B-02 Highlighted Symposium - **The Past, Present and Future of ACL Injury Prevention: Biomechanics Screening and Neuromuscular Interventions that Work!**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-101AB

This symposium will highlight previous and current work related to reducing the risk of anterior cruciate ligament (ACL) injuries in athletes. The future of implementing evidence based lab and field screening with targeted neuromuscular interventions will be discussed.

454 **Chair:** Kevin R. Ford, FACSM. *High Point University, High Point, NC.*
(No relevant relationships reported)

455 May 30 1:10 PM - 1:40 PM
Keynote - State of the Art Screening and Biofeedback for ACL Injury Prevention
Kevin R. Ford, FACSM. *High Point University, High Point, NC.*
(No relevant relationships reported)

456 May 30 1:40 PM - 1:55 PM
Focused Interventions for Special Populations
Jeffrey B. Taylor. *High Point University, High Point, NC.*
(No relevant relationships reported)

Anterior cruciate ligament injury prevention programs (ACL-IPP) are generally successful at reducing injury rates; however, these ACL-IPP are more effective with women's soccer (SOC) than basketball (BB) athletes. Purpose: To compare the biomechanical profiles and responses to an ACL-IPP in women's BB and SOC players. Methods: 87 single-sport athletes (38 BB, 49 SOC) were cluster randomized into intervention (6-week ACL-IPP) and control groups. 3D biomechanical analyses of drop vertical jump (DVJ), double- (SAG-DL) and single-leg (SAG-SL) sagittal, and double- (FRONT-DL) and single-leg (FRONT-SL) frontal plane jump landing tasks were tested before and after the intervention. Baseline peak angles, excursions, and joint moments were analyzed using repeated measures MANOVA, while delta (Δ) scores of the same biomechanical measures were analyzed using two-way MANCOVAs controlling for pre-test scores. Results: At baseline, BB players landed with less hip and/or knee excursion during all tasks ($p<0.05$) except for the SAG-SL task. The FRONT-SL task elicited the most distinct differences, including decreased hip adduction angles (mean difference: 5.0±1.3°, $p<0.001$), increased hip internal rotation excursion (mean difference: 2.8±0.9°, $p=0.003$), greater knee abduction moments (mean difference: 0.07±0.02 N·m/kg·m, $p=0.003$) and lower hip adduction moments (mean difference: 0.15±0.05 N·m/kg·m, $p=0.001$) in basketball players. After completing the ACL-IPP, the basketball intervention group exhibited a lower reduction in peak knee abduction angles (Δ=0.9±3.5°) compared to the basketball control group (Δ=2.6±3.0°, $p=0.004$) and soccer intervention group (Δ=1.5±3.4°, $p=0.01$) during the SAG-SL. During FRONT-SL, the basketball intervention group exhibited greater knee flexion excursion (Δ=1.5±4.5°) after training than the control group (Δ=-1.8±5.5°, $p=0.01$). Conclusion: Soccer players exhibit a more protective landing strategy than basketball players, yet women's basketball and soccer players largely exhibit similar biomechanical adaptations to ACL-IPP. These data indicate that ACL-IPP may need to account for sport-specific biomechanics, including technique training that emphasizes soft landings during basketball-specific frontal plane and single-leg jumping activities.

457 May 30 1:55 PM - 2:10 PM
Modeling of ACL Injury Mechanism
Nathaniel A. Bates. *Mayo Clinic, Rochester, MN.*
(No relevant relationships reported)

Invasive biomechanical techniques and the unpredictable nature of anterior cruciate ligament (ACL) injury events limit direct in vivo investigations. Instead, researchers have developed in vitro models such as the mechanical impact simulator to recreate ACL injury events. Purpose: To quantify the biomechanical response of the ACL and medial collateral ligament (MCL) in a simulated landing environment capable of producing ACL ruptures consistent with clinical injury presentation. Methods: 39 cadaveric full lower extremity specimens (19M:20F) completed testing with impulse forces delivered to sole of the foot in the mechanical impact simulator. Pneumatic pistons mounted on the mechanical impact simulator generated knee abduction moments (KAM), internal tibial rotation moments (ITR), anterior tibial translation forces (ATS), hamstrings, and quadriceps forces <1 sec prior to impulse load delivery. KAM, ATS, and ITR magnitudes corresponded to in vivo recorded kinetics from athlete cohorts exhibiting high, medium, low, and no relative risk for ACL injury. Each kinetic input was independently randomized and a series of impulses was repeated on each specimen until hard or soft tissue failure occurred. ACL and MCL strains were recorded with implanted sensors, while a 6-axis load cell recorded forces and torques at the knee. Results: 87% of specimens produced ACL failures during simulation, with 92% presented at the femoral insertion or midsubstance and concomitant MCL failures in 31%. Peak strain was greater in the ACL (15.3 ± 8.7%) than the MCL (5.1 ± 6.3%; $P < 0.01$). Overall ACL strain across all external loading conditions was 3.5% greater in females than males ($P = 0.04$), but no sex differences were noted in the MCL ($P = 0.36$). Under identical external loading conditions, female specimens also exhibited larger KAM moments than males ($P = 0.04$). Conclusion: The mechanical impact simulator is the first in vitro model to reliably create ACL ruptures consistent with clinical presentation. Female specimens were more susceptible to ACL injury and KAM than males, which supports the established association between sex, KAM, and ACL injury risk. Future iterations of this model could be manipulated to investigate efficacy of injury prevention interventions and ACL reconstructions during simulated ACL injury events.

458 May 30 2:10 PM - 2:40 PM
Keynote - Future Directions for ACL Injury Prevention: Coupled Biomechanics and Epidemiology
Timothy Hewett, FACSM. *Mayo Clinic, Rochester, MN.*
(No relevant relationships reported)

B-08 Thematic Poster - **Concussion Assessment and Management in Pediatric Athletes**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100C

485 **Chair:** Daniel C. Herman, FACSM. *University of Florida, Gainesville, FL.*
(No relevant relationships reported)

486 Board #1 May 30 1:00 PM - 3:00 PM
Static And Dynamic Cognitive Task Performance In Youth And Collegiate Athletes With Concussion
Anna N. Brilliant[1], William P. Meehan, III[1], David R. Howell[2]. *[1]Boston Children's Hospital, Waltham, MA. [2]Children's Hospital Colorado, Aurora, CO.*
(No relevant relationships reported)

PURPOSE: To determine if individuals with a concussion demonstrate worsened cognitive task performance while standing still or walking, relative to uninjured controls.
METHODS: Athletes seen at a local sports medicine clinic and college were recruited. Participants were diagnosed with a concussion by a physician and assessed within 10 days of injury. All participants were asked to stand still for 30 seconds while completing a cognitive task and to walk along a 16m pathway while completing the same cognitive task. Each condition was repeated five times. One of three different cognitive tasks were completed on each trial, including subtraction by 7s from a 2-digit number, spelling five-letter words backwards, and reciting the months in reverse order from a random month. Cognitive task accuracy and the number of responses were recorded for both conditions. We used ANCOVAs to evaluate the effect of group (concussion vs. control) on cognitive accuracy and total number of responses, while controlling for the independent effect of age, gender, and prior concussion history.
RESULTS: Two hundred and eighteen participants completed the study (n=76 with concussion, 5.5±3.0 days post-injury, 51% female, 16.7±3.3 years of age; n=142 controls, 31% female, 18.0±1.9 years of age). Controlling for the effect of age, gender, and prior concussion history, the concussion group was significantly less accurate than the control group while walking (89.3±15.1% vs. 95.0±6.0%; $p=0.04$) but similar while standing (93.6±9.9% vs. 96.4±5.0%; $p=0.15$). The concussion group had fewer total responses than the control group while standing (34.8±14.3 vs. 44.5±17.3 total responses; $p < 0.001$) and walking (22.2±7.7 vs 32.4±12.6 total responses; $p < 0.001$).
CONCLUSIONS: Athletes displayed lower cognitive task accuracy rates after concussion compared to controls while walking, but similar levels of accuracy while standing. Walking during cognitive processing may be a more accurate representation of sport-like activity than movement or cognitive based assessments performed in isolation. Following concussion, understanding the ability to perform a cognitive task while walking may be crucial when determining readiness to return to full athletic participation, as deficits may not be otherwise identified.

487 Board #2 May 30 1:00 PM - 3:00 PM

Persistent Vestibular Symptoms and Impairment following Concussion in Adolescents

Aaron M. Sinnott[1], Valerie L. Reeves[2], Cyndi L. Holland[2], Nicholas A. Blaney[2], Andrew M. Rosse[2], Hannah B. Blitzer[2], R.J. Elbin[3], Michael W. Collins[2], Anthony P. Kontos[2]. *[1]University of Pittsburgh, Pittsburgh, PA. [2]University of Pittsburgh Medical Center, Pittsburgh, PA. [3]University of Arkansas, Lafayette, AR.*

(No relevant relationships reported)

Vestibular impairment following concussion is associated with higher symptom burden, worse cognitive performance, and longer recovery. However, the role of persistent vestibular symptoms and impairment on these outcomes among adolescents is unknown. **PURPOSE:** Determine the role of persistent vestibular symptoms and impairment following concussion on recovery time and clinical outcomes among adolescents. **METHODS:** 50 (F-22/M-28) adolescents aged 12-20 years completed the Vestibular/Ocular Motor Screening tool (VOMS), Immediate Post-concussion Assessment and Cognitive Testing (ImPACT), and Post-concussion Symptom Scale (PCSS) at 0-10 and 11-21 days after concussion. Participants were grouped into: 1) persistent vestibular (PV), 2) vestibular improvement (VI), and 3) no vestibular (NoV). A 3 (group) X 2 (time) ANOVA with Bonferroni correction was performed for cognitive and symptom scores, and one-way ANOVA was performed for recovery time. **RESULTS:** Participants included 17 (35%) PV, 12 (25%) VI, and 20 (40%) NoV with one being excluded based on outlier analyses. Results supported group differences on PCSS at 11-21 days (p=.004), with PV (29.0±24.9) reporting higher symptoms than VI (13.0±15.5; p=.045) and NoV (5.45±10.0; p=.005). The VP group took longer to recover (34.9±11.6 days, p=.03) than the NoV (22.9±14.9 days) group. There were no significant group by time interactions for cognitive scores. However, all groups improved on verbal (p=.007) and visual (p=.03) memory, visual motor speed (p=.02), and reaction time (p=.03) from 0-10 to 11-20 days. Females were 5.7x more likely than males to be in the PV versus NoV group (p=.02, *95% CI*=1.3-24.6). **CONCLUSION:** Persistent vestibular symptoms and impairment following concussion may play a role in higher symptom burden and prolonged recovery that warrants attention from clinicians. Females may be more likely to experience these persistent vestibular symptoms and impairment.

Funding
This research was supported in part by a grant to the University of Pittsburgh from the National Institute on Deafness and Other Communication Disorders (1K01DC012332-01A1) to Dr Kontos.

488 Board #3 May 30 1:00 PM - 3:00 PM

Influence Of Motion Sensitivity On Baseline Symptoms, Cognitive, And Vestibular/oculomotor Scores In Adolescent Athletes

R.J. Elbin[1], Mallory McElroy[1], Katie Stephenson-Brown[1], Anthony Kontos[2]. *[1]University of Arkansas, Fayetteville, AR. [2]University of Pittsburgh Medical Center, Pittsburgh, PA.*
(Sponsor: Dr. Matthew Ganio, FACSM)

(No relevant relationships reported)

Researchers report that a history of motion sensitivity is associated with vestibular/oculomotor impairment and symptoms in non-concussed collegiate athletes. However, previous research did not include other commonly used baseline concussion assessments (e.g., neurocognitive, symptoms) or adolescent athletes. **PURPOSE**: To examine the effects of motion sensitivity on baseline neurocognitive, symptom, and vestibular/oculomotor scores in high school athletes (HS). **METHODS**: A total of 423 HS athletes (15.04 $\pm$ 1.24 years; 97 females - 24%) completed the Motion Sickness Sensitivity Questionnaire (MSSQ), the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT), Post-Concussion Symptom Scale (PCSS), and Vestibular/Ocular Motor Screening tool (VOMS) at baseline. Athletes were categorized into three groups: 1) NONE- MSSQ score=0 (33%, 142/421), 2) LOW-MSSQ score >0<7.07 (34%, 144/421) or 3) HIGH- MSSQ score >7.20 (32%, 135/421) based on median split of MSSQ scores >0. A series of ANOVAs were performed to examine between group differences on VOMS item scores, near-point convergence (NPC) distance, cognitive testing, and symptoms. A series of chi-square analyses with odds ratios (ORs) were used to analyze the association of motion sensitivity to clinical cutoffs on VOMS (i.e., $\geq$2 on any item) and NPC distance ($\geq$ 5cm). **RESULTS**: A total of 34% (150/441) and 30% (18/62) of athletes exceeded clinical cutoffs on at least one VOMS item and NPC distance, respectively. Total PCSS scores were greater for the HIGH compared to the NONE group (p=.003). There were no differences between motion sensitivity groups on cognitive performance (p >.05). The HIGH group had higher total VOMS scores than the NONE group for horizontal saccades, horizontal vestibulo-ocular reflex (VOR), vertical VOR, and visual motion sensitivity (p < .01). The HIGH group was 2.94x ($p\leq$ .001) more likely than the NONE group to exceed clinical cutoffs on VOMS. **CONCLUSION**: Motion sensitivity was associated with scores above clinical cutoffs on VOMS. Sports medicine professionals should assess motion sensitivity in athletes at baseline to inform better SRC care.

489 Board #4 May 30 1:00 PM - 3:00 PM

Longitudinal Multimodal Assessment To Quantify Concussion Recovery Trajectory Among Youth Athletes

David R. Howell[1], Gregory D. Myer[2], Anna N. Brilliant[3], Kim Barber Foss[2], William P. Meehan, III[3]. *[1]Children's Hospital Colorado, Aurora, CO. [2]Cincinnati Children's Hospital Medical Center, Cincinnati, OH. [3]Boston Children's Hospital, Waltham, MA.* (Sponsor: Louis R. Osternig, FACSM)

(No relevant relationships reported)

PURPOSE: Our aim was to evaluate a quantitative and multifaceted approach for determination of concussion recovery among youth athletes across different functional domains.
METHODS: Youth athletes 8-18 years of age and diagnosed with a concussion were tested 3 times: within 10 days of injury (T1), approximately 3 weeks post-injury (T2), and after clinical recovery, defined as symptom resolution and return to sport clearance (T3). Control participants completed the protocol in similar temporal increments as concussion participants. All participants completed a multifaceted protocol that included a symptom inventory (PCSS), a dual-task gait evaluation, an electroencephalography (EEG)-based auditory oddball task, and objective eye tracking. Repeated measures ANCOVAs were used to evaluate between group differences with sex, age, and prior concussions as covariates. We also examined if the rate of change across time for each outcome variable was different between groups using analysis of response profiles for longitudinal data.
RESULTS: Sixty-seven athletes participated: 36 post-concussion (age= 14.0±2.6 years; 44% female) and 31 controls (age=14.6±2.2 years; 39% female). Concussion symptoms were significantly higher for the concussion group compared to controls at T1 (PCSS=31.7±18.8 vs. 1.9±2.9; p<0.001) and T2 (PCSS=10.8±11.2 vs. 1.8±3.6; p=0.001), but resolved by T3 (PCSS=1.7±3.6 vs. 2.0±3.8; p=0.46). The concussion group walked significantly slower during dual-task gait than controls at each of the three tests (0.83±0.19 vs. 0.95±0.15 m/s; p=0.049). We found no significant differences between groups for the EEG oddball task or objective eye tracking measures. The EEG auditory oddball connectivity recovery trajectory differed significantly between groups, where the concussion group scores decreased and the control group scores increased across the testing timeline (χ2=14.1, p=0.001).
CONCLUSIONS: Despite symptom resolution, athletes with concussion displayed altered dual-task gait speeds at their final visit and their auditory oddball connectivity scores worsened throughout the test timeline. A multimodal and objective approach to concussion monitoring may support clinicians in the detection of brain function deficits that are undetectable with standard clinical assessments.

490 Board #5 May 30 1:00 PM - 3:00 PM

Association Between Sleep Quality and Symptoms Following a Sports-Related Concussion in the Pediatric Population

Aaron J. Zynda[1], Jane Chung[1], Shane M. Miller[1], Meagan J. Sabatino[1], Chan-Hee Jo[2], Cason Hicks[3], Nyaz Didehbani[3], Kathleen Bell[3], Munro Cullum[3]. *[1]Texas Scottish Rite Hospital for Children, Plano, TX. [2]Texas Scottish Rite Hospital for Children, Dallas, TX. [3]University of Texas Southwestern Medical Center, Dallas, TX.*

(No relevant relationships reported)

PURPOSE: To determine if there is an association between reported sleep quality and concussion symptoms in pediatric athletes. **METHODS:** A review of prospectively collected data from subjects diagnosed with a sports-related concussion between October 2015 and June 2017, and enrolled in the North Texas Concussion Network Prospective Registry (Con-Tex), was performed. Subjects were treated at one of four outpatient clinics, in North Texas, specializing in concussions. Records were reviewed for sleep quality, indicated by composite scores on the Pittsburgh Sleep Quality Index (PSQI). According to PSQI guidelines, good sleep quality (GOOD SLEEP group) is indicated by a composite score of $\leq$5 (possible total=21), and poor sleep quality (POOR SLEEP group) by a score of >5. Demographics, symptoms, and total symptom score, as assessed by the Sports Concussion Assessment Tool 3 (SCAT3) at initial visit and 3-month follow-up, were compared between groups. **RESULTS:** Of 356 eligible subjects, 180 (50.6%) were girls and 176 (49.4%) were boys, with a mean age of 14.38 years (7-18). 261 subjects had a PSQI composite score of $\leq$5 at their initial visit (GOOD SLEEP), while 95 had scores >5 (POOR SLEEP). At initial visit, the POOR SLEEP group had a higher mean PSQI composite score (8.7) and total symptom score on SCAT3 (39.2) compared to the GOOD SLEEP group (2.6 and 20.4, respectively, p<.0001). The POOR SLEEP group also had a higher mean PSQI composite score (5.7) and total symptom score (12.2) at 3 months compared to the GOOD SLEEP group (3.0 and 4.2, respectively, p<.0001), although both groups improved. Additionally, subjects in the POOR SLEEP group reported more fatigue, drowsiness, and trouble falling asleep on the SCAT3 at both the initial visit and 3-month follow-up when compared to the GOOD SLEEP group (p<.005). Gender was also significantly different between the two sleep groups with more girls included in the POOR SLEEP

group than boys (61.1% vs 38.9%, respectively, p=.017). **CONCLUSIONS:** Poor sleep was strongly associated with increased symptom burden within pediatric athletes both at initial visit and 3-month follow-up post-concussion. Clinicians should include an evaluation of sleep quality in young athletes treated for a sports-related concussion.

491 Board #6 May 30 1:00 PM - 3:00 PM

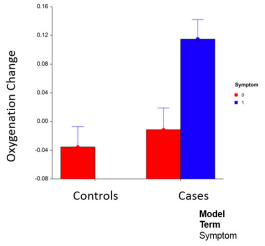
Functional Near Infrared Spectroscopy Identifies Changes in Cognitive Workload Following Pediatric Concussion

christina lin master[1], Eileen Storey[1], Lei Wang[2], Olivia Podolak[1], Matthew Grady[1], Andrew Mayer[3], Hasan Ayaz[2]. *[1]The Children's Hospital of Philadelphia, Philadelphia, PA. [2]Drexel University, Philadelphia, PA. [3]Mind Research Network, Albuquerque, NM.*

(No relevant relationships reported)

PURPOSE: To determine if functional near infrared spectroscopy (fNIRS), a noninvasive imaging modality detecting oxygenation changes reflective of cognitive workload, distinguishes physiologic differences between concussion subjects and healthy controls during King-Devick (KD) testing, a rapid number naming task **METHODS**: We recruited 57 cases, ages 7 to 21 years, 51% female, and 17 controls, ages 10-21 years, 47% female from a subspecialty referral concussion program for this prospective case control study where the subjects performed the KD test while wearing a fNIRS device consisting of a headband which records anterior prefrontal cortex oxygenation changes with 4 optodes at a 4Hz sampling rate. The main outcome measures were KD times, symptom provocation and oxygenation change during KD testing. **RESULTS**: Concussion subjects demonstrated longer times and greater oxygenation change on fNIRS compared to healthy controls. However, within the group of concussion subjects, KD times did not distinguish between those with and without symptom provocation upon testing. In contrast, fNIRS was able to detect oxygenation change differences between these two subgroups, with the symptomatic group exhibiting greater oxygenation change with testing.
CONCLUSIONS: Based on our data, the prolongation of KD times observed following concussion has physiologic correlates with increased cognitive workload. Among subjects with concussion, KD times did not distinguish between those with and those without symptom provocation upon testing. In contrast, fNIRS was able to differentiate between these two subgroups of concussion, with symptomatic subjects exhibiting a pattern of greater cognitive workload compared to asymptomatic. fNIRS has utility in detecting subclinical differences in cognitive workload in concussion. In addition, our data supports the concept that the physiologic basis for symptom provocation in concussion may be related to cognitive overload.

fNIRS with Symptom Provocation on KD testing



Model Term	F-Value	Num DF	Denom DF	Prob Level
Symptom	22.3458	1	729.1	0.000003

492 Board #7 May 30 1:00 PM - 3:00 PM

The Effect of Anxiety on Baseline Concussion Assessment in Adolescent Females

Christopher P. Tomczyk, Jody Langdon, George Shaver, Tamerah Hunt, FACSM. *Georgia Southern University, Statesboro, GA.* (Sponsor: Tamerah Hunt, FACSM)

(No relevant relationships reported)

Anxiety occurs in approximately 15-20% of adolescent females. The potential for the interaction between anxiety and impaired cognition commonly assessed by concussion batteries require clinicians and researchers to examine the effect of anxiety on baseline concussion test scores. **PURPOSE**: Examine the effects of trait anxiety on concussion baseline testing in adolescent female athletes. **METHODS:** Prior to their competitive season, 35 adolescent female athletes ranging from 13-18 years of age (mean age: 15.66 ± 1.28) were administered the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT) and the State Trait Anxiety Inventory during baseline testing. Participants were divided into groups, based off a previously validated T-Anxiety cutoff score of 35, which was derived from the literature (low n=18, high n=17). ImPACT composite scores served as dependent variables. Multiple one-way ANOVAs were calculated to examine group differences on ImPACT composite scores. All statistical analyses were conducted using SPSS 23.0 (IBM, Armonk, NY). Significance level was set *a priori* at 0.05 with a Bonferroni correction (p<.008) **RESULTS:** Significant differences were found between high and low trait anxiety groups for total symptom score ($F_{(1, 33)} = 9.58$, $p = .004$; High: 12.30 ± 10.57, Low: 4.12 ± 5.57), and composite visual motor speed ($F_{(1, 33)} = 10.11$, $p = .003$; High: 37.31 ± 4.96, Low: 40.31 ± 5.82). Athletes with high trait anxiety reported more symptoms and performed slower on visual motor speed. No statistical differences existed for composite: verbal memory, visual memory, reaction time and impulse control (p>0.05). **CONCLUSION:** This study provides preliminary evidence that adolescent females with high trait anxiety during baseline concussion assessment present with higher symptoms and slower visual motor speed. In order to subscribe to a holistic approach of concussion management, anxiety needs to be incorporated into the clinical decision process. Without examining adolescent levels of anxiety the clinician may be vulnerable to making inaccurate interpretations of baseline test scores.

