two-way ANOVA (condition) x (group) were used to examine the number of errors within each group at each joint position. **Results:** The YG made significantly more errors than the OG for the left lower limb during C1 and C3 (p < .05). Furthermore, for the YG, the number of errors decreased from C1 through C3 (p<.05). The YG also produced significantly more errors than the OG in C1 for the left and right ankles (p<.05). The OG made more errors during C2 then any other condition for both ankles (p<.05). **Conclusion:** The YG made more JPS errors then the OG. These findings are contrary to the proposition that proprioception decreases with age. Based on these findings, older individuals appeared to be more aware of their knee and ankle joint positions. These differences may be attributed to the OG paying greater attention to their movement patterns during day to day activities as a precaution to reduce fall risk.

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

During- Versus Post-Exercise Affective Forecasts: Some Affective Forecasts Are More Important than Others

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(No relevant relationships reported)

An affective forecast is the prediction of how positive or negative one will feel in response to a future event. Researchers have identified a positive relation between affective forecasts and exercise behavior. **PURPOSE:** The purpose of this study was to determine whether forecasts about pleasure experienced during an exercise bout are more strongly related to behavior and intentions than forecasts about pleasure experienced after an exercise bout. **METHODS:** A four-item scale was generated to assess forecasted affect, both during and after a future exercise bout (Cronbach's α = .97 and .98, respectively). These items consisted of bipolar visual analog scales (e.g., "I will feel terrible" to "I will feel wonderful"). Participants (N = 250, 51% men, 48% women, 1% non-binary, age: 36 ± 12 years) were randomly assigned to either (1) forecast their affect during their next exercise bout (i.e., "How will you feel during your next exercise session?"), or (2) forecast their affect 10 minutes after their next exercise bout ends (i.e., "How will you feel 10 minutes after your next exercise session?"). Participants also indicated the number of minutes of aerobic exercise they completed in the previous week and how many minutes they intend to complete in the next week. **RESULTS:** Forecasts about during-exercise affect were more strongly related to exercise intentions than forecasts about post-exercise affect (r = .49 vs. r = .22, Z = 2.34 p = .01). Likewise, forecasts about during-exercise affect were more strongly related to past exercise behavior than forecasts about post-exercise affect (r = .46 vs. r = .22, Z = 1.99, p = .02). **CONCLUSIONS:** Forecasts about post-exercise affective states explained 4.75% and 5.01% of the variance in exercise intentions and past behavior, respectively. However, forecasts about during-exercise affective states explained 23.52% and 20.70% of the variance in exercise intentions and past behavior, respectively. Researchers should consider more specific measures of affective forecasts; these data indicate that predictions about how one will feel at different times (e.g., during and after an exercise experience) are differently related to exercise behavior and intentions. Further, specifying a time point may help reduce participant confusion and measurement error.

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

Effects Of Mental Fatigue Induced By A Continuous Cognitive Task On Attention Abilities Of Athletes

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(No relevant relationships reported)

Athletes need to maintain high concentration of attention in training and competition, while mental fatigue could damage their concentration, response and motor control abilities. However, there is a lack of research exploring the effect of mental fatigue on specific attention abilities of athletes.
Purpose: The present study is aimed to explore the effect of mental fatigue on athletes' selective attention and involuntary attention from the evidence of behavioral and ERPs.
Methods: Thirty elite tennis players (16 male, 14 female) were randomly selected and separated into Experiment Group (EG, n=15, age 21.08±1.5) and Control Group (CG, n=15, age 20.92±1.04). The athletes in EG were in mental fatigue after 1 hour of Flanker task, while the athletes in CG relaxed and kept themselves clear-headed for 1 hour. Heart rate variability (HRV), behavioral index and Rating of Perceive Exertion (RPE) were measured to detect players' mental fatigue during Flanker task which was divided into 4 periods (each stage 15 min). Selective attention (P3b) and involuntary attention (P3a) were evoked by novel auditory oddball task before and after the Flanker task.
Results: The accuracy of behavioral data was significantly different in 4 periods (F=35.83, $p<0.001$). The RPE score was higher in EG than CG (F=47.62, $p<0.001$). The time domain (rMSSD) and frequency domain (LF, HF and LF/ HF) in HRV data showed significant difference between the EG and the CG in all periods. Such, the mental fatigue was induced after the Flanker task. In the auditory oddball task, the reaction time was prolonged after the fatigue was induced (371.13±100.21ms vs. 388.07±93.64ms, t = 4.878, $p<0.01$). ERPs data showed that, after the fatigue-inducing task, P3a (19.290μV vs. 14.836μV, F=6.749, $p<0.05$) significantly decreased, indicating the impaired involuntary attention. Meanwhile, the P3b amplitude decreased and the latencies (15.373μV vs.12.036μV, F=10.451, $p<0.05$) at Fz, Cz and Pz sites increased significantly, indicating that the selective attention was impaired.
Conclusion: One hour of continuous cognitive task could induce psychological fatigue. Athletes' involuntary attention and selective attention were damaged after mental fatigue.

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

Effects of Sedentary Behavior and Physical Activity on Cognitive Function are Conferred by Cortical Thickness

Evan Pasha, Takashi Tarumi, Tsubasa Tomoto, Marcel Turner, Justin Repshas, Rong Zhang. *University of Texas Southwestern Medical Center, Dallas, TX.*

(No relevant relationships reported)

Effects of Sedentary Behavior and Physical Activity on Cognitive Function are Conferred by Cortical Thickness
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Physical activity and aerobic fitness may have positive impacts on brain structure and function in older adults. Conversely, sedentary behavior may have negative effects.
PURPOSE: To determine associations of sedentary behavior with cerebral cortical thickness and neurocognitive function in older adults in cognitively normal older adults (NC) and patients with mild cognitive impairment (MCI).
METHODS: We tested 28 NC and 50 MCI participants matched for age, sex, and education. Participants wore a 3D accelerometer for 1 week to measure daily physical activity levels. Minutes spent in sedentary behavior (<4.0METs) and moderate-to-vigorous physical activity (MVPA) (>5.0METs) were recorded.
RESULTS: Sedentary behavior and MVPA were associated with cortical thickness in multiple brain regions within the default mode network. The effects of sedentary behavior on Trails B performance were mediated through left middle temporal gyrus (B=0.0017, SE=0.0010, 0.0002 to 0.0046 95% CI) and right frontal pole (B=0.0027, SE=0.0013, 0.0006 to 0.0058 95%CI) cortical thickness. MVPA (B=-0.011, SE=0.0070, -0.0304 to -0.0006 95%CI) positively impacted Trails B through left middle temporal gyrus thickness. California Verbal Learning Test cued recall was negatively affected by sedentary behavior (B=-0.00026, SE=0.0013, 0.0006 to 0.0058 95%CI), but positively affected by MVPA (B=0.0012, SE=0.0008, 0.0001 to 0.0033 95%CI) through right superior parietal cortical thickness. Cognitive status moderated the association of sedentary behavior with left posterior cingulate thickness (interaction, p=0.02) and MVPA to right supramarginal gyrus thickness (interaction, p=0.04) with greater effects occurring in NC.

CONCLUSION: Sedentary behavior is associated with reductions in cerebral cortical thickness which lead to impairment in memory and executive function in older adults. Sedentary behavior may be more detrimental to individuals with normal cognitive function.

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

Don'T Forget To Exercise: The Effects Of Different Forms Of Exercise On Memory

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(No relevant relationships reported)

Acute bouts of exercise have been shown to positively affect memory. Although the majority of previous research has focused on the effects of exercise on retrospective memory, recent findings suggest resistance exercise may enhance prospective memory. The impact of yoga on prospective memory has not been previously examined.
PURPOSE: This study examined the effects of different forms of exercise on prospective memory (i.e., the ability to remember to execute tasks in the future) and retrospective memory (i.e., the ability to remember previously learned information).
METHODS: 145 students were randomly assigned to one of four groups: 1) treadmill running (R) (n=37), 2) kettlebell resistance exercise (K) (n=32), 3) yoga (Y) (n=35), or 4) sitting (S) (control group) (n=41). After exercising or sitting, participants completed a one-hour battery of neuropsychological tests that included two prospective memory tests: 1) an episodic prospective memory test (the reminder test) and 2) a habitual prospective memory test (the difficulty ratings test). To assess retrospective memory participants completed 1) a verbal memory test (CVLT-II) and 2) a visuospatial memory test (BVMT-R). Participants in the R, K, and Y groups performed video-guided exercise at a moderate level of intensity (50-70% of HHR) for 20 minutes, with a 5-minute warmup and a 5-minute cooldown. Participants in the S group watched an exercise video while sitting for 30 minutes. **RESULTS:** There was no significant effect of exercise on the habitual prospective memory test [$F_{(1,140)}$=.64, p=.59], but there was a significant effect of exercise on the episodic prospective memory test [$\chi_{(3)}$=8.30, p=.04]. Follow-up tests indicate that aerobic exercise led to fewer episodic prospective memory failures (11%) than resistance exercise (41%), yoga (31%), or sitting (27%). No significant effects were detected on either retrospective memory test [CVLLT-II, $F_{(3,141)}$=.71, p=.55; BVMT-R, $F_{(3, 141)}$=.48, p=.70]. **CONCLUSION:** Prospective memory is positively affected by exercise among college students. In contrast to previous findings, aerobic exercise specifically (but not resistance) appears to enhance prospective memory. This discrepancy may be due to differences in the time at which the prospective memory instructions were administered in the two studies.

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

Relationship between Affective State and Enjoyment of Acute Exercise

Battogtokh Zagdsuren, Colleen L. Geary, Hayley V. MacDonald, Mark T. Richardson, Jonathan E. Wingo, FACSM, Phillip A. Bishop, FACSM, James D. Leeper, Frances A. Conners. *The University of Alabama, Tuscaloosa, AL.* (Sponsor: Jonathan E. Wingo, FACSM)

(No relevant relationships reported)

Increasing exercise adherence is one of the main challenges in lifestyle interventions. Although the affective response to exercise has been investigated extensively, it is unclear whether one's enjoyment of exercise is influenced by pre-exercise affective state. **PURPOSE:** To evaluate the relationship between pre-exercise affective state and enjoyment of acute bouts of walking of varying durations. **METHODS:** Regularly active college-aged participants (n=29; mean ± SD age=21±2 y) completed 3 counterbalanced exercise sessions involving moderate-intensity (3–5 METs) walking for 5, 10, and 30 minutes, respectively. Participants completed the Positive and Negative Affect Scale pre-exercise and Physical Activity Enjoyment Scale (PAES) immediately post-exercise. **RESULTS:** Positive affect (PA) was similar across walking bouts (28.9±6.9). Pre-exercise PA was not associated with PAES after 5 min of walking (r=0.35, p=0.07). In contrast, there was a significant association between PA and physical activity enjoyment following both the 10- (r=0.45, p=0.02) and 30-min (r=0.73, p<0.001) walking bouts. **CONCLUSION:** Pre-exercise PA appears to influence physical activity enjoyment experienced following acute walking bouts lasting 10 min or more, an effect that was strongest following the longest walking duration.

A-51   Free Communication/Poster - **Cognition and Emotion, Special Populations**

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

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

Cognitive Function And Quality Of Life: Relationships In Individuals With And Without Spinal Cord Injury

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(No relevant relationships reported)

Cognitive decline is a problematic secondary complication of spinal cord injury (SCI), arising from chronic hypotension, undiagnosed brain injury, medications, or other systemic causes. In many other patient populations (the elderly, multiple sclerosis, Alzheimer's disease), mild cognitive decline exerts a negative effect on quality of life (QOL). People with chronic SCI often report lower QOL than the general population, but the potential influence of cognitive function is unknown. **PURPOSE:** The purpose of this study is to examine relationships between cognitive function and QOL in individuals with and without SCI. **METHODS**: Individuals (n = 25) with and without SCI rated QOL with two global scales (EQ-5D, PROMIS physical/mental health), and two SCI-validated scales (Secondary Health Conditions Scale (SCS-M), SCI-QOL). Cognitive function was assessed using NIH Toolbox (Dimensional Change Card Sort, Flanker Inhibitory Control & Attention, List Sorting Working Memory, Picture Sequence). **RESULTS**: Subjects with SCI rated physical function QOL dimensions (EQ-5D, PROMIS physical health, SCS-M) lower than non-SCI subjects (all p < 0.0002). QOL dimensions relating to mental/emotional function (PROMIS mental health, SCI-QOL Positive Affect & Well-Being (PAWB), Anxiety, Depression, Resilience) did not differ between groups (all p > 0.14). Subjects with SCI reported greater Pain Interference and lower Ability to Participate than non-SCI subjects (both p < 0.011). In non-SCI subjects, correlations existed between cognitive test scores and certain QOL domains (Resilience R^2 = 0.46 to 0.72; PAWB R^2 = 0.29 to 0.51). No correlations between QOL and cognition emerged for participants with SCI. **CONCLUSIONS**: Individuals with SCI may report high mental/emotional QOL despite reporting low QOL on domains related to physical function and participation. Relationships between cognitive function and QOL were not observed in participants with SCI, despite robust associations in those without SCI. The relationship between the QOL domain Resilience and the cognitive trait "executive function" warrants further investigation. Supported by R01HD084645 and R01HD082109. REDCap access (Institute for Clinical and Translational Science) provided via the National Center for Advancing Translational Sciences (U54TR001356).

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

Both Combined And Aerobic Training Improve Cognitive Function In Hypertensive Elderly

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(No relevant relationships reported)

Aging process and diseases such as hypertension contributes to cognitive impairment. Exercise training has been extensively recommended due to its benefits to the cognitive function in elderly. Inconsistent findings in the literature related to the better exercise training program for learning, executive functions and memory. **PURPOUSE:** Compare the effects of two different exercise program (combined vs. aerobic) on cognitive function of hypertensive elderly. **METHODS:** Hypertensive medicated elderly (age 65.5±4, mini-mental state examination 25.4±3, geriatric depression scale 3.5±2.2, PAS 133.8±20, PAD 84±11) were allocated to combined training (CT, n=17), composed by resistance exercises to the main muscle groups (15 rep) twice/week and the aerobic exercises at 50min walking on a treadmill at 60% VO_2 reserve, three times/week, or to Aerobic Training (AT, n=13) composed by the same aerobic protocol, or to the control group (CG, n=19) which received no treatment. Cognitive function of the three groups were performed before and after 16 weeks of interventions or control period. Groton Maze Learning Test (GML) was used to assess spatial memory executive function (Working memory, attention and inhibitory control), along with Shopping list (ISL) for auditory learning and latter memory recall. We compared delta of groups by ANOVA One-way followed by Hochberg post hoc test and by Kruskal-Wallis following by Mann-Whitney for parametric and non-parametric data, respectively. Data is presented in mean ± standard deviation. **RESULTS:** There was larger GML rule-break error reduction (P<0.05) for CT (-2.7±6) and AT (-2.7±4) compared to CG (2.3±4). There was a tendency (p<0.07) to improve recording short auditory memory (ISL) after CT (1.5 ± 2) when compare to CG (0.0±0). No differences were found for latter recall. Furthermore, CT (-2.6±2) reduced more depression scores (P<0.05) compared to AT (-0.7±0) and CG (0.16±1). **CONCLUSIONS:** The reduction in rule-break errors suggest CT and AT improve attention, inhibitory control and working memory and only CT improve short term auditive memory in hypertensive elderly individuals. The improvement in short-term memory could be associated with the improved attention which could be also dependent of lower depression score in this group.