493 Board #8 May 30 1:00 PM - 3:00 PM

Concussion Recovery In Adolescents: The Influence Of Race And Sex On Neurocognition

Seema S. Aggarwal, Summer D. Ott, Nikhil S. Padhye. *The University of Texas Houston Health Science Center, Houston, TX.*

(No relevant relationships reported)

An estimated 500,000 to 800,000 concussions occur annually among U.S. high school athletes. However, the association of sex and race/ethnicity with recovery remains unclear. **PURPOSE:** The aim of this study was to examine influence of sex and race/ ethnicity on the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) in adolescents. **METHODS:** This was a retrospective cohort study of adolescents, 13-19 years old, evaluated for an acute concussion (≤10 days from injury) at a university-based concussion clinic. General linear models (GLM) were used to examine race and sex interaction on post-concussion ImPACT composite scores on verbal memory, visual memory, visual motor, reaction time, and symptoms. **RESULTS:** A total of 227 charts that met inclusion criteria. There were no differences in the distributions of age and sex. The sample (N = 227) was primarily male (75%), and the median age was 15 years. Minorities (Blacks and Hispanics) constituted 46% of the sample. White females had the longest recovery time (median 27.5 days) and minority males had the shortest recovery time (median 11 days). Univariate tests indicated that the interaction of sex and race was statistically significant for visual memory ($F(3,223) = 3.83$, $p = .011$, $\eta_p^2 = .049$), reaction time ($F(3,223) = 2.87$, $p = .037$, $\eta_p^2 = .037$), and symptoms ($F(3,223) = 9.46$, $p < .001$, $\eta_p^2 = .113$). On these ImPACT subscales, White females had the poorest performance, and minority males had the best performance. Compared to the scores for minority males, ImPACT scores for White females on these subscales were as follows: visual memory (70.67±14.1 vs. 60.95±14.5), reaction time (.67±.17 vs. .76±.19), and symptom scores (12.19±14.5 vs. 28.29±22.04). Multivariate tests for the main effect of the interaction of race and sex ($F(15,663) = 3.00$, $p = <.001$, $\eta_p^2 = .06$) were statistically significant. **CONCLUSION:** This study found that both race and sex appear to influence concussion recovery. White females took longest to recover and had worse ImPACT visual memory, reaction time, and symptoms scores than White males, minority females, and minority males. In contrast, minority males had shorter recovery times and better ImPACT scores on these subscales than all other race-sex categories.

B-09 Thematic Poster - Exercise Psychology-Stress

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100E

494 **Chair:** Steven J. Petruzzello, FACSM. *University of Illinois at Urbana-Champaign, Urbana, IL.*

(No relevant relationships reported)

495 Board #1 May 30 1:00 PM - 3:00 PM

Multidimensional Stress influencing Mental Health of Chinese Professionals and the Health Promotion of Physical Activity

Chunmei Zheng. *Shandong University, Jinan, China.*

(No relevant relationships reported)

Social and economic changes in China have seriously influenced the mental health of citizens. Although work stress has been studied by scholars within China and

abroad. little is known about multidimensionality of stress factors and their effects among various populations. **PURPOSE:** The purpose of this study was to examine the influence of multidimensional stressors on the mental health in Chinese adults and identify the impact of physical exercise on mental health. **METHODS:** Participants for the survey were randomly recruited from Jinan institutions, parks, squares and streets. A total of 1000 questionnaires were distributed, of which 819 questionnaires were returned (response rate 81.9%), 110 invalid excluded. A total of 709 valid questionnaires were used for the data analysis. Using SPSS version 16.0, descriptive statistics, T-test, Multivariate Analysis of Variance (MANOVA) and hierarchical regression analysis were used to analyze the data. **RESULTS:** Analysis of variance ($P = 0.046 < 0.05$) indicated that the stress levels of professionals across the ranks are significantly different. Descriptive Statistic analysis showed that the main sources of stress across different occupational groups are work (35.8%), education (36.1%), and health (18.1%). MANOVA (Wilkslambda Criterion = 0.86) showed that satisfaction, emotional balance, self-awareness, and interpersonal relationship are significantly different among different occupations ($p < 0.01$, respectively). T-test indicated that there was significant differences in life satisfaction, emotional balance, self-awareness, and interpersonal relationships between physical activity and non-physical activity group (all $p < 0.05$). **CONCLUSION:** It can be concluded that China has distinct social classes, whose mental health conditions vary; The stress levels of professionals across the ranks are significantly different; Work, education, and healthcare were identified as main sources of stress among working professionals; Respondents who regularly engaged in physical activity far better in terms of mental health compared to the non-exercise group. Supported by the China Scholarship Council; Shandong Soft Science. [2015RKE27016]; National science and technology basic work. [2015FY111600].

496 Board #2 May 30 1:00 PM - 3:00 PM

Effects of Voluntary Wheel Running Exercise on the Depressive-Like Behavior and Circadian Alterations of Neuroendocrine Induced by Chronic Unpredictable Mild Stress in Rats

YAN ZHAO. *CHENGDU SPORT UNIVERSITY, CHENGDU, China.*

(No relevant relationships reported)

PURPOSE: To investigate effects of voluntary wheel running exercise on circadian rhythmic alterations of plasma hormone and peptide induced by Chronic Unpredictable Mild Stress (CUMS).
METHODS: Ninety male SD rats were divided into three groups: CUMS, EC (Exercise plus CUMS), and Con (Control) group. Rats were under a 12h/12h light/dark cycle (19:00 light up; 07:00 light off). The CUMS procedure consists of a variable sequence of 11 stressors. Rats were randomly exposed to two stressors every day for 3 weeks. Rats in EC group were trained in a voluntary wheel running program for a total of 8 weeks, plus CUMS procedure during the last three weeks. Blood samples were collected at each of six time points (ZT1 and 5, 9, 13, 17, 21). Plasma concentrations of corticosterone (CORT), melatonin (MT) and vasoactive intestinal peptide (VIP) were detected by ELISA. Data were analyzed by one-way ANOVA, and the circadian rhythms by single cosinor method.
RESULTS: Rats in Con group showed robust circadian rhythms in plasma CORT, MT and VIP. Rats in CUMS group showed an obvious disorder in circadian rhythm of plasma CORT, including phase advance and decrease in amplitude, and markedly blunted circadian rhythm. There also showed a markedly blunted circadian rhythm and decreased levels of plasma melatonin in CUMS rats compared to Con rats. VIP still has 24-hour rhythm, but the amplitude was significantly lower than that of the Con group, peak phase also delayed for 6 hours, expression was significantly higher than that of the Con group. 8-week voluntary wheel running exercise can significantly inhibit the disturbance of MT, CORT and VIP circadian rhythm, and also the abnormal expression of these hormones secretion.
CONCLUSION: CUMS induce these peptides and hormones desynchronized from SCN and voluntary wheel running exercise can rescue the disturbed circadian rhythms of these synchronizers.
Supported by the Innovation Project of Sports Medicine and Health Institute of Chengdu Sport University

Table 1. The comparison of CORT circadian property in each group

Group	*P*	Median±SE	Amplitude (95% CL)	Peak Phase (95% CL)
Con	<0.01	77.365±4.225	14.586 (7.044, 22.129)	-157.405 (-182.181, -132.626)
CUMS	0.432	83.918±3.025	8.954 (3.560, 14.354)	-89.852 (-116.942, 62.761)
EC	0.041	74.366±3.356	14.296 (8.305, 20.288)	-146.302 (-177.441, -115.161)

Table 2. The comparison of MT circadian property in each group

Group	*P*	Median±SE	Amplitude (95%CL)	Peak Phase (95%CL)
Con	<0.01	5.769±0.167	1.093 (0.795, 1.392)	-359.232 (-343.385, -15.081)
CUMS	0.653	2.773±0.158	0.718 (0.436, 1.001)	-149.495 (-192.680, -106.311)
EC	0.032	5.332±0.176	1.037 (0.722, 1.351)	-356.925 (-339.267, -14.583)

Table 3. The comparison of VIP circadian property in each group

Group	*P*	Median±SE	Amplitude (95% CL)	Peak Phase (95%CL)
Con	<0.01	64.420±1.823	5.915 (2.661, 9.168)	-258.505 (-291.875, -225.130)
CUMS	0.046	81.120±2.055	3.422 (0.654, 6.190)	-348.738 (-332.477, -14.998)
EC	0.022	62.225±1.707	5.033 (1.987, 8.080)	270.178 (307.429, 232.925)

Notes for Table 1-3: 360 degrees=24 h, Phase reference: 00:00=0 degree, P<0.05, meaning existence of circadian rhythm by Single cosinor method.

497 Board #3 May 30 1:00 PM - 3:00 PM

A Comparison Of Stress Levels And Coping Skills Of Collegiate Freshmen Athletes And Non-athletes

Jessica E. Jochum, Nicole Vetroczky, Marina Kuchenberg, Lauren Dybwad. *University of Indianapolis, Indianapolis, IN.* (Sponsor: Amy Jo Sutterluety, FACSM)

(No relevant relationships reported)

Despite knowing the factors that increase stress levels in collegiate freshmen, there is limited research that compares the stress levels and coping mechanisms between collegiate, freshmen athletes and freshmen non-athletes. **PURPOSE:** To investigate differences in perceived stress levels and coping mechanisms in collegiate freshmen athletes and non-athletes. **METHODS:** One hundred and forty-seven NCAA Division II freshmen ($n_{athlete} = 68$, $n_{non\text{-}athlete} = 69$) ($n_{female} = 86$, $n_{male} = 49$) completed three self-report questionnaires: Perceived Stress Scale (PSS-10), Brief COPE, and demographic information questionnaire. The 10-item PSS-10 was used to measure the degree to which an individual appraises his/her situation as stressful. The 28-item Brief COPE was used to measure frequency of positive, neutral and negative coping mechanisms on fourteen different scales. An alpha level of $p \leq .05$ was set for statistical significance. An independent t-test was conducted to compare mean scores of the PSS-10, and Mann-Whitney U tests were used to compare Brief COPE scales. A Spearman's rho correlation was used to determine relationships between perceived stress and coping mechanisms. **RESULTS**: Analysis revealed no statistical difference between athletes and non-athletes on perceived stress or coping mechanisms. All participants rated a high level of perceived stress on the PSS-10, (females 29 (SD = 6) males 26 (SD = 5)) out of 40 possible points, yielding a statistical difference between genders, $t(133) = -3.117$, $p = 0.002$. Of the 14 coping strategies measured, four were found to be statistically significant for females: emotional support ($p = 0.001$), instrumental support ($p = 0.03$), venting ($p = 0.001$), and self-blame ($p = 0.05$). A positive correlation exists between increased stress levels and eight coping mechanisms. The two highest correlations were disengagement $r_s = .422$, $p < .001$ and self-blame $r_s = .523$, $p < .001$. **CONCLUSION**: No difference was observed in perceived stress levels between collegiate freshmen athletes and non-athletes, all freshmen perceive high levels of stress. Females perceive higher levels of stress than males, and tend to select negative coping mechanisms. The higher levels of perceived stress, the more likely the person would be to use disengagement and self-blame as coping mechanisms.

498 Board #4 May 30 1:00 PM - 3:00 PM

Relationships Among Physical Fitness, Sleep-wake Behavior, And Hemodynamic And Cortisol Responses To Stress In Women

Shannon K. Crowley, Julia Rebellon, Abigail J. Leonard, Christina Huber, Lyndsay Wolfe, Andrea Tobar, Sierra Hayden, Daniel Henderson, Meir Magal, FACSM. *North Carolina Wesleyan College, Rocky Mount, NC.*

(No relevant relationships reported)

PURPOSE: Dysregulation in the physiological stress response has been proposed as one mechanism by which disturbed sleep increases risk for the development

of psychiatric diseases. Being physically fit has been associated with improved sleep. However, to date, there has been limited investigation of physiological stress responding as a mediating factor in the relationship between physical fitness and improved sleep, and even fewer which have investigated this relationship in women while experimentally controlling for the influence of the ovarian cycle on the physiological stress response. This study aimed to investigate relationships among physical fitness, sleep disturbances, and physiological responses to psychosocial stress in women. **METHODS:** Following a two-tiered screening process, 30 healthy women (18-45y) who were medication-free and had regular menstrual cycles completed: (1) enrollment visit, (including mood and sleep assessment and assessment of cardiorespiratory fitness via maximal oxygen consumption during exercise); (2) one-week sleep monitoring period (objective and subjective measures of sleep-wake behavior); and (3) psychosocial stressor protocol for the collection of heart rate (HR) and cortisol stress responses. Psychosocial stress testing sessions occurred during the follicular phase of the menstrual cycle to control for hormone fluctuations which have been shown to influence the physiological response to stress. **RESULTS:** Higher levels of physical fitness were significantly associated with reduced objectively measured wake after sleep onset (WASO) duration (r = -.38, p = 0.04), higher self-reported sleep quality (higher scores reflect poorer sleep quality; r = -.37, p = 0.05), and lower HR during the psychosocial stressor (r = -.39, p = 0.04). Consequently, lower self-reported sleep quality was significantly associated with a higher HR during the psychosocial stressor (r = .41, p = 0.02), and increased WASO duration was significantly associated with blunted cortisol responses to the psychosocial stressor (r = -.41, p = 0.04, n=26). **CONCLUSIONS:** Results suggest that, in women, physical fitness may be protective against the deleterious effects of stress via improved sleep-wake behavior.

499 Board #5 May 30 1:00 PM - 3:00 PM

Correlations Between Serum Biomarkers Of Stress And Subjective Measures Of Well-being In Collegiate Swimmers

Connor A. Kuremsky[1], Wang Haoyan[1], Neil M. Johannsen[1], Jack Marucci[1], Shelly Mullenix[1], Brian A. Irving[1], Rick L. Sharp, FACSM[2], Brian Harrell[3], Guillaume Spielmann[1]. *[1]Louisiana State University, Baton Rouge, LA. [2]Iowa State University, Ames, IA. [3]Baton Rouge General Sports Medicine, Baton Rouge, LA.*
(Sponsor: Rick Sharp, FACSM)

(No relevant relationships reported)

Collegiate student-athletes experience prolonged physical, psychological and academic stressors, putting them at risk for impaired athletic performance and overall well-being. Practical feasibility undermines the use of objective physiological measures of stress, such as serum cortisol, alternatively favoring subjective measures of well-being by using self-reported questionnaires. **Purpose**: To determine the relationship between serum cortisol and various subjective measures of well-being in NCAA D1 swimmers over a 6-month training period. **Methods**: Early morning resting serum samples were collected from sixteen NCAA Division 1 swimmers (8 M, 8 F: 19.81 ± 0.65 yrs) at 2 timepoints (early season and immediate post-season), and an additional mid off-season timepoint was collected in a subset of 10 swimmers. Self-reported subjective measures of well-being were collected at each timepoint by using questionnaires for overtraining (DALDA), sleep quality (PSQI) and mood state (AD-ACL). The gold-standard physiological biomarker of stress, serum cortisol, was measured using commercially-available ELISA kits (R&D Systems). Pearson's correlation coefficients determined linear correlations between serum cortisol concentration and questionnaire responses (α=0.05). **Results**: At the pre-season timepoint, higher serum cortisol concentrations (138.99 ± 33.9 ng/mL) were observed in swimmers reporting less calmness (r=-0.79, p=0.006), while this association disappeared at the early season timepoint (p=0.935). At the post-season timepoint, serum cortisol concentrations (123.3 ± 76.7 ng/mL) were negatively correlated with calmness (r=-0.46, p=0.035) and tension (r=-0.45, p=0.041). Surprisingly, however, swimmers reporting greater symptoms of overtraining at the post-season timepoint had reduced cortisol concentration (r=-0.44, p=0.046). **Discussion**: Subjective questionnaires have been used as a surrogate to objective biomarkers of stress, such as serum cortisol concentration. Although the results obtained from self-reported questionnaires were highly correlated with serum cortisol levels during periods of high academic and athletic stress (post-season), the correlation between cortisol concentration and mood states did not remain consistent throughout the competitive season.

500 Board #6 May 30 1:00 PM - 3:00 PM

Resting Heart Rate Variability Moderates a Relationship Between Attentional Bias and Stress Response

Derek C. Monroe[1], Zachary Rader[2], Matthew P. Herring[3], Jonathan Golden[2]. *[1]University of Califorina--Irvine, Irvine, CA. [2]Georgia College & State University, Milledgeville, GA. [3]University of Limerick, Limerick, Ireland.*

(No relevant relationships reported)

University students report greater symptoms of psychological distress compared to age-matched controls, which plausibly contribute to a greater incidence of anxiety and depressive disorders. Maladaptive responses to, and recovery from, stress may be partially explained by cognitive (e.g., threat bias) and physiological (e.g., poor autonomic balance) correlates of affective dysfunction that may be modifiable through exercise training. Thus, elucidating interactions among psychological and physiological predictors of stress has implications for better understanding the mental health benefits of exercise training.

PURPOSE

To quantify the moderating effect of heart rate variability on a relationship between threat bias and perceived stress during exam week in healthy, undergraduate students.

METHODS

45 undergraduate students completed a Spielberger Trait Anxiety Inventory, a computerized Dot-Probe Task, and a 5-minute assessment of resting heart rate variability (HFTF). Threat bias was operationalized as a positive bias score (discordant vs. concordant trials), and HFTF was computed as a ratio of power density in the high frequency spectrum (.15-.40 Hz) to power density in the entire spectrum (.04-.40 Hz). The Perceived Stress Scale was completed online during exam week 4-8 weeks later. Bivariate correlations were computed between trait anxiety and threat bias and HFTF. Moderation was tested using hierarchical linear regression with interaction effects.

RESULTS

Trait anxiety was inversely associated with HFTF (r_s -.35, p =.01) and positively associated with bias scores (r_s .34, p =.01). The relationship between threat bias and perceived stress during exam week was moderated by HFTF, $F(1,26)=26.04$, $p<.001$, $\Delta R^2=.2605$. Lower stress was only predicted by a lack of attentional bias among participants who also had the highest resting HFTF, $b= 6.60$, $SE_b= 1.43$, $p < .001$. There was no association between trait anxiety and perceived stress.

CONCLUSION

Findings suggest that in young, healthy individuals the protective effects of high parasympathetic tone are only revealed among those who do not exhibit threat biases. Cognitive and physiological correlates of affective dysfunction should be measured when determining the efficacy of exercise training programs designed to improve mental health outcomes.

501 Board #7 May 30 1:00 PM - 3:00 PM

Appraisals Significantly Influence Endurance Performance and Psychophysiological Response: Stress Appraisals, Emotions, Coping, and Cortisol Responses

Mark A. Thompson, John Toner, John L. Perry, Rachel Burke, Adam R. Nicholls. *University of Hull, Hull, United Kingdom.*

(No relevant relationships reported)

Athlete stress appraisals have been associated with athletic performance, which is purported to be mediated by emotions and coping behaviours. However, our understanding of how these psychological mechanisms underpin endurance performance is equivocal. **PURPOSE:** To assess the causal psychophysiological and performance impact of past- (e.g., harm/loss and benefit) and future-oriented (e.g., challenge and threat) stress appraisals on performance. **METHODS:** Thirty trained and gender-matched athletes were randomly engendered with one of five stress appraisals (challenge, threat, benefit, harm/loss, or control) and completed three 16.1km cycling time trials on a SRM cycle ergometer. Salivary cortisol concentration was measured via an ELISA to assess neuroendocrine response, whilst psychometrics measuring appraisals, emotions, and coping behaviours were also completed. **RESULTS:** Penalized Multinomial Logistic Regression analyses of performance change revealed that temporal orientation of appraisal was a causal influence upon performance, with benefit (β = 5.13, 95% CI = 1.90, 10.93, $p < 0.001$, OR = 169.00) and harm/loss (β = 3.15, 95% CI = .46, 8.18, $p = 0.019$, OR = 23.40) groupings significantly facilitating and inhibiting performance respectively. Threat appraisals lead to a performance dichotomy, with both significant improvement (β = 3.41, 95% CI = .52, 8.54, $p = 0.018$) and significant deterioration (β = 3.08, 95% CI = 0.06, 8.23, $p = 0.046$) more likely to occur than a non-significant change (OR = 30.33 and 21.67 respectively). Variation across temporal orientation also translated into neuroendocrine response, with cortisol spikes found in threat (g = -0.9), compared to a decrease in harm/loss (g = 0.74). **CONCLUSION:** Stress appraisals significantly influence psychophysiological response and performance, with past-oriented appraisals as autonomous and influential as future-oriented appraisals. Spikes in cortisol levels in

the future-oriented stress appraisal threat, compared to a decline in the past-oriented harm/loss, suggest that the fear of defeat may be physiologically more stressful than losing itself. Practitioners are advised to engender benefit stress appraisals in order to facilitate both psychophysiological well-being and subsequent performance proficiency among their athletes.

B-10 Basic Science World Congress - Thematic Poster - **Moderating Skeletal Muscle I**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100C

502 **Chair:** Troy Hornberger. *University of Wisconsin-Madison, Madison, WI.*

(No relevant relationships reported)

503 Board #1 May 30 1:00 PM - 3:00 PM

No Effect Of Hmb Or α-hica On Training-induced Changes In Performance Or Body Composition

Filipe J. Teixeira[1], Catarina N. Matias[2], Cristina P. Monteiro[2], Maria J. Valamatos[2], Joana F. Reis[3], Francisco Tavares[4], Christophe Domingos[1], Francisco B. Alves[2], Ana R. Batista[1], Luís B. Sardinha[2], Stuart M. Phillips, FACSM[5]. *[1]Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal. [2]CIPER, Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal. [3]Universidade Europeia, Laureate International Universities, Lisbon, Portugal. [4]Waikato University, Hamilton, New Zealand. [5]McMaster University, Hamilton, ON, Canada.*

(No relevant relationships reported)

Some leucine metabolites like β-hydroxy-β-methylbutyrate (calcium: HMB-Ca and free acid: HMB-FA) and α-hydroxy-isocaproic acid (α-HICA or leucic acid) have been suggested to augment training-induced adaptations in body composition and performance. **PURPOSE:** To compare the effects of commercially available supplements, HMB-Ca, HMB-FA and α-HICA, on resistance training-induced changes in fat mass and fat-free mass (FFM) and performance. **METHODS:** Forty men were block-randomized (based on handgrip strength, age, and fat-free mass [FFM]) to one of four groups: HMB-FA (n=11, age 30 ± 2.4 y, FFM 62.7 ± 10.5 kg), HMB-Ca (n=9, age 34 ± 1.5 y, FFM 65.6 ± 10.1 kg), α-HICA group (n=10, age 31 ± 2.7 y FFM 62.0 ± 7.1 kg), and placebo (PLA) group (n=10, age 31 ± 2.1 y FFM 64.2 ± 5.7 kg). The training program consisted of whole body thrice weekly training for 8wk (7 exercises/session, 3-4 sets per session, 70-80% 1RM). Whole body fat and FFM were assessed by DXA, and performance measures (vertical jump, 1RM for bench press, squat and Wingate test) were all assessed at baseline and at the end of weeks 4 and 8. Participants were instructed to consume at least 45 kcal/kg FFM/d and 1.6 g protein/kg body weight/d. **RESULTS:** Time-dependent changes were observed for 1RM bench press ($p < 0.001$), 1RM Squat ($p < 0.001$), vertical jump height ($p = 0.028$) and vertical jump power ($p = 0.006$). No significant between-group or time-group interactions were observed for body weight, Wingate peak and average power, handgrip, whole body fat or whole body FFM (Δ changes: HMB-FA 0.1 ± 1.5 kg; PLA 0.6 ± 0.8 kg; α-HICA -0.1 ± 1.0 kg; HMB-Ca 0.6 ± 2.0 kg) **CONCLUSION:** When consuming sufficient protein while in an estimated positive energy balance, none of the leucine metabolites studied resulted in any ergogenic effects on any outcome variable. We do not recommend leucine metabolites as a supplement strategy to augment training-induced gains in performance or body composition.

504 Board #2 May 30 1:00 PM - 3:00 PM

Human Skeletal Muscle Lipid Mediator Responses to Resistance Exercise and Anti-inflammatory Drugs

Tommy R. Lundberg[1], Mats Lilja[1], Mirko Mandić[1], Krishna Rao Maddipati[2], Thomas Gustafsson[1], Eric Rullman[1]. *[1]Karolinska Institutet, Stockholm, Sweden. [2]Wayne State University, Detroit, MI.*

(No relevant relationships reported)

Exercise has been found to induce bioactive lipid mediators which possess both pro- and anti-inflammatory activity, yet the role of these mediators in the muscle adaptive response to resistance exercise (RE) remains to be explored. **PURPOSE:** The present study aimed to characterize the presence of polyunsaturated fatty acid-related bioactive lipids in human skeletal muscle. Specifically, we hypothesized that high doses of anti-inflammatory drugs (NSAIDs) would hinder the action of both pro-inflammatory and pro-resolving lipid mediators in response to acute RE, thereby providing a mechanistic link to the negative effect of high (compared with low) doses of NSAIDs on the muscle hypertrophic response to RE reported by us. **METHODS:** Thirty-one men and women (18-35 years old) performed 8 weeks of RE with daily consumption of either a high dose of ibuprofen (IBU; 1200 mg) or a low dose of aspirin (ASA; 75 mg). Muscle biopsies were obtained before the training/treatment period and 3 h after an acute RE bout at week 4 of the intervention. We used a targeted lipidomics approach (High-Performance Liquid Chromatography with Tandem Mass Spectrometry) to compare the response of over 140 pro- and anti-inflammatory lipid mediators in IBU and ASA as well as in relation to untreated controls (CON). **RESULTS:** We could reliably detect 71 lipid metabolites in skeletal muscle, where 12/71 belonged to the cyclooxygenase pathway but the majority of the mediators were from the lipoxygenase and epoxygenase pathways. Overall, both the pro-inflammatory and the pro-resolving lipid mediator signature was decreased in both IBU and ASA, yet remained unchanged with exercise in CON. Pathway analysis revealed significant differences between drug treatments in the lipoxygenase pathway, specifically in mediators derived from the 5-LOX and 15-LOX enzymes, where levels after exercise were significantly lower in ASA compared with IBU. Specific metabolites driving these differences were 5-HETE, 13-OxoODE and 17-HDoHE. **CONCLUSIONS:** The results show that both high and low doses of NSAIDs markedly affect the skeletal muscle lipid mediator response to RE. We put forth the idea that lipid mediators from the lipoxygenase pathway may have a role in explaining the differential muscle hypertrophic response to RE noted with different doses of NSAID treatment.

505 Board #3 May 30 1:00 PM - 3:00 PM

Hyperbaric-oxygen Reduces Inflammation And Regenerates Rats Skeletal Muscle Via Macrophage And Satellite Cell Activation.

Takuya Oyaizu, Mitsuhiro Enomoto, Naoki Yamamoto, Masaki Horie, Atsushi Okawa, Kazuyoshi Yagishita. *Tokyo Medical and Dental University, Tokyo, Japan.*

(No relevant relationships reported)

Muscle contusion injury is the most common sport-related injury. Hyperbaric oxygen treatment (HBO) promotes rapid recovery from soft tissue injuries. **PURPOSE**: Uncover a potential mechanism of the restorative effect of HBO on injured muscle. **METHODS**: A muscle contusion injury was performed by the drop-mass method on the rat calf muscle. Rats were divided into non-treated (NT) and HBO-treated (HBO). HBO consisted of 2.5ATA 100% oxygen for 120 minutes once per day. Circulating CD11b, CD68 positive cells were measured with flow cytometry. Injured muscles were homogenized and interleukin-6 (IL-6) and signal transducer and activator of transcription 3 (STAT3) were measured with enzyme-linked immune-sorbent assay (ELISA). Calf muscles sections were immunostained with CD68 and CD163 (macrophage markers), Pax7 and MyoD (satellite cell markers). **RESULTS**: Expression of IL-6 (NT vs. HBO: 995±144 vs. 1964 ± 396 pg/mg, $p<0.05$) and the ratio of phosphorylated to total STAT3 (0.42± 0.05 vs. 1.17 ± 0.07, $p<0.01$) are increased at 3 hrs in HBO. The percentages of circulating CD11b-positive cells 6 hrs (NT vs. HBO: 65.5 ± 4.6 vs. 42.2 ± 4.1%, $p<0.001$) and 24 hrs (45.6 ± 6.1 vs. 21.9 ± 1.1%, $p<0.001$) were deceased in HBO. In the injured muscle, peak infiltration of CD68-positive cells occurred 2 days earlier in HBO. CD163-positive cells were higher at 3 days (NT vs. HBO: 9.3 ± 0.75 vs. 12.7 ± 0.83/HPF, $p<0.05$), 5 days (13.3 ± 0.63 vs. 17.2 ± 0.89/HPF, $p<0.01$) and 7 days (11.9 ± 0.86 vs. 17.3 ± 1.70/HPF, $p<0.05$) after injury. In muscle tissue, the number of Pax7+MyoD- cells was higher at 3 days (NT vs. HBO: 8.7 ± 0.75 vs. 17.2 ± 0.99/HPF, $p<0.01$) and 5 days (14.73 ± 2.7 vs. 24.89 ± 2.2/HPF, $p<0.05$) after injury. The number of Pax7+MyoD+ cells was higher at 1 day (NT vs. HBO: 9.9 ± 1.4 vs. 15.4 ± 0.48/HPF, $p<0.01$) and 3 days (12.6 ± 1.5 vs. 21.96 ± 1.4/HPF, $p<0.05$) and the number of Pax7-MyoD+ cells was higher at 1 day (NT vs. HBO: 4.4 ± 0.21 vs. 8.2 ± 1.0/HPF, $p<0.05$), 3 days (6.9 ± 1.1 vs. 15.5 ± 2.6/HPF, $p<0.05$) and 5 days (13.0 ± 1.4 vs. 23.4 ± 1.4/HPF, $p<0.01$). **CONCLUSIONS**: HBO increased levels of a tissue inflammatory cytokine, reduces circulating inflammatory cells and induces a rapid macrophage response. These early-onset inflammatory responses appear to enhance satellite cell proliferation and differentiation, leading to rapid recovery of injured skeletal muscle.

506 Board #4 May 30 1:00 PM - 3:00 PM

Muscle Fiber Type Adaptations To Exercise Differ In Obese And Non-obese Volunteers

Maxime Moreillon, Yannick Morard, Nicholas T. Broskey, Sonia Conde Alonso, Cyril Besson, Francesca Amati, FACSM. *University of Lausanne, Lausanne, Switzerland.*

(No relevant relationships reported)

Human skeletal muscle is composed of slow fibers (type I), fast fibers (IIa and IIx), and a continuum of hybrid fibers co-expressing different myosin heavy chains. Cellular responses to exercise involve changes in fiber type proportions and cross sectional area (CSA). To our knowledge, the impact of obesity on these responses is not yet known. **PURPOSE:** To determine if obesity impacts changes in fiber type proportions and CSA in response to endurance exercise in a sedentary population.

METHODS: Twenty-two obese sedentary healthy men and women (O, BMI>30kg/m^2) and 15 non-obese (Lean, L, BMI<26kg/m^2) volunteers participated in a 4 months supervised endurance exercise intervention. 18 endurance trained volunteers matched by gender and age (60-79) served as controls (C). *Vastus lateralis* muscle biopsies were analyzed using immunohistochemistry to determine fiber type distribution and CSA. Baseline group comparisons were made using 1-way ANOVA. Pre/post-intervention changes were assessed by paired *t* tests.
RESULTS: At baseline, both L and O had less type I fibers than C. No difference was found in proportions of type IIa, IIx or hybrid I-IIa fibers. The proportion of hybrid type IIa-IIx was higher in O than C. Type I CSA was larger in O than L. No difference in CSA was found for type IIa, IIx or hybrid fibers. With intervention, proportions of type I, IIa, IIx and hybrid type IIa-IIx were not modified. An increase in proportion of hybrid type I-IIa was seen in L but not in O. Type I CSA increased in O and L, while IIa CSA increased only in L.
CONCLUSION: Different adaptations in proportion of fiber types and CSA were observed in O and L previously sedentary volunteers. The increased proportion of hybrid I-IIa fibers with intervention observed in L could be interpreted as a shift of fibers towards a more oxidative muscle such as the profile of C. This transition was not observed in O. As exercise dose was similar in both groups, this unequal shift may be time-dependent, thus not yet apparent here in O. Although fiber CSA was on average 1.5x larger in O than L at baseline, similar CSA increments were observed with endurance exercise in both groups. In previously sedentary seniors, increments of CSA with exercise, even if concurrent to a significant weight loss in the obese subjects, are crucial to prevent age related muscle atrophy.

507 Board #5 May 30 1:00 PM - 3:00 PM

2000 Steps/Day Does Not Prevent Muscle Atrophy or Strength Loss During Bed Rest

Emily Arentson-Lantz, Elfego Galvan, Sneha Nagamma, Adam Wacher, Christopher Fry, Doug Paddon-Jones, FACSM. *University of Texas Medical Branch, Galveston, TX.* (Sponsor: Douglas Paddon-Jones, FACSM)
(No relevant relationships reported)

Bed rest rapidly compromises muscle health in older adults. Physical activity interventions in an inpatient setting often include periods of walking, but are hampered by key knowledge gaps that limit our ability to provide efficient, evidence-based exercise prescription.
PURPOSE: To determine if 2000 steps/day can protect key markers of skeletal muscle health during 7 days of bed rest.
METHODS: Healthy, community-dwelling older adults (N=17, 11M/6F; 68 ± 2 y; 72.5 ± 3.2 kg; 169.4 ± 2.4 kg) were subjected to 7-days bed rest, with and without a 2000 steps/day intervention. This model mimics the physical inactivity experienced during hospitalization, while isolating the intrinsic catabolic effects of skeletal muscle disuse.
RESULTS: Performing 2000 steps/day during 7 days of bed rest corresponded to 155 minutes/week of walking at a moderate intensity (50% heart rate reserve: 102 ± 5 bpm). The intervention partially preserved lean leg mass (Δ STEP: -609 ± 129 vs. Δ CON: -1035 ± 159 g), glucose tolerance; OGTT AUC (Δ STEP: -0.5 ± 6.3 vs. CON: 9.6 ± 5.5 %) and type 1 muscle fiber cross sectional area (Δ STEP: 27 ± 745 vs. CON: -698 ± 343 μm^2), but had no effect on muscle strength (Δ STEP: -14.4 ± 3.8 vs. CON: -16.2 ± 2.4 Nm), or aerobic capacity (Δ STEP: 0.3 ± 1.1 vs. CON: -1.2 ± 1.0 mL/kg/min).
CONCLUSIONS: Performing 2000 steps/day is broadly consistent with cardiovascular fitness guidelines, but in isolation does not fully counter the negative effects of bed rest in healthy older adults.
Supported by NIH Grant R01NR012973 and NIH/NIA grant #P30-AG024832

508 Board #6 May 30 1:00 PM - 3:00 PM

Muscle Size and Strengths and their Associations with Sports Participation among Young Adults

Harold H. Lee[1], Theodore J. Angelopoulos, FACSM[2], Paul M. Gordon, FACSM[3], Niall M. Moyna[4], Paul S. Visich[5], Robert F. Zoeller[6], Heather Gordish-Dressman[7], Paul D. Thompson, FACSM[8], Eric P. Hoffman[7], Joseph M. Devaney[7], Linda S. Pescatello, FACSM[9]. *[1]Brown University, Providence, RI. [2]University of Central Florida, Orlando, FL. [3]Baylor University, Waco, TX. [4]Dublin City University, Dublin, Ireland. [5]Florida Atlantic University, Boca Raton, FL. [6]7Children's National Medical Center, Washington, DC. [7]Children's National Medical Center, Washington, DC. [8]Hartford Hospital, Hartford, CT. [9]University of Connecticut, Storrs, CT.* (Sponsor: Linda Pescatello, FACSM)
(No relevant relationships reported)

PURPOSE: A decision to participate in physical activity is heavily influenced by one's self-efficacy related to exercise capacity, but it is not clear if muscle size and strength influence one's decision to engage in sports and recreation. We examined this relationship and hypothesized that those with stronger and larger muscle would engage in more sports and recreation.
METHODS: Subjects were young (23.4 ± 5.6yr), normal weight (24.4 ± 4.6 kg/m^2) European-American women (n=227) and men (n=192). The Paffenbarger Physical Activity Questionnaire assessed self-reported weekly Kcal expended in sport and recreational physical activity. We obtained muscle size and strength on the dominant and non-dominant arms. Muscle strength was measured with the maximum voluntary contraction (MVC) and one repetition maximum (1RM), and muscle size by cross sectional area (CSA) using magnetic resonance imaging. Weekly sport and recreation participation was categorized by the median for purposes of statistical analysis. Logistic regression tested the associations among muscle size and strength and sport and recreation participation by gender adjusting for age and body mass index (BMI). Akaike Information Criterion was used to identify the most parsimonious model.
RESULTS: On average, men spent about 1568.7±2397.5 kcal/wk and women spent 1732.2±2184.8kcal/wk in sports and recreation. Among men, a one-unit increase in dominant arm 1RM and MVC was associated with 16.9% (95%CI: 5.0-31.1%) and 2.3% (95%CI: 0.6-4.2%) higher odds of engaging in sports and recreation, respectively. Among women, a one-unit increase in non-dominant arm MVC was associated with 5.3% (95%CI = 2.2-8.7%) higher odds of engaging in sports and recreation, while a one-unit increase in non-dominant arm CSA was associated with 19.8 % (95%CI = 8.9-30.0%) lower odds of engaging in sports and recreation.
CONCLUSIONS: As hypothesized, greater MVC predicted engaging in more sport and recreation for both men and women, but greater 1RM predicted engaging in more sport and recreation among men only. Contrary to our hypothesis, greater CSA (i.e., muscle size) predicted engaging in less sports and recreation among women only. The interactions among putative psychosocial mediators, muscle capacity, and sport and recreation participation warrants future investigation.

B-11 Thematic Poster - Muscle Basic Science Applications

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100F

509 **Chair:** Cory Baumann. *University of Minnesota, Minneapolis, MN.*
(No relevant relationships reported)

510 Board #1 May 30 1:00 PM - 3:00 PM

Aerobic Exercise Training Alters The Lipopolysaccharide-induced Cytokine Secretory Profile Of Skeletal Muscle In Mice

Alex J. Mattingly, Orlando Laitano, Thomas L. Clanton. *University of Florida, GAINESVILLE, FL.*
(No relevant relationships reported)

Skeletal muscles secrete cytokines in response to engagement of toll-like receptors (TLR) with pathogen associated molecular patterns (PAMPS), such as lipopolysaccharides (LPS). Though acute exercise is a known stimulus for cytokine secretion, it is unknown if chronic exercise training alters the cytokine secretory response to LPS. PURPOSE: To determine if spontaneous free-wheel aerobic exercise training in mice alters the cytokine secretory profile from isolated soleus muscles in response to LPS. METHODS: Age-matched (12 weeks old) C57BL6 mice (N=4) were given 24-hour access to running wheels for 69 days (EX). Their daily running distance was recorded. Results were compared to matched sedentary controls (CON; N=8). Solei from the mice were excised in Krebs-Ringer and placed in 2 ml, 35°C muscle baths with 1 μg/ml LPS for 2 hours. Bath samples were drawn after hours 1 (T1) and 2 (T2), flash frozen, and analyzed via Luminex multiplex analysis. Cytokine accumulations at T1 and T2 were compared via one-way parametric or nonparametric ANOVA, as appropriate. RESULTS: Mean daily running distance for EX mice was 3406 m/day, with a peak of 5477 m/day at day 21. At T1, EX muscles secreted less IL-12p70 (6.03 vs. 56.17pg/ml; p=0.016), and more TNFα (1.89 vs. 1.60pg/ml; p=0.020) than CON. At T2, the concentrations of IL-12p70 (8.08 vs. 46.56pg/ml) and KC (36.54 vs. 572.43pg/ml) were reduced in EX baths compared to CON (p=0.016 for both), but TNFα was elevated (1.99 vs. 1.60pg/ml; p=0.020). All other cytokines (MIP-1β, IL-13, IL-12p40, MIP-1α, IL-6, GCS-F, MCP-1, IL-10, RANTES, GM-CSF, IL-15, IP-10, IL-1β, IL-1α, MIP-2, and IFN-γ) were not significantly different. CONCLUSION: Spontaneous free wheel running in mice alters the cytokine secretory profile of isolated mouse solei in response to LPS. Since endurance exercise training has been shown to reduce mortality in rodent models of septic shock, the results raise the possibility that conditioned muscles may be participating in improvements in host defense associated with aerobic exercise training. *Supported by NIGMS 1R01GM118895-01*

511 Board #2 May 30 1:00 PM - 3:00 PM

Activation of G Protein-Coupled Estrogen Receptor Contributes to Muscle Force Potentiation in Ovariectomized Mice

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(No relevant relationships reported)

Estrogens influence force generation of skeletal muscle. When estrogen is deficient, post-tetanic potentiation (PTP) of force is low and estradiol treatment can rescue potentiation in ovariectomized mice both in vivo and in vitro. However, it is not known whether this estrogenic influence is through estrogen receptors, and if so, activation of which specific receptor augments PTP is also unknown. **PURPOSE**: We hypothesized estrogens utilize G protein-coupled estrogen receptor (GPER) to enhance in vivo skeletal muscle PTP in ovariectomized mice. **METHODS**: Adult female C57BL/6J mice (n = 7-12 per treatment) had a nerve cuff surgically implanted on the left common peroneal nerve. Six weeks later mice were ovariectomized (OVX). Four weeks later, PTP of the anterior crural muscles was measured immediately before and 1 h after treatment with either vehicle (OVX+vehicle), GPER agonist G1 (OVX+G1; 2.4 nM G1) or GPER antagonist G15 (OVX+G15; 27 nM G15) via tail vein injection. PTP was measured and calculated as the percent increase in twitch torque from baseline to the highest torque of the post-tetanic twitches. One-way ANOVAs with Holm-Sidak post hoc tests were used for data analysis of PTP. Results are reported as mean ± SE. **RESULTS**: Peak torques of unpotentiated, baseline twitches were not different among OVX+vehicle, OVX+G1, and OVX+G15 mice (0.51 ± 0.03, 0.48 ± 0.03 and 0.54 ± 0.02 N*mm, respectively; p=0.25). Potentiated twitches generated 15-108% more torque than unpotentiated twitches. However, the extent of PTP depended on the presence of GPER modulator (main effect, p=0.03). PTP of OVX+vehicle and OVX+G15 mice were not significantly different from each other (35 ± 5% and 46 ± 4% increase, respectively; p=0.26). PTP of OVX+G1 mice resulted in a 61 ± 7% increase which was significantly greater than that of OVX+vehicle mice (p=0.02), but not different from OVX+G15 mice (p=0.26). **CONCLUSION**: Acute treatment with a GPER agonist increased in vivo PTP of the anterior crural muscles in anesthetized mice, supporting our hypothesis that estrogens mediate their effects on skeletal muscle force potentiation through specific estrogen receptors. Supported by NIH grants R01-AG031743 and T32-AR050938.

512 Board #3 May 30 1:00 PM - 3:00 PM

The Role Of Dynamin-related Protein 1 (drp1) In The Adaptations To Exercise

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(No relevant relationships reported)

Mitochondria are highly dynamic organelles within eukaryotic cells that function primarily to produce energy. Exercise has been known to positively impact mitochondria for over 50 years. Our previous work indicated that one novel factor, dynamin-related protein 1 (Drp1) that is responsible for splitting mitochondria, was impacted by exercise. However, it is not known whether Drp1 is essential for the development of exercise adaptations. **Purpose:** To determine the impact of reduced Drp1 expression in skeletal muscle on muscle strength, exercise performance, and long-term exercise induced adaptations. **Methods:** For each protocol, skeletal muscle specific heterozygous ($mDrp1^{+/-}$) and littermate control mice were used. Animals were sacrificed and tissues harvested at the times indicated. Protocol 1: Treadmill exercise at 15 m/min (5° grade) for 90 minutes for controls and 13 m/min for $mDrp1^{+/-}$ mice. Protocol 2: Thirty days of in cage voluntary wheel running (VWR) after which wheels were locked. Animals were sacrificed 30 hours later. Exercise effects were statistically assessed with two-way ANOVA or t-test ($P<0.05$ established *a priori*; values presented as mean ± SEM). **Results:** Muscle strength was reduced in $mDrp1^{+/-}$ mice resulting in a reduction in protocol 1 exercise speed but not relative intensity. Following protocol 1, signaling molecules and cellular factors regulating mitochondrial life cycle were not different between $mDrp1^{+/-}$ and control exercised mice. Additional metabolites including plasma lactate and triglyceride and muscle glycogen levels post exercise were not different between groups. In untrained mice, endurance exercise capacity was not different between groups; however, following VWR, $mDrp1^{+/-}$ mice had a reduced increase in exercise capacity when compared to control trained mice. Several cellular factors and signaling molecules regulating mitochondrial life cycle showed similar expression levels in $mDrp1^{+/-}$ animals when compared to control exercise trained animals. **Conclusions:** Our results indicate that Drp1 is particularly important for muscle strength in untrained mice and may play a role in the improvement of exercise capacity.

513 Board #4 May 30 1:00 PM - 3:00 PM

Effect of Inflammation on Ribosome Biogenesis during Myotube Hypertrophy in Primary Human Myogenic Cells

Brandon M. Roberts, Derek Wiggins, Sam Windham, Marcas Bamman, FACSM. *University of Alabama at Birmingham, Birmingham, AL.* (Sponsor: Marcas Bamman, FACSM)

(No relevant relationships reported)

Background: Ribosomal biogenesis and protein translation are finely coordinated with and essential for cell growth, proliferation, differentiation, and muscle development. Furthermore, there is a significant positive correlation between the fold change in total muscle RNA content from pre- to post- resistance training and the increase in muscle fiber cross sectional area. Our previous findings in vitro indicate de novo ribosome biogenesis is necessary for myotube hypertrophy. Because chronic muscle inflammation appears to impair myofiber hypertrophy in vivo, we hypothesize this inhibitory influence of inflammation may manifest by disrupting ribosome biogenesis. **PURPOSE**: The aim of the present study was to determine if inflammation inhibits myotube hypertrophy by interfering with ribosome biogenesis in human primary myogenic cells.
METHODS: Skeletal muscle satellite cells were isolated from untrained older (69 ± 4 y, $n = 6$) adults after percutaneous needle biopsy of the vastus lateralis. Cells were grown in DMEM containing 20% FBS, 5 ng/ml fibroblast growth factor, 100 µl/ml streptomycin, and 100 U/ml penicillin until they reached ~70% confluence. They were then placed in differentiation media (DMEM containing 2% horse serum, 100 µl/ml streptomycin, and 100 U/ml penicillin) for seven days to induce formation of multinucleated myotubes. Myotubes were then treated for 48 hours with 20% FBS, TNFa (5ng/mL), 20% FBS + TNFa (5ng/mL), or control (differentiation) media. Cells were subsequently harvested for analysis of mRNA, muscle protein synthesis, ribosomal RNA (rRNA) and constituent ribosomal proteins, myotube size and myofusion index.
RESULTS: Myotubes treated with FBS increased myotube diameter by 20% compared to control. TNFa (5ng/mL) induced 16% atrophy, while a combination of both treatments caused 7% hypertrophy compared to control. Total RNA concentration (ng/ul) increased 32% in FBS treated cells but only 20% in response to the combination of FBS + TNFa. Phase II fusion was decreased in myotubes treated with TNFa or a combination of FBS + TNFa.
CONCLUSIONS: TNFa-mediated inflammation impairs human myotube hypertrophy, which may be driven by impairments in both ribosome biogenesis and phase II myoblast-myotube fusion

514 Board #5 May 30 1:00 PM - 3:00 PM

Skeletal Muscle Gene Expression Study of Monozygous Twins with 35 Years of Divergent Exercise History

Adam Osmond[1], Robert J. Talmadge[1], Katie E. Bathgate[2], James R. Bagley[3], Lee E. Brown, FACSM[2], Jared W. Coburn, FACSM[2], Andy J. Galpin[2], Kevin A. Murach[4], Edward Jo[1]. [1]*Cal Poly Pomona, Pomona, CA.* [2]*California State University Fullerton, Fullerton, CA.* [3]*San Francisco State University, San Francisco, CA.* [4]*University of Kentucky, Lexington, KY.* (Sponsor: Lee Brown, FACSM)

(No relevant relationships reported)

Variations in physical ability and capacities among individuals depend on both genetic inheritance and lifestyle. Previous research has yet to utilize a human model of monozygous (MZ) twins with substantial and long-term differences in exercise backgrounds to identify molecular and cellular mechanisms underlying exercise-mediated adaptations in muscle and whole-body phenotype. **PURPOSE**: In particular, this study examined skeletal muscle expression of genes related to muscle growth, inflammation, metabolism, and fiber type distribution in MZ twins with 35 years of substantially differing exercise history. **METHODS**: Muscle biopsies were collected from the vastus lateralis of male, 52-year-old MZ twins. Reverse transcriptase-polymerase chain reaction was used for the quantification of mRNAs associated with the following gene markers of various adaptive responses: a) skeletal muscle fiber type shift: MyHC-1, MyHC-2a, and MyHC-2x; b) adaptations in oxidative capacity: transcription factor A of the mitochondria (TFAM), and citrate synthase; c) angiogenesis: endothelial nitric oxide synthase, and vascular endothelial growth factor; d) muscular growth and satellite cell activation: myostatin, Pax7 (PAX7), mechano-growth factor (IGF1Ec), insulin-like growth factor a (IGF1Ea), and MyoD; and e) the inflammatory response: TWEAK (TNFSF12), the FN14 TWEAK receptor (TNFRSF12A) and tumor necrosis factor-α (TNF). **RESULTS**: MyHC-2x was expressed at a lower level in the trained subject relative to the untrained subject. No differences were observed for other markers of fiber type or metabolic or angiogenesis gene products. Some differences were observed in the expression of genes related to muscle growth including elevations in PAX7, MGF and IGF1Ea, and a reduction in MyoD. Finally, the only difference in expression of markers for the inflammatory

response was an elevation in TNFRSF12A in the trained twin. **CONCLUSIONS**: At the mRNA-level, differences in expression of some key markers related to muscle fiber type, muscle growth, and the inflammatory response were observed in the trained vs the untrained twin. These data highlight the adaptability of skeletal muscle at the molecular level with decades of divergent physical activity patterns.