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

Mismatch Between Perception of Disability and Functional Outcomes in Individuals with Large Burn Injuries

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(No relevant relationships reported)

Functional limitation can be a serious problem in burn survivors. Such individuals report physical limitations following a burn injury which leads to a perceived reduction in health-related quality of life that persists years after the initial injury. **Purpose:** We tested the hypothesis that well-healed burn survivors having prior burn injuries covering a large body surface area will have greater subjective and objective functional limitations compared to those with prior injuries covering a small body surface area. **Methods:** Subjective information was collected through the SF-36 questionnaire, with a focus on the physical function domain. Objective measurements of functional ability included a maximal aerobic capacity test, timed-up-and-go, five times sit-to-stand, and timed stairs test. These variables were collected in three experimental groups: 8 individuals (2 female) with burn injuries greater than 50% (high burn, HB) of their total body surface area (TBSA); 9 individuals (5 female) with burn injuries covering less than 50% (low burn, LB) of their TBSA; and 7 (3 female) non-injured control subjects (CON). **Results:** Analysis of the perception of limitations in Physical Function from the SF-36 revealed a statistically significant difference between groups (P=0.0014). Further post hoc pairwise testing revealed that SF-36 Physical Function scores were higher in the CON group (99±2, p=0.002) and LB group (93±9, p=0.02) when compared to the HB group (71±19). No difference was found in the SF-36 Physical Function scores between the LB and control groups (p>0.99). Of note, this pattern of differences in the perception of physical limitations between the experimental groups was not reflected in the functional measurements. Specifically, no significant differences were identified in maximum aerobic capacity (CON:32±10, LB:27±5, HB:29±5 ml/kg/min, p=0.65), five times sit-to-stand (CON:9±2, LB10±2, HB:10±1 s, p=0.26), timed up-and-go (CON:13±3, LB:13±2, HB:14±2 s, p=0.51), and timed stairs test (CON:11±2, LB:11±1, HB:11±2 s, p=0.85). **Conclusion:** Collectively, these data suggest that in burn survivors with injuries covering greater than 50% of their TBSA, perceived physical limitations do not reflect objective measures of functional ability. Supported by NIH Grant GM068865

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

Effects of Acute Aerobic Exercise on Cognitive Function in Individuals with Down Syndrome

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(No relevant relationships reported)

Individuals with Down syndrome (DS) commonly exhibit a mild to moderate level of cognitive impairment, which further affects quality of life in this population. Regular aerobic exercise has been shown to improve cognitive function among individuals with and without DS. However, if an acute bout of moderate intensity aerobic exercise has cognitive benefit in individuals with DS has yet to be explored. **PURPOSE**: To investigate the effect of an acute bout of aerobic exercise on cognitive function in individuals with and without DS.
METHODS: Forty volunteers with and without DS (DS=20, 25 yrs; Control=20, 25 yrs) participated in this study. VO2peak was obtained via indirect calorimetry by an individualized maximal exercise treadmill protocol. Participants exercised at 60% of maximal capacity for 20 min on a separate day. Cognitive function tests (task completion time and accuracy of task completion, A Quick Test for Cognitive Speed, AQT) were measured before, immediately after, and 30 min after the submaximal walking bout. Individuals without DS performed an additional cognitive function test, the Flanker test, to avoid the known ceiling effect of the AQT.
RESULTS: Individuals with DS exhibited impaired cognitive function compared to individuals without DS with slower task completion time and higher error rate. (p < 0.05 for both). AQT components, task completion time and error rate, were not altered after 20 min of treadmill exercise in either group. However, improved reaction time and error rate on the Flanker test (immediate; 30 min post), suggest exercise positively benefited cognitive function among those without DS. (p < 0.05).

WEDNESDAY, MAY 30, 2018

CONCLUSIONS: Our results indicate that individuals with DS may need a higher intensity or longer exercise time for cognitive improvement. In addition, in-depth cognitive function testing may be more sensitive in detecting changes with exercise in individuals with DS.

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402   Board #243   May 30 11:00 AM - 12:30 PM

The Effects of Cardiovascular Health on Cognitive Function in Older Adults

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(No relevant relationships reported)

Aging is associated with a decline in cognitive and psychomotor functions, resulting in difficulties with daily activities such as driving. Cognitive function has been found to be associated with carotid intima-media thickness (IMT) and aortic stiffness (carotid-femoral PWV, cfPWV). These age-related decrements can be mitigated through routine aerobic exercise.
PURPOSE: To determine the effects of life-long aerobic exercise on cognitive function, driving performance, and cardiovascular health among older adults (65 – 84 years old). **METHODS:** A cross-sectional design was utilized to compare 27 endurance-trained (ET) with 35 sedentary (S) older adults (70±5yrs). Older adults were excluded from the study if they were classified as having stage II hypertension, diabetes mellitus, cardiovascular diseases, or currently taking more than 1 medication for blood pressure or cholesterol. Driving performance and cognitive function were measured via driving simulator and a cognitive battery, respectively. Cardiovascular health consisted of assessing estimated VO_2max, carotid IMT, and cfPWV. Fitness comparisons were made using an independent sample t-test. Cognitive function and driving performance scores were transformed to Z-scores. **RESULTS:** VO_2max was higher among ET than S (41±9 vs 25±3 ml/kg/min, p<.01). BMI was higher among S than ET (26±4 vs 24±4, p<.01) There were no differences in brachial systolic blood pressure (131±13 vs 132±19 mmHg), cfPWV (12±2 vs 12±2 m/s), carotid-IMT (.74±.15 vs .76±.13 mm), and cognitive function scores (-.01±.57 vs -.09±.97) between the groups. However, ET performed better on the driving simulator (.18±.58 vs -.28±.92, p<.05). Carotid IMT and cfpwv were moderately associated (r = .38, p < .01). VO_2max was no associated with age, carotid IMT, or cfpwv. **CONCLUSION:** Enhanced cardiorespiratory fitness may mitigate age-related decrements in driving performance independently of central artery structure and function.

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403   Board #244   May 30 11:00 AM - 12:30 PM

Longitudinal Investigation of Daily Physical Education on Fitness Levels and Processing Speed among Minority Youth

Brooke E. Huhn, Julian A. Reed, Caroline E. Stanton. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)
(No relevant relationships reported)

PURPOSE: To examine the impact of 45 minutes of daily physical education on the fitness levels and Processing Speed among minority elementary school youth. **METHODS**: An analysis of variance (ANOVA) univariate linear model was used to evaluate the effectiveness of 45 minutes of daily physical education on physical fitness and Perceptual Speed among youth in grades 2 through 5 attending Legacy Early College, a Title I school in the southeastern United States. Gain scores (post-test assessment in May 2017 -- pre-test assessment in September 2015) were calculated, stratified by ethnicity and gender, and analyzed for significance. The interaction between school and time was estimated for each outcome. Each analysis was stratified by gender and adjusted by age to control for baseline differences by school. Control school students received physical education only once per week. **Summary of RESULTS**: Legacy students demonstrated significant gain increases on 3 of 3 (p<0.05) FITNESSGRAM[R] assessments. Legacy females improved on the number of laps during the Progressive Aerobic Cardiovascular Endurance Run (PACER) (Gain Score=10.58; F=7.766; df =1; p=0.007), number of push-ups (Gain Score=4.09; F=15.030; df =1; p=0.000), and number of curl-ups (Gain Score=13.69; F=19.619; df =1; p=0.000). Legacy males improved on PACER laps (Gain Score=15.97; F=10.355; df=1; p=0.002), number of push-ups (Gain Score=4.16; F=19.030; df=1; p=0.000), number of curl-ups (Gain Score=14.79; F=24.138; df=1; p=0.000), and 3 of 4 Perceptual Speed sections. Most notably, significant increases were observed in the Total section (Gain Score=15.43; F=8.294; df=1; p=0.005). **CONCLUSION**: 45 minutes of daily physical education led to an increase in physical fitness levels and Processing Speed among minority elementary school youth attending Legacy Early College.

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404   Board #245   May 30 11:00 AM - 12:30 PM

Investigation Between Daily PE, Fluid Intelligence, Fitness and BMI among Middle School Youth Over Time

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(No relevant relationships reported)

Developmental research has demonstrated that higher cognitive abilities are often linked to physical activity participation. **PURPOSE**: The purpose of the study was to examine the impact of 45 minutes of daily physical education on Fluid Intelligence, fitness levels and BMI among middle school youth. **METHODS**: An analysis of variance (ANOVA) mixed effect linear model was used to evaluate the effectiveness of 45 minutes of daily physical education on Fluid Intelligence, Progressive Aerobic Cardiovascular Endurance Run (PACER), push-ups, curl-ups and BMI among youth in grades 6th-8th attending Legacy Early College, a Title I school in the southeastern US. Gain scores (final post-test assessment in May 2017 - original pre-test assessment in September 2014) were calculated and analyzed for significance. The interaction between school and time was estimated for each outcome. Each analysis was stratified by gender and adjusted by age to control for baseline differences by school. A Title I control school that provided physical education for only one semester was identified and utilized as a comparison. **Summary of RESULTS**: Legacy Early College students observed gain increases on Fluid Intelligence sections, significantly the Total Section, (Gain Score=10.31; F=5.920; df=140; p=.016) over time. Legacy students observed gain increases in PACER laps, push-ups and curl ups, over time compared to controls. Legacy students also observed decreases in BMI over time, compared to gain increases in controls. **CONCLUSIONS**: 45 minutes of daily physical education led to increases in Fluid Intelligence, PACER laps, push-ups and curl-ups, as well as decreases in BMI among Legacy middle school students from 2014 to 2017.

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405   Board #246   May 30 11:00 AM - 12:30 PM

Lasting Effects of Acute Exercise on Working Memory Performance in Older Adults with Long and Short Sleep

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(No relevant relationships reported)

BACKGROUND: A growing body of research indicates that acute exercise in older adults is associated with enhanced executive function, including inhibitory control and working memory. However, most studies have measured cognition shortly after the exercise session, and whether or not acute exercise has longer lasting cognitive benefits in older adults has not been established.
PURPOSE: To investigate executive function performance 1.5 hours after a single session of exercise, compared to rest, in healthy older adults; and to secondarily determine if sleep moderates these effects.
METHODS: 24 healthy older adults (65.8±8.1 years) completed two experimental sessions on different days that entailed 30-min of seated rest or moderate intensity exercise on a Monark cycle ergometer. Ninety minutes after exercise and rest, participants performed the Stoop Color and Word Task (Stroop) to measure inhibitory control and the Symbol Digit Modalities Test (SDMT) to for working memory. To examine sleep, participants wore an actigraphy watch for at least three days prior to the first experimental session.
RESULTS: SDMT performance following acute exercise (60.0±9.6) was significantly better compared to rest (57.7±8.9) [p = .049, η^2 = 0.146]. Moreover, oral SDMT performance was significantly better after exercise compared to rest in short sleepers (< 7.5 hr/night) [p < .001, η^2 = 0.885], but did not differ between exercise and rest in long sleepers (> 7.5 hr/night) [Condition*Sleep interaction, p = .047, η^2 = 0.174]. Short sleepers also significantly performed better in written SDMT after exercise relative to rest [p = .004, η^2 = 0.583]. Stroop interference score (incongruent minus congruent) was not significantly different between exercise and rest conditions.
CONCLUSION: These findings suggest that working memory performance is enhanced up to 1.5 hours after acute exercise in older adults who sleep less. Future studies should explore whether these effects of acute exercise confer a long-term protection against cognitive decline in older adults with poor sleep.

406   Board #247   May 30 11:00 AM - 12:30 PM

Cognitive Performance Changes After 12 Weeks Of Strength Training In Elderly Overweight Women

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(No relevant relationships reported)

Healthy aging is a challenge to the world population, not only due to age related cognitive impairment but also dinapenia and sarcopenia which can affect strength dependent activities. Therefore, it is of interest to evaluate the effects of strength training concurrent with cognitive performance. The purpose of the study was to determine the effect of 12 weeks of strength training on cognitive performance changes in overweight older women. Twenty-one elderly overweight women were recruited and divided into a Control group (n = 5) and Intervention Group (n = 16). Participants had body mass, height, body mass index (BMI), waist circumference, waist to height ratio, Upper Lean Limbs (ULL) Lower Lean Limbs, (LLL) and cognitive performance measured. To evaluate differences between the control group and intervention group, a 2-way ANOVA with Tukey's post hoc comparison was used. The results indicate that after the intervention period with strength training, there were no differences in anthropometric variables. However, significant differences were found (p ≤0.05) in ULL, LLL and cognitive performance. Strength training in elderly overweight women exerts positive effects on upper and lower limb strength and also increases cognitive performance.

407   Board #248   May 30 11:00 AM - 12:30 PM

Associations Of Objectively Measured Physical Activity With Executive Functioning In Chinese Young Adults

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(No relevant relationships reported)

Purpose: The purpose of study was to examine the associations of objectively measured physical activity with executive functioning in Chinese young adults.
Methods: Participants were 162 university students (45.7% females, mean age =19.0 ± 1.1 years) recruited from a university in Shanghai, China. Participant's daily physical activity was measured by hip-mounted accelerometers (Actigraph wGT3X-BT, Pensacola, FL, USA). The accelerometer data were analyzed using Actilife 6 software (Pensacola, FL, USA). Executive functioning was assessed by a task-switching paradigm programed using E-Prime 2 professional (Psychology Software Tools, Inc., Sharpsburg, PA, USA). Global switch costs and local switch costs were derived and used as the outcomes of the task. Anthropometrics were measured using standardized procedures.
Results: After controlling for wear time of accelerometers, age and gender, moderate-to-vigorous physical activity (MVPA, β = -0.19, 95% CI, -0.35 to -0.03, p = 0.02) and light physical activity (LPA, β=-0.17, 95% CI, -0.34 to -0.01, p = 0.04) were associated with smaller global reaction time (RT) switch costs. The findings suggested that higher levels of both MVPA and LPA were associated with better task-switching performance, as indicated by smaller global RT switch costs. No significant association was observed between total PA and global RT switch costs, despite a trend toward near statistical significance (β = -0.15, 95% CI, -0.31 to 0.01, p = 0.06). PA indicators were not associated with global accuracy switch costs, and no associations were observed between PA indicators and local RT or accuracy switch costs. Taken together, the results indicated that higher levels of MVPA and LPA were associated with some aspects of executive functioning measured by a task-switching paradigm.
Conclusion: Higher levels of objectively measured MVPA and LPA were associated with better performance on some aspects of executive functioning in Chinese young adults.