515 Board #6 May 30 1:00 PM - 3:00 PM

Exercise Training Attenuates the Muscle Genomic Response to Bed Rest

Shlomit Aizik, Fadia Haddad, Gregory R. Adams. *University of California Irvine, Irvine, CA.* (Sponsor: Kenneth M Baldwin, FACSM)

(No relevant relationships reported)

Long stays in space can have deleterious effects on the body homeostasis. Significant adverse effects of long-term weightlessness include loss of skeletal muscle mass, strength and endurance that can lead to fatigue and poor performance of astronauts during space missions and put them at high risk of injury when they return to earth. Bed rest studies have been proven to be a reliable model to study the effect of spaceflight on muscle. **PURPOSE:** To characterize the vastus lateralis (VL) gene and microRNA (miR) responses to 70-day bed rest with and without countermeasures to mitigate the negative consequences of weightlessness. **METHODS**: 22 healthy young adults participated in a NASA 70 day bed rest study with and without 2 different modes of exercise interventions (6 participants bed rest only; 8 bed rest + flywheel exercise; 8 bed rest + standard aerobic training). RNA extracted from the VL was hybridized to Agilent Human Gene (V3) and miR (V2) microarrays. Data was analyzed using GeneSpring 14.5 and differential gene and miR expression was determined using ANOVA, (FDR<0.05, Fold Change>2 for GE, >1.1 for miR). Kegg pathway was used to classify the genes into pathways (EASE<0.05). **RESULTS:** 70 day bed rest significantly altered the level of 268 VL genes and 83 miRs. 16 oxidative phosphorylation pathway genes (e.g., ATP5G1, ATP5G3, ATP5J, NDUFS1, COX7A2, SDHB and UQCR10) and 37/40 metabolic pathway genes (e.g., HMGCS2, NDUFS3, ACY1 and FH) that were significantly altered had reduced expression in all 3 conditions. All genes in the oxidative phosphorylation pathway and 31 out of 40 genes in the metabolic pathway had attenuated response when exercise was introduced with no significant difference between the two different modes of exercise. Five let-7 family miRs were significantly upregulated and miR-1 and miR-133a were downregulated (30 and 50% respectively in the bed rest only group), all of which known to be linked to muscle atrophy. Both exercise modes mitigated the miRs response. **CONCLUTION:** 70-day bed-rest altered the expression of genes and miRs that could affect muscle metabolism and promote muscle atrophy. Introducing exercise as countermeasures mitigated the expression of almost all bed rest altered genes and miRs, with no significant difference in the 2 modes of exercise. Supported: NSBRI MA02801 & PERC Systems Biology Fund

516 Board #7 May 30 1:00 PM - 3:00 PM

Altered Skeletal Muscle IGF-1 and miR-206 at Rest and Following Resistance Exercise in Obese Humans

Brian P. Sullivan[1], Jessica A. Weiss[2], Ron T. Garner[1], Yaohui Nie[3], Tim P. Gavin, FACSM[1]. *[1]Purdue University, West Lafayette, IN. [2]Bellarmine University, Louisville, KY. [3]Harvard University, Cambridge, MA.* (Sponsor: Tim Gavin, FACSM)

(No relevant relationships reported)

Obesity is a significant health problem and is associated with numerous changes in skeletal muscle. Obesity increases muscle mass and muscle fiber cross sectional area (FCSA) of type I and II fibers. Resistance exercise (RE) promotes muscle fiber hypertrophy. Activation of the IGF-1/Akt/mTOR pathway is critical for muscle mass maintenance and muscle hypertrophy. **PURPOSE**: To investigate: 1) if obesity alters basal muscle IGF-1/Akt/mTOR expression; and 2) if obesity alters the muscle response to acute RE. **METHODS**: Vastus lateralis biopsies were obtained to investigate mRNA, miRNA, and protein expression between lean (LN) and obese (OB) sedentary subjects at rest, and 15 min and 3 hr post-acute RE. **RESULTS**: Type II FCSA in OB was larger than FCSA of type I in OB and type I and II in LN (Type 1: LN=4804.53 vs. OB=6044.78 µm, Type II: LN=4609.71 vs. OB=8114.34 µm). Skeletal muscle expression was lower in OB for IGF-1 mRNA (Pre: LN=1.00 vs. OB=0.53 AU; 15 min: LN=1.00 vs. OB=0.58 AU; 3 hr: LN=0.96 vs. OB=0.54 AU) and IGF-1 protein (Pre: LN=0.82 vs. OB=0.56 pg/µg; 15 min: LN=3.98 vs. OB=2.19 pg/µg; 3 hr: LN=4.98 vs. OB=2.91 pg/µg). The expression of miR-206, a post-translational inhibitor of IGF-1 expression, was higher in OB (Pre: LN=1.00 vs. OB=1.60 AU; 15min: LN=0.97 vs. OB=1.66 AU; 3hr: LN=1.18 vs. OB=1.61 AU), but there was no difference in pri-miR-206 (Pre: LN=1.00 vs. OB=0.81 AU; 15min: LN=0.95 vs. OB=0.94 AU; 3hr: LN=1.04 vs. OB=1.20 AU). A negative relationship was observed between miR-206 and IGF-1 mRNA at rest (r = -0.54) consistent with miR-206 regulating IGF-1 expression. **CONCLUSIONS**: In spite of greater muscle FCSA, obesity decreases muscle IGF-1 expression suggesting a negative feedback mechanism may be limiting muscle mass expansion in obesity.

B-12 Thematic Poster - **Running**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Lower level L100H

517 **Chair:** William R. Lunn, FACSM. *Southern Connecticut State University, New Haven, CT.*

(No relevant relationships reported)

518 Board #1 May 30 1:00 PM - 3:00 PM

The Effects of the VK Performance Insole on Running Economy in Highly-Trained Distance Runners

Robert W. Gregory, William R. Lunn, Marc I. Robertson, Robert S. Axtell, FACSM. *Southern Connecticut State University, New Haven, CT.* (Sponsor: Robert S. Axtell, FACSM)

(No relevant relationships reported)

Several design features of running shoes such as decreased mass, appropriate midsole cushioning, and increased longitudinal bending stiffness are associated with improved running economy (RE). While increased longitudinal bending stiffness has been achieved through the use of carbon fiber plates inserted into shoe midsoles, there are several limitations associated with this construction method. An alternative solution to increase longitudinal bending stiffness in running shoes is to utilize a carbon fiber shoe insole (CFI) tuned for optimal mechanical efficiency of the athlete-footwear system. **PURPOSE**: To determine if a carbon fiber shoe insole (VK Performance Insole; VKTRY Gear; Milford, CT) can improve running economy in highly-trained distance runners. **METHODS**: Ten highly-trained male distance runners (age: 24.7 ± 6.8 years, height: 177.9 ± 5.59 cm, mass: 67.7 ± 5.7 kg) participated in this study. To measure RE, participants ran for 6 min at 16 $km \cdot hr^{-1}$ for the following three conditions: 1) control footwear (no CFI), 2) medium flex CFI (VK Pro 4), and 3) stiff flex CFI (VK Pro 5). Indirect calorimetry was used to measure oxygen consumption (VO_2). The first 4 min were to allow the athlete to reach a steady state and metabolic data from the last 2 min were used to determine submaximal VO_2. The shoe insole conditions were presented in random order; each RE test was separated by a period of 6 min to minimize the effects of fatigue. A repeated-measures ANOVA was used to determine the effects of shoe insole condition on RE.
RESULTS: The submaximal VO_2 values for each of the shoe insole conditions were as follows: 1) control (no CFI): 49.8 ± 3.0 $ml \cdot kg^{-1} \cdot min^{-1}$; 2) medium flex CFI (VK Pro 4): 50.2 ± 3.5 $ml \cdot kg^{-1} \cdot min^{-1}$; and, 3) stiff flex CFI (VK Pro 5): 51.3 ± 3.1 $ml \cdot kg^{-1} \cdot min^{-1}$. Based on these submaximal VO_2 values, there was no difference in RE between the three different shoe insole conditions [$F(2,8) = 0.97$, $p = 0.44$].
CONCLUSIONS: Previous studies have shown that increased longitudinal bending stiffness achieved through the use of carbon fiber plates inserted into shoe midsoles can significantly improve RE by 1-4%. However, the use of a CFI did not result in similar improvements in RE. Further design work and testing of the CFI is required to determine the optimal longitudinal bending stiffness for improved RE at submaximal velocities.

519 Board #2 May 30 1:00 PM - 3:00 PM

The Effectiveness of Compression Socks on Aerobic Running Performance and Heart Rate Response

Christopher Ball, Elaina Biechler. *Loras College, Dubuque, IA.* (Sponsor: Vincent Paolone, FACSM)

(No relevant relationships reported)

PURPOSE: The purpose of the present investigation was to determine the effect of compression socks on maximal aerobic running performance and heart rate response.
METHODS: Moderately fit college aged students (n=28) were recruited as subjects for the study. Each subject completed four exhaustive treadmill runs utilizing the McConnell Treadmill Protocol. Each phase included two testing sessions, 24 hours apart. Each phase was separated by a minimum of seven days to ensure proper recovery. The two phases included a control phase, and a compression phase. In the compression phase, subjects wore compression socks during the 24 hours separating trial one and two. The assignment of phases was determined by a randomized crossover design. During each treadmill test, time to exhaustion was recorded, as well as maximal heart rate achieved during the run and 20 minutes post run.
RESULTS: Time to exhaustion was significantly higher (p = .012) in the compression phase in comparison to the control phase (15.82 min; 15.11 min, respectively). Maximal heart rate achieved during the treadmill run was significantly lower (p = .024) while wearing the compression socks compared to the control phase (189.65 BPM; 192.39 BPM, respectively). Heart rate measurement 20 minutes post run was significantly lower (p = .032) in the compression phase when compared to the control phase (99.89 BPM; 101.46 BPM, respectively).
CONCLUSIONS: Time to exhaustion was significantly improved while wearing compression socks, which indicated an improvement in fatigue resistance and enhanced running performance. Moreover, heart rate, both maximal and recovery (20

minute) was significantly lower while wearing compression socks, which indicated a reduction in cardiovascular stress. Compression socks have a positive effect on running performance and heart rate responses associated with maximal aerobic exercise for moderately fit college aged individuals. It is hypothesized that this change is brought about as the compression applied decreases venous pooling in the lower leg, assisting in venous return. The applied compression allows for a more efficient circulation path back to the heart, promoting increased clearance rates of muscle metabolites while also lowering the workload on the heart.

520 Board #3 May 30 1:00 PM - 3:00 PM

The Effects Of Training Load On Salivary Amylase, Testosterone And Performance In Collegiate Runners

Dylan Mariano, Christopher Peterson, Richard Feinn, Thomas Martin. *Quinnipiac University, Hamden, CT.*

(No relevant relationships reported)

PURPOSE: To determine the effects of training load on salivary amylase and testosterone levels and their association with race performance in Female Division I cross-country athletes. **METHODS:** 18 female athletes (18.9 ± 0.86 yrs old) were monitored during the 2015 cross-country season. VO_2 max, and baseline salivary amylase and testosterone levels were assessed during the pre-season. Participants also underwent tri-weekly data collection sessions in which saliva samples were collected. Salivary levels of amylase and testosterone were analyzed using ELISA kits from Salimetrics (State College, PA) according to the manufacturers instructions. Athletes utilized a GPS/HR monitor system daily during practice sessions to record training load. Training load was calculated using the Running Training Stress Score (rTSS) according to a commercial website (www.TrainingPeaks.com). Race performance was also monitored during the season. Linear mixed models were used to analyze the effect of cumulative training load on amylase and testosterone levels and race performance during the season. **RESULTS:** There were no significant effects of training load on salivary amylase levels however, training load was a significant predictor of weekly salivary testosterone levels (p=0.009). Athletes, who had a high weekly training load, expressed lower levels of testosterone for that week. While controlling for race distance and baseline VO2 max, both salivary amylase and testosterone were predictive of race performance. Athletes who expressed higher than normal salivary amylase levels for a particular week, showed a decline in performance (p=0.006). However, the higher the weekly salivary testosterone level, the better the athletes performed (p=0.002). **CONCLUSION:** In this study, higher levels of weekly salivary testosterone were associated with optimal training and improved race performance. While higher levels of salivary amylase, were associated with a decline in race performance. Periodic measurements of salivary amylase and testosterone could be an important diagnostic marker for monitoring overtraining and predicting performance in collegiate athletes. Funding was provided by the School of Health Science Faculty Grant.

521 Board #4 May 30 1:00 PM - 3:00 PM

Evaluating The Effects of Two-Minutes Active Recovery On A "Booster" VO_2max Test Using Ultramarathon Runners

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(No relevant relationships reported)

Maximal oxygen consumption (VO_2max) tests typically end at the point of volitional exhaustion. However, prior research with averagely fit females and males as well as highly fit female collegiate athletes suggest that concluding a maximal treadmill test with 2min active recovery and allowing subjects to exercise a second time (ie. a booster test) at the workload eliciting the initial volitional exhaustion results in significantly greater VO_2max values (1.4% and 4.2% mean increase, respectively). The potential effects of this testing sequence (ie. 2min active recovery) on VO_2max treadmill graded exercise tests (GXT) has not been evaluated utilizing ultramarathon runners, yet accurate assessment of these unique athletes' VO_2max is crucial for training program design, implementation, and evaluation of training adaptations. **PURPOSE:** To examine changes in VO_2max values, in fit ultramarathon runners, following 2min of active recovery at the conclusion of a treadmill GXT to volitional exhaustion. **METHODS:** Twenty-nine (19 males and 10 females) ultramarathon runners completed a max treadmill GXT by reaching volitional exhaustion (MX1). Following 2min active recovery (at 0% grade & 2.5 mph) after reaching MX1, subjects had an immediate return to the ending MX1 speed and grade and exercised (ie. a booster test) to volitional exhaustion a second time (MX2). MX1 and MX2 values were compared using a Paired-Samples t-Test with significant differences occurring at $p \leq 0.05$. **RESULTS:** MX1 (53.9 ± 6.0 ml/kg/min) was significantly different ($p = 0.03$) than MX2 (52.7 ± 7.0 ml/kg/min). The mean change from MX1 to MX2 was -2.2%, yet 37.9% of the subjects benefited (+2.9% mean increase) from the booster test with individual increases of +0.2% up to +8.0%. **CONCLUSION:** Mean results suggest that 2min active recovery may not allow significantly greater VO_2max values to be achieved by fit ultramarathon runners during a max treadmill GXT, yet 37.9% of the subjects increased their VO_2max during the "booster VO_2max test" treadmill protocol. Future research may examine if fitness level, training experience, age, ultramarathon distance specialty, or other variables might affect this exercise testing protocol.

522 Board #5 May 30 1:00 PM - 3:00 PM

Effect of 8 Weeks of Eccentric Cycling Training on Running Economy in Healthy Males

Albino G. Schifino, Andrew J. Weiler, Jonathan Huaqui, Chee Hoi Leong. *Central Connecticut State University, New Britain, CT.* (Sponsor: Dr. Sean Walsh, FACSM)

(No relevant relationships reported)

Running economy (RE) has been shown to be a determinant of running performance. Evidence from recent investigations suggests that various forms of resistance and plyometric training can improve RE by augmenting changes in leg spring stiffness and/or exaggerating the stretch-shortening cycle. While eccentric cycling training (ECT) has been demonstrated to elicit improvements in muscular hypertrophy, muscular power, and increased leg spring stiffness, it remains unclear if ECT will improve running economy and/or performance. **PURPOSE**: The purpose of our investigation was to examine if an 8-week ECT intervention could improve RE and in healthy males. **METHODS**: Seven healthy males (age=29±9 yrs; mass=76.6±15.6 kg; height=1.72±0.1 m; BMI=25.6±3.7 kg/m^2) performed modified 10-second Wingate tests to obtain peak power output (PPO). ECT intensity was prescribed based on baseline PPO values. Participants performed ECT for 8 weeks (2x/week; 5-10.5 min; 20-55% of PPO). RE was obtained through metabolic analysis during treadmill running at 3 randomized speeds (2.24m/s, 2.68m/s, and 3.13m/s) for 4 minutes consecutively. PPO (W) and RE (ml/kg$^{0.75}$/min) were assessed prior to, and following the 8-week ECT intervention. Pre- versus post training changes in RE were analyzed using paired sample t-tests, alpha level was set at 0.05. Cohen's d effect size (*ES*) were calculated for all analyses and *ES* magnitudes of 0.10, 0.30, and 0.50 were interpreted as small, medium, and large effects, respectively. **RESULTS**: Post-training RE was significantly improved while running at 2.24m/s (P=0.002, *ES*=0.91; Table 1). **CONCLUSIONS**: These results demonstrate that 8 weeks of ECT was effective in improving RE in healthy individuals. We speculate that the improvement in RE may be attributed to an increase in leg spring stiffness. To the best of our knowledge, this is the first report of a significant improvement in RE following ECT. Improvement in RE would be beneficial for both coaches and athletes.

Table 1. Pre- versus post-training changes in Running Economy (RE) Data presented as mean±SD.

Running Speed (m/s)	Running Economy (ml/kg$^{0.75}$/m)			
	Pre-training	Post-training	*P*	*ES*
2.24	0.71 ± 0.08	0.67 ± 0.08	0.002*	0.91
2.68	0.65 ± 0.04	0.63 ± 0.04	0.085	0.64
3.13	0.66 ± 0.04	0.63 ± 0.04	0.153	0.20

*Significantly different compared to pre-training (P<0.05).

Supported By: 2017 Faculty-Student Research Grant – Central Connecticut State University.

523 Board #6 May 30 1:00 PM - 3:00 PM

The Impact of a Novel Wrist Cooling Device on 10km Running Performance in the Heat

Kelsey Denby, Emily Schlicht, Ronald Caruso, Michael Lopez, Stephen Ives. *Skidmore College, Saratoga Springs, NY.* (Sponsor: Paul Arciero, FACSM)

(No relevant relationships reported)

The combination of environmental heat stress and exercise is a potent physiological challenge and is known to impair performance. While pre-cooling might improve performance in the heat, it may prove impractical. PURPOSE: to investigate the impact of a novel wrist cooling device (DhamaSport™), which can be worn during exercise, on exercise performance and physiological responses in the heat. METHODS: In a single-blind, counterbalanced, crossover design, 13 male athletes (33±9 yrs, 15±7 %body fat, and VO_2max 59 ± 5 ml/kg/min, range 50-71) completed three 10km running time trials in the heat (80°F, 60% relative humidity), while wearing two

DhamaSport™ bands: 1) both bands were off (off/off), 2) one band on (off/on), 3) both bands on (on/on). Heart rate (HR), core temperature (T_{CO}), running speed (RS), rating of perceived exertion (RPE) and thermal sensations (TS) were recorded at baseline, during the 10km TT, and during recovery. To understand potential impacts on recovery and fatigue post-exercise, heart rate variability (root mean square of successive differences; RMSSD, and standard deviation of N-N intervals; SDNN), mean arterial pressure (MAP), and visual analog scale (VAS) for fatigue were measured. Due to safety constraints, trials were terminated if $T_{CO} \geq 39.2°C$, in which average speed was used to estimate 10km time. RESULTS: Use of the cooling bands had no effect ($p<0.05$) on resting T_{CO}, MAP, TS, VAS, RPE, RMSSD, or SDNN, but modestly increased ($p>0.05$) HR (Δ3-5 beats/min). During exercise, use of the bands significantly ($p<0.05$) increased RS (-0.25 Δmi/hr), HR (5 Δbeats/min), but had no significant effects on T_{CO} (Δ0.3°C), RPE, or TS were observed over time. The increased RS with the use of the bands, tended to reduce projected 10km time (~10-30s). Use of the cooling bands did not impact RMSSD, SDNN, MAP, or fatigue post-exercise ($p>0.05$). CONCLUSION: Our data demonstrate that use of the cooling bands improves running speed, decreasing projected 10km time. This modest improvement in performance comes at a cost of increased HR; although, interestingly, sensations of effort and thermal comfort were not impacted, despite the faster speed and higher HR. Taken together, use of the cooling bands has the potential to improve exercise performance in the heat perhaps due to altered thermal sensation. Support: Dhamausa.

524 Board #7 May 30 1:00 PM - 3:00 PM

The Influence of AlterG Treadmill Training on Lower Extremity Muscle Performance in Cross Country Runners

Tracy A. Dierks[1], Vincent C. Nittoli[2], Todd W. Arnold[2], Jason Pociask[3], Jacquelyn Fletcher[1]. *[1]Indiana University, Indianapolis, IN. [2]St. Vincent Sports Performance, Indianapolis, IN. [3]Community Health Network, Indianapolis, IN.*

(No relevant relationships reported)

Running on an AlterG® Treadmill (AGT) at reduced bodyweight requires speed to be increased if heart rate response is to match overground running. This can be beneficial as one can run at faster speeds for longer durations, without increasing impact forces or heart rate intensity beyond typical training, all while increasing lower extremity muscle demands. However, it is unknown if AGT training influences lower extremity muscle performance. **PURPOSE:** Investigate the effect of an AGT training program on lower extremity muscle performance. **METHODS:** As an offseason supplement, 19 uninjured high school boys cross country runners replaced 2 overground running sessions/week with AGT runs for 6 weeks. AGT runs were 80-85% of bodyweight with speed increased to elicit a heart rate intensity and distance/time consistent with each runner's mile pace for that day. Bilateral isokinetic muscle performance testing was completed at baseline and post program; 10 concentric/eccentric contractions at a speed of 180°/s for sagittal motions at the hip, knee, and ankle. A 2-way ANOVA (side x time) was used to assess pre-post changes (torque, work, power) and side-to-side symmetry ($p \leq 0.05$). **RESULTS:** Significant interactions were found for almost all hip variables for pre-post and side-to-side comparisons, while both the knee and ankle generally showed no differences. At the hip, the right generally improved pre-post for all variables, while the left decreased. This resulted in side-to-side asymmetries at pre, but improved to mostly symmetric at post. **CONCLUSION:** The AGT program seemed to primarily influence hip musculature, possibly related to pre-existing asymmetry. However, after training in the AGT environment for 6-weeks, both sides were generally symmetric post-program, mostly due to right side improvements. Thus, AGT training appears to be associated with improved symmetry of hip muscle performance, which may be significant when considering the role of the hip in overuse injuries.

Table 1. Outcome variables for the hip flexor and hip extensor muscle groups at pre and post program for the right and left sides. Contraction type (Concentric or Eccentric) indicates the type of muscle contraction performed during isokinetic testing. ^The hip extensors eccentric contraction variables displayed a similar outcome pattern to the extensors concentric, with the exception of mean power where no difference was observed.

Hip Muscles, Contraction	Peak Torque (Nm)		Mean Peak Torque (Nm)		Work (Joules)		Mean Power (watts)	
Flexors, Concentric								
Right Pre	77.2*	(30.8)	55.7*	(25.2)	653.4*	(323.4)	83.4*	(41.2)
Right Post	81.4*	(17.6)	63.5*	(16.3)	706.1*	(198.1)	93.6*	(25.5)
Left Pre	86.6*	(28.9)	64.2*	(21.5)	783.3*	(234.4)	101.2*	(29.7)
Left Post	74.7*	(18.2)	57.9*	(16.7)	632.2*	(164.8)	86.8*	(22.7)
Flexors, Eccentric								
Right Pre	117.5**	(23.8)	94.2**	(27.4)	1005.5*	(460.5)	83.4*	(40.0)
Right Post	109.1**	(24.9)	88.6**	(23.5)	1007.4*	(431.6)	85.5*	(37.3)
Left Pre	114.5**	(25.7)	89.5**	(27.2)	879.2*	(350.4)	77.2*	(29.5)
Left Post	94.6**	(24.2)	77.9**	(25.5)	765.5*	(357.4)	68.0*	(31.1)
^Extensors, Concentric								
Right Pre	116.0*	(38.4)	88.6*	(31.8)	1007.8**	(545.6)	75.8*	(36.2)
Right Post	132.9*	(36.8)	108.4*	(37.5)	1070.5**	(374.1)	112.1*	(41.4)
Left Pre	132.9*	(42.2)	105.4*	(40.0)	1227.6**	(481.9)	96.2*	(43.0)
Left Post	133.2*	(39.4)	106.6*	(37.8)	1120.0**	(328.6)	107.7*	(48.4)

*Significant interaction between side and time ($p<0.05$).
**Trend towards significant interaction between side and time ($p<0.10$).

525 Board #8 May 30 1:00 PM - 3:00 PM

Nocturnal Heart Rate Variability and Morning Orthostatic Test as Tools to Monitor Training Load

Ville Vesterinen, Ari Nummela. *KIHU - Research Institute for Olympic Sports, Jyväskylä, Finland.*

(No relevant relationships reported)

Both the nocturnal heart rate variability (HRV) and the morning Orthostatic Test are widely used to monitor training load and recovery status of athletes. Both measurements have been observed to be associated with cardiac autonomic regulation. But less is known whether the measurements show similar responses to training load. **PURPOSE**: This study investigated the effects of easy and hard training days on the nocturnal HRV and the Orthostatic Test. In addition, the aim was to investigate relationships between nocturnal and morning HRV variables. **METHODS**: Thirty-four recreational endurance runners performed nocturnal R-R interval recordings and the morning Orthostatic test (5 min supine + 3 min standing) after an easy and a hard training day (moderate- or high-intensity endurance training). Nocturnal HRV was analyzed as four-hour period starting 30 min after going to bed for sleep. Morning HRV was analyzed over 4 min supine (00:30-04:30) and 2 min standing position (06:00-08:00). In addition, peak HR after stand-up and Orthostatic heart rate (HR) (HRstanding - HRsupine) were analyzed. **RESULTS**: Training load (session RPE) of hard training day (638 ± 638) was significantly ($P < 0.001$) greater compared to easy training day (50 ± 100). Nocturnal HR was lower (52 ± 6 vs. 57 ± 9, $P < 0.001$) and all nocturnal HRV variables were higher (Total power: 8.86 ± 0.63 vs, 8.41 ± 0.79, $P < 0.001$) after easy training day. HR in supine position was lower (53 ± 7 vs. 56 ± 7, $P = 0.011$) and high frequency power in supine position was higher (8.06 ± 0.89 vs. 7.74 ± 0.93, $P = 0.027$) after easy day. Other Orthostatic test variables were not different between easy and hard training days. Nocturnal HR and HRV variables showed moderate correlations ($r = 0.62 - 0.78$, $P < 0.001$) to the morning supine variables, but trivial and small correlations (0.19 - 0.39) to standing variables. **CONCLUSIONS**: Different training load after easy and hard training days can be observed in both nocturnal HRV and Orthostatic Test. However, the differences are greater in nocturnal HRV recordings compared the morning Orthostatic Test. In addition, it seems that standing variables are not able to evaluate the training load of the previous day. The results suggest that both nocturnal HRV and selected, supine variables of the Orthostatic test can be used in monitoring training load.

B-13 Free Communication/Slide - **Heat Stress/ Stroke**

Wednesday, May 30, 2018, 1:00 PM - 2:45 PM
Room: CC-101CD

526 **Chair:** W. Larry Kenney, FACSM. *Pennsylvania State University, University Park, PA.*
(No relevant relationships reported)

527 **Chair:** Jody Greaney. *Pennsylvania State University, University Park, PA.*
(No relevant relationships reported)

528 May 30 1:00 PM - 1:15 PM

Fitness Level Does Not Impact Cardiovascular Drift and Decreased Maximal Oxygen Uptake during Heat Stress

Tori M. Stone, Jonathan E. Wingo, FACSM. *The University of Alabama, Tuscaloosa, AL.* (Sponsor: Jonathan E Wingo, FACSM)
(No relevant relationships reported)

Cardiovascular drift (CV drift) has been shown to be related to reduced maximal oxygen uptake (VO_{2max}) during heat stress. At a given relative metabolic intensity (%VO_{2max}), individuals with higher fitness levels would be expected to experience greater CV drift, and thereby greater decrements in VO_{2max}, because of a greater metabolic heat production resulting from exercising at a higher absolute intensity. However, this has not been directly investigated. PURPOSE: To test the hypothesis that individuals with a higher initial VO_{2max} (i.e., fitness level) will experience a greater magnitude of CV drift and accompanying decrement in VO_{2max} compared to those with a lower initial VO_{2max} during prolonged, moderate-intensity exercise in the heat. METHODS: Data from 7 studies (n = 62) were used to assess the relationships between fitness level and 1) CV drift (change in heart rate and stroke volume) and 2) VO_{2max}. CV drift and VO_{2max} were assessed between 15 and 45 min or between 15 and 60 min of cycling at 60% VO_{2max} in 35 °C or 30 °C. RESULTS: Initial VO_{2max} (i.e., fitness level) was not related to change in heart rate (r=0.17, p=0.20), change in stroke volume (r=-0.06, p=0.63), and decrease in VO_{2max} (r=-0.14, p=0.28). CONCLUSION: Contrary to our hypothesis, fitness level was unrelated to the magnitude of CV drift or decrement in VO_{2max} during prolonged submaximal exercise in the heat. However, these findings support the results of previous studies in that the greater the magnitude of CV drift—regardless of fitness level—the greater the decrement in VO_{2max} during constant-rate, moderate-intensity exercise in the heat.

529 May 30 1:15 PM - 1:30 PM

24 Hour Naproxen Dose On Core Temperature And Il-6 During Cycling In The Heat

Dawn M. Emerson[1], J. Mark Davis, FACSM[2], Toni M. Torres-McGehee[2], Stephen CL Chen[3], Charles C. Emerson[4], Craig E. Pfeifer[5], Joseph D. Bivona[2], Justin V. Stone[2], J. Larry Durstine, FACSM[2]. *[1]University of Kansas, Lawrence, KS. [2]University of South Carolina, Columbia, SC. [3]Bob Jones University, Greenville, SC. [4]University of Missouri - Kansas City, Kansas City, MO. [5]Lander University, Greenwood, SC.*
(No relevant relationships reported)

Due to anti-pyretic and anti-inflammatory effects, non-steroidal anti-inflammatory drugs (NSAIDs) are theorized to blunt core temperature (Tc) rise during exercise. On the other hand, the adverse events from NSAID use (eg, gastrointestinal and renal damage) can cause an inflammatory response. Existing literature examining NSAIDs on Tc during exercise in the heat is limited and conflicting. **PURPOSE:** To determine the effects of naproxen on Tc and interleukin-6 (IL-6) in hydrated, exercising humans. **METHODS:** We utilized a double-blind, randomized and counterbalanced, cross-over design. Independent variables were a 24 hr naproxen dose (220 mg naproxen/dose) or placebo (0 mg naproxen/dose) and an ambient (22.7 ± 1.8°C, 52.4 ± 5.5% humidity) or hot (35.7 ± 1.3°C, 53.2 ± 3.2% humidity) environment. Participants (n = 11; 6 male, 5 female; age = 27.8 ± 6.5 yrs, weight = 79.1 ± 17.9 kg, height = 177 ± 9.5 cm) completed 4 conditions: 1) placebo and ambient (Control); 2) placebo and heat (Heat); 3) naproxen and ambient (Npx); and 4) naproxen and heat (NpxHeat). Participants cycled 80 min at a heart rate corresponding to 70% VO_{2max} followed by a 10 min time trial for maximum distance. Participants then rested 3 hrs in an ambient environment. Tc and IL-6 were assessed pre-, during, post-, and 3 hrs post-cycling. **RESULTS:** Tc significantly increased pre- to post-cycling (37.1 ± 0.4°C to 38.2 ± 0.3°C, P < 0.001) and decreased during rest (P < 0.001), reaching baseline by 75 min post-cycling. Rate of Tc change and maximum Tc were not significantly different between conditions. IL-6 increased pre- to post-exercise (0.54 ± 0.06 pg/ml to 2.46 ± 0.28 pg/ml, P < 0.001) and remained significantly higher than pre- at 3 hrs post- (1.17 ± 0.14 pg/ml, P = 0.001). No significant IL-6 differences were found between conditions. **CONCLUSION:** A 24 hr over the counter naproxen dose did not significantly affect Tc or IL-6 among hydrated males and females cycling at moderate intensity in hot or ambient conditions. These results are important for physically active individuals and those working with persons who may be taking naproxen. Future research should examine stronger naproxen doses, longer usage, and more intense exercise to determine potential effects on the thermoregulatory and inflammatory systems.
Supported by the ACSM Foundation Carl V. Gisolfi Memorial Fund

530 May 30 1:30 PM - 1:45 PM

Music Mitigates Heat-Related Reductions In Exercise Performance, But At What Cost?

Timothy English, Yorgi Mavros, Ollie Jay, FACSM. *The University of Sydney, Lidcombe, Australia.* (Sponsor: Dr Ollie Jay, FACSM)
(No relevant relationships reported)

PURPOSE: It is well established that reductions in exercise performance are observed in hot environmental conditions relative to cooler environments. Listening to motivational music is known to improve exercise performance, by enhancing positive affect and reducing ratings of perceived exertion. However, it is not known if listening to motivational music mitigates heat-related reductions in exercise performance, and if any additional work leads to a greater rise in core temperature and/or cardiovascular strain. Our aim was to determine if listening to motivational music during a 15-minute cycling time trial (15TT) mitigates the decrement in cumulative work output typically observed in the heat, leading to a greater increase in core temperature and cardiovascular strain.
METHODS: 7 participants (27±6 y; 71±13 kg) completed a VO_2max test on a cycle ergometer with a VO_2max verification stage (48±7 ml·kg^{-1}·min^{-1}). Each participant completed 30 mins of cycling at 50% VO_2max, followed by a 5-min rest, a 15TT and 5 mins of post-exercise recovery on six occasions. The protocol was completed three times for familiarisation in a neutral (~20°C) environment, and then another three trials in a counterbalanced crossover order under the following conditions: i) 21°C/50%RH (CLD); ii) 36°C/50%RH (HOT); and iii) 36°C/50%RH with motivational music during the 15TT (HOT-MUSIC). Cumulative work output, the rise in rectal temperature (ΔT_{re}) and Rate Pressure Product (RPP) were measured throughout.
RESULTS: Cumulative work output was lower (p<0.001) in HOT (155±54 kJ) compared to CLD (180±50 kJ). However, work output was greater (p<0.001) in HOT-MUSIC (166±51 kJ) compared to HOT, but still lower than CLD (p<0.001). The greater work output in HOT-MUSIC resulted in a greater ΔT_{re} (0.82±0.35°C, p<0.05) at the end of the 5-min post-exercise recovery period compared to HOT (0.67±0.36°C). By the end of the 15TT, there was a trend for a higher RPP (p=0.06) in HOT-MUSIC (31696±4871 mmHg·beats·min^{-1}) compared to HOT (26696±3035 mmHg·beats·min^{-1}).
CONCLUSIONS: Listening to motivational music partially mitigated (by approximately half) the observed heat-related decrements in exercise performance. However, the greater work output resulted in a greater increase in core temperature, and a trend towards a greater cardiovascular strain.

531 May 30 1:45 PM - 2:00 PM

Acute Response to Skeletal Muscle Heating via Pulsed Short-wave Diathermy

Paul Hafen, Rob Hyldahl. *Brigham Young University, Provo, UT.*
(No relevant relationships reported)

The heat stress response is associated with several beneficial adaptations to promote cell health and survival. Specifically, *in vitro* and animal investigations have shown that exposure to a mild heat stress (~40°C) elicits mitochondrial adaptations within skeletal muscle that are similar to those observed with exercise. **Purpose:** To investigate the acute effects of deep tissue heating on heat shock protein (HSP) expression and signaling pathways associated with mitochondrial adaptation. **Methods:** Twenty healthy men (n = 10) and women (n = 10) volunteered for the study (21 ± 2 yrs, 172 ± 11 cm, 65 ± 13 kg). From each volunteer, a randomly selected leg underwent a 2-hr heating session via pulsed short-wave diathermy. Intramuscular temperature was measured with the insertion of a temperature probe to the approximate depth at which muscle tissue would be sampled (≈ 3.5 cm). Muscle biopsies were taken immediately after heating from the vastus lateralis muscles of both legs (treatment and control). From the collected tissue, we measured HSP phosphorylation and protein expression. In addition, we explored whether the heating protocol was able to elicit phosphorylation of AMPK and several well-defined MAPKs (p38, JNK, and ERK1/2) associated with mitochondrial biogenesis. **Results:** Muscle temperature increased significantly in response to the diathermy treatment (3.96 ± 0.51°C, p<0.0001). In response to the 2-hr heating session, we found the phosphorylation of HSP27 to be significantly depressed (-28 ± 0.08%, p = 0.0016), with no changes in overall total protein expression of any of the measured HSPs (HSP27, 60, 70, and 90). Additionally,

in the heated muscle we found significant increases in the phosphorylation of AMPK (32 ± 16% p = 0.0365) and ERK1/2 (205 ± 77%, p = 0.0246). There were no changes in the phosphorylation of either p38 or JNK. **Conclusion:** The altered phosphorylation status of HSP27, together with the increased phosphorylation of AMPK and ERK1/2, suggest that a single, 2-hr heating session is capable of eliciting a significant cellular stress response, which may influence metabolic adaptive processes.

532 May 30 2:00 PM - 2:15 PM

Sustained Metabolic Switch to Lipid Oxidation In Murine Cardiac Muscle After Exertional Heat Stroke

Orlando Laitano[1], Brian Ingram[2], Christian K. Garcia[1], Gerard P. Robinson[1], Alex J. Mattingly[1], Danielle L. Ippolito[3], Lisa R. Leon[4], Thomas L. Clanton[1]. *[1]University of Florida, Gainesville, FL. [2]Metabolon, Morrisville, NC. [3]US Army, Ft Detrick, MD. [4]US Army, Natick, MA.* (Sponsor: Scott K. Powers, FACSM)

(No relevant relationships reported)

Cardiac dysfunction has been documented after exertional heat stroke (EHS), but little is known about the metabolic (mal)adaptations occurring in the heart after exposure to EHS. **PURPOSE:** To identify metabolic biomarkers in a preclinical model of EHS that could indicate long-term cardiometabolic complications or adaptations to EHS. **METHODS:** 56 male mice ran on an incremental forced running wheel while exposed to 37.5°C/ ~40% humidity to induce EHS. Mice ran 124.1 ± 7.2 min, reaching a core temperature of 42.2 ± 0.07 °C at the time of collapse. Animals lost 7.5 ± 0.9 % body weight. Plasma and heart ventricle tissue were obtained at 0.5, 3, and 24 h and at 4, 9 and 14 days post EHS and compared to exercise-matched controls at 4 days post-exercise. Metabolites were extracted from biospecimens and analyzed by mass spectrometry. Ions were matched to a library of standards for identification and quantification. **RESULTS:** At 0.5-3 h after EHS, there was a marked loss in carbohydrate availability (1.6-1.9-fold reduction in plasma glucose, pyruvate and lactate. During the immediate post-EHS period there was also evidence for mobilization of a variety of amino acids. Elevations in acetylated amino acids were also observed. Elevated nucleic acid breakdown products were evident until 24 h post EHS, then recovered. By 3 h, 1.4-12.1-fold increases in acyl carnitine and ketone bodies were evident in the plasma. In cardiac muscle, most species of acyl carnitines were 2.2-25.0-fold lower than control at 0.5 h, suggesting rapid intracellular turnover of available free fatty acids (FFA). Interestingly, in the heart, carnitine FFA remained 2.0-16.7-fold lower than control through 14 d. **CONCLUSION:** Our results are consistent with an acute "energy crisis" following EHS that resolves within 3-24 hours, primarily via a sustained, persistent (≥ 14 day) shift toward fatty acid metabolism in the heart. Other metabolic changes reflect responses to injury, inflammation or wound repair during the recovery phase. *The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or reflecting the views of the Army or the DoD.*

533 May 30 2:15 PM - 2:30 PM

Physical Factors Related To Heat Exchange In Male And Female Mice During Exertional Heat Stroke

Christian K. Garcia, Alex Mattingly, Gerard P. Robinson, Orlando Laitano, Thomas L. Clanton. *University of Florida, Gainesville, FL.* (Sponsor: Scott K Powers, FACSM)

(No relevant relationships reported)

Physical factors related to heat exchange in male and female mice during exertional heat stroke

Christian Kyle Garcia, Alex Mattingly, Gerard Patrick Robinson, Orlando Laitano, and Thomas Clanton

Physical and biological characteristics such as body surface area (BSA), mass and power production can influence heat tolerance during exercise. The extent of their influence has yet to be determined in a comprehensive model of exertional heat stroke in mice. We hypothesize that differences observed in performance between male and female mice in the heat may be attributed to their physical factors related to heat exchange. **PURPOSE**: To determine the effects of sex, body surface area to mass (BSA/mass), and rate of thermal radiation on heat stroke defense in a preclinical exertional heat stroke model. **METHODS:** 84 mice were separated by sex and given exertional heat stroke within an environmental chamber. Mice ran on a forced running wheel with incremental increases in speed. Environmental conditions included an ambient temperature and humidity of 37.5°C/~40%RH. **RESULTS**: Using analysis of covariance, with BSA/mass, power and sex as the factors determining distance ran in the heat, we found the following in both sexes. Power output and the BSA/Mass were significant predictors for run distance (P<0.000001 for both). Crossed effects between sex and power output as well as sex and BSA/mass were highly significant (P<0.000001 for both). We also hypothesized that females may have had a physical advantage in terms of capacity for thermal radiation in the heat and indeed females exhibited a ~44% higher maximal rate of thermal radiation when normalized for BSA (P<0.03). **CONCLUSION**: In both sexes the rate of power production and body surface area to mass were strong determinants of performance in the heat; however, sex remained a significant factor over and above these variables. When thermal radiation is normalized per area available for net exchange females had higher heat radiation capacity. Therefore, the results are consistent with a biological advantage in females that incorporates an elevated rate of heat radiation capacity independent of other physical factors. *Author views not official US Army or DoD policy. W81XWH-15-2-0038*

534 May 30 2:30 PM - 2:45 PM

Comparison of Rectal Temperature Responses During a Modified Heat Tolerance Test

Yuri Hosokawa, Kelsey M. Rynkiewicz, Luke N. Belval, Courteney L. Benjamin, Ryan M. Curtis, Gabrielle E.W. Giersch, Rachel K. Katch, Rebecca L. Stearns, Douglas J. Casa, FACSM. *Korey Stringer Institute, Storrs, CT.*

(No relevant relationships reported)

Heat tolerance testing (HTT) has been used in clinical settings to determine readiness to return to activity after exertional heat stroke. However, published HTT data are mostly limited to a walking protocol (5km·h^{-1} at 2% grade) in a climatic chamber set at 40°C and 40% relative humidity (RH), which may limit application in determining one's ability to achieve thermoregulatory equilibrium during exercise. **Purpose:** To investigate factors that are associated with differences in temperature response during a modified HTT (mHTT). **Methods:** Thirty-two participants completed mHTT on a treadmill set at 60% of the velocity at VO_2max in a climatic chamber set at 27.3±0.4°C and 51.1±1.7%RH. Within this cohort, we identified three pairs of participants (A, B, C) who tested at the same treadmill speed respectively, with body mass (BM) and body surface area (BSA) difference <5% but exhibited rectal temperature (T_{REC}) difference ≥0.75°C at the end of mHTT. Pooled data of participants with lower end T_{REC} (LOW) and higher end T_{REC} (HIGH) during the first 60 min of the mHTT were compared using a two-way ANOVA. **Results:** BM and BSA %difference in pairs A, B, C were 3.8%, 4.8%,1.0% and 3.4%, 3.5%, 1.1%, respectively. Starting T_{REC} difference was largest in pair A (HIGH-LOW: A, 0.72°C; B, 0.06°C, 0.27°C). The ten-minute average of the slope of T_{REC} change was greater at all time points in HIGH than LOW with no statistical significance ($p>0.05$). However, all LOW exhibited a plateau in slopes during the last 20 min (slope ≤0.01°C·min^{-1}). Greater SR (sweat rate) was observed in HIGH in two pairs (SR %difference: A, 26.1%; C, 16.3%). Overall RR was greater in HIGH in all pairs but the difference observed in pair A was negligible (0.001°C·min^{-1}). **Conclusions:** Fluid was not replaced during mHTT, which may have served as the limiting factor for high sweaters in pair A and C to sustain thermoregulatory equilibrium and contributed in the greater slope, SR, and overall RR. In designing a mHTT that accounts for physical demands greater than walking, SR should be recorded to understand the influence from dehydration. Starting T_{REC} may have also affected the negligible difference observed in RR in pair A. Future studies should investigate the normative values for T_{REC} response during mHTT under a setting where the treadmill speed, BM, BSA, and body mass loss are controlled.

B-14 Free Communication/Slide - Respiratory Physiology

Wednesday, May 30, 2018, 1:00 PM - 2:45 PM
Room: CC-Mezzanine M100D

535 **Chair:** Jonathon L. Stickford. *Appalachian State, Boone, NC.*

(No relevant relationships reported)

536 May 30 1:00 PM - 1:15 PM

Thoracic Blood Volumes and Periodic Breathing in Chronic Heart Failure

Caitlin C. Fermoyle, Steven C. Chase, Bruce D. Johnson. *Mayo Clinic, Rochester, MN.*

(No relevant relationships reported)

Purpose: Half of all heart failure (HF) patients have a reduced left ventricular ejection fraction (LVEF) and cannot achieve a cardiac output sufficient to meet the metabolic demands of the body. Reduced ejection of the left ventricle causes a centralization of blood volume, specifically an increase of blood within the pulmonary vasculature, which can alter the compliance of the lung tissue leading to changes in breathing patterns. Periodic breathing (PB), defined as cyclic oscillations in ventilation, has been observed in stable HF patients at rest. However, the mechanism underlying the disturbance in ventilation control is unknown. We investigated the relationship between PB and thoracic blood volumes in patients with stable HF.
Methods: Eleven stable HF subjects (10M, age=69±12years, height=178.0±9.5cm, weight=92.2±12.6kg, BMI=29.0±2.4kg/m^2) and twelve healthy controls (8M,

age=65±9years, height=168.5±9.3cm, weight=70.8±12.8kg, BMI=24.7±2.6kg/m^2) participated in the study. PB was determined by the presence of a distinct peak in the 0.003-0.04 Hz frequency range of the flow signal during six minutes of resting breathing. Blood volumes in the thorax (V_t), heart (V_h), and pulmonary circulation (V_p) were quantified using CT perfusion imaging from the mean transit time of iodinated contrast moving through the pulmonary circulation.
Results: PB was observed in 7 HF subjects and was associated with poorer functional status and lower LVEFs. HF subjects with PB had blood volumes that were nearly doubled compared to healthy and HF subjects without PB. This relationship persisted when blood volumes were normalized to body surface area (Volumes reported as ml·m^{-2}, p-values vs. healthy; V_t, Healthy = 779.2±257.4, HF without PB = 821.6±160.7, p=0.981, HF with PB = 1579.2±547.9, p=0.002; V_p, Healthy = 393.9±104.9, HF without PB = 434.2±57.5, p=0.874, HF with PB = 748.3±187.7, p=0.000; V_h, Healthy = 385.3±169.4, HF without PB = 387.5±107.8, p=1.000, HF with PB = 830.9±373.3, p=0.008).
Conclusions: HF patients with PB at rest have augmented central blood volumes, which is consistent with previous studies demonstrating a relationship between PB and high pulmonary pressures. Supported by NIH grant HL71478.