408   Board #249   May 30 11:00 AM - 12:30 PM

The Effects Of High-Cadence Cycling On Emotional Recognition In Individuals With Parkinson'S Disease

Angela L. Ridgel, Sara A. Harper, Bryan T. Dowdell, Brandon S. Pollock. *Kent State University, Kent, OH.* (Sponsor: J Derek Kingsley, FACSM)
(No relevant relationships reported)

Parkinson's disease (PD) is a progressive neurodegenerative disease that can lead to cognitive dysfunction including deficits in emotional recognition, which is the ability to identify facial expression of happiness, sadness, fear, anger and disgust. This deficit has been shown to lead to difficulties in social interaction and communication. High cadence cycling is a unique rehabilitation modality that has been shown to improve motor function in PD, but it is not known how this modality alters cognition. **PURPOSE:** To examine if three bouts of high-cadence cycling improved emotional recognition in individuals with PD. **METHODS:** Individuals (N=17) completed three sessions of high cadence cycling, on a custom motorized stationary cycle, consisting of a 5-minute warm-up at 50 revolutions per minute (rpm), 30 minutes of high cadence cycling between 75-85 rpm, and a 5-minute cool down. Emotional recognition was assessed using a computerized cognitive assessment battery at baseline and after (post-test) the three cycling sessions. The percentage of accurately identified emotions and the average reaction time to correctly select an emotion (emotion bias) was used for the analysis. Z-scores were used for the analysis and negative numbers represented scores below expected normal values. **RESULTS:** Three bouts of high-cadence cycling resulted in a significant improvement in the accuracy of identifying emotions from baseline to post-test for disgust (0.007±1.2 vs. 0.71±1.17, p=0.013). There were also improvements in emotion bias from baseline to post-test for sad (-1.37±1.29 vs. -0.66±1.00, p=0.003), anger (-1.18±1.08 vs. -0.41± 1.21, p=0.006) and fear (-1.60±1.33 vs. -1.10±1.25, p=0.030), but there were no significant changes in emotion bias for disgust (-1.55±1.28 vs. -1.23±1.15, p=0.130). **CONCLUSIONS:** Three bouts of high-cadence cycling improved several measures of emotional recognition, specifically negative-bias emotions. These findings suggest that high-cadence cycling could be a valuable rehabilitation modality for improving emotional recognition and potentially social interactions in individuals with PD. Support: Kent State University's School of Health Sciences, Midwest American College of Sports Medicine, Ohio Parkinson Foundation Northeast Region Grant.

409   Board #250   May 30 11:00 AM - 12:30 PM

Impact of Physical Activity on Cognition in Older Mexican Americans

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*(No relevant relationships reported)*

Alzheimer's disease (AD) is a devastating public health problem that affects over 5.4 million Americans. Exercise is considered a modifiable risk factor for Alzheimer's disease and cognitive decline. Physical activity has been found to improve cognitive function in older adults. However, few studies have examined the relationship between self-reported PA and cognitive functioning in Mexican American elders.
PURPOSE: To examine to impact of PA levels (inactive vs. highly active) on cognition in Mexican Americans elders.
Methods: Data was analyzed from HABLE (Health and Aging Brain among Latino Elders), which is an epidemiological study of aging among Mexican Americans. The IPAQ-long form was administered to 361 cognitively normal participants (59+7yrs). IPAQ scores were stratified into two groups inactive and high PA. Cognition was assessed via neuropsychological test scores in five domains: Memory (Logical Memory I & II), Executive (CLOX 1, Trails A), Visual Spatial (CLOX 2, Trails B), Attention (Digit Span), Language (Animal Naming), and global cognition (MMSE). An independent samples t-test was used to compare inactive and high PA groups on cognitive performance.
RESULTS: The inactive group scored significantly lower on WMS III Logical Memory I (32+9 vs. 35+9, p<0.01), WMS III Logical Memory II (19+7 vs. 22+7, p<0.01), CLOX 1 & 2 (24+3 vs. 25+3, p<0.05), and MMSE (26+3 vs. 27+2, p<0.01). There were no significant differences found among the groups on Trails A (59+31 secs vs. 54+23 secs), Trails B (141+68 secs vs. 145+69 secs), Digit Span (11+3 vs.11+3), and Animal Naming (16+4 vs.17+4).
CONCLUSION: High levels of physical activity was associated with better performance in memory, executive functioning, and global cognition among Mexican American elders with normal cognition. Inactivity was associated with poorer cognitive performance.
Supported by NIH R01 AG054073 and The Alzheimer's Association AARG-16-442652.

410   Board #251   May 30 11:00 AM - 12:30 PM

Safety, Enjoyment, And Physiological Responses Of Kinect-based Exergames In Older Adults At Risk For Falls

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(No relevant relationships reported)

Exergaming has the potential to improve physical function, cognition and dual-task function, and could be an effective new strategy for reducing risk of falling in older adults. **PURPOSE:** To evaluate and test the safety, enjoyment, and physiological responses on custom Microsoft Kinect-based motion-tracking games that train specific dual-task function in older adults at risk for falls. **METHODS:** Community-dwelling older adults who reported current mobility difficulties or falling in the past year were included in the study. Participants played three newly developed exergames (Double Decision, Target Trackers, and Visual Sweeps, 5 minutes each) in random order. Heart rate (HR) was measured during each exergame, and blood pressure (BP), rating of perceived exertion (RPE) and rating of the Physical Activity Enjoyment Scale were recorded immediately after each exergame. Student t-tests were used to examine the differences in variables at resting state and during/after exercise. Repeated measure analyses of variance were used to examine the differences in variables among the three exergames. **RESULTS:** Seven participants (aged 76±6 years; 4 females) completed the study. The exergames did not cause any injuries. Average exercise HRs for Double Decision, Target Tracker, and Visual Sweeps were 87.57±6.58 bpm, 84.71±8.48 bpm, and 82.00±9.72 bpm; post-exercise BPs were 129.29±12.35/78.14±9.06 mmHg, 129.86±7.99/81.86±13.28 mmHg, 132.86±14.31/79.43±13.01 mmHg; post-exercise RPEs were 11.14±1.07, 10.14±1.21, and 9.86±1.86; and post-exercise enjoyment ratings were 81.22±0.14%, 90.61±0.18%, and 79.59±0.16%, respectively. Average exercise HRs were significantly higher than resting HRs for all three exergames (p<0.01). Visual Sweep had significantly lower average exercise HR compared to Double Decision (p<0.05) and Target Tracker (p<0.05), and there was a significant difference in post-exercise RPE between Double Decision and Target Tracker (p<0.05). There was a significant difference between Target Tracker and Double Decision in post-exercise enjoyment ratings (p<0.05). **CONCLUSION:** The newly developed exergames were safe, enjoyable, and light for older adults who are at risk for falls. Future intervention studies are needed to examine the benefits of exergames for this special population.
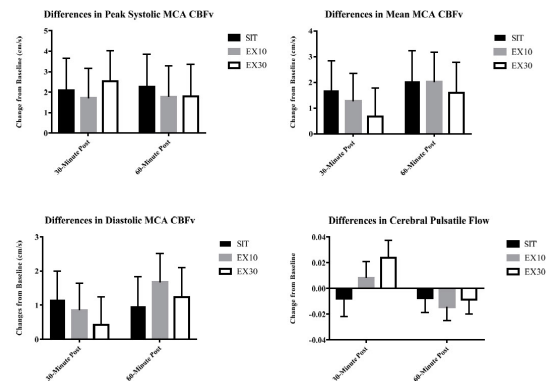
A-52   Free Communication/Poster - **Exercise Psychology, Neuroscience**

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

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411   Board #252   May 30 11:00 AM - 12:30 PM

Acute Dose-response Effects Of Aerobic Exercise On Cerebrovascular Hemodynamics

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(No relevant relationships reported)

Exercise may influence cerebrovascular hemodynamics. Few studies have evaluated acute effects of aerobic exercise on cerebral blood flow and cerebral pulsatile flow. **PURPOSE**: To evaluate acute effects of aerobic exercise on cerebrovascular hemodynamics following sitting, a 10-minute exercise bout and a 30-minute exercise bout. **METHODS:** Fifteen adults (age = 45.4±8.9 years) participated in this randomized crossover study comprised of three experimental sessions: 30 minutes of sitting (SIT), 20 minutes of sitting followed by 10-minutes of exercise (EX10), and 30-minutes of exercise (EX30). The exercise consisted of walking on a treadmill at 70-75% of age-predicted maximum heart rate. Cerebrovascular hemodynamics were measured using transcranial Doppler ultrasonography before the experimental session and at 30- and 60-minutes post-session. Beat-to-beat peak systolic, mean systolic and diastolic cerebral blood flow velocities (CBFv) as well as pulsatility index were recorded bilaterally for 1 min via insonation of the middle cerebral artery (MCA). **RESULTS**: Pulsatility index was 4.7% (P=0.08) higher in EX30 vs. SIT at the 30-minute but not the 60-minute post session assessment. There was no difference in pulsatility index at the 30 or 60-minute post-session between SIT and EX10 (P>0.33) or EX30 and EX10 (P>0.27). Peak systolic, mean and diastolic CBFv were not different across conditions at either post-session assessment (P>0.10). **CONCLUSIONS**: Exercise that is either 10 or 30 minutes in duration does not

improve cerebrovascular hemodynamics in the MCA within one hour of following the exercise session. Research may be necessary to understand affects cerebrovascular dynamics in response to acute and chronic exercise.

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412   Board #253   May 30 11:00 AM - 12:30 PM

Endocannabinoid Responses to Exercise in Individuals with Substance Use Disorders

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(No relevant relationships reported)

The endocannabinoid system (eCB) is downregulated in substance use disorder (SUD) patients. Pharmacologically targeting the eCB system has led to improved SUD treatment outcomes in both preclinical and clinical studies. Exercise is a non-pharmacological method of augmenting the eCB system in healthy adults, but it is unknown whether exercise can activate the eCB system in SUD patients. **PURPOSE:** To examine eCB responses to acute and chronic aerobic exercise in SUD patients. **METHODS:** Twenty-one SUD patients (35 ± 9 yrs) were recruited from local intensive outpatient treatment programs. Participants were randomized to either treatment-as-usual (TAU, at their outpatient clinic) or TAU plus aerobic exercise training (EX). EX participants engaged in supervised, moderate-intensity exercise sessions 3 x/wk for 6 wks. TAU participants came into the laboratory once per week for assessments and a quiet rest session. At 0- (baseline), 3- (mid), and 6- (post) wks, participants provided blood samples before and after exercise or quiet rest to assess plasma eCB concentrations (anandamide [AEA] and 2-arachidonoylglycerol [2-AG]). Data were analyzed using mixed model ANOVAs and Cohen's *d* effect size calculations. **RESULTS:** There was a significant group X time interaction for AEA (p < 0.001). Simple effects indicated that AEA increased acutely after exercise in the EX group (p < 0.001) but did not change after quiet rest in the TAU group (p = 0.39). There were no group differences or significant changes in 2-AG (p > 0.05). Effect size calculations indicated there were small to moderate increases in AEA (*d* = 0.36) and 2-AG (*d* = 0.37) concentrations from 0 to 6 weeks in the EX group but small to moderate decreases in AEA (*d* = -0.42) and 2-AG (*d* = -0.40) concentrations in the TAU group, though these changes were not statistically significant. **CONCLUSION:** These results indicate that aerobic exercise is able to activate the eCB system in SUD patients, which may contribute to improved treatment outcomes. Exercise may also increase basal eCB concentrations over time, suggesting that exercise could be one method to restore eCB function in SUD patients. Additional investigations with larger sample sizes and longer exercise program durations are warranted. Supported by NIH R36DA040140 and the UW Virginia Horne Henry Fund.

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413   Board #254   May 30 11:00 AM - 12:30 PM

Impact of High-Intensity Interval Exercise on Executive Function and Brain Derived Neurotrophic Factor

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(No relevant relationships reported)

PURPOSE: Prefrontal cortex (PFC)-dependent executive function (EF) is enhanced immediately following completion of high-intensity interval exercise (HIIE). Brain-derived neurotrophic factor (BDNF) is a key protein that enhances EF at rest and in

response to acute exercise. However, no studies have examined the possible utility of plasma and/or serum BDNF as a biomarker of improved EF in response to a single session of HIIE.

METHODS: Thirteen subjects performed the Wisconsin Card Sorting Task (WCST) to assess EF immediately following a 5 min seated rest and participation in a HIIE (10 x 20 s bouts of maximal cycling against 5.5% of the subject's body weight). Whole blood was collected prior to and immediately following HIIE and the WCST to assess plasma and serum BDNF concentrations.

RESULTS: HIIE increased the number of correct responses (p = 0.048) and reduced the number of total and non-preservative errors (p = 0.048; p = 0.027, respectively) on the WCST compared to the seated rest. Elevated plasma and serum BDNF concentrations prior to exercise were also associated with enhanced WCST performance during the seated rest, and in response to HIIE, BDNF concentrations in plasma, and to a lesser extent in serum, predicted a faster and more accurate performance on the WCST. However, while plasma BDNF concentrations were unaltered and serum BDNF concentrations increased in response to HIIE (F[2,48] = 6.759, p = 0.003), these response were not associated with improved WCST performance.

CONCLUSIONS: These data provide evidence supporting circulating BDNF in plasma, and to a lesser extent in serum, as a biomarker of enhanced PFC-dependent EF at rest and in response to HIIE.

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414   Board #255   May 30 11:00 AM - 12:30 PM

Effect Of A Single Session Of High-intensity, Resistance Or Combination Exercise Training On Neurotrophic Factors In Overweight Collegiate Men: The Brainfit Study

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(No relevant relationships reported)

PURPOSE: To compare the neurotrophic factor response following one session of high-intensity exercise, resistance training or both in a cohort of physically inactive overweight adults aged 18-30 years old.

METHODS: A randomized, parallel-group clinical trial of fifty-one men (23.6±3.5 years; 83.5±7.8 kg; 28.0±1.9 kg/m^2) who are physically inactive (i.e., <150 min of moderate-intensity exercise per week for greater than 6 months) and are either abdominally obese (waist circumference ≥ 90 cm) or have a body mass index ≥ 25 and ≤ 30 kg/m^2 were randomized to the following four exercise protocols: high-intensity exercise (4×4 min intervals at 85-95% maximum heart rate [HRmax] interspersed with 4 min of recovery at 75-85% HRmax) (n=14), progressive resistance training (25 to 30 repetitions per set, at 70% of one repetition maximum with 60 s of recovery) (n=12), combined high-intensity and resistance exercise (n=13), or non-exercising control (n=12). The plasma levels of neurotrophin-3 (NT-3), neurotrophin-4 (also known as neurotrophin 4/5; NT-4 or NT-4/5), and brain-derived neurotrophic factor (BDNF) were determined before (pre-exercise) and 1-min post-exercise for each protocol session.

RESULTS: Resistance training induced trivial increases in BDNF, NT-3 and NT-4/5 (15.5 ng/mL [95% CI, 1.2 to 32.3; d=0.14], 39.6 ng/mL [95% CI, 2.5 to 76.6; d=0.19], and 1.3 ng/mL [95% CI, 0.3 to 2.3; d=0.17], respectively). Additionally, combined training results in favorable effects on both BDNF (22.0, 95% CI, 2.6 to 41.5; d=0.19) and NT-3 (32.9, 95% CI, 12.4 to 53.4; d=0.25). In the per-protocol analyses, the combined training group but not the other interventions showed greater changes in BDNF (99.7, 95% CI, 22.4 to 176.7; d=1.01), NT-3 (89.9, 95% CI, 2.2 to 172.1; d=0.79), and NT-4 (7.5, 95% CI, 1.7 to 13.3; d=1.07) compared to the control group.

CONCLUSIONS: The findings indicate that acute resistance training and combined exercise increase neurotrophic factors in physically inactive overweight adults. Further studies are required to determine the biological importance of changes in neurotrophic responses in overweight men and chronic effects of these exercise protocols.

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415   Board #256   May 30 11:00 AM - 12:30 PM

Effects Of Prior Endurance And Resistance Training On PD: Role Of Autophagy And Apoptosis

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(No relevant relationships reported)

PURPOSE: To determine the relationship between autophagy and apoptosis in midbrain striatum in PD model mice and to investigate whether prior endurance and resistance training can intervene the pathogenesis.

METHODS: Male C57BL/6J mice aged 12 months were randomly divided into 3 groups: control (C), endurance training (E), or resistance training (R). E were exercised on a treadmill for 12 weeks. R was subjected to ladder training for 12 weeks. After training, each group was randomly administered with either MPTP (2*30mg/kg×2, i. p., 16 hr apart, M) or saline (S). Mitochondrial function, proteins in autophagy and apoptosis were measured in the midbrain striatum.

RESULTS: Compared with C, M suppressed mitochondria state 3 respiration (-42%, p<0.01) , respiratory control ratio (RCR, -44%, p<0.01) , and ATP synthesis activity (-40%, p<0.01); and elevated Beclin1 (+35%, p<0.05), LC3-II (+26%,p<0.05), BCl2 (+41%,p<0.01) , and BAX (+21%,p<0.05) protein levels(p<0.05). Both ME and MR significantly elevated mitochondria state 3 (+72%,+101%, p<0.01), RCR (+47%,+98%, p<0.01), and ATP synthesis activity (+27%,+45%, p<0.01), and elevated Beclin1 (+28%, p<0.05; +57%, p<0.01), LC3-II (+30%,+39%; p<0.05), BCl2 (+23%,+38%; p<0.01), and BAX (+30%,+48%, p<0.01) protein levles. MR increased mitochondria state 3 respiration (+16%, p<0.05), RCR (+34%, p<0.01), ATP synthesis (+14%, p<0.05), Beclin1 (+23%, p<0.01), LC3-II (+7%, p<0.05) , BCl2(+12%,p<0.05), BAX (+13%, p<0.05) protein levels , compared to ME.

CONCLUSIONS:MPTP can damage mitochondrial respiratory function in the midbrain and striatum possibly related to an up-regulation of autophagy and apoptosis. Prior training increases autophagy and apoptotic tendency in PD mice. Resistant training appears more effective in ameliorating autophagy and apoptosis and mitochondrial function. (Supported by NSFC No.31000523 and 31370021).

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416   Board #257   May 30 11:00 AM - 12:30 PM

Impacts of Cerebellar tDCS During a Dual-Task: Sustained Balance Improvement

Kira G. Oberle, Caroline J. Ketcham. Elon University, Elon, NC. (Sponsor: Dr. Eric Hall, FACSM)
(No relevant relationships reported)

The importance of accurate cognitive performance during a complex motor task is essential for professions including athletes, police and military personnel. Cerebellar transcranial direct current stimulation (tDCS) has been used as a low-cost, non-invasive technique to enhance performance of individuals in a variety of isolated motor and cognitive tasks but not in a dual-task. **PURPOSE**: The purpose of this study was to examine the effect of cerebellar tDCS during a dual task. **METHODS**: Twenty healthy college-age individuals completed this study. A baseline dual-task was conducted with participants completing four cognitive tasks: Reaction Time (simple, choice) and Working Memory (Stroop and N-Back) while simultaneously maintaining balance on an unstable BioDex Balance platform. Each participant received anodal (n=10) or sham (n=10) cerebellar tDCS at 1mA for a total of 40mA (~45mins). During this time, participants completed cognitive and balance training. Participants repeated the dual-task testing immediately following training, and again one week later. **RESULTS**: Results showed no differences in cognitive performance between the tDCS and sham groups (p>0.05). Balance continued to show improvements during the simple cognitive tasks in the tDCS group one week later (p<0.05). **DISCUSSION**: Overall there were limited dual-task performance improvements of cerebellar tDCS in a 45-minute training session. It is possible the dual-task was too complex and the training session too short for this population. There is potential of cerebellar tDCS in an athletic population who rely on peak performance in both cognitive and motor skills simultaneously.

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417   Board #258   May 30 11:00 AM - 12:30 PM

Aerobic Exercise Training Effects on NrF2 and the Antioxidant Defense System

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(No relevant relationships reported)

Nuclear factor erythroid 2 related factor 2 (NrF2), is an essential transcription factor and master regulator of the antioxidant defense system aiding in cellular protection and survival. **PURPOSE**: To determine the effect of chronic aerobic exercise on NrF2 and antioxidant factors in individual brain regions. **METHODS**: Male Sprague Dawley

rats (n=12-13/group), 6 weeks of age, were exercise trained (ET) or were sedentary controls (SD). The exercised rats ran on a treadmill using a ramped protocol for 5-7 weeks at an intensity equal to ~75% VO_{2max}. Five hours after the final exercise session rats were euthanized and the cortex, hippocampus, and cerebellum brain regions were collected and stored at -80°C until further analysis. NrF2 protein concentration was measured via western blot analysis. Total glutathione (TGSH) and reduced glutathione (GSH) concentration were measured via HPLC. Manganese superoxide dismutase (Mn-SOD) activity was measured using a spectrophotometric assay. All samples were analyzed in duplicate. The significance level was set a-priori at p<0.05 and the results are displayed as the mean ± SEM. **RESULTS**: Hippocampal NrF2 was significantly elevated with exercise (ET=3.62±0.20 vs. SD=2.28±0.10 arbitrary units), but was significantly reduced in the cortex (ET=3.20±0.24 vs. SD=6.39±0.26 arbitrary units) and cerebellum (ET=2.02±0.11 vs. SD=3.12±0.16 arbitrary units). TGSH and GSH significantly increased in the hippocampus (ET=182.76±4.64 vs. SD=135.54±4.89 umol/mg protein) (ET=178.94±4.59 vs. SD=131.36±4.83 umol/mg protein), respectively, but were unchanged in cortex and cerebellum regions. No significant differences were detected in Mn-SOD with aerobic exercise in any brain region. **CONCLUSIONS**: NrF2 and antioxidant factors were up-regulated in the hippocampus only with chronic aerobic exercise training compared to sedentary controls. However, other brain regions respond differently to aerobic exercise. This merits notation as the hippocampus is a primary brain region susceptible to neurodegenerative diseases.

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418   Board #259   May 30 11:00 AM - 12:30 PM
The Effects of Acute Aerobic Exercise On Primary Motor Cortical Excitability in Healthy Older Adults

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(No relevant relationships reported)

Age-related motor deficits are associated with a decreased ability to modulate primary motor cortex (M1) excitatory and inhibitory circuits. In young healthy adults, an acute bout of lower-limb aerobic exercise modulates upper-limb corticospinal excitability and intracortical circuitry. Importantly, these changes are associated with improved performance on skilled upper-limb motor tasks. However whether these effects extend to healthy older adults is not known. **PURPOSE:** To determine whether an acute bout of lower-limb aerobic exercise alters corticospinal and intracortical excitability using single and paired pulse transcranial magnetic stimulation (TMS) of the extensor carpi radialis muscles in healthy older adults. **METHODS:** Corticospinal excitability, short-interval intracortical inhibition (SICI), and intracortical facilitation (ICF) were assessed in 16 healthy older adults (10 female, aged 65.3 ± 6.4 years) at two time-points prior to (30 minutes pre- and immediately pre-exercise) and two time-points following an exercise bout (immediately and 30 minutes post-exercise) to evaluate the time course of cortical excitability modulation. The exercise bout consisted of 20 minutes of continuous cycling at moderate-intensity (50% peak power output (watts) from a maximal stress test performed in a pre-experimental session). **RESULTS:** Due to no significant difference between baseline time-points, the two pre-exercise time-points were collapsed to provide an average baseline value for all measures. To control for baseline fitness levels (VO2$_{peak}$), a one-way repeated measures ANCOVA revealed an increase in SICI by 12 ± 7% immediately after and by 11 ± 9% 30 minutes post-exercise compared to baseline levels ($F_{(2,14)}$=3.829, p=.034). There was no effect of exercise on any of the other measures. **CONCLUSION:** This study is the first to show that primary motor cortical inhibitory circuits may be modulated by a single bout of aerobic exercise in healthy older individuals. These findings imply that short bouts of moderate intensity exercise promote motor cortical plasticity in healthy older people.

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419   Board #260   May 30 11:00 AM - 12:30 PM
Pathways To Functional Hypothalamic Amenorrhea: Role Of Energetic And Psychosocial Factors

Nicole C. Aurigemma. *Pennsylvania State University, University Park, PA.* (Sponsor: Mary Jane De Souza, FACSM)
(No relevant relationships reported)

Functional hypothalamic amenorrhea (FHA) can occur due to the independent or combined effects of psychogenic and energetic stressors. In exercising women, research has primarily focused on energy deficiency related to restrictive eating as the cause of FHA while other psychogenic stressors known to contribute to FHA have been ignored. **PURPOSE:** To assess psychosocial and energetic factors associated with FHA in exercising women. **METHODS**: We performed a cross-sectional comparison of exercising women (≥2 hours/week, age 18-35 years, BMI 16-25 kg/m²) who were eumenorrheic or who had hypothalamic amenorrhea. Menstrual status was determined using daily urine samples assayed for estrogen and progesterone metabolites and menstrual calendars. Blood samples, exercise logs, DXA, and resting metabolic rate (RMR) testing provided data on metabolic hormones, physical activity, anthropometrics, and energy expenditure.

Psychosocial factors were assessed with these scales: Beck Depression Inventory (BDI), Dysfunctional Attitudes Scale (DAS), Daily Stress Inventory (DSI), Perceived Stress (PSS), Brief Resilience Coping Scale (BRCS), Profile of Mood States (POMS), Eating Disorder Inventory (EDI-3), and Three-Factor Eating Questionnaire (TFEQ). Differences between groups were assessed using ANOVA and Mann-Whitney tests. **RESULTS**: Participants did not differ with respect to weight, lean body mass, and fat free mass; however, amenorrheic women had significantly lower body mass index (p=0.010), percent body fat (p=0.017), and fat mass (p=0.018). Amenorrheic women also had significantly lower serum T4 (p=0.008), T3 (p<0.001), leptin (p<0.001), and ratio of measured to predicted RMR (p=0.011) as well as elevated PYY (p<0.000) and scores for drive for thinness (p=0.016), cognitive restraint (p=0.001) subscales. **CONCLUSIONS**: FHA in exercising women is associated with energy deficiency but only mild indications of psychosocial factors known to be associated with the suppression of reproductive function. FHA in women may vary in its etiology depending on the population studied.

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420   Board #261   May 30 11:00 AM - 12:30 PM
Objective Sleep Characteristics of Young Elite Female Gymnasts

Jasmien Dumortier[1], Jan Boone[1], An Mariman[2], Liesbeth Delesie[2], Els Tobback[2], Dirk Vogelaers[2], Jan G. Bourgois[1]. [1]*Ghent University, Ghent, Belgium.* [2]*Ghent University Hospital, Ghent, Belgium.*
(No relevant relationships reported)

PURPOSE: Sleep is considered one of the most important recuperation techniques for elite athletes, with its specific features implicating different aspects of learning skills and physical recuperation. The aims of this study were (1) to assess objectively the sleep characteristics of elite gymnasts and (2) to correlate these findings with their age. **METHODS**: Twelve elite female gymnasts (15.1 ± 1.5 years old; VO_{2MAX}: 53.18 ± 5.1 ml·min^{-1}·kg^{-1}; 30.7 ± 1.7 training hours/week) underwent a nocturnal polysomnography (PSG) after a regular training day (6 - 6.5 h of training). The PSG was scored according to the guidelines of the American Academy of Sleep Medicine (AASM). Time in bed (min), Total Sleep Time (TST, min), Sleep Efficiency (SE, %), Non Rapid Eye Movement 1 (NREM1, %), NREM2 (%), Slow Wave Sleep (SWS, %), REM (%), Wake After Sleep Onset (WASO, min), Sleep Onset Latency (SOL, min), Awakening Index (/h) and Apnea-Hypopnea-Index (/h) were measured and analyzed. Furthermore, the gymnasts completed the Epworth Sleepiness Scale (ESS) and Pittsburgh Sleep Quality Index (PSQI). Sleep parameters were correlated with age using a Pearson Correlation. **RESULTS**: The following objective values were attained: time in bed 487 ± 13 min, TST 437 ± 27 min, SE 89.5 ± 4.1 %, NREM1 4.9 ± 3.6 %, NREM2 38.7 ± 10.2 %, SWS 36.9 ± 11.4 %, REM 19.3 ± 3.8 %, WASO 32.4 ± 9.2 min, SOL 18.3 ± 16.5 min, Awakening Index 16.1 ± 6.3 /h, Apnea-Hypopnea-Index 0.9 ± 0.8 /h, ESS 5.3 ± 2.5 (/24), PSQI 2.6 ± 1.9 (/21). Age-matched correlations for %SWS (R=-0.693, P=0.013) and arousals from SWS (R=-0.622, P=0.031) were found. The younger the gymnasts, the higher %SWS was found, with higher amounts of arousals from SWS in the younger gymnasts. **CONCLUSIONS**: Objective sleep assessments through PSG in elite female athletes suggest a higher amount of SWS compared to non-elite athletic peer students (Suppiah et al., Ped. Ex. Sc. 2016; 28:588-595) as a salient feature in their sleep architecture. This may represent an advantage towards higher performance, as sleep deficits are related with lower performance. Hence, it needs to be explored whether a thorough analysis of elite athletes' sleep should be incorporated in health screenings.

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421   Board #262   May 30 11:00 AM - 12:30 PM
Impact of a Carbohydrate Mouth Rinse on Motor Performance and Corticospinal Motor Excitability

Darrin C. LaForge[1], Julie Hibbard[1], Madison Moon[1], Stephen Folger[1], Gabriel K. Harris[2], Stephen Bailey, FACSM[1]. [1]*Elon University, Elon, NC.* [2]*North Carolina State University, Raleigh, NC.*
(No relevant relationships reported)

Application of a carbohydrate (CHO) mouth rinse (MR) prior to exercise has been shown to improve physical performance and facilitate corticospinal motor excitability. It is unclear if different forms of CHO impact this phenomenon. PURPOSE: The purpose of this investigation is to determine the effects of different forms of a CHO MR on muscular performance and corticospinal motor excitability. METHODS: Ten normal healthy subjects (5 females, 5 males; 25±1 years; 1.71±0.03 m 73±5 kg) completed 4 trials each separated by at least 48 hours. A different MR condition was applied during each trial (Placebo (PLAC), 6.4% glucose (GLU), 6.4% maltose (MAL), 6.4% maltodextrin (MDX)). Maximal voluntary contraction (MVC) of the right knee extensors and motor-evoked potential (MEP) of the right vastus medialis was determined pre (10 min before), immediately after, and post (10 min after) application of the MR. MEP was precipitated by applying transcranial magnetic stimulation (TMS) during muscle contraction (50% of MVC). The MR was held

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Abstracts were prepared by the authors and printed as submitted.

in the mouth for 20 sec and MR treatments were applied using a Latin square design. RESULTS: No differences were found in the change of MEP from pre to immediately after the MW across the conditions (PLAC=1.5±4.4%; GLU=-6.2±11.2%; MAL=3.9±3.4%; MDX=8.9±7.9%). In contrast, the increase in MEP was greater at the post time point in CHO conditions (GLU=-11.3±14.7%, p=0.01; MAL=12.9±7.9%, p=0.07; MDX=28.0±14.4%, p=0.02) as compared to PLAC (PLAC=-14.3±7.8%). MVC was similar at pre (PLAC=260±26 Nm; GLU=241±19 Nm MAL=245±21 Nm; MDX=248±25 Nm), after (PLAC=269±26 Nm; GLU=249±18 Nm MAL=257±19 Nm; MDX=250±23 Nm), and 10 min after (PLAC=262±28 Nm; GLU=256±17 Nm MAL=269±25 Nm; MDX=253±21 Nm) the MW. CONCLUSIONS: CHO MR increased corticospinal motor excitability 10 min after application; however, the form of CHO used did not influence this response. The increase in corticospinal motor excitability did not translate into an improvement in motor performance.