537 May 30 1:15 PM - 1:30 PM

Elastic and Resistive Work of Breathing in Older and Younger Adults

Joshua R. Smith, Troy J. Cross, Erik H. Van Iterson, Thomas P. Olson, FACSM. *Mayo Clinic, Rochester, MN.* (Sponsor: Thomas Olson, FACSM)

(No relevant relationships reported)

Aging results in significant alterations in the structure and function of the pulmonary system. For example, aging is associated with the loss of elastic recoil, stiffening of the chest wall as well as decreased airway caliber, and expiratory flow rates. During exercise, older adults exhibit greater expiratory flow limitation (EFL) and increased operating lung volumes than younger adults; however, it is not known if these translate to a higher total work of breathing (WOB) owing to elevated elastic and resistive WOB. **PURPOSE**: To compare the total WOB and its components (inspiratory and expiratory elastic and resistive WOB) in older and younger adults at matched ventilations (V_E). We hypothesized that older compared to younger adults would exhibit a greater total WOB as a result of greater inspiratory and expiratory elastic and resistive WOB.
METHODS: Older (OA: n=9; 60±8 yrs) and younger (YA: n=9; 38±7 yrs) adults were recruited for this study. Participants performed an incremental cycling test to volitional fatigue. Esophageal pressure, lung volumes, EFL, and ventilatory variables were measured at matched V_E (i.e. 25, 50, and 75 L/min) during exercise. Modified Campbell diagrams were used to determine the inspiratory and expiratory elastic and resistive WOB.
RESULTS: At V_E of 75 L/min, older adults had greater % EFL and tidal volume to forced vital capacity ratio ($p<0.05$), while end-expiratory and inspiratory lung volumes were not different ($p>0.19$). Older compared to younger adults had greater total WOB at V_E of 50 (OA: 47±20 vs. YA: 31±7 J/min) and 75 L/min (OA: 97±41 vs. YA: 64±18 J/min) ($p\leq0.05$ for both). At V_E of 50 L/min, older adults had a greater inspiratory resistive WOB (OA: 13±8 vs. YA: 6±2 J/min, $p<0.03$). At V_E of 75 L/min, older adults had a greater inspiratory elastic and resistive WOB (OA: 44±27 vs. YA: 24±22 and OA: 23±15 vs. YA: 11±3 J/min, respectively) ($p<0.02$ for both) and expiratory resistive WOB (OA: 23±19 vs. YA: 14±9 J/min, p=0.04) than younger adults.
CONCLUSIONS: These data demonstrate that aging-induced pulmonary alterations result in a greater WOB during exercise owing to greater inspiratory (elastic and resistive) and expiratory resistive WOB. These findings suggest that the respiratory muscles necessitate an increased blood flow demand in older than younger adults for a given V_E during exercise.

538 May 30 1:30 PM - 1:45 PM

Experimentally Manipulating Mechanical Ventilatory Constraint During Exercise Does Not Influence Dyspnea in Older Men and Women

Yannick Molgat-Seon[1], Andrew H. Ramsook[1], Carli M. Peters[1], Michele R. Schaeffer[1], Paolo B. Dominelli[2], Lee M. Romer, FACSM[3], Jeremy D. Road[1], Jordan A. Guenette[1], A. William Sheel, FACSM[1]. *[1]University of British Columbia, Vancouver, BC, Canada. [2]Mayo Clinic, Rochester, MN. [3]Brunel University London, Uxbridge, United Kingdom.* (Sponsor: Bill Sheel, FACSM)

(No relevant relationships reported)

During exercise at a standardized metabolic work load, the perception of dyspnea is higher in older women than older men, which is thought to be related to sex-differences in mechanical ventilatory constraint; however, this hypothesis has yet to be experimentally tested. **PURPOSE**: To determine the effect of manipulating the magnitude of mechanical ventilatory constraint during submaximal exercise on dyspnea in older men and women. **METHODS**: Thirteen healthy subjects (60-80 y; n=7 women) completed two days of testing. On Day 1, subjects performed pulmonary function testing and a maximal incremental cycle exercise test. On Day 2, esophageal pressure (P_{es}) and diaphragm electromyography (EMG_{di}) were recorded during three constant load cycle exercise tests (6 min each) at ventilatory threshold (V_{Th}). Constant load exercise tests were performed under three conditions in a single blind, randomized, counterbalanced fashion: i) breathing normoxic helium-oxygen gas (HeO_2) to reduce the work of breathing (W_b) and alleviate expiratory flow limitation (EFL); ii) inspiratory resistance (RES) of 5 $cmH_2O{\cdot}l^{-1}{\cdot}s^{-1}$ to increase W_b; and iii) control (CON) breathing room air. During exercise on Day 2, P_{es}-derived measures of W_b, EMG_{di}, and EFL were assessed. **RESULTS**: During the HeO_2 condition, there was a significant decrease in W_b (men= -20±4%, women= -16±5%) and EMG_{di} (men= -11±7%, women= -9±7%) relative to CON (both $p<0.01$). Moreover, if EFL was present during the CON condition (n=3 men, n=5 women), it was alleviated during HeO_2. Conversely, during the RES condition, there was a significant increase in W_b (men= 34±11%, women= 50±12%) and EMG_{di} (men= 32±15%, women= 23±12%) relative to CON (both $p<0.01$). The effect of condition on W_b and EMG_{di} was not significantly different between the sexes (both $p>0.05$). Across conditions, women reported significantly higher levels of dyspnea than men (3.3±0.4 vs. 1.9±0.4 Borg units, $p<0.05$). However, despite significant differences in the degree of mechanical ventilatory constraint between conditions, there was no effect of condition on the perception of dyspnea intensity, regardless of sex ($p=0.46$). **CONCLUSION**: Our results suggest that during short bouts of exercise at V_{Th}, sex-differences in dyspnea in older adults are not related to sex-differences in mechanical ventilatory constraint.

539 May 30 1:45 PM - 2:00 PM

Alterations In Pulmonary And Respiratory Muscle Function In Response To 10 Marathons In 10 Days

Nick B. Tiller[1], Louise A. Turner[1], Bryan J. Taylor[2]. *[1]Sheffield Hallam University, Sheffield, United Kingdom. [2]University of Leeds, Leeds, United Kingdom.*

(No relevant relationships reported)

Alterations in pulmonary and respiratory muscle function in response to 10 marathons in 10 days
Tiller NB, Turner LA, Taylor BJ.
[1] Academy of Sport and Physical Activity, Sheffield Hallam University, UK
[2] Faculty of Biological Sciences, School of Biomedical Sciences, University of Leeds, UK
Background: Marathon and ultramarathon running are sufficient to induce pulmonary dysfunction and respiratory muscle fatigue. However, it is unknown how the respiratory system responds to multiple, consecutive days of endurance exercise.
Methods: Eleven well-trained endurance runners (8 male, 3 female) contested an ultra-endurance challenge comprising 10 marathons in 10 consecutive days. Lung function (FVC, FEV_1, FEV_1/FVC, PEF) and maximal static inspiratory and expiratory mouth pressures (MIP and MEP) were measured before and after marathon 1, 4, 7 and 10. Perceptual ratings of breathlessness (Borg CR10), respiratory muscle soreness (Visual Analogue Scale), and symptoms of upper-respiratory tract infection (URTI) were also recorded. **Results:** Group mean time for the 10 marathons was 276 ± 35 min, and post-marathon breathlessness was 2.0 ± 0.3 (range 1.0 to 3.0). Relative to pre-challenge baseline (159 ± 32 cmH_2O), MEP was reduced after marathon 1 (136 ± 31 cmH_2O, $p = 0.017$), marathon 7 (138 ± 42 cmH_2O, $p = 0.035$) and marathon 10 (130 ± 41 cmH_2O, $p = 0.008$), but there were no consistent reductions in baseline (pre-marathon) MEP. There were no changes in FVC, FEV_1, FEV_1/FVC, PEF, MIP, perception of breathlessness or respiratory muscle soreness throughout the challenge ($p > 0.05$). Moreover, there was no change in symptoms of URTI during and up to 2-weeks following the challenge ($p > 0.05$). **Conclusions:** Ten days of marathon running did not induce a chronic reduction in resting pulmonary or respiratory muscle function, despite acute pre-to-post-marathon reductions in maximal expiratory muscle strength. These data underscore the robustness of the healthy respiratory system.

540 May 30 2:00 PM - 2:15 PM

Work of Breathing Influences Muscle Sympathetic Nerve Activity During Whole-Body Exercise

Paolo B. Dominelli[1], Keisho Katayama[2], Tyler D. Vermuelen[3], Troy JR Stuckless[3], Courtney V. Brown[3], Glen E. Foster[3], Andrew W. Sheel, FACSM[1]. *[1]University of British Columbia, Vancouver, BC, Canada. [2]Nagoya University, Nagoya, Japan. [3]University of British Columbia, Kelowna, BC, Canada.*

(No relevant relationships reported)

Manipulating the work of breathing (Wb) during exercise influences: quadriceps and respiratory muscle blood flow, locomotor and respiratory muscle fatigue, exercise performance and sensations of dyspnea. The mechanism underpinning these changes is hypothesized to be a sympathetically mediated respiratory muscle metaboreflex. However, no direct evidence for altered muscle sympathetic nerve activity (MSNA) during whole-body exercise has been demonstrated. **PURPOSE**: To determine if

lowering the Wb decreases MSNA during whole-body cycle exercise. **METHODS**: Healthy active subjects (n=12, 3 female) performed semi-recumbent cycling to exhaustion (VO_{2peak}= 45±2 ml kg^{-1} min^{-1} means ± SE). On a subsequent day, three constant load exercise trials at 40, 60 and 80% of peak workload were performed. Each trial was 7 min long and consisted of: 3 min spontaneous breathing, 2 min reduced Wb followed by 2 min spontaneous breathing. MSNA was recorded via microneurography of the right median nerve at the elbow. A proportional assist ventilator (PAV) was used to reduce the Wb. All statistical comparisons were made within each workload between PAV and post-PAV. **RESULTS**: The 40, 60 and 80% trials resulted in 57±1, 79±1 and 96±2 % of VO_{2peak}, respectively. At 40%, the PAV resulted in a similar Wb (62±7 vs. 67±7 J min^{-1}, P=0.4), decreased MSNA as (27±2 vs. 30±2 burst min^{-1} P>0.05) and increased V_E (67±3 vs. 55±2 l min^{-1}, P>0.05); for PAV and post-PAV, respectively. At 60%, the PAV significantly (P<0.05) reduced Wb (103±2 vs. 144±14 J min^{-1}), MSNA (35±3 vs. 42±2 burst min^{-1}), heart rate (151±4 vs. 154±4 beats min^{-1}) and VO_2 (2.4±0.2 vs. 2.6±0.1 l min^{-1}) without influencing V_E (86±3 vs. 82±3 l min^{-1} P>0.05); for PAV and post-PAV, respectively. At 80% (n=8) the PAV reduced (P<0.05) Wb (235±39 vs. 361±53 J min^{-1}), MSNA (48±2 vs. 53±4 burst min^{-1}), heart rate (173±4 vs. 176±4 beats min^{-1}) and VO_2 (2.9± 0.2 vs. 3.2±0.2 l min^{-1}) but not V_E (121±7 vs. 123±7 l min^{-1}) compared to post-PAV. **CONCLUSIONS**: During whole-body aerobic exercise above ~57% of VO_{2peak}, attenuating the normally occurring Wb has a significant effect on sympathetic vasomotor outflow. Our findings support the theory of a respiratory muscle metaboreflex that influences the integrative response to exercise.
Funding: NSERC, JSPS KAKENHI Grant Number JP16KK0201

541 May 30 2:15 PM - 2:30 PM

Lack of Association Between Muscle and Ventilatory Chemoreflexes

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(No relevant relationships reported)

PURPOSE: Ventilation and blood pressure during exercise are mediated, in part, by chemoreflex activation in medullary and muscle interstitial spaces, respectively. We therefore hypothesized that intra-subject variability in the responsiveness to both reflexes would be similar.
METHODS: Ventilatory chemoreflex and exercise pressor reflexes were assessed in 30 healthy, normotensive college-aged men and women. Ventilatory responsiveness was measured as the slope of the relation between breath-by-breath ventilation and end-tidal PCO_2 elicited by hyperoxic, hypercapnic rebreathing. Sensitivity of the exercise pressor reflex was assessed as the slope of the relation between systemic systolic blood pressure (SBP, Finapres) and estimated forearm perfusion pressure (SBP minus cuff pressure) during steady-state rhythmic handgrip exercise (30 contractions/minute at 10% maximum) with progressive forearm blood flow restriction induced by a pneumatic cuff inflated at 3 mmHg/15 sec. For both tests, inflection points defining thresholds for reflex engagement were determined using cumulative sums (Changepoint package, R 3.3.2). Linear regression was used to quantify stimulus:response slopes beyond inflection points to relate the two reflex slopes.
RESULTS: 14 subjects were eliminated because the responses were not amenable to statistical analysis. The remaining data were normally distributed. Across subjects there were wide differences in ventilatory (mean=2.4 L/min/mmHg, range=0.9-5.0) and exercise pressor (mean=0.5 mmHg/mmHg, range=0.1-1.4) reflex responsiveness. However, there was no correlation between the two reflexes (r^2=0.02, P=NS).
CONCLUSION: We suggest that neural pathways invoked by ventilatory and muscle chemoreflexes are sufficiently different that a "stress sensitive" phenotype does not exist.
Supported by American Heart Association 16UFEL27930008

542 May 30 2:30 PM - 2:45 PM

Effect Of Daily, High-intensity Voluntary Hyperpnea On Maximal Expired Airflow And Maximal Voluntary Ventilation

Hans C. Haverkamp, Adriane Morrison-Taylor, Jeni Demar, Andrew Klansky, Kasie Craig, Eden Towers. *Johnson State College, Johnson, VT.*
(No relevant relationships reported)

Repeated bouts of voluntary isocapnic hyperpnea (i.e., hyperpnea training) has been used in both healthy and diseased populations as a potential means to improve exercise capacity and functional status. However, the repeated episodes of high airflow may cause airway inflammation and subsequently compromise airway function.
PURPOSE: To determine if repeated, daily bouts of voluntary isocapnic hyperpnea alters airway function in healthy adults. **METHODS**: Eleven subjects (age, 21 yrs; ht, 1.7 m; wt, 65 kg) completed ten days of hyperpnea training (HYP) over the course of no more than 15 days. Hyperpnea sessions were 20-minutes in duration with the targets for minute ventilation based on percentage of maximal voluntary ventilation (MVV): days 1-4, 70% MVV; days 5-7, 75% MVV; days 8-10, 80% MVV. During hyperpnea, dead space was added to maintain end-tidal CO2 at baseline levels. Maximal forced exhalations and MVV were performed at baseline prior to each hyperpnea session. Eight control subjects (CON) completed ten days of spirometry but no hyperpnea training. Outcome variables included peak expiratory flow (PEF), forced vital capacity (FVC), forced expiratory volume 1.0 second (FEV1) and MVV.
RESULTS: In both HYP and CON subjects, PEF, FVC, and FEV1 did not change during the ten experimental days. In CON subjects, MVV did not change during the ten experimental days (MVV10-MVV1, +0.05 ± 0.3 L/min). In HYP subjects, MVV decreased gradually over time during the ten experimental sessions, reaching its nadir during the final day of training (MVV10-MVV1, -14 ± 22 L/min; -7 ± 14%); however, the decrease was not statistically significant (P=0.07).
CONCLUSIONS: These findings suggest that repeated bouts of high airflow hyperpnea do not compromise airway function in healthy adults. In the absence of any changes in the maximal forced exhalations, we speculate that the decreased MVV in HYP subjects may be due to respiratory muscle fatigue.

B-15 Clinical Case Slide - **Cardiovascular I**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-200E

543 **Chair:** Aaron L. Baggish, FACSM. *Massachusetts General Hospital, Boston, MA.*
(No relevant relationships reported)

544 **Discussant:** Sourav Poddar. *University of Colorado Health Sciences Center, Denver, CO.*
(No relevant relationships reported)

545 **Discussant:** Mats Börjesson. *Sahlgrenska University Hospital, Gothenburg, Sweden.*
(No relevant relationships reported)

546 May 30 1:00 PM - 1:20 PM

Exercise Induced Electrocardiogram Abnormalities In Elite Swimmer

Dalya Navot-Mintzer[1], Naama W. Constantini, FACSM[2]. *[1]Wingate Institute and Clalit Health Services, Netanya, Israel. [2]Shaare Zedek Medical Center, Jerusalem, Israel.*
(No relevant relationships reported)

HISTORY: A 17-year-old male national team swimmer came for an intake examination at The Academy for Sports Excellence at Wingate Institute. He reported being a non-symptomatic carrier of familial long QT mutation of the LQT2 type (KCNH2 mutation (R744X)) which was diagnosed through a family screening examination. He is taking Bisoprolol 2.5 milligrams once daily since he was 10 years old. Three other family members were diagnosed with the same long QT mutation (brother, mother and maternal grandfather). None of the family members have ever developed cardiac symptoms or arrhythmia, except for the grandfather who had one event of Torsade de Pointes at an old age, following acute MI. The whole family was screened following this event.PHYSICAL EXAMINATION: PE revealed no pathological finding, including normal cardiac examination. Resting ECG at supine position was within normal limits (Herat rate (HR)=49/min, QTc=415 msec). QT interval became elongated (HR=88/min, QTc=550 msec) at the first minute on the treadmill stress test. During the stress test the swimmer was asymptomatic, had a normal blood pressure response and reached maximal oxygen consumption of 65ml/min/Kg. Exercise ECG showed two patterns of wide premature beats with few bigeminis that started at a HR of 95/min.DIFFERENTIAL DIAGNOSIS: 1- Benign ventricular pre-mature beats during exercise.2- Electrical myocardial instability, due to channelopathy.3- Co-existence of CPVT in the family.TESTS AND RESULTS:1- Repeated resting ECG, normal.2- Echo-cardiography, normal.3- Repeated family history and family ECG examination. No evidence of any cardiac symptoms except for the index event of the maternal grandfather.4- Repeated 24h holter, normal. 5- Expert consultation. WORKING DIAGNOSIS:Asymptomatic elite swimmer. A carrier of benign familial LQT2 type mutation. No evidence of QT elongation on resting ECG and therefore does not meet QTc elongation criteria. Exercise induced ventricular pre-mature beats should be evaluated separately. Channelopathy expert physicians concluded that there is no justification for disqualification.TREATMENT AND OUTCOME:Cleared for swimming with no limitations. Repeated stress test and switching to a non-selective beta-blocker drug was recommended.

547 May 30 1:20 PM - 1:40 PM

Cardiac Rehabilitation: A Gateway to the Senior Olympics

Kirk D. Hendrickson. *Beaumont Health, Royal Oak, MI.* (Sponsor: Barry A. Franklin, FACSM)
(No relevant relationships reported)

HISTORY: An 81 year old male with a history of hypertension in 2012 initially underwent graded exercise testing (GXT) followed by cardiac catheterization that revealed severe multivessel coronary artery disease (CAD). He underwent urgent coronary artery bypass surgery (CABG x 4) and enrolled in an exercise-based cardiac rehabilitation program (CR).
PHYSICAL EXAM: (1/2012): Lipid values: Total cholesterol (TC), HDL-C, LDL-C, and triglycerides (TG) were 118, 25, 56, and 186 mg/dL, respectively. Resting heart rate (HR) and blood pressure (BP): 59 bpm and 102/80 mmHg; body mass index (BMI), 29.2 kg/m^2.
DIFFERENTIAL DIAGNOSIS: CAD
TEST AND RESULTS:
Baseline GXT with myocardial perfusion imaging (MPI): patient achieved 94% HRmax and 4.8 METs; no symptoms or diagnostic ST segment depression were noted. However, MPI revealed a transient inferoapical wall and a fixed posterior wall perfusion defect. Peak HR and BP: 136 bpm and 192/110 mmHg. Resting ejection fraction (EF) = 55%.
Cardiac Cath 1/13/2012: Left anterior descending coronary artery (LAD) had 70-80% stenoses in the proximal and distal LAD. There were multiple 80-95% lesions in the left circumflex coronary artery (LCx), obtuse marginal artery (OM), and right coronary artery (RCA). EF=55%.
CABG x 4, 1/16/2012: LAD, OM1, OM2, and RCA.
Most recent GXT 2/18/2015: 8.3 METs, negative for symptoms or ischemic ST segment shifts. MPI showed mild reversible defects in the anterior and lateral wall. Follow-up coronary computed tomography angiography was unremarkable. Lipid values (9/2017) were largely unchanged from his 2012 profile, except for an increased HDL-C, 41 vs 25 mg/dL, formerly. His BMI also decreased, 27.1 vs 29.2 kg/m^2 at baseline.
FINAL/WORKING DIAGNOSIS: CAD; previous CABG
TREATMENT AND OUTCOMES: Patient initiated CR in 2012, follows a plant-based diet, is currently taking a beta-blocker, ACE inhibitor, aspirin, and statin and exercises in our CR program 5 d/wk (cycle
ergometer, graded treadmill walking) complemented with outdoor biking, ≤25 miles/wk. In 2016 he won a silver medal in the Senior Olympics, 10 Km Cycling, 80-84 year old class and in 2017 won silver medals in the 5 and 10 Km events. By improving his lifestyle, risk factors, and fitness, and by attaining silver medal status in the Senior Olympics, he serves as a role model for our CR program.

548 May 30 1:40 PM - 2:00 PM

Chest Pain and Palpitations - Lacrosse

Elizabeth E. Barton, Vicki R. Nelson, Irfan M. Asif. *Steadman Hawkins Clinic of the Carolinas, Greenville Health System, Greenville, SC.* (Sponsor: Kyle J. Cassas, FACSM)
(No relevant relationships reported)

HISTORY:
A 15-year-old female HS lacrosse player presented for episodes of chest pain and palpitations, initially at rest for minutes and then became exertional with SOB. She denied nausea, HA, and syncope. Family history was negative for congenital heart disease and sudden cardiac death, but her mother had atrial fibrillation and MGF died before age 60 from an MI.
PHYSICAL EXAMINATION:
T 97.7°F, HR 56, BP 116/68, RR 20, SpO_2 98% RA, BMI 20.7
Well appearing with clear breath sounds. Cardiac exam: regular rhythm, normal S1 and S2, no S3 or S4, and a 2/6 low frequency systolic murmur best heard at the left upper sternal border. 2+ pulses. No peripheral edema, cyanosis, or hepatomegaly.
DIFFERENTIAL DIAGNOSIS:
1. arrhythmia - SVT, WPW, aflutter, afib, PACs
2. pulmonary valve stenosis, tricuspid valve regurgitation
3. cardiomyopathy—hypertrophic cardiomyopathy, ARVD
4. ASD
5. anemia
6. hyperthyroidism
TEST AND RESULTS:
-ECG- sinus bradycardia, no chamber enlargements or pre-excitation, normal QTc
-28 day event monitor- two episodes of chest pain and rapid heart beat correlate with nsr and sinus tachycardia
-Transthoracic echocardiogram- normal cardiac segmentation, valvular function, biventricular size, and systolic function. No effusion. There is a small coronary cameral fistula entering the main pulmonary artery.
-Exercise stress with 2D echocardiogram performed showed normal EF with no wall motion abnormalities, ischemia, or arrhythmias
FINAL WORKING DIAGNOSIS:
Coronary-cameral fistula
TREATMENT AND OUTCOMES:
1. The patient was cleared to play after symptoms spontaneously resolved and serial echocardiograms over a 5 year period demonstrated a stable coronary-cameral fistula.
2. Cardiology consultants recommended a rest/stress MRI to further determine the anatomical nature of the fistula given the symptom history. However, they believe that the fistula was an incidental finding and likely not the cause of her symptomatology.
3. Coronary-cameral fistula is a rare cause of congenital cardiac anomalies. Although most are small and asymptomatic, larger ones may cause MI or CHF, thus requiring intervention.
4. There are no published reports of this condition in athletes, highlighting provocative issues surrounding risks of incidental findings of unknown significance and return to play considerations.