422　Board #263　May 30 11:00 AM - 12:30 PM

Endocannabinoid System Involvement in Exercise-Induced Enhancement of Fear Extinction in Mice

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(No relevant relationships reported)

The endocannabinoid (eCB) system has emerged as a promising target for enhancing fear extinction learning, which has therapeutic implications for the treatment of stress and anxiety disorders that rely primarily on exposure-based therapies. Although previous investigations have used pharmacological approaches to enhance fear extinction, there is a strong rationale to investigate the efficacy of non-pharmacological approaches (e.g., exercise) shown to activate the eCB system. **PURPOSE:** To examine the effects of exercise on the extinction of conditioned fear, anxiety-like behaviors, and eCB adaptations in cortico-limbic regions. **METHODS:** ICR/CD1 male mice (N = 26) completed a series of behavioral tests prior to and following a fear-conditioning (day 1; FC) and fear-extinction (days 2-5; FEXT) protocol. Following FC, mice were randomly assigned to caging containing either an unlocked (EX) or locked (CON) running wheel, with unlimited access until 24 hours following the last FEXT session. Mice were sacrificed 48 hours after the last behavioral test in order to examine central eCB tissue content. Data were analyzed using a series of one-way and mixed model ANOVAs, Pearson correlations, and Cohen's *d* effect sizes. **RESULTS:** EX mice exhibited a significant reduction in anxiety-like behaviors from pre to post compared to the CON mice ($p < 0.05$). Although both groups experienced less freezing over time, EX mice exhibited significantly less freezing on days 2 ($d = 0.39$), 3 ($d = 0.50$), 4 ($d = 1.16$), and 5 ($d = 0.89$) compared to CON mice ($p < 0.05$). Additionally, moderate to strong negative correlations were found between wheel running revolutions and freezing time on days 2 through 5, indicating that mice who ran more in between extinction sessions tended to freeze less during subsequent sessions. Lastly, EX mice exhibited significantly greater amygdalar eCB content and significantly less hippocampal eCB content compared to CON mice ($p < 0.05$). **CONCLUSION:** These preliminary results suggest that voluntary exercise enhances fear-extinction and reduces anxiety-like behaviors in mice, possibly due to eCB system adaptations in brain regions involved in regulating fear and anxiety responses.
Supported by the UW Virginia Horne Henry Fund and the Advancing a Healthier Wisconsin Endowment at the Medical College of Wisconsin.

A-53　Free Communication/Poster - Age and Gender Issues

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

423　Board #264　May 30 11:00 AM - 12:30 PM

Moderate Risk of the Female Athlete Triad Predicts Injuries in Division II Female Athletes

Jennifer L. Scheid, Morgan E. Stefanik, Michelle Copolo-Ziemer, Karen L. Roehling. *Daemen College, Amherst, NY.*
(No relevant relationships reported)

BACKGROUND: The female athlete triad is the interrelation of low energy availability, menstrual dysfunction, and low bone mineral density. Previously, the components of the female athlete triad have been linked to stress fractures and tendinopathies. However, limited research exists regarding the female athlete triad beyond the relationship of these injuries. **PURPOSE:** The purpose of this study was to explore the relationship between risk for the female athlete triad and musculoskeletal injuries. We hypothesized that athletes who presented with a higher risk of the female athlete triad would have a greater occurrence of musculoskeletal injuries during their competitive season. **METHODS:** Fifty-seven female athletes from a NCAA Division

II college completed questionnaires that assessed female athlete triad cumulative risk using 5 factors (low energy availability, low body mass index, delayed menarche, oligomenorrhea or amenorrhea, and stress fractures). Women were grouped according to how many risk factors they had for the female athlete triad. At the end of each sport season, injury data was compiled using SportsWare (an electronic medical record database used by the athletic trainers to manage injury data). **RESULTS:** Forty-one women were considered low risk for the female athlete triad (Low Risk Triad group) and 16 women were considered moderate risk for the female athlete triad (Moderate Risk Triad group). No women in our study were at high risk for the female athlete triad. Forty-seven of the 57 women (82%) incurred 90 musculoskeletal injuries. The most prevalent injuries included: low back pain/spasm/strain (n=12), followed by shin splints/medial tibial stress syndrome (n=9), general knee pain (n=7), quadriceps strain (n=6), and knee sprain (anterior cruciate ligament, posterior cruciate ligament, medial collateral ligament and lateral collateral ligament sprains; n=5). The number of in-season injuries in the Moderate Risk Triad group (2.1±0.4) was higher (p<0.05) than the Low Risk Triad group (1.3±0.2). **CONCLUSION**: Moderate risk of the female athlete triad appears to increase the risk of injury during the competitive season beyond stress fractures and women with a moderate risk of the female athlete triad should be monitored closely by athletic trainers and coaches.

424　Board #265　May 30 11:00 AM - 12:30 PM

Perceptions Regarding Injury and Training in Elite, Adolescent Rock Climbers

Rachel N. Meyers[1], Morgan N. Potter[2], Steven L. Hobbs[1], Aaron J. Provance[2]. [1]*University of Colorado Boulder, Boulder, CO.* [2]*Children's Hospital Colorado, University of Colorado School of Medicine, Aurora, CO.*
(No relevant relationships reported)

PURPOSE: Our objective was to examine the awareness and knowledge of youth-specific climbing injuries and risk factors amongst elite, adolescent rock climbers. **METHODS**: We surveyed elite adolescent rock climbers, ages 8-18 competing in the 2017 USA Climbing Sport and Speed National Championships. Subjects answered questions on their knowledge and awareness of the most common youth climbing injury and safe training practices. One-way ANOVAs and Bonferroni post hoc tests identified misperceptions about youth climbing injuries and the safe age to start double dyno campusing, a climbing-specific training exercise. Risk ratios were used to compare the proportion of athletes who self-reported as "informed" and "uninformed" when asked about common finger injuries in adults and youth. **RESULTS**: 267 climbers completed the survey (age =13.99±2.66, 51.9% male, 48.1% female). The adult-specific A2 pulley injury, was erroneously reported by the subjects to be the most common youth climbing injury, with an average ranking of 3.09±2.20 on a scale of 1 (most common) to 8 (least common). The youth-specific and most common injury in adolescent climbers, growth plate finger injuries, ranked second most common, with an average of 4.0±2.22. These rankings were significantly different (p<0.001). Only 5.7% of climbers correctly reported the safe age to begin double dyno campusing, a risk factor for growth plate injuries. 48.9% of climbers reported they were aware of growth plate injuries to the finger; yet only 54% of these climbers correctly identified the injuries as stress fractures. 73.5% overall reported growth plate finger injuries to either be a type of A2 pulley injury or did not know. **CONCLUSION**:
Adolescent climbers demonstrated the misconception that skeletally immature climbing-specific injuries and training techniques do not need to be treated differently from skeletally mature climbers. As climbing enters the 2020 Olympics, it is imperative that adolescent climbers, coaches, and parents be better educated on pediatric-specific climbing injuries and when to seek medical attention. Improved knowledge can help reduce the risk of these injuries and the potential for permanent finger deformity and/or loss of function.

425　Board #266　May 30 11:00 AM - 12:30 PM

The Relationship Between Flexibility and Low Back Pain in Female Adolescent Gymnasts

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(No relevant relationships reported)

PURPOSE: Our objective was to elucidate the association between lower back pain, flexibility, and individual characteristics in adolescent female gymnasts. **METHODS:** Female gymnasts ages 6-18 years competing in the USA Women's Artistic Junior Olympic Program levels 3-10 were enrolled in the study. Subjects underwent active and passive flexibility measurements at the shoulder, hip, quadriceps, and hamstrings. They were then asked if they experienced back, shoulder, and/or hip pain in the last 12 months. Those with a history of back pain then completed the Micheli Functional Scale and Oswestry Low Back Pain Scale. Demographic information, clinical characteristics, and flexibility measurements were compared between gymnasts with and without back pain in the previous 12 months using t-tests

and Chi square tests. A binary multivariable logistic regression model was used to assess the association between back pain in the past 12 months, flexibility, and participant characteristics.
RESULTS: Fifty-one gymnasts participated: 19 who reported back pain in the past 12 months (age= 13.3±3.3 years; BMI= 18.6±2.6) and 32 who did not (age= 11.1±2.4 years; BMI= 17.5±1.9). Those with back pain reported more hours per week of gymnastics participation (22.7±6.9 vs. 18.5±5.9 hours/week; p= 0.026), and a higher proportion reported experiencing menarche (37% vs. 6%; p= 0.009) than those who did not. Passive Hookline shoulder flexion (178.6±6.1 vs. 180.0±0.0 degrees; p= 0.008) and active right prone knee flexion (131.1±9.2 vs. 132.0±5.1 degrees; p= 0.07) were lower among those who reported back pain. When considered together, having experienced menarche at the time of assessment was independently associated with the presence of self-reported back pain the past 12 months (adjusted odds ratio= 7.317, 95% CI= 1.22-43.87; p= 0.029).
CONCLUSION: Risk factors for back pain in adolescent female gymnasts may be more complex and multifaceted than the simple flexibility measurements we used. While the history of low back pain and flexibility were not significantly associated, low back pain was more common in gymnasts with a history of menarche. As back pain etiology is likely related to many factors,
clinicians should be aware of intrinsic patient factors, such as pubertal maturation, when considering risk of future back injury.

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426   Board #267   May 30 11:00 AM - 12:30 PM
Sex Differences in Objective and Subjective Sleep in Collegiate Athletes

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(No relevant relationships reported)

Despite the importance of sleep in athletic performance, objective assessments of sleep are not well characterized in collegiate athletes, and the impact of sex (i.e., male vs. female) on subjective and objective sleep in collegiate athletes remains equivocal. **Purpose:** To establish normative estimates of subjective and objective sleep in male and female collegiate athletes, and determine if sex differences exist. **Methods:** Subjective and objective sleep were assessed during the off-season in 108 collegiate athletes (56 males, 21 ± 1 years; 52 females, 20 ± 1 years) recruited from the Michigan Tech University varsity football, basketball, volleyball, soccer, hockey, track, and nordic ski teams. Subjective assessments included Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS), and 3-5 consecutive weeknights of sleep diary to determine subjective total sleep time (TST). Objective assessments of TST, sleep efficiency (SE), and wake after sleep onset (WASO) were determined using wrist actigraphy in parallel with sleep diaries. The apnea-hypopnea index (AHI) was determined using an at-home apnea screening test during one of the actigraphy nights. **Results:** Actigraphy revealed that 94% of all athletes received <8 hrs of objective TST, with 61% receiving <7 hrs. Male athletes reported significantly higher subjective TST (i.e., sleep diary) compared to female athletes (7.6±0.1 vs. 6.9±0.1 hrs, p<0.001). However, objective TST (i.e., actigraphy) was not different between males and females (6.9±0.1 vs. 6.8±0.1 hrs, p=0.56). Moreover, females demonstrated significantly higher SE (87±1 vs. 82±1%, p<0.001) and lower WASO (31±2 vs. 38±2 min, p=0.02) compared to males. PSQI, ISI, and ESS were not significantly different between sexes. AHI was significantly higher in male athletes (1.2±0.2 vs. 0.5±0.1 episodes/hr, p<0.001), but both groups were well below the threshold for clinical sleep apnea. **Conclusion:** Subjective and objective assessments of sleep differed in male and female subjects, yet both groups were well below recommended levels of sleep for collegiate athletes. These findings suggest that different sleep education strategies and interventions may be necessary in male and female collegiate athletes to improve sleep duration and/or quality.

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427   Board #268   May 30 11:00 AM - 12:30 PM
Can Ultrasound Subcutaneous Fat Thickness be used to Estimate Percent Body Fat in Older Adults?

Robert Thiebaud[1], Takashi Abe[2], Jeremy Loenneke[2], Eiji Fujita[3], Takuya Akamine[3]. [1]*Texas Wesleyan University, Fort Worth, TX.* [2]*University of Mississippi, Oxford, MS.* [3]*National Institute of Fitness and Sports in Kanoya, Kagoshima, Japan.*
(No relevant relationships reported)

Ultrasound imaging has been used to estimate body composition, which includes percent body fat (%BF), in young and middle-aged adults. However, it is unknown whether ultrasound imaging can predict %BF in older adults when using dual-energy x-ray absorptiometry (DXA) as the criterion method. **PURPOSE**: To develop prediction equations to estimate %BF in older men and women using ultrasound subcutaneous fat thickness. **METHODS**: Four-hundred and nineteen men (n=176) and women (n=243) participated in this study. The average age, BMI and %BF of participants were 70.6 ± 6.4 yrs, 23.5 ± 3.0 kg/m^2 and 28.2 ± 7.4%. Participants were randomly separated into a model development group (n=260) and cross-validation

group (n=159). B-mode ultrasound using a 5-MHz scanning head imaged subcutaneous fat thickness on the right side of the body at the anterior forearm, anterior and posterior upper arm, anterior trunk, posterior trunk, anterior and posterior thigh, and anterior and posterior lower leg. A whole body scan using DXA was used to determine %BF. IBM SPSS Statistics 24 was used to analyze the data. For multicollinearity assumption, variables with a variance inflation factor (VIF) > 10 were excluded from analysis. Stepwise multiple linear regression analysis was used to develop prediction equations. Bland-Altman plots were used to validate the prediction equations. **RESULTS**: Variables included in the stepwise linear regression analysis were height, sex, and all fat thicknesses. Age and weight were not significantly correlated with %BF (p<0.05). The prediction equation for %BF was the following: %BF = 27.075 + (3.284*Anterior Trunk) + (4.916*Posterior upper arm) + (2.166*Sex) - (0.099*height) where males = 1 and females = 2. The adjusted r-square of the prediction equation was 0.701 with a standard error of the estimate of 4.1%. Bland-Altman plots revealed a mean bias of 0.2266 ± 7.9772 (95% confidence intervals). A significant correlation (r = 0.245, p=0.002) between the difference in %BF (measured - predicted) and the average %BF [(Measured + predicted %BF)/2] suggests some systematic error in the prediction equation.
CONCLUSIONS: Ultrasound imaging can be used to predict %BF in older adults; however, there is some systematic error in the prediction equation.