549 May 30 2:00 PM - 2:20 PM

Painful Arm Mass-Weight Lifting

Jenna Crowder, Franklin Sease, FACSM, Irfan Asif, Vicki R. Nelson. *Greenville Health System, Greenville, SC.* (Sponsor: Franklin Sease, FACSM)
(No relevant relationships reported)

HISTORY:
A 29 year old male reports acute onset of pain and palpable mass in his right distal bicep while weight lifting 2 weeks prior to presentation. He reports a dull ache that has persisted despite heat and ibuprofen. He developed bruising which resolved. He has continued lifting. He has no paresthesia, weakness, or radiculopathy. He has no exertional pain. He has a known history of multiple aneurysms diagnosed at the age of 7 with negative genetic testing. **PHYSICAL EXAMINATION**: There are no overlying skin changes or deformity. There is a tender, non-pulsatile 2cm mass within the medial distal bicep with firmness of the surrounding soft tissues. Active range of motion at the shoulder and elbow are full and symmetric. Pain cannot be recreated with manual muscle testing. Brachial and radial pulses are symmetric and equal. Right ulnar pulse is difficult to palpate. Allen's test reveals reduced right ulnar blood flow. Lower extremity pulses are symmetric and equal. Cervical spine motion is normal. Spurling's test is negative bilaterally. **DIFFERENTIAL DIAGNOSIS**:
Superficial phlebitis
Intramuscular hemorrhage
Biceps or brachioradialis muscle tear
Neoplasm (vascular, sarcoma, nerve sheath)
Brachial artery aneurysm or pseudoaneurysm
TEST AND RESULTS: Bilateral extremity angiogram - Right arm: multiple aneurysms proximal to the antecubital fossa, the largest measures over 1.5 cm. Aneurysms at the origin of the ulnar and radial arteries without distal abnormality. Left arm: 1.5 cm aneurysm proximal to the antecubital fossa. Right mid vertebral artery aneurysm (1.4 cm); prior coil embolization of the left vertebral artery. Lower extremities: 33 discrete aneurysms. Pseudoaneurysm at the proximal anastomosis of the aorto-bi-iliac graft that measures 4 cm proximally and 2.2 cm on the right iliac limb. **FINAL WORKING DIAGNOSIS**:
Multiple aneurysmal disease of unknown origin **TREATMENT AND OUTCOMES**: This case highlights provocative issues of a rare vascular disorder with no literature related to physical activity recommendations. Increased intravascular pressure related to heavy resistance likely accelerates disease progression, and as such, the athlete was advised to refrain from weightlifting. Vascular surgery was consulted for evaluation of abdominal aortic pseudoaneurysm and right vertebral artery aneurysm.

550 May 30 2:20 PM - 2:40 PM

Cardiovascular Disease—Ice Hockey

Bradley Changstrom[1], Robert Quaife[1], Matt Sokolowski[2], Nicholas Edwards[1], Gregory Coe[3], William Cornwell[1].
[1]University of Colorado Hospital, Denver, CO. [2]Colorado Avalanche Hockey Club, Denver, CO. [3]University of Colorado Denver- Anschutz Medical Campus, Denver, CO.
(No relevant relationships reported)

History:
An 18 year-old healthy male semi-professional ice hockey player presented with a chief complaint of dizziness during a graded oxidation and lactate bike test. During the episode, he exhibited fluctuating levels of consciousness, gagging and cough. Following this episode, he mentioned two similar episodes while performing bike fitness tests. During hockey activities, he denied chest pain, dyspnea, dizziness, or syncope.Physical Examination: On examination following the episode, he was responsive to verbal commands but appeared dizzy and confused. He was frequently coughing and appeared dyspneic. Blood pressure 120/70. Heart rate was in the 120s. Pulse oximetry was 93%. Heart was regular rhythm without murmurs, rubs or gallops. Pulmonary exam demonstrated upper respiratory rhonchi.
The patient was transferred to the emergency room.

Differential Diagnosis:
1) Cardiac arrhythmia
2) Structural heart disease
3) Seizure disorder
4) Hypoglycemia
5) Exercise induced asthma
Test and Results:
An electrocardiogram was normal. A complete blood count, comprehensive metabolic panel, cardiac troponin and brain natriuretic peptic were normal. A chest radiograph was normal. The patient was discharged with follow up.
The following day, a transthoracic echocardiogram was normal.
A stress echocardiogram on a bike was performed under the same graded exercise protocol as the provoking bike test. At similar sub-maximal effort for heart rate and lactate levels, the patient developed recurrent symptoms. A continuous EKG did not demonstrate arrhythmia; however, the stress echocardiogram demonstrated hyperdynamic left ventricular contractility. At the same time, a cerebral perfusion monitor demonstrated a decrease in cerebral blood flow. No left ventricular outflow tract gradient was noted.
A cardiac magnetic resonance imaging (MRI) was normal.
A dobutamine stress echocardiogram was performed which confirmed an abnormal cardioinhibitory reflex response.
Final Diagnosis:
Bezold-Jarisch (Cardioinhibitory) response to exercise due to a hyperdynamic left ventricle.
Treatment and Outcomes:
1) He was cleared for full athletic participation.
2) He has returned to hockey activities without issues.

551 May 30 2:40 PM - 3:00 PM

Palpitations, Diaphoresis, Left-sided Chest, And Shoulder Pain - Football

James N. Cornwell, David Wilhelm. *LECOM Health Sports Medicine, Erie, PA.* (Sponsor: Patrick F. Leary, DO FACSM, FACSM)

(No relevant relationships reported)

Palpitations, Diaphoresis, Left-sided Chest and Shoulder pain – Football
James N. Cornwell, LECOM Health Sports Medicine, Erie, PA
e-mail: james.cornwell@med.lecom.edu
(Sponsor: Patrick F. Leary, FACSM)
HISTORY: A 19 year-old freshman division II football player presented to the athletic training staff at a local university with palpitations, abdominal discomfort, left-sided chest and shoulder pain along with severe diaphoresis. At that time, the football player had denied trauma to the chest or abdomen during the practice. The athletic training staff immediately arranged for transport of the patient to a local hospital for evaluation.
PHYSICAL EXAMINATION: Upon evaluation in a local emergency department, the athlete was found to be in moderate distress, but A+Ox3. Skin was cool and diaphoretic. Cardiovascular - tachycardia, distal pulses present. Pulmonary - tachypnic, breath sounds present in all fields. Abdominal tenderness in epigastric & left upper quadrant regions, bowel sounds present. Musculoskeletal examination of left shoulder normal
DIFFERENTIAL DIAGNOSIS:
1. Blunt force trauma to spleen
2. Pneumothorax
3. Liver laceration
4. Pancreatitis
5. Left Kidney trauma
TEST & RESULTS:
Vital Signs – 98.4, 112, 24, 108/68, 98% RA
Labwork – slight anemia
CXR – wnl, no pneumothorax
CT of Abdomen and Pelvis
- Grade 3 splenic laceration, free blood
Repeat CT of Abdomen and Pelvis
- Grade 4 splenic laceration, free blood
FINAL/WORKING DIAGNOSIS:
Splenic Laceration (Grade 4) secondary to blunt force trauma to left abdomen
TREATMENT & OUTCOMES:
1. After initial ED eval and diagnosis of splenic laceration, athlete transferred to hospital with interventional radiology capabilities
2. Athlete did remember getting a direct helmet hit to the left side of the abdomen, that "knocked his wind out," 2 days prior
3. Diagnosed with grade 4 splenic laceration
4. Endovascular embolization procedure performed with optimal results - no complication
5. ICU for post-surgical care
6. After an uncomplicated hospital course, the patient was discharged home
7. Follow-up instructions included serial labwork and repeat CT of the abdomen/pelvis in 3 months
8. The aim of this case presentation is to review into current literature and practice and to discuss what is advisable versus safe for return to play in this case of abdominal organ injury

B-16 Clinical Case Slide - **Musculoskeletal: Spine to Ankle**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-200F

552 **Chair:** Joshua Blomgren. *Rush University Medical Center, Chicago, IL.*

(No relevant relationships reported)

553 **Discussant:** Kaleigh Suhs. *Advocate Lutheran General, Park Ridge, IL.*

(No relevant relationships reported)

554 **Discussant:** Kyle J. Cassas, FACSM. *Greenville Health System, Greenville, SC.*

(No relevant relationships reported)

555 May 30 1:00 PM - 1:20 PM

Ankle Pain--Volleyball Player

Jacob Reisner[1], Cara Prideaux[2], Edward Laskowski, FACSM[2]. [1]*Mayo School of Graduate Medical Education, Rochester, MN.* [2]*Mayo Clinic, Rochester, MN.* (Sponsor: Edward Laskowski, FACSM)

(No relevant relationships reported)

HISTORY:
An otherwise healthy 24 year old female volleyball player presented to the sports medicine clinic with a two week history of atraumatic severe left ankle pain and swelling. She localized the pain to her tibiotalar area. She described a sensation of "tightness" in the ankle. She denied any numbness or tingling or mechanical features to her pain, and she denied focal weakness. She did not endorse any other swollen or painful joints. She denied any history of autoimmune disease, inflammatory arthritis, or exposure to ticks. She had tried Ibuprofen and Tylenol with no significant relief.
PHYSICAL EXAMINATION:
Exam revealed a left ankle effusion and tenderness to touch over the anterior tibial-talar joint but not on the medial, lateral or posterior ankle. No laxity was noted with anterior drawer test. External rotation stress test was not painful. No pain was produced with resisted ankle motion in all planes. Neurologic exam did not reveal any focal strength or sensory changes in the lower extremities. Distal pulses and capillary refill were symmetric.
DIFFERENTIAL DIAGNOSIS:
1. Septic Arthritis
2. Inflammatory Arthritis/Synovitis
3. Crystalline Monoarthritis
4. Lyme Arthritis
5. Internal Derangement
6. Occult Fracture
7. Pigmented Villonodular Synovitis
8. Synovial Chondromatosis
TEST AND RESULTS:
Laboratory testing showed normal white blood cell count. Sedimentation rate and C-reactive protein were slightly elevated. Lyme disease ELISA, rheumatoid factor, and CCP were all negative.
X-ray showed left ankle effusion but no fractures. Attempted ultrasound guided aspiration showed extensive tibiotalar synovitis but did not produce any fluid for analysis. MRI of the left ankle showed extensive nodular synovial thickening of the anterior compartment consistent with Diffuse PVNS.
FINAL WORKING DIAGNOSIS:
Diffuse Pigmented Villonodular Synovitis(PVNS)
TREATMENT AND OUTCOMES:
1. Modest improvement of pain with activity reduction
2. Orthopedic Foot and Ankle Surgery consult for planned arthroscopic nodule excision and synovectomy

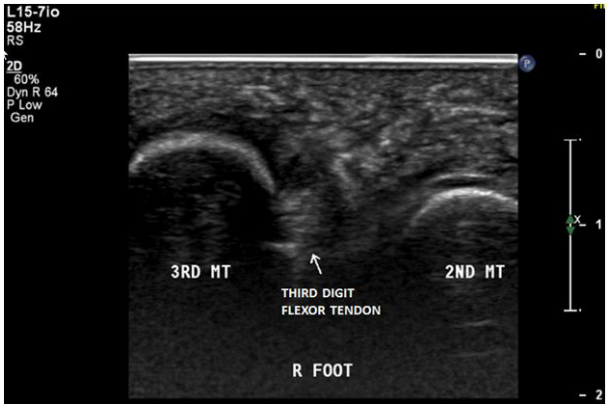
556 May 30 1:20 PM - 1:40 PM

Rare Cause of Second Webspace Interdigital Neuritis Diagnosed with Ultrasound

Marissa L. Dombovy-Johnson[1], Brennan J. Boettcher[2], Jonathan T. Finnoff, FACSM[2]. [1]*Mayo Clinic, Rochester, MN.* [2]*Mayo Clinic Sports Medicine Center, Minneapolis, MN.* (Sponsor: Jonathan T. Finnoff, FACSM)

(No relevant relationships reported)

HISTORY: A 68 year-old male with history of right second metatarsal Weil osteotomy, third webspace interdigital neuroma removal and third hammertoe correction presented with non-traumatic, burning pain in his second webspace that radiated into his second and third toes over the last four years. His pain was present at rest and worsened with activity.
PHYSICAL EXAMINATION:
He had full, symmetric, and painless ankle and subtalar joint range of motion. Strength and sensation to light touch were full and normal. There was tenderness to palpation in right second webspace but no tenderness over the second and third MTP joints. No pain or click was elicited on Mulder's test. He walked without a limp.
DIFFERENTIAL DIAGNOSIS:
- Interdigital neuroma
- Intermetatarsal bursitis
- Metatarsophalangeal joint instability
- Metatarsalgia
- Metatarsal stress fracture
TEST AND RESULTS:
Foot Radiographs
- Healed osteotomy right 2nd metatarsal neck with screw fixation
- Post-operative changes right 2nd and 3rd PIP joints
Diagnostic Ultrasound
- No neuroma or intermetatarsal bursitis was noted
- Third digit flexor tendons were dislocated medially between the second and third metatarsal heads compressing the adjacent neurovascular structures



Foot MRI
- Confirmed US findings of medial dislocation of the third flexor digitorum longus and brevis tendons in between the second and third metatarsal heads
FINAL/WORKING DIAGNOSIS:
- Medial dislocation of third flexor digitorum longus and brevis tendons between the second and third metatarsal heads likely causing mass effect on the interdigital nerve in the second interspace
TREATMENT AND OUTCOMES:
- It was felt that relocation of the tendons was not a technically feasible surgery
- An ultrasound-guided second webspace corticosteroid injection along the interdigital nerve provided immediate relief of all patient's symptoms, however the pain and burning returned within one week
- Definitive treatment with an interdigital neurectomy was planned

557 May 30 1:40 PM - 2:00 PM

Low Back Pain in a First-year Medical Student

Michael S. Antonis. *MedStar Georgetown University, Washington, DC.*

(No relevant relationships reported)

HISTORY:
A 22-year-old male presents to MedStar Sports Medicine clinic from Student Health physician with complaint of hamstring and back pain for the last year. Patient describes the pain is worse when he rides his bike to school (5 miles) improved with walking to class and through the day, but worsens when he tries to run at night beyond 4 miles.
PHYSICAL EXAMINATION:
Gait: antalgic gait
Palpation -- Tone: [abnormal]
Tenderness: [paraspinous area at level of T10 through S1]
Range of Motion: Forward Flexion - [90 +] Deg
Extension - [15] Deg
Forward bending: [symmetric / normal]
Extension: [exacerbates pain] [R] and [L]
Stork test: [exacerbates pain] [R] and [L]
Straight Leg Raise (Laseague) Test: [negative]
DIFFERENTIAL DIAGNOSIS:
1. Lumbago
2. Stress Fracture
3. Hamstring/ITB Syndrome
4. Psychosomatic
5. Spondylarthropathy
TEST AND RESULTS:
Lumbar Xray (obtained via fax from PCP visit in New York): There is mild lumbar scoliosis. There is narrowing of all intervertebral disc spaces from T12-L5. Schmorl node endplate deformities and discogenic changes are present. No fracture or subluxation. Facet joints and SI joints are normal.
MRI Lumbar: Degenerative changes greater than expected for age and multiple Schmorl's nodes. No spondylolisthesis or spondylolysis. Consider ordering thoracic MRI as concern exists for Scheuermann's disease. There is subchondral sclerosis along the iliac sides of bilateral sacroiliac joints.
MRI Thoracic: Scattered endplate irregularities and small Schmorl's nodes with disc space narrowing throughout the thoracic spine with associated endplate change.
LABS:
HLA B-27: negative
CRP: 7.4
ESR: 4
Quantiferon Gold TB: negative
ANA: positive
DS-DNA and Anti-Sm: negative
FINAL/WORKING DIAGNOSIS:
Schueuermann's Disease and HLA-B27 seronegative Axial Spondyloarthritis
TREATMENT AND OUTCOMES:
Patient is doing well in medical school and currently being managed on naproxen 500mg twice a day with no gastrointestinal side effects.
Patient has followed up with Rheumatology who recommends naproxen at this time and if symptoms flair will consider initiating an anti-TNF agent with monitoring of CRP values.

558 May 30 2:00 PM - 2:20 PM

Rib Injury in a Professional Baseball Player

Christopher Trinh, Brian Coleman, James Barrett. *University of Oklahoma Health Science Center, Oklahoma City, OK.*

(No relevant relationships reported)

History: A 24 year old previously healthy left handed male professional baseball pitcher was warming up on the mound before a game when he suddenly felt a vague pain in his lower left anterior-lateral rib cage region but denied hearing a pop. Pain was a localized deep ache on the lower anterior rib cage. Although he felt discomfort the player was able to complete his warm up regimen and start the game. During the game he was only able to throw four pitches prior to unbearable pain during the acceleration phase of pitching causing him to be pulled from the game and seek medical attention.
Physical Exam: Normal appearance of the chest wall. Point tenderness to palpation and a 1x1cm soft tissue mass on the lower left anterior chest wall on palpation. Any active and passive motion of the torso exacerbated the pain and the mass was exquisitely tender to palpation. Bilateral shoulder exams were within normal limits and pain was not affected by inhalation or exhalation. On exam, he was neurologically and vascularly intact. There was no winging of the scapula or crepitus along the rib cage.
Differential Diagnosis:
1. Oblique muscle strain
2. Rib stress fracture
3. Costochondral junction avulsion fracture
4. Serratus anterior avulsion fracture
5. Intercostal muscle strain
Test and Results:
Thoracic MRI findings suggested either a fracture or stress injury of the costochondral cartilage along the left anterior-inferior aspect of the ribcage. There was extensive edema present along the region that measured 8x10 cm but there was no evidence of rib fractures.
Chest CT without contrast revealed edema around the costochondral junction of ribs 7 and 8 on the left with anterior prominence of the cartilage but no focal displacement or rib fractures.
Final Working Diagnosis: Based on Imaging, injury most likely to be costochondral junction avulsion fracture of ribs 7 and 8.
Treatment and Outcomes:

The player was initially treated with 6 weeks of activity restriction and rest. Surgery was not warranted due to lack of significant separation of the fragment. Repeat radiographs were obtained at 6 weeks which revealed proper healing. After 6 weeks he began a graduated pitching regimen. Pain improved throughout his rehabilitation with rest and NSAIDS once he began physical activity. He returned to full activity at 8 weeks.

559 May 30 2:20 PM - 2:40 PM

Acute Lumbar Pain - Football

Timothy J. Durkin, Katherine Edenfield, Guy Nicolette, Stephen Carek, Jay Clugston. *University of Florida, Gainesville, FL.*

(No relevant relationships reported)

HISTORY:
A freshman collegiate football player presented to the athletic training facility after his first official practice, complaining of worsening, severe pain in his R greater than L lumbar region without radiation or radicular symptoms. He denied any injury during practice. He had previously reported mild low back tightness during summer conditioning workouts that resolved with rest. He and the sports health staff were aware that he has sickle cell trait.
PHYSICAL EXAMINATION:
Pt in severe distress with diaphoresis, agitation and restlessness Limited lumbar ROM. Tenderness in lumbar paraspinal muscles R greater than L. Non-tender abdomen, symmetric pulses x4 extremities, no neurologic deficits or costa-vertebral tenderness. HR and BP elevated. Afebrile. High-flow oxygen by mask initiated and athlete transported to ED.
DIFFERENTIAL DIAGNOSIS:
Lumbar muscle/myofascial strain
Lumbar disc rupture
Lumbar paraspinal myonecrosis
Ureteral calculus
Renal angiomyolipoma
TESTS AND RESULTS:
CMP Cr 1.7, Ca 10.6, Glu 140; otherwise normal WBC 11.8, Hgb 15.5, Hct 47.5, Plt 178 CK 747 U/L Urinalysis SpGr 1.010, Pro 30, Small blood, 2 RBC, 4 WBC, myoglobin negative
MRI lumbar spine: T2 hyperintense signal in the paraspinous muscles bilaterally, R greater than L. Spine and nervous structures normal. *Impression*: Multifocal paraspinous muscular edema. Considerations would include strain, acute myonecrosis (given clinical history), or acute blood products
FINAL DIAGNOSIS:
Acute lumbar paraspinal myonecrosis in athlete with SCT
TREATMENT AND OUTCOMES:
1. High-flow oxygen continued
2. IV fluids initiated and 3L NS bolus given by pressure infusion
3. IV hydromorphone prn for pain control
4. Rapid improvement in pain post IV fluid bolus
5. Inpatient admission, transitioned from IV hydromorphone to PO oxycodone
6. Peak CK of 10,169 approximately 13 hours post event
7. Discharged home hospital day 2 with CK down trending at 7,060 ,Cr 0.98, off all pain meds
8. Cleared for activity at 7 days post event
9. Completed return to play activities, returned to full practice at 11 days post event
10. No related medical issues, no visible loss of muscle bulk/tone and continued full team participation as of abstract submission

560 May 30 2:40 PM - 3:00 PM

Low Back Pain - Recreational Soccer Player

Sean Matsuwaka, Brian Liem. *University of Washington, Seattle, WA.*

(No relevant relationships reported)

HISTORY: A 21-year-old female recreational soccer player presented with intermittent right-sided low back pain for two years. She denied any trauma or inciting event. Pain was localized to the right lumbosacral region without radiating leg pain and was described as dull and aching. It was rated on average 5/10 on a numerical rating scale and associated with nausea when pain worsened. Symptoms were worse with prolonged sitting, and several times in the last month she reported worsening of typical pain with alcohol intake. She denied leg weakness, numbness, or bowel/bladder dysfunction. She participated in six weeks of physical therapy, which helped with nausea and pain with sitting, but she continued to have pain with alcohol consumption.
PHYSICAL EXAM: Full and symmetric strength, sensation, and reflexes. Mild lumbar dextroscoliosis. No palpable step-offs. Tenderness over right lumbar paraspinals and above right iliac crest. No tenderness over PSIS. Full, non-painful range of motion with lumbar flexion and extension. No pain with facet loading. Full, non-painful hip range of motion. Negative FABER, FADIR, and straight leg raise test bilaterally.
DIFFERENTIAL DIAGNOSIS: 1. Discogenic pain 2. Facet-mediated pain 3. Disc herniation 4. Muscular strain 5. Sacroiliac joint dysfunction 6. Intrabdominal/ intrapelvic etiology 7. Neoplasm
TESTS AND RESULTS: 1. Lumbar spine X-rays: -Normal alignment, normal vertebral body and disc space height -Partial lumbarization of S1 vertebral body -Five degrees of lumbar dextroscoliosis 2. MRI lumbar spine: -Lumbarization of S1 vertebral body -Normal disc heights and signal -Normal central canal and neural foramen size throughout lumbar spine -T1/T2 hyperintensity within S2 vertebral body, likely lipoma -Increased T2 signal medial to right kidney suggestive of hydronephrosis
3. Renal ultrasound:-Moderate right hydronephrosis with extrarenal pelvis. No nephrolithiasis. 4. Renogram with furosemide: - Right kidney with blunted flow and delayed clearance improved slightly with furosemide, consistent with partial obstruction at right ureteropelvic junction
FINAL/WORKING DIAGNOSIS: Ureteropelvic junction obstruction causing Dietl's crisis
TREATMENT AND OUTCOMES: 1. Referral to urology 2. Resolution of pain and improvement in renal function after pyeloplasty

B-17 Clinical Case Slide - **Shoulder**

Wednesday, May 30, 2018, 1:00 PM - 3:00 PM
Room: CC-Mezzanine M100F

561 **Chair:** Tracy Ray, FACSM. *Duke University, Durham, NC.*

(No relevant relationships reported)

562 **Discussant:** C. Mark Chassay, FACSM. *IRONMAN Sports Medicine Institute, Houston,TX.*

(No relevant relationships reported)

563 **Discussant:** David Olson, FACSM. *University of Minnesota, St. Paul, MN.*

(No relevant relationships reported)

564 May 30 1:00 PM - 1:20 PM

Pectoralis Muscle Rupture While Lifting Weights

Mimi Zumwalt, Thomas Githens, Adam Wooldridge. *Texas Tech University Health Science Center, Lubbock, TX.* (Sponsor: Jacalyn McComb, FACSM)

(No relevant relationships reported)

HISTORY: 41 y/o male RHD sustained an injury to his chest area while performing a heavy bench press. His arm gave out when his spotter failed to assist him during the eccentric phase. He felt a painful snapping sensation near his right shoulder with subsequent throbbing, swelling and bruising. He suddenly felt nauseated/lightheaded, unable to perform any more exercises so he immediately sat down. He was evaluated by a fitness specialist, obtained an MRI study within 2 days, then seen 3 days later in Sports clinic. He denies any supplement usage or paresthesias but relates some weakness when using his arm.
PHYSICAL EXAMINATION: Right upper extremity/chest region reveals asymmetry of pectoralis muscle with less fullness/dimpling upon "hands on hips" pose; ecchymosis of proximal arm area with loss of axillary fold; tender over medial humerus with difficulty palpating the tendon; weakness with resisted shoulder internal rotation/adduction maneuvers.
DIFFERENTIAL DIAGNOSIS:
1. Right arm contusion/tendon strain
2. Right partial pectoralis muscle tear
3. Right pectoralis major tendon rupture
TESTS AND RESULTS:
Right shoulder radiographs: AP, Y and axillary lateral views show no bony avulsion
MRI films: reveal "extensive edema around musculotendinous junction of right pectoralis"; "small amount of linear fluid" in area of humeral insertion and "absence of tendon" with "retraction" into chest wall
FINAL/WORKING DIAGNOSIS:
Right pectoralis major tendon rupture
TREATMENT AND OUTCOMES:
1. Underwent primary open right pectoralis tendon repair/reattachment 6 days post injury
2. Wore shoulder immobilizer for 6-8 weeks
3. Participated in formal physical therapy rehabilitation at 1month post-surgery
4. Progressed to light weightlifting at 4 months
5. Experienced transient scar hypersensitivity-resolved with local massage
6. Discharged himself at 5 months
7. Follow-up 2 years 9 months later for another complaint-doing well, back to working out (lighter weights/higher reps)

565 May 30 1:20 PM - 1:40 PM

Teen With Acute Shoulder Pain Four Years After A Car Accident.