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428   Board #269   May 30 11:00 AM - 12:30 PM
Menstrual Cycle Influence on Iron-Status Markers in Female Athletes. IronFEMME Pilot Study

Ana B. Peinado[1], Laura Barba[1], Ángel E. Díaz[2], Javier Butragueño[1], Nuria Romero-Parra[1], Francisco J. Calderón[1], Pedro J. Benito[1], Rocío Cupeiro[1]. [1]*LFE Research Group, Universidad Politécnica de Madrid, Madrid, Spain.* [2]*Ministry of Education, Culture and Sport, Highest Spanish Sports Council, Madrid, Spain.*
(No relevant relationships reported)

Female athletes may experience an elevated risk of iron deficiency as iron status may decline during physical training. Further, the interaction between hormones involved in regulating the menstrual cycle and its effect on iron status still remains unclear. **PURPOSE:** To study the influence of the menstrual cycle phases on iron-related parameters in women after endurance exercise. **METHODS:** Thirteen healthy eumenorrheic endurance-trained women (34.9± 4.2 years; 163.9±6.1 cm; 58.4±5.5 kg; peak oxygen consumption (VO$_{2peak}$) 49.7±3.1 ml·min^{-1}·kg^{-1}) participated in the study. Each participant performed 40 min running at the speed corresponding to the 75% of VO$_{2peak}$. Exercise was completed on a treadmill and was performed in three different phases of menstrual cycle randomly assigned: early follicular (EFP), mid-follicular (MFP) and luteal phase (LP). Blood samples were obtained at baseline and immediately (Post0h) and 3 hours (Post3h) after exercise and analyzed for serum iron, ferritin and transferrin. Mixed linear models were conducted to analyze the data. **RESULTS:** Serum iron (μg/dl) was not different across menstrual cycle phases (EFP: 59.7±36.1; MFP: 80.2±39.6; LP: 83.6±58.2; p=0.101), although we observed lower values at EFP. Time was not significant on serum iron (Baseline: 69.9±45.4; Post0h: 76.6±49.3; Post3h: 77.0±45.6; p=0.247). Ferritin (ng/ml) values were similar across menstrual cycle phases (EFP: 27.9±21.7; MFP: 31.8±25.2; LP: 32.0±27.4; p=0.451); however there was a significant effect for time (p=0.017) with higher values at Post0h (33.1±27.0) compared to baseline (28.8±23.1). We observed similar values of transferrin (mg/dl) across menstrual cycle phases (EFP: 300.8±40.4; MFP: 298.6±44.6; LP: 300.5±47.2; p=0.902). Time was significant on transferrin (p=0.001) with higher values at Post0h (307.7±47.8) compared to baseline (293.7±41.5) and Post3h (298.5±41.8). No significant menstrual cycle phases × time interactions were found for any of these variables. **CONCLUSION:** Based on the preliminary results from this pilot study, iron-status markers are not influenced by the menstrual cycle, although serum iron values seem to be lower at EFP. Ferritin and transferrin values were increased after exercise along the menstrual cycle. Funding: DEP2016-75387-P (Spanish National Plan 2013-2016)

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429   Board #270   May 30 11:00 AM - 12:30 PM
Menstrual Cycle Influence on Hepcidin Secretion and Inflammatory Reponses in Female Athletes. IronFEMME Pilot Study

Laura Barba[1], Rocío Cupeiro[1], Ángel E. Díaz[2], Elena Santiago[3], Víctor Alfaro[1], Beatriz Rael[1], Cristina Maestre-Cascales[1], Juan Orellana[4], Ana B. Peinado[1]. [1]*LFE Research Group, Universidad Politécnica de Madrid, Madrid, Spain.* [2]*Ministry of Education, Culture and Sport, Highest Spanish Sports Council, Sports Medical Center, Madrid, Spain.* [3]*Tambre Clinic, Madrid, Spain.* [4]*ETSIAAB, Universidad Politécnica de Madrid, Madrid, Spain.*
(No relevant relationships reported)

Deficient iron absorption may be conditioned by an increase in inflammatory markers and hepcidin levels after exercise. The interaction between inflammatory markers

and hepcidin along menstrual cycle is still unknown. **PURPOSE:** To elucidate the effect of hormonal fluctuations during menstrual cycle on inflammatory and hepcidin responses after endurance exercise **METHODS:** Thirteen healthy eumenorrheic endurance-trained women (34.9± 4.2 years; 163.9±6.1 cm; 58.4±5.5 kg; peak oxygen consumption (VO_{2peak}) 49.7±3.1 ml·min⁻¹·kg⁻¹) participated in the study. Subjects performed 40 min running on a treadmill at the speed corresponding to the 75% of VO_{2peak}. Exercise was performed in three different moments: during early follicular (EFP), mid-follicular (MFP) and luteal phase (LP). Blood samples were obtained at baseline and immediately (Post0h) and 3 hours (Post3h) after exercise and were analyzed for interleukin-6 (IL-6), C-reactive protein (CRP) and hepcidin. Mixed linear models were conducted to analyze the data. **RESULTS:** Hepcidin (ng/ml) was not different across menstrual cycle phases (EFP: 76.5±25.3; MFP: 78.4±19.5; LP: 78.0±23.0; p=0.762). Time was significant (p=0.001) on Hepcidin with higher values at Post0h (81.9±21.5) compared to Baseline (74.2±24.1) and Post3h (76.8±21.9). IL-6 (pg/ml) levels were not different over menstrual cycle (EFP: 3.5±3.0; MFP: 3.0±1.5; LP: 5.4±6.6; p=0.079); however time (p<0.001) at Post3h (5.4±6.3) showed significant higher values compared to Baseline (2.6±2.1) and Post0h (3.9±3.2). We found an interaction between menstrual cycle phases and time (p=0.038) with greater values at Post3h during LP (8.7±9.9) compared to EFP (3.7±2.90) and MFP (3.7±1.9). Increased CRP (mg/dl) levels were reported (p=0.033) during EFP (2.0±3.3) related to MFP (1.0±1.1) and LP (0.8±1.4). Time had no significant effect on CRP (Baseline: 1.3±2.4; Post0h: 1.3±2.3; Post3h: 1.2±2.0; p=0.707). **CONCLUSION:** According to our preliminary results, inflammatory responses seem to be influenced by menstrual cycle even though hepcidin levels may not be affected by hormonal fluctuations. Hepcidin and IL-6 peak levels were found Post0h and Post3h after exercise respectively. CRP levels did not show an increase after exercise at any phase. Funding: DEP2016-75387-P (Spanish National Plan 2013-2016)

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430   Board #271   May 30 11:00 AM - 12:30 PM

Biolosical Matulity for Japanese Soccer Player 2007-2015

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University of Tsukuba, TSUKUBA, Japan.
(No relevant relationships reported)

PURPOSE: The soccer is one of the sports loved all over the world. Many children will dream of professional football player and being National team member in the future.Upbringing of the player is begun than low age and the player selection of the athlete spreads among lower aged people. The Late maturity player is not found in many cases when a coach select player by only physical ability. U-17 international championship of the soccer had many early maturity players. This study predicted a biological maturity degree and final height prediction of the Japanese soccer players. **METHODS:** The sample included 483 male soccer players(12.4±0.6y,154.7±8.9 cm,182.2-134.1cm) who were professional soccer club under category team(2007-2015). Players were evaluated the skeletal maturity degree, skeletal age and final height in Tanner-Whitehouse 2 Method (JAPAN) and Tanner-Whitehouse 3 Method. The biological maturity classification method assumed it mature early,on time,late divided differences between chronological age and skeletal age by ±1.0 year. The statistics processing assumed it less than level of significance 5% with, SPSS ver.25. **RESULTS:** The Bone maturation score(Radius-ulna-short bone score) was 465.4 ± 156.3pt. Average of skeletal age was 12.5 ± 1.3 years old with Tanner-Whitehouse 2 Method(Japan). Biological maturity classification was Late 68 players, On time 318 players, Early 90 Players and Adult 4 players. Final height prediction average was 173.3±5.2cm(187.7-149.8cm) with Tanner-Whitehouse 2 Method(TAKAI). **CONCLUSION:** In this study, 7 players were adults by biological maturity. The difference of the skeletal age was 7.3 years old in early and late. When a team performs the player selection, Coach and recuiter should select in consideration of the difference of the biological maturity degree.

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431   Board #272   May 30 11:00 AM - 12:30 PM

The Effect of Pre-Sleep Consumption of Casein Protein on Resting Metabolic Rate and Appetite in Postmenopausal Women

Christopher Schattinger[1], Joeseph Leonard[2], Ashley Artese[1], Michael Ormsbee, FACSM[1], Cara Pappas[1], Lynn Panton, FACSM[1]. *[1]Florida State University, Tallahassee, FL. [2]Florida State University College of Medicine, Tallahassee, FL.* (Sponsor: Lynn B. Panton, FACSM)
(No relevant relationships reported)

PURPOSE: To determine the acute effects of nighttime pre-sleep consumption of casein protein (CP) and a placebo (PLA) supplement on next-morning measures of resting metabolic rate (RMR) and appetite in postmenopausal women. METHODS: This study was a randomized crossover double-blind placebo-controlled trial. Eight postmenopausal (N=8, age: 57±5 yrs, BMI= 28±6 kg/m2) women participated. Subjects had body composition (DXA), RMR (indirect calorimetry), and appetite (visual analog scale; VAS) measured. Subjects consumed either CP (35 g, 130

kcals) or PLA (7.2g, 10 kcals) 30 min prior to bed time on two separate occasions separated by 48-hours. RMR and measures of hunger, desire to eat, and satiety were analyzed using Paired T-tests. Significance was accepted at p≤0.05. RESULTS: RMR (CP:1286±175; PLA:1278±201 kcals/day) and relative oxygen consumption (CP:2.66±0.33; PLA 2.67±0.26 ml/kg/min) were not different between CP and PLA. There were also no effects of CP and PLA on measures of appetite (Hunger: CP: 3.44±2.98; PLA: 3.75±3.06 cm; Satiety: CP: 4.06±2.09; PLA:4.79±3.11 cm; Desire to Eat: CP:4.28±3.58; PLA:4.06±3.17 cm). CONCLUSION: There were no differences in RMR and measures of appetite between CP and PLA. There is growing evidence that a small snack before bed (150-200 kcal) is not harmful to metabolism or appetite. This study was supported with product by Dymatize Nutrition.

**A-54   Free Communication/Poster - Exercise -
Multiple Sclerosis and Parkinson's Disease**

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

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432   Board #273   May 30 11:00 AM - 12:30 PM

Cardiometabolic Prediction Equations Overestimate Cardiorespiratory Fitness for Treadmill and Cycle Ergometry in Multiple Sclerosis Patients

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(No relevant relationships reported)

Multiple sclerosis (MS) patients exhibit a decreased peak oxygen uptake (VO_{2peak}) compared to age-matched peers, and therefore have the potential for increased relative gains in VO_{2peak} in response to chronic exercise training. Individualized exercise prescriptions and monitoring improvement both rely on accurate assessment of VO_{2peak}; however, expired gas analysis is not always available. Therefore, prediction equations have been established to estimate VO_{2peak} for both treadmill (TM) and cycle ergometry (CE) tests based on work rates. Whether or not these equations are appropriate for MS patients has yet to be investigated. **PURPOSE:** To compare VO_{2peak} obtained via TM and CE maximal exercise tests to previously established cardiometabolic prediction equations. **METHODS:** MS patients (44 ± 11 yrs, 28.1 ± 8.0 kg/m², 11 ± 10 yrs since dx) performed a maximal graded exercise test on both a TM and CE. Twenty-five subjects completed the TM test, and 26 completed the CE test. TM tests consisted of 2 min stages with a constant, self-selected pace, with a 2% increase in grade per stage. CE tests increased by 15 Watts/min. VO_{2peak} was compared to previously established mode-specific cardiometabolic prediction equations using paired samples t-tests and further examined with Bland-Altman plots. **RESULTS:** Predicted VO_{2peak} was higher than measured values for both TM and CE ($p<0.05$). The TM had a mean bias, upper limit of agreement (LOA), and lower LOA of -2.35, 6.63, and -11.32 mL/kg/min, respectively. The CE had a mean bias, upper LOA, and lower LOA of -2.20, 3.31, and -7.72 mL/kg/min, respectively. **CONCLUSION:** Cardiometabolic prediction equations resulted in higher VO_{2peak} estimates for both TM and CE in MS patients. The wide limits of agreement (Bland-Altman plots) suggest the accuracy in predicting individual VO_{2peak} values is compromised among individuals with MS.

	Measured VO_{2peak} (mL/kg/min)	Predicted VO_{2peak} (mL/kg/min)
Treadmill	26.6 ± 6.3	28.9 ± 7.0*
Cycle Ergometry	24.1 ± 7.0	26.3 ± 6.0*

Data are mean ± SD. *$p<0.05$ between measured and predicted VO_{2peak}.

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433   Board #274   May 30 11:00 AM - 12:30 PM

Relationship Between Dorsiflexion Strength Asymmetry, Walking Performance, and Disability in Multiple Sclerosis Patients

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(No relevant relationships reported)

Multiple sclerosis (MS) is one of the most common progressive neurological diseases in young adults and is characterized by neurologic disruption within the

central nervous system. Previous research has shown strength asymmetry (SA) in the quadriceps of MS patients to be correlated with a decrease in functional walking performance (FWP). Due to limited ankle mobility in MS patients during walking, an investigation of the relationship between dorsiflexion SA and walking ability is necessary to better understand the impact on quality of life in MS patients. **PURPOSE:** To investigate SA during isometric/isokinetic dorsiflexion in MS patients compared to healthy individuals (Non-MS), and investigate the relationship between SA and FWP in both groups. **METHODS:** 26 individuals participated in the study (MS = 13, Age = 50.3 ± 9.1 years; Non-MS = 13, Age = 50.8 ± 8.5 years). Visit 1 consisted of test familiarization. Visit 2 consisted of maximal isometric (MVC) and isokinetic (MVIC) dorsiflexion contractions performed at 60º/s in both legs. SA ratio was calculated from the peak torque achieved. On visit 3, subjects performed three tests of FWP: 25 Foot Walk Test (25W), Timed Up-and-Go Test (TUG), and 6-Minute Walk Test (6MW). **RESULTS:** The mean expanded disability status score (EDSS) for the MS patients was 3.5 ± 1.8, indicating mild-moderate disability. There was a significant difference in MVC SA between groups (MS vs NON-MS = 13.7 ± 18.1 vs. 3.3 ± 2.6, p = 0.03) however no difference was observed in MVIC SA between groups (p > 0.05). Differences were observed between groups for all three FWP tests and gait speed (p < 0.05). There was a significant relationship between MVC SA and two FWP tests in the MS group (25W: r = 0.76, p = 0.002; TUG: r = 0.61, p = 0.03) and a significant relationship between MVIC SA and all four FWP variables (25W: r = 0.93, p < 0.001; gait speed: r = -0.76, p = 0.002; TUG: r = 0.81, p < 0.001; 6MW: r = -0.67, p = 0.01). There was no significant relationship between MVC or MVIC SA and the FWP tests in the Non-MS group (p > 0.10). There was no significant relationship between MVC SA or MVICSA and EDSS in the MS patients (p > 0.05). **CONCLUSION:** SA differed between groups, and dorsiflexion SA appears to be related to impaired walking performance in MS patients. This relationship may be independent of disease severity based on EDSS.

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434   Board #275   May 30 11:00 AM - 12:30 PM

Relationship between Soleus H Reflex and Balance Metrics in People with Multiple Sclerosis

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(No relevant relationships reported)

Multiple Sclerosis (MS) is a disease of the central nervous system with poor balance as one of the most reported symptoms. Previous research has shown limb to limb differences in a number of physiological measures (e.g., leg strength). One measure yet to be evaluated between limbs in MS patients is the soleus Hoffmann (H) reflex, which is regarded as the electrical analogue to the stretch reflex. **Purpose:** The intent of this study was to 1) quantify the soleus H reflex in both legs to determine whether asymmetry was present and 2) correlate H reflex asymmetry to balance performance. **Methods:** The study consisted of six visits. The first visit consisted of paperwork and familiarization. The soleus H reflex was measured twice in both legs over four visits (V2 - V5) to assess bilateral differences in 17 participants (MS=9, Age=49.3±11.3 years; Non-MS=8, Age=48.6±11.3 years). Balance testing was conducted on the final visit, and consisted of a sensory organization test (SOT) and limits of stability (LOS). **Results:** One MS participant was unable to complete balance testing, leaving 16 participants in the balance analyses. The mean expanded disability status score for the MS participants was 3.4±2.2 (range=1 to 6; median=2), indicating mild-to-moderate disability. No difference was observed between limbs in the soleus H reflex for either group; however, when converted into an asymmetry score (AS) the MS group had significantly more asymmetry (MS=26.1±16.6, Non-MS=4.6±3.9; p=0.01). The MS group had a significantly lower SOT composite score (MS=80.4±4.0, Non-MS=85.8±2.9, p < 0.05). Sagittal plane endpoint excursion (EPE) and maximum excursion (ME) were significantly less in the MS group (EPE: MS=36.8±9.2, Non-MS=69.0±11.4, p <0.001; ME: MS=61.5±16.4, Non-MS=83.0±10.2, p <0.01) during LOS testing. A significant negative relationship was observed between AS and EPE (r=-0.625), ME (r=-0.709), and directional control (r=-0.615) during LOS testing in the sagittal plane. A significant positive relationship (r=0.518) was observed between AS and reaction time in the sagittal plane during LOS testing. **Conclusion:** Differences in the soleus H reflex asymmetry was observed between groups, which appears to significantly influence balance performance as the Non-MS participants generally performed better than the MS participants.

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435   Board #276   May 30 11:00 AM - 12:30 PM

Body Temperature Regulation In Ms Patients Performing Physical Activity In The Heat

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(No relevant relationships reported)

PURPOSE: The impact of heat intolerance and associated fatigue among people with multiple sclerosis (MS) is well documented, particularly during physical activity in the heat. However to date it is unclear whether an impaired thermoregulatory capacity is evident in people with MS. It is also unknown whether any such impairment is manifested in the sudomotor (sweating) system or vasomotor (skin blood flow) system. Therefore the aim of this study was to determine whether thermoregulatory responses are independently altered in MS patients relative to healthy controls during physical activity in a warm/hot environment. **METHODS**: Sixteen participants with relapsing-remitting MS (EDSS 2.8±0.9; 47±8 y; 77.6±14.0 kg; 1.7±0.1 m) and 14 age- and mass-matched healthy controls (43±11 y; 78.6±17.0 kg; 1.70±0.09 m) cycled at a fixed metabolic heat production of 4 W.kg^{-1} on a semi-recumbent ergometer for a maximum of 40 minutes in a 30°C, 30%RH environment. A subset of 8 MS (EDSS: 2.6±0.5; 44±8 y; 82.3±18.2 kg; 1.7±0.1 m) and 8 healthy controls (44±12 y; 81.2±21.1 kg; 1.7±0.1 m) also completed the same exercise bout in a 35°C, 30%RH environment. In both trials, rectal temperature (T_{re}), mean skin temperature (T_{sk}), and local sweat rate (LSR) and cutaneous vascular conductance (CVC) on the upper-back was measured throughout. **RESULTS**: At 30°C, end-exercise T_{re} (MS:37.2±0.3, CON:37.3±0.4°C; P=0.31), T_{sk} (MS:34.5±0.5, CON:34.6±0.5°C; P=0.43), LSR (MS:0.44±0.22, CON:0.47±0.21 mg.cm^{-2}.min^{-1}; P=0.71), and CVC (MS:344±256, CON:268±157% of baseline; P=0.35) were similar between groups. Likewise, at 35°C, end-exercise T_{re} (MS:37.2±0.4, CON:37.3±0.3°C; P=0.70), T_{sk} (MS:35.5±0.5, CON:35.5±0.5°C; P=0.87), LSR (MS:1.26±0.44, CON:1.34±0.38 mg.cm^{-2}.min^{-1}; P=0.61), and CVC (MS:425±163, CON:378±236% of baseline; P=0.68) were not different. **CONCLUSIONS**: Individuals with relapsing-remitting MS do not demonstrate any clear impairments of sweating or skin blood flow control during moderate levels of physical activity at air temperatures as high as 35°C.

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436   Board #277   May 30 11:00 AM - 12:30 PM

Physical Activity is Associated with Walking Capacity in Persons with Multiple Sclerosis

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(No relevant relationships reported)

Multiple sclerosis (MS) is a chronic inflammatory disease of the central nervous system which affects 1 in 1000 persons in the United States. MS results in functional limitations, including impairments in walking capacity, balance, and increases in overall fatigue, leading to decreased physical activity. However, the potential associations between physical activity, walking ability and functional capacity are not clear in this population. **Purpose:** To evaluate the association between physical activity, walking ability and functional capacity in individuals with MS. **Methods:** Fifty-eight individuals with MS between the ages of 18-70 (Male = 15, 47 ± 12 years, BMI = 28.8 ± 6.5, EDSS = 0-4) performed a maximal incremental cycle test to assess peak aerobic capacity (VO$_2$ peak). Subjects completed a timed 25-foot walk test (T25FW), 6 minute walk test (6MW), and wore an accelerometer for one week to determine physical activity. Moderate / vigorous physical activity (MVPA) was defined as >1722 counts per minute. **Results:** MVPA was correlated with 6MW, T25FW and VO$_2$peak (p<0.05, Table 1). In stepwise regression analyses, MVPA was a stronger predictor of T25FW (β: −0.44, p<0.01) and 6MW (β: 0.48, p<0.01) than VO$_2$peak (β: −0.29, p=0.03; β: 0.32, p<0.01). **Conclusion:** Although both MVPA and VO$_2$ peak provide unique contributions to the prediction of 6MW and T25FW, MVPA is a stronger predictor. These results suggest that improving both physical activity and cardiovascular fitness may improve walking ability in persons with MS.

Table 1				
	6MW	T25FW	VO$_2$ peak	MVPA
6MW	--	--	--	--
T25FW	-0.793*	--	--	--
VO$_2$ peak	0.568*	-0.504*	--	--
MVPA	0.630*	-0.580*	0.478*	--

*Significant correlation, p<0.05

437   Board #278   May 30 11:00 AM - 12:30 PM

Reduced Cognitive Function and Preserved Physical Function in Cannabis Users with Multiple Sclerosis

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(Sponsor: Thorsten Rudroff, FACSM)
(No relevant relationships reported)

Multiple Sclerosis (MS) is an inflammatory disease of the central nervous system characterized by a variety of symptoms including reduced physical and cognitive function. Cannabis is known to improve spasticity and pain in MS, but its effects on physical function are unknown.**PURPOSE**: The purpose of this study was to compare physical/cognitive function and overall quality of life in cannabis users and non-users with MS.
METHODS: Twenty-two people with relapsing-remitting MS (Users, N = 13, age: 51.0 (14.2); Non-users, N = 9, age: 53.4 (14.7)) completed the following evaluations: 25ft walk test, timed up and go, 9-hole peg test, mCTSIB (balance), handgrip strength, and the Paced Auditory Serial Addition Test (PASAT). The MS Quality of Life-54, Patient Determined Disease Steps (disability status), Activities of Balance Confidence, Numerical Rating Scale of Spasticity, and Fatigue Severity Scale questionnaires were also completed by all participants. Cannabis use status was confirmed via urinalysis. Comparisons between the groups were made using independent T-Tests.
RESULTS: Cannabis users and non-users were similar in all measures of physical function and overall quality of life ($P \geq 0.12$). Cannabis users scored significantly lower on cognitive function than non-users (PASAT, Users 32.4 ± 9.9 vs. Non-users 43.0 ± 8.4, $P = 0.02$).
CONCLUSIONS: People with MS currently using cannabis perform similarly on physical tasks as non-users. However, the performance of the cannabis users during abstinence from the drug is not known. These results suggest that cannabis may not have an impact on physical function and overall quality of life in people with MS, although cannabis likely has negative effects on cognitive function, which is consistent with findings from healthy individuals. Longitudinal and/or interventional studies with on/off drug testing are needed to better quantify the positive and negative effects of cannabis in MS.

438   Board #279   May 30 11:00 AM - 12:30 PM

Body Fatness is Associated with Lower Aerobic Fitness in Persons with Multiple Sclerosis

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(No relevant relationships reported)

Multiple sclerosis (MS) is an unpredictable disorder of the central nervous system that results in a varied of symptoms and is often disable. Studies conducted in large samples of persons with MS (pwMS), estimate a combined prevalence of overweight (body mass index; BMI ≥ 25kg/m²) and obesity (BMI ≥ 30 kg/m²) ranging from approximately 50 to 65 percent. This is a concern as this measure appears to be strongly correlated with various adverse health outcomes. Excess body fat may have negative implications in health-related fitness and consequently in participation in this population. However, little is known about the impact of body fatness on components of health-related fitness in pwMS. **PURPOSE:** To examine the impact of body fatness on aerobic fitness (AF) in pwMS with similar levels of disability. **METHODS:** This study involved a secondary data analysis and interpretation from a previous work where 62 pwMS were assessed. For the purpose of this study participants were separated in three different groups based on established BMI categories (i.e., normal, overweight, obese). BMI was used as an indirect measure of body fatness and AF was measured using peak oxygen consumption (i.e., VO$_{2peak}$). ANCOVA with priori linear contrast analysis on the outcome controlling for age, sex, disease duration and disability was performed. The univariate F-ratio, and η² were used to examine the presence and magnitude of linear differences in the dependent outcome (i.e., AF) per BMI category. Statistical significance was set at p <.05. **RESULTS:** The average AF (i.e., VO$_{2peak}$) for the entire sample was 19.5 (7.2) mL.kg⁻¹.min⁻¹ and differed significantly between the subsamples of BMI categories (normal: 20.8 (.85); overweight: 19.7 (1.13); obese: 16.9 (1.73) mL.kg⁻¹.min⁻¹) based on the linear contrast analysis; F (2, 55) = 3.33, p = 0.043; η² = 0.11. **CONCLUSION:** The findings suggest that body fatness (i.e., BMI) has a negative impact on AF in pwMS, with a marked

difference for those classified as obese. This is important as low AF and excess body fatness are important risk factors for developing cardiovascular diseases and the potential devastating impact of co-morbidities in this population.
Keywords: Aerobic Fitness, Body Fat, Neurological Disease.

439   Board #280   May 30 11:00 AM - 12:30 PM

Hemodynamic and Functional Variables in Parkinson Disease Patients: High Intensity Interval versus Continuous Moderate Exercise Training

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(No relevant relationships reported)

PURPOSE: To assess the effects of high-intensity interval training (HIIT) versus continuous moderate exercise training (CME) on hemodynamic and functional capacity in subjects with Parkinson disease (PD). **METHODS**: 20 subjects (13/7 men/women) with PD were randomly assigned to a twice-weekly HIIT ($N = 12$) or CME ($N = 8$) for 12 weeks, and have hemodynamic (resting heart rate and blood pressure, carotid femoral pulse wave velocity, endothelial reactivity and heart rate variability) and functional variables (5-time seat-to-stand (STS), timed-up and go and 6 min walking test (6MWT)) assessed before and after training period. Exercise training intensity was regulated by the 6-20 rating of perceived exertion scale (RPE), and consisted of 25 min of HIIT (4 min walking warm-up at 9-11 RPE level, followed by 21 min alternating 1 min of briskly walking/jogging/running at 15-17 RPE level with walking at 9-11 RPE level) or 30 min of CME (4 min walking warm-up at 9-11 RPE level, followed by 26 min of walking/jogging at 11-13 RPE level). **RESULTS**: No significant differences between HIIT and CME were found in all variables at baseline. Endothelial reactivity tended to increase after HIIT, but not after CME, which result in improved level (~8%, P < 0.01) of this variable in HIIT versus CME during follow-up (Figure 1). 6MWT improved (10.4 ± 3.8 %, P < 0.05) after HIIT, but did not changed after CME. STS improved similarly after HIIT (27.2 ± 6.1 %, P < 0.05) and CME (21.5 ± 5.4 %, P < 0.05). No significant changes were found after HIIT or CME in any other variable assessed. **CONCLUSIONS**: There different adaptations of endothelial reactivity and 6MWT after HIIT and CME, whereas no changes between group were found in the other assessed variables. The present results suggest that exercise intensity may influence the training-induced adaptation on endothelial reactivity and walking capacity in PD patients.
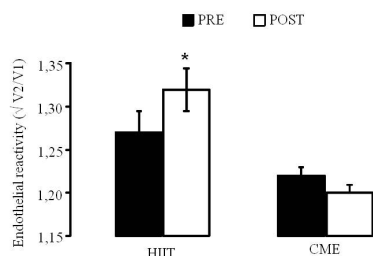

Figure 1. Endothelial reactivity pre and post 12 weeks of high-intensity interval (HIIT) and continuous moderate exercise training (CME). * denotes significant difference from CME during the same period ($P < 0.05$)

440   Board #281   May 30 11:00 AM - 12:30 PM

Inflammation And Denervation In Skeletal Muscle Of Parkinson'S Disease Patients: Impact Of High-intensity Exercise Training

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(No relevant relationships reported)

PURPOSE: Parkinson's disease (PD) is a neurodegenerative condition that compromises skeletal muscle function in ~1% of the population over 60y. Increasing evidence indicates PD has an inflammatory component, which may contribute to denervation in skeletal muscle and eventual motor unit loss. However, while the effects of aging on muscle inflammation are reasonably well-studied, the effects of aging with PD are unclear. Compared to age-matched controls, we have previously shown exaggerated architectural changes in PD muscle (e.g., type I myofiber grouping

resulting from dynamic denervation/renervation cycling) along with increased expression of indices of neuromuscular junction instability, and some signs of reversal with high intensity exercise training. The purpose of this study is to further investigate PD skeletal muscle pathology, examine the role of muscle inflammation, and explore the impact of exercise training.

METHODS: Vastus lateralis skeletal muscle biopsies were obtained from three cohorts of individuals: PD patients (n=30, 67±7y, Hoehn & Yahr stage 2-3), age-matched older adults (OA) and young adults (YA). To assess the effect of exercise training, a subset of PD patients (n=16) underwent 16wk high intensity training. Markers of denervation (e.g., neural cell adhesion molecule (NCAM) and sodium channel $Na_v1.5$) and inflammation [e.g., IL-1β, TNF-α, and TNF-like weak inducer of apoptosis (TWEAK)] are being assessed across the three groups and within the PD group pre- and post-training.

RESULTS AND CONCLUSION: We expect the study findings to aid in differentiating the effects of primary aging vs. aging with PD in skeletal muscle. Further, we anticipate high intensity exercise training will improve the inflammatory profile of PD muscle.

Complete results will be available for presentation at the 2018 ACSM national meeting.