Natalie Ronshaugen, Kyle Nagle. *University of Colorado, Aurora, CO.* (Sponsor: John Hill, FACSM)

(No relevant relationships reported)

HISTORY: 18yo male with sudden onset, severe right shoulder pain occurring while sitting in class 11 days prior to presentation. He had a history of a posterior shoulder dislocation at age 14 in a car accident, requiring relocation under sedation without known complication. He completed PT at that time, however was unable to return to football or overhead throwing activities. At the start of his new onset pain, he suspected re-dislocation of his shoulder and went to the ED. X-rays were abnormal but with unclear diagnosis. He was referred to sports medicine clinic for further evaluation and treatment.
PHYSICAL EXAMINATION: Inspection: Significant atrophy of the supraspinatus and infraspinatus. Right shoulder was held elevated. Intertrigo noted in right axilla. Range of motion of the shoulder: 20 degrees forward flexion, 20 degrees forward flexion, 0 degrees external rotation, and internal rotation to T12. Strength: 4/5 empty can, 4/5 internal rotation, 3+/5 external rotation. Neurovascular: Brisk pulses, 2 second capillary refill, intact motor exam, and sensation intact in all dermatomes. Special tests: Neer's positive pain with no increased ROM, Speed's test positive, O'Brien's test positive, cross over test negative, and Hawkin's positive.
DIFFERENTIAL DIAGNOSIS: Recurrent shoulder dislocationMalignant or benign bony lesionPathologic fracture of proximal humerusRotator cuff tearDisruption of suprascapular nerve **TEST AND RESULTS**: X-rays of the right shoulder:- Patchy sclerosis and irregular shape of the humeral head. - Decreased joint space of the glenohumeral joint and elevation of the humeral head.- Hill-Sachs deformity with small adjacent osseous fragment. - Curvilinear osseous density superior to the humeral head - likely calcification of the rotator cuff or loose body. MRI with and without contrastiv>
FINAL WORKING DIAGNOSIS: Osteonecrosis of the humeral head
TREATMENT AND OUTCOMES: Referred to orthopedic shoulder specialist who plans to do a hemiarthroplasty without a stem. Surgery is planned for December 1, 2017. Follow-up will be available by May 2018.

566 May 30 1:40 PM - 2:00 PM

Back and Shoulder Pain in a Weightlifter with Ehlers Danlos

James Kelley. *Wellspan, York, PA.* (Sponsor: Mark Lavallee, FACSM)

(No relevant relationships reported)

Back and Shoulder Pain in a Female Weight Lifter with Ehlers Danlos
History: The Patient is a 44 yo woman who is a former fitness model, power lifter, and police office. She has a past medical history consisting of, pituitary tumor, Macromastia (C to DDD), right and left temporal aneurysms, Bilateral hip subluxation, Chiari Type I herniation – nonoperable and Ehlers Danlos. She is treated for chronic pain and her regimen consists of Tylenol, Tramadol and Oxycodone based on severity. NSAIDs are contraindicated due to the Xarelto use. In her most recent EDS clinic visit, she was referred to the sports medicine clinic for pain in her back and right shoulder. She was swimming and performing rehab exercises and presented with her 9/10 shoulder pain. The pain is worse with motion and is located on her posterior and lateral shoulder.
Physical Exam:
GENERAL: Healthy appearing, Alert and Oriented, no acute distress, mood appropriate, respiratory rate non-labor, hearing intact
THORACIC:
PALPATION: TENDER over Bilateral Trapezius, splenius captius, rhomboids
ROM: LIMITED inflexion-extension lateral rotation B/L
EXTREMITY EXAM
SENSATION:
Upper Extremity: intact bilateral, no deficits
Lower Extremity: intact bilateral, no deficits
STRENGTH:
Upper extremity: full strength in all major muscle groups
Lower extremity: full strength in all major muscle groups
SPECIAL TESTS
(+) Hawkins right side
(+) Spurling's away from affected
Differential Diagnosis : 1. Complex Regional Pain Syndrome 2. Thoracic outlet syndrome 3. Acute shoulder instability Nerve entrapment (i.e. suprascapular nerve) 4. Strain of her rhomboids/trapezius/splenus capitus 5. Brachial artery aneurysm 6. RTC injury 7. Spinal Stenosis/Radiculopathy 8. Polymyalgia Rheumatica Syringomelia
Final Working Diagnosis: Chronic Rotator Cuff tendonosis from chronic subluxation, and bilateral trapezius, rhomboid and splenus capitus strain, likely from overly active rehab and her Macromastia
Treatment: Subacromial shoulder injection with glucocorticoids and dry needling of her splenus capitus, rhomboids, and trapezius muscles
Outcome: Significant reduction in her pain, reduced narcotic use and continuing with her rehab and swimming. Receiving dry needling on a monthly basis.

567 May 30 2:00 PM - 2:20 PM

Shoulder Pain - Builder with Chronic Calcifications

Lauren Nadkarni, Krystian Bigosinski, Heather Gillespie, FACSM. *Maine Medical Center, Portland, ME.* (Sponsor: Heather Gillespie, FACSM)

(No relevant relationships reported)

History:
A 48 year old right hand dominant male smoker who works as a builder presents with chronic left shoulder pain. 15 years ago, he dislocated his left shoulder while breaking up a fight. Since then, he has dislocated it several times, most recently 5 years ago, but is able to replace it on his own. Two years ago, he had x-rays at an outside hospital emergency room and was diagnosed with calcium in his shoulder (images were unavailable). Last year, he felt a "squishy mass" and then "felt like something left my shoulder" when he was getting out of his car, and has had pain since then. He feels his shoulder is weaker and has less muscle mass, but denies hand weakness. However, he has had some neck issues and had numbness in his left arm secondary to cervical stenosis at C5-7, spondylolisthesis of C2-3, disc herniation at C4-5, and radiculopathy of C5-6, which improved after physical therapy which was prescribed by a physiatrist (PM&R, neuro/spine).
Physical Exam:
Office examination of his left shoulder revealed mild pain at terminal motion with overhead movements, full range of motion, 5/5 rotator cuff and distal strength, and negative AC joint testing. Impingement tests (Hawkins and Neer), and instability tests (apprehension and relocation) were positive. Distal neurovasculature was intact. His elbow and contralateral shoulder exam were normal.
Differential Diagnosis:
Rotator cuff tear, shoulder impingement, osteoarthritis, osteochondromatosis, labrum tear, lipoma, ganglion cyst, foreign body, erosive arthritis, pigmented villonodular synovitis, synovial sarcoma, intra-articular fracture fragments, neuropathic joint, and multidirectional instability
Tests and Results:

Left shoulder x-rays (AP/Outlet/Axillary): "innumerable calcific loose bodies consistent with synovial osteochondromatosis as well as significant osteoarthritic changes at the glenohumeral joint with close to bone-on-bone narrowing seen best on the axillary view. The loose bodies are dispersed throughout the joint capsule and into the bicipital groove."
Final/Working Diagnosis:
Synovial osteochondromatosis
Treatment and Outcomes:
- Continued physical therapy
- Over the counter analgesics, ice/heat as needed
- Referral to orthopedic surgeon for loose body removal vs. shoulder joint replacement

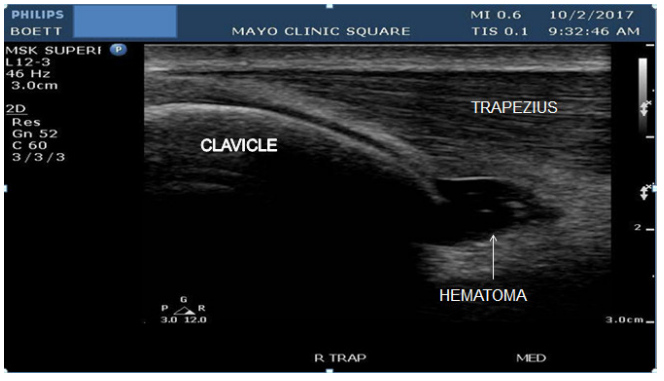
568 May 30 2:20 PM - 2:40 PM

Shoulder Pain in a Youth Hockey Player

Brennan J. Boettcher, Jeffrey M. Payne, Jonathan T. Finnoff, FACSM. *Mayo Clinic, Minneapolis, MN.* (Sponsor: Jonathan T. Finnoff, FACSM)

(No relevant relationships reported)

HISTORY: A 14 year-old male hockey player presented for right shoulder pain. He checked an opponent with his left shoulder and developed right shoulder pain immediately. There were no associated neurovascular symptoms. The pain was sharp, and radiated down the lateral shoulder to the mid-arm with abduction. Outside shoulder radiographs were normal.
PHYSICAL EXAMINATION:Athletic male resting with his right hand on his abdomen. Asymmetric depression of his right acromion with arms unsupported at his side. Right shoulder range of motion was slightly limited due to pain. He had tenderness just posterior to the distal mid-third of the clavicle diaphysis over the trapezius insertion. Neurologic and strength examination were normal.
DIFFERENTIAL DIAGNOSIS: -Trapezius strain -Occult clavicle fracture -ACJ separation -Physeal injury -Brachial plexus injury -Rotator cuff injury -Labral tear
TEST AND RESULTS: Diagnostic Ultrasound revealed an avulsion of the deep fibers of the trapezius from the clavicle, with ACJ sprain and distal clavicular hypermobility. Repeat radiographs demonstrated subtle periosteal lifting of the inferior clavicle near the avulsion visualized on sonographic evaluation indicative of a clavicular physeal injury.
FINAL WORKING DIAGNOSIS: Grade 1 right ACJ separation with trapezius avulsion off of the clavicle and distal clavicular physeal injury.
TREATMENT AND OUTCOMES: The patient was placed in a sling for comfort for 2 weeks. At the 3 week follow-up, he was about 95% of normal, repeat ultrasound demonstrated a small amount of distal clavicular callus formation. He was cleared to resume non-contact aerobic activity (e.g.skating) and gentle, non-painful shoulder isometrics. Re-evaluation at 6 weeks demonstrated full, pain-free shoulder range of motion, normal strength, and distal clavicular callus formation on radiographs. He was released to unrestricted activity.



569 May 30 2:40 PM - 3:00 PM

"OCD": A Zebra In The Glenoid Fossa

Elizabeth Barchi. *New York University, New York, NY.*

(No relevant relationships reported)

History:
A 19-year-old female Division 1 volleyball player presented with 5 months of right shoulder pain and decreased range of motion. The pain was localized to "inside" the shoulder and aggravated by serving and setting (right hand dominant). 2 months after the onset of symptoms, she noticed an acute increase in pain following a collision that resulted in a cervical strain. The symptoms persisted despite 3 months of physical therapy in the training room and 2 months of post-season rest. She denied neurological or instability symptoms.
Physical exam:
Right shoulder: Tenderness to palpation over AC joint. Limited active and passive range of motion: Forward flexion 160deg, Abduction 160deg, External rotation 60deg, Internal rotation to T12. Mild supraspinatus weakness. Positive Neer and Hawkins tests. Positive Obrien test. Negative cross arm adduction and anterior apprehension.
Differential Diagnosis:
1. Impingement Syndrome
2. Labral tear
3. Rotator cuff tendinopathy
4. Osteochondral defect of the glenoid fossa
5. Osteochondroma
Testing and Results:
MRI Right Shoulder: Large osteochondral defect centered in the posterior superior aspect of the glenoid measuring approximately 1.6 x 1.7 cm. Associated marked irregularity and bone loss of the subchondral plate and subchondral bone, suspicious for an instable osteochondral fragment. Tear of the adjacent posterior superior labrum.
Final Diagnosis
Osteochondral defect of the glenoid fossa
Treatments/Outcomes:
1. Hyaluronic acid injection into glenohumeral joint with no change in symptoms
2. PRP injection into glenohumeral joint with excellent reduction in pain and eventual return to baseline range of motion
3. Physical therapy- rotator cuff strengthening, range of motion exercises, joint mobilization, and manual modalities
4. Returned to full sports 8 weeks following PRP injection. After complete resolution of symptoms, she played volleyball in the following season as a setter.

B-36 Thematic Poster - Get Up, Get Moving: New Research in Sedentary Behavior

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100C

631 **Chair:** David W. Dunstan. *Baker IDI Heart and Diabetes Institute, Melbourne, Australia.*

(No relevant relationships reported)

632 Board #1 May 30 3:15 PM - 5:15 PM

Association Between Exercise And Prolonged Television Viewing Days On Time-use And Physical Activity Energy Expenditure In Older Us Adults

Charles E. Matthews, FACSM[1], Sarah Keadle[2], Pedro Saint-Maurice[1], Steven C. Moore[1], Erik A. Willis[1], Joshua N. Sampson[1], David Berrigan[1]. *[1]National Cancer Institute, Rockville, MD. [2]Cal Poly, San Luis Obispo, CA.*

(No relevant relationships reported)

PURPOSE. Our goal was to estimate the time-use exchanges associated with exercise, prolonged television viewing, and work days on the amount and type of sedentary and physically active behaviors and physical activity energy expenditure. **METHODS.** Participants were 1,020 older adults who completed up to 6 detailed previous-day recalls over 12-months that provided a profile of the use of time in sedentary and physically active pursuits. We predicted time-use and physical activity energy expenditure (PAEE) outcomes for 1) days with and without exercise, 2) days with or without prolonged television (2+h/day), and 3) work vs non-work days. To estimate time-use exchanges we used repeated measures and linear mixed models, adjusting for age, sex, season of the year, and day of the week. **RESULTS.** Exercise days were associated with less sedentary time (-0.37 hrs/d) and light activity (-0.29 hrs/d), and less household, work, and shopping activities. Compared to non-exercise days, the increase in total PAEE on exercise days (2.83 MET-hrs/d) was only about half that expended during exercise (5.98 MET-hrs/d). Prolonged television viewing was associated with an increase in total sedentary time (0.86 hrs/d) and less light (-0.45 hrs/d) and moderate-vigorous intensity activity (-0.41 hrs/d), and thus lower total PAEE (-2.43 MET-hrs/d). Work days were associated with less sleep (-0.91 hrs/d) and an increase in total sedentary time (1.32 hrs/d). **DISCUSSION.** Exercise was associated with an increase in PAEE, but due to reductions in other activities, only about half of the energy expended during exercise trickled-up to total daily PAEE. Prolonged television viewing was associated less PAEE and less moderate-vigorous activity. These findings provide new insights into possible compensation associated with exercise training, and suggest a strong link between television viewing and physical inactivity.

633 Board #2 May 30 3:15 PM - 5:15 PM

Prolonged Uninterrupted Sitting Impairs Vascular Function and Increases Biomarkers of Atherosclerotic Risk in Overweight Adults

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(No relevant relationships reported)

Purpose. Prolonged uninterrupted sitting amplifies postprandial glucose, insulin and lipid responses in overweight/obese adults with or without type 2 diabetes; and, impairs lower limb endothelial-mediated vasodilation in healthy adults. It is unknown whether prolonged sitting impairs vascular function or modulates other vascular inflammatory and pro-atherogenic mechanisms in those at heightened risk of cardiometabolic disease. In overweight/ obese adults, we examined the potential pro-atherogenic effects of an acute bout of prolonged sitting, compared to sitting interrupted with brief activity breaks.
Methods. In a randomised crossover trial, following a standardised breakfast meal, 19 (11 Male, 8 Female) overweight/obese participants (BMI 30.6±3.4 kg/m^2; age 57±12 years; mean±SD) either: (i) sat uninterrupted for 5h (SIT); or, (ii) interrupted 5h of sitting with 3min light-intensity simple body-weight resistance activities every 30min (SRA). Brachial and femoral artery endothelial-mediated vasodilation were measured using flow mediated dilation (FMD). Circulating levels of vasoactive and pro-atherosclerotic biomarkers (total nitrate+nitrite, ET-1, ICAM-1 and VCAM-1) were measured. Sympathetic nervous activity was also estimated (peroneal microneurography and circulating catecholamines). Data were analysed using generalised linear mixed models controlling for age, sex, BMI, baseline values and treatment order, and are presented as marginal mean±SEM.
Results. Femoral artery FMD was impaired in the SIT condition, compared to SRA (5.1±0.5% vs 9.0±0.5%, respectively, $p<0.05$). Significantly higher circulating levels of the potent vasoconstrictor and pro-inflammatory mediator ET-1 (1.6±0.1 vs 1.4±0.1 pg/ml) and pro-atherogenic adhesion biomarker VCAM-1 (616±33 vs 564±26 ng/ml) were observed in SIT compared to SRA, respectively ($p<0.05$). There were no differences between conditions for any other outcomes.
Conclusion. In overweight/obese adults, an acute bout of uninterrupted sitting impaired femoral artery endothelium-mediated vasodilation and increased circulating levels of pro-atherosclerotic biomarkers. Prolonged sitting may have implications for vascular function, leukocyte adhesion and atherogenesis in those at heightened risk of cardiometabolic disease.

634 Board #3 May 30 3:15 PM - 5:15 PM

Sedentary Behavior and Physical Activity are associated with Sleep Duration and Sleep Quality in Postmenopausal Women

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(No relevant relationships reported)

PURPOSE: There is a general decline in sleep duration and sleep quality with aging. It is unclear whether lifestyle behaviors such as physical activity and sedentary behavior are related to these declines in sleep health. In this analysis, we evaluated the associations between sedentary behavior (SB), total physical activity (total-PA), light physical activity (LPA), moderate physical activity (MOD-PA), and vigorous physical activity (VIG-PA) with self-reported sleep quantity and quality in a cohort of postmenopausal women.
METHODS: Baseline Data from the Women's Health Initiative Observational Study (N=89,853, age: 63.6±7.4 years, BMI: 27.2±5.8 kg/m^2, 84% Non-Hispanic White) were used in this cross-sectional analysis. Total-PA, LPA, MOD-PA, and VIG-PA were categorized by metabolic equivalents of the activity (MET-hrs/wk) and were measured using self-reported questionnaire. SB was categorized by hrs/day and was also measured via questionnaire. Logistic regression was used to examine the relationships between these activity variables and the odds of having self-reported short sleep (<7 hours), subjective sleep disturbance, and reduced subjective sleep quality. Odds ratios (OR, 95% confidence intervals) were adjusted for age, race, neighborhood SES, BMI, health status, depressive symptoms, smoking status, alcohol use, hormone therapy, and history of CVD, diabetes, and cancer.
RESULTS: Higher SB (>11 hrs/day) was associated with increased odds of short sleep (1.87, 1.79-1.96), poor sleep quality (2.21, 2.10-2.33), and sleep disturbance (1.56, 1.49-1.64). Conversely, more LPA (>4.5 MET-hrs/wk) was associated with a reduced odds of short sleep (0.96, 0.92-1.00). Furthermore, higher Total-PA (0.90, 0.84-0.97), LPA (0.94, 0.89-1.00), and MOD-PA (0.91, 0.86-0.97) were associated with reduced odds of poor sleep quality.
CONCLUSIONS: In postmenopausal women, physical activity at the light or moderate level was associated with better sleep quality. Whereas, engaging in more sedentary behavior increased the risk for shortened and lower quality sleep. Future investigations may focus on reducing sedentary behavior as a novel method for improving overall sleep health in older women.

635 Board #4 May 30 3:15 PM - 5:15 PM

Association of Combined Sedentary Behavior and Diabetes Mellitus with All-Cause Mortality in Brazilian Adults

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(No relevant relationships reported)

Diabetes mellitus (DM) is associated with increased specific and all-cause mortality in different populations. Although sedentary behavior (SB) has been identified as a modifiable risk factor for DM, cardiovascular disease, and all-cause mortality, investigations regarding the combined effect of DM and SB on all-cause mortality are scarce. **PURPOSE:** To investigate the combined effect of DM and SB on all-cause mortality in adults from the Brazilian National Health System (NHS). **METHODS:** Data were obtained from 970 adults (709 women; mean age 64.7 ± 9.1 years) enrolled in the Brazilian NHS from 2010-2016. Participants were 50 years or older, registered for at least one year in the NHS, and received at least one medical visit in the past six months. SB was estimated via self-reported TV viewing frequency on the Baecke questionnaire and was subsequently classified into thirds: low, middle, and high. For our analysis the low and middle groups were combined to indicate lower level of SB due to the small sample size. Presence of physician-diagnosed DM was assessed via medical record. Mortality was reported by participants' relatives and confirmed via medical records of the Brazilian NHS. Cox regression determined hazard ratios (HRs) and its 95% confidence intervals (95%CIs). Reference group was lower SB without DM at baseline (health status, sociodemographic and behavioural covariates were potential confounders). **RESULTS:** In overall sample, 276 (28%) had DM, 210 (21.6%) had high SB, and 62 (6.4%) had both DM and high SB at baseline (89 deaths were registered). In the adjusted model, the combination of DM and high SB was associated with greater risk of all-cause mortality (HR: 3.38; 95%CI = 1.86-6.13) compared to those without DM who also did not have high SB at baseline. The presence of DM (HR: 1.33; 95%CI = 0.76-2.34) or high SB alone (HR: 1.16; 95%CI = 0.62-2.17) were not significantly different from referent group. **CONCLUSION:** In this sample, the combination of both DM and high SB (but not DM and SB alone) had more than three times greater risk for all-cause mortality compared to those without DM and high SB. Supported by São Paulo Research Foundation (FAPESP) Grant 2015/17777-3 and 2016/11140-6.

636 Board #5 May 30 3:15 PM - 5:15 PM

Within-Day Trajectories of Sedentary Time at Work Among Sedentary Office Workers

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(No relevant relationships reported)

Office workers can spend 70-80% of their workday sedentary; however, little is known about the trajectory of sedentary time over the course of the workday and if it varies by worker characteristics such as age, gender, job type (executive, professional, or clerical), or weight status.
PURPOSE: To understand within-day trajectories of sedentary time by age, gender, job type, and weight status among sedentary office workers.
METHODS: Participants (N=632, 72% female, 71% white, 45 ± 11 years of age) were recruited from 24 worksites in Phoenix and Minneapolis areas to participate in the 'Stand & Move @ Work' cluster randomized controlled trial to reduce sedentary time and increase light-intensity physical activity in the workplace. Participants wore

an activPAL accelerometer/inclinometer on the thigh continuously across workdays (n = 5.8 ± 1.8 days/person) to assess sedentary time prior to any intervention. Work time was segmented using daily work logs and time of day was temporally aligned based on "work time" (i.e., minutes since starting workday) or "clock time" (i.e., minutes since midnight). Mixed-effects regression models (clustered by time within workdays) were used to account for within person time variations and to examine intercept (i.e., main effects) and time trajectory differences by worker characteristics.
RESULTS: Based on work time (min/hour), there was a small negative trajectory for sedentary time (b [SE] = -0.31 [0.12], p=0.010). Women were less sedentary overall (b [SE] = -2.90 [0.62], p<0.001); however, men had greater decreases in sedentary time over the workday (b [SE] = 0.278 [0.10], p=0.002).
Obese individuals were less sedentary than overweight (b [SE] = 4.90 [0.65], p<0.001) and normal weight (b [SE] = 6.61 [0.63], p<0.001) individuals overall; however, overweight individuals (b [SE] = -0.26 [0.10], p=0.006) had greater decreases in sedentary time over the workday relative to obese (whose sedentary time remained stable). These patterns were similar when time was aligned by clock time.
CONCLUSION: Sedentary time was modestly reduced over the work day. This pattern varied by gender and weight status, but not by age or job type. These findings inform potential tailoring strategies by identifying when and for whom to optimally target interventions to reduce sedentary time in the workplace.

637 Board #6 May 30 3:15 PM - 5:15 PM

Effect Of A Worksite Sedentary Behavior Intervention On Energy Intake In Adult Men And Women

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(Sponsor: Matthew Buman, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of this study was to investigate the effects of a worksite sedentary behavior intervention on energy intake and perceived appetite in full-time sedentary office workers over the first three months of intervention.
METHODS: Data were derived from the ongoing study 'Stand & Move at Work', a multi-level group randomized