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441   Board #282   May 30 11:00 AM - 12:30 PM

Effects Of Boxing Training On Cognitive And Physical Function In Patients With Parkinson's Disease

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(No relevant relationships reported)

Boxing training is a community based exercise program incorporating high intensity exercise for patients with Parkinson's disease (PD). A 90 min boxing session consists of performing footwork to improve balance and agility, performing punching combinations to develop coordination, and engaging in vocal exercises to strengthen the voice. Flexibility exercises are performed to reduce muscle rigidity. Core strengthening and weight lifting exercises are performed to strengthen muscles. Long-term benefits of boxing training include improvements in gait, balance, activities of daily living, and quality of life. An immediate effect of this nontraditional form of exercise on cognitive function, strength, and fall risk has not been explored. **PURPOSE** The purpose of the study was to investigate the immediate effect of a single boxing training session on cognitive and physical function in patients with PD. The hypothesis was that cognitive function, fall risk, and functional strength would improve immediately following a boxing training session. **METHODS** Cognitive function was measured with the Montreal Cognitive Assessment (MoCA). The MoCA assesses attention, concentration, executive function, orientation, language, memory, conceptual thinking, and calculation. The physical function tests included an assessment of fall risk with the Timed-Up-and-Go (TUG) test. The Sit-to-Stand (STS) test was used to assess functional strength. Measurements were performed before and immediately after the boxing session. **RESULTS** Participants were male and female persons with PD ($N = 13$) with a mean age of 70 (±8.2) years, who attended a mean of 2.5 (±0.7) boxing sessions weekly. Mean body mass index was 31.1 (±7.0) kg·m⁻². The MoCA score increased from pre (24.2 ± 3.8) to post (25.7 ± 4.4) boxing session, $t(12)$ = -2.9, $p =.01$. TUG times did not statistically improve from pre (7.8 s ± 2.2) to post (7.4 s ± 2.4) exercise, $t(12) = 1.6$, $p = .13$. Participants were able to perform more chair stands after (18.31 ± 6.61) compared to before the training session (16.4 ± 6.4), $t(12)$ = 2.4, $p = .03$. **CONCLUSION** An improvement in cognitive and physical function was observed following a single session of boxing training in patients with PD. Performing a single boxing session may lead to improved cognitive function and functional strength throughout the day.

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442   Board #283   May 30 11:00 AM - 12:30 PM

The Influence of Long-Term Transcranial Direct Current Stimulation on Gait Function in Parkinson's Disease

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(No relevant relationships reported)

INTRODUCTION: Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation form capable of improving motor performance in the upper limbs in healthy individuals as well as in Parkinson's disease (PD). One of the major motor symptoms of PD is impaired gait function. PURPOSE: The purpose of this study was to determine the long-term influence of tDCS on gait function in PD. METHODS: The study was a sham-controlled, double-blind, between-subjects design. Ten PD patients were allocated to either a tDCS or a SHAM stimulation group. Each subject performed 9 training similar sessions involving gait training on an instrumented treadmill with online feedback of performance during either tDCS (motor cortex contralateral to their primarily affected leg (dominant hemisphere). Stimulation lasted 20 minutes with a current strength of 2 mA. Gait function was quantified in testing sessions performed

before the first training session, after the last training session, as well as two and four weeks post training using an instrumented walkway (Zeno Walkway). The following variables related to gait performance were quantified in the test sessions: gait velocity, step length, stride length, and gait cycle time. The dependent variables were analyzed with a 2 (group) x 4 (test session) ANOVA. RESULTS: For all of the dependent variables, there was no main effect for group (*P* value range: 0.09-0.555), no main effect for testing session (*P* value range: 0.332-.88), and no group x testing session interaction (*P* value range: 0.212-0.786). Main comparison across groups with means and SD for the variables after baseline were: gait velocity (116.22 ± 13.35 vs 123.45 ± 11.38 cm/s); step length (63.31 ± 8.12 vs 65.34 ± 7.22 cm); stride length (126.75 ± 15.87 vs 131.21 ± 14.59 cm); gait cycle time (1.08 ± 0.05 vs 1.06 ± 0.04 s), tDCS and SHAM, respectively. CONCLUSION: These preliminary findings indicate that long-term tDCS applied to the motor cortex does not seem to elicit improvements in gait function in Parkinson's disease. Therefore, tDCS may not be as effective for improving complex, whole body movements compared to upper limb movements involving fine motor control. The first author is a CAPES PhD student grantee (BEX 13509/13-6). This research was supported by an intermural research grant to Brach Poston.

A-55   Exercise is Medicine®/Poster - **EIM: Cognitive and Mental Function**

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

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443   Board #284   May 30 11:00 AM - 12:30 PM

The Behavior of Activity Tracker Usage in Trained Users

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(No relevant relationships reported)

Purpose: The purpose of this cross-sectional study was to assess the continued activity tracker (AT) usage of a convenience sample of 165 university faculty and staff, determine the prevalence of various behaviors that comprise AT usage, and elucidate the relationship between usage and number of steps per day.
Methods: Participants were recruited by email from five cohorts of faculty/staff in the Ready-to-Move (RTM) coaching program during 2014-2016; all had been previously trained to use ATs as part of the program. In the summer of 2016, an online Qualtrics survey was utilized to discern usage patterns and steps/day; various quantitative analyses were performed using SPSS.
Results: In a sample of 165 trained users (mean age: 47.6 years; 84.8% female), a pattern variable frequency analysis showed that a total of 61.2% of previously trained users continued to do some, or all, of three usage behaviors (wearing, looking, and adjusting) on the day prior to data collection. There was a significant difference in the number of self-reported steps between those who did all 3 usage behaviors yesterday (M = 9032.4) and those who did not (M = 6459.2); $p \leq .005$.
Conclusion: Results showed that about half of trained-users from a physical activity program continued to use their trackers for months or even years after an initial period of coaching, depending on the cohort. This finding contrasts with findings from other studies where AT owners' usage dropped off more dramatically. We also found that those who consistently performed wearing, looking, and adjusting behaviors took significantly more steps than those who did not. The findings from this study indicate that AT use can be sustained in trained users and that the application of three usage behaviors can lead to an increased number of steps/day.

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444   Board #285   May 30 11:00 AM - 12:30 PM

The Effects of Exercise and Cortisol on Cognitive Functioning

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(No relevant relationships reported)

PURPOSE: To examine effects of cortisol and an acute bout of moderate intensity, aerobic exercise on Cognitive Functioning. **METHODS:** A counterbalanced, random selection repeated measures design was implemented for this study. 19 subjects (M=6, F=13; 20.3 +/- 1.6yrs) completed two testing sessions separated by one week. During the first session, participants filled out a PAR-Q, medical health history, and informed consent paper. Saliva samples were taken to measure cortisol levels. The CogState Brief Battery Assessment was administered. Body composition was assessed using DXA. Subjects rested quietly for 30 minutes while listening to soothing music. During the exercise testing, subjects cycled on a Monark cycle ergometer for 20 minutes at a submaximal exercise intensity against 1 kp and self-selected rpm's to elicit at 70% HRR (or RPE of 15). Subjects then performed a cool-down for 5 minutes where

salivary samples were again taken to determine post-treatment cortisol levels. The CogState Brief Battery Assessment was administered a second time. **RESULTS:** Changes in Speed of Performance (SOP) for working memory (WM) was found to be significantly quicker in post cognitive assessments for both resting and exercise trials (Resting Δ = 0.044 +/- 0.0519, p= 0.002; Exercise Δ = 0.036 +/- 0.0516, p= 0.007). However, accuracy of performance (AOP) for WM was only shown to increase in the resting trial (p > 0.05). SOP for Visual Learning (VL) was significantly enhanced only after exercise (Pre = 2.99 +/- 0.0768; Post = 2.96 +/- 0.0892, p= 0.016). Significant differences were not seen in the AOP for VL between the two trials. Subsequent analysis showed that there was no significant interaction between cortisol and the cognitive tests (p > 0.05). **CONCLUSION:** An acute bout of moderate intensity exercise was found to significantly improve the SOP of VL. The SOP during the WM assessment was significantly improved after both the resting and exercise trials. Supported by Georgia College and State University Faculty Grant, 2016.

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445   Board #286   May 30 11:00 AM - 12:30 PM
The Effects of Pilates on Mental Health Outcomes: A Meta-Analysis of Controlled Trials

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(No relevant relationships reported)

Population-based and experimental evidence supports the mental health benefits of exercise among otherwise healthy adults, chronically-ill patients and adults with anxiety and depressive disorders. Mental health benefits have been supported for traditional modes of exercise, including aerobic exercise training. However, the mental health benefits of non-traditional modes of exercise such as yoga, tai chi, and qigong remain understudied. Pilates, an alternative form of exercise, is posited to provide a valuable tool for every individual, regardless of age, gender, capacity, or ability to utilise in order to enhance both physical and mental states. **PURPOSE:** This meta-analysis estimated the population effect size for Pilates effects on mental health outcomes. **METHODS:** Articles published prior to August 2017 were located with searches of Pubmed, Medline, Cinahl, SportDiscus, Science Direct, PsychINFO, Web of Science, and Cochrane Controlled Trial Register using combinations of: *Pilates*, *Pilates method*, *mental health*, *anxiety*, and *depression*. Eight English-language peer-reviewed articles that included both allocation to a Pilates intervention or non-active control condition that lacked exercise training and a validated measure of depressive and/or anxiety symptoms assessed at baseline and after the Pilates intervention were selected. Extracted data included participant and intervention characteristics, anxiety and depression outcomes, and other relevant mental health outcomes, including feelings of energy and fatigue and quality of life. Hedges' *d* effect sizes were computed, study quality was assessed, and random effects models were used to estimate sampling error and population variance for the observed effects. **RESULTS:** Pilates resulted in significant, large, heterogeneous improvements in depressive (Δ=1.27, 95%CI: 0.44, 2.09, z=3.02, p≤0.003) and anxiety symptoms (Δ=1.29, 95%CI: 0.24, 2.33, z=2.40, p≤0.02), and feelings of energy (Δ=1.49, 95%CI: 0.67, 2.30, z=3.57, p<0.001) and fatigue (Δ=0.93, 95%CI: 0.21, 1.66, z=2.52, p≤0.012). Though statistically non-significant, a large increase was also found for quality of life (Δ=0.79, 95%CI: -0.04, 1.61, z=1.87, P>0.06). **CONCLUSIONS:** The available evidence supports that Pilates improves mental health outcomes.

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446   Board #287   May 30 11:00 AM - 12:30 PM
Sleep Quality Moderates the Association Between Physical Activity Frequency and Feelings of Energy and Fatigue in Adolescents

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(No relevant relationships reported)

Physical activity (PA) can improve sleep quality, low energy, fatigue. Though poor sleep quality may induce feelings of low energy and fatigue, the potential moderating effect of sleep quality on associations between PA and feelings of energy and fatigue among adolescents is unknown. **PURPOSE:** This study examined the moderating effect of sleep quality on associations between PA frequency and feelings of energy and fatigue among adolescents in Ireland. **METHODS:** Adolescents (N=481; 281 male, 200 female) aged 15.1±1.7y self-reported PA frequency (Patient-Centered Assessment and Counselling for Exercise Plus Nutrition; low-, moderate- and high PA frequency were classified as 0-2, 3-4 and ≥5d/wk), the intensity of feelings of energy and fatigue (Profile of Mood States - Brief), and sleep quality (Pittsburgh Sleep Quality Index; criterion for poor sleep was a global score >5). Two-way ANCOVAs examined variation in feelings of energy and fatigue according to the interaction of PA and sleep quality. Standardized mean differences (*d*) quantified the magnitude of differences. **RESULTS:** A statistically significant two-way interaction between poor sleep status and PA was found for feelings of fatigue (F$_{(2,413)}$=5.91, p≤0.003, η_p^2=0.028). Poor

sleepers with low PA reported greater feelings of fatigue compared to normal sleepers with low PA (*d*=1.02; 95%CI: 0.60, 1.44), and poor sleepers with moderate PA reported greater feelings of fatigue compared to normal sleepers with moderate PA (*d*=0.50; 0.17, 0.82). Poor sleepers with low PA reported greater feelings of fatigue compared to both poor sleepers with moderate PA (*d*=0.44; 0.05, 0.83) and poor sleepers with high PA (*d*=0.87; 0.46, 1.28). Poor sleepers with moderate PA reported greater feelings of fatigue compared to poor sleepers with high PA (*d*=0.52; 0.14, 0.91). Poor sleep did not moderate the association between PA and feelings of energy (*p*>0.57). **CONCLUSIONS:** Sleep quality moderated the association between PA frequency and intensity of feelings of fatigue. Among adolescents with good sleep quality, fatigue scores were invariant across PA frequency categories. However, a dose-response relationship was suggested among adolescents with poor sleep quality, with less fatigue symptoms with greater PA frequency among adolescents with poor sleep quality.

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447   Board #288   May 30 11:00 AM - 12:30 PM
Exercise Referral for Major Depressive Disorder

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Reported Relationships: C. Rethorst: *Contracted Research - Including Principle Investigator; NIH.*

PURPOSE: Despite its proven efficacy in research trials, exercise is rarely used as a treatment for Major Depressive Disorder (MDD) in real-world clinical settings. Clinicians cite a lack of training in exercise prescription as a barrier, and indicate a preference for referral to community resources. The purpose of this project was to assess the feasibility and preliminary efficacy of referral from primary care to a research-tested exercise program in the treatment of MDD.
METHODS: Patients diagnosed with MDD in a primary care clinic were provided a written Exercise Is Medicine prescription by their provider and referred to a research-tested exercise program. Patients met weekly for 12 weeks with an exercise specialist at a community recreation center. In addition, patients received access to the recreation center for 6 months and a Fitbit Charge HR to monitor their activity. Depressive symptoms were assessed on a weekly basis.
RESULTS: To date, 24 patients have been referred to the program and 17 patients (70.8%) have been enrolled. Patients have attended 73.75% of supervised exercise sessions. Based on Fitbit data, patients have engaged in a mean of 150.66 minutes of moderate-vigorous physical activity per week ("Very Active" minutes + Fairly Active" minutes). Depressive symptoms, as assessed by the PHQ-9, reduced from 9.06 at baseline to 4.76 at last observation (p < 0.01).
CONCLUSIONS: Patient adherence data indicates exercise referral is a feasible intervention in patients with MDD. Furthermore, patients experienced a significant reduction in depressive symptoms demonstrating the potential of referral to exercise as a viable treatment option.

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448   Board #289   May 30 11:00 AM - 12:30 PM
Factors Influencing Firefighters' Perceptions of Worksite Exercise

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(No relevant relationships reported)

PURPOSE: Firefighters have physically demanding jobs resulting in high rates of cardiovascular disorders, musculoskeletal injuries, and disabilities. Many fire service stakeholders advocate worksite exercise to counteract the impact of these disorders in firefighters. However, implementation of worksite exercise is fragmented in this population, and barriers and facilitators have not been fully explored. The purpose of this study was to assess factors influencing firefighters' perceptions about implementation of worksite exercise.
METHODS: A cross-sectional study was conducted in career firefighters (n = 181; 23 F, 158 M; age 35.3 +/- 8.6 yr) from 3 fire departments in the Tampa Bay region of Florida. The participants completed a 45-item implementation questionnaire after a 12-month worksite exercise injury prevention trial. The questionnaire inquired about implementation outcomes, such as uptake, adherence, access, resources, and stakeholder engagement. Relationships were assessed between items responses and independent variables, including department, age, BMI, physical activity, and low back pain history.
RESULTS: Significant departmental differences were noted for perceptions in leadership support for exercise (p = 0.03), fitness personnel availability (p < 0.001), regular off-duty exercise (p = 0.03) and gym memberships (p = 0.01). Respondents with lower BMI values were more likely to report that regular exercise was important (p = 0.04). Younger respondents were more likely to have gym memberships (p = 0.003) and to report sufficient fitness personnel availability (p = 0.01). Respondents without low back pain history were more likely to exercise off-duty (p = 0.05). No significant relationships were observed between questionnaire responses and physical activity.
CONCLUSIONS: Intrapersonal, interpersonal, and institutional factors influence firefighters' perceptions about the implementation of worksite exercise. Stakeholder engagement (leadership support) and available resources vary across departments and

impact implementation. Potential barriers related to these factors need be addressed to successfully implement worksite exercise programs to reduce the adverse effects of injuries, illnesses, and subsequent disabilities in firefighters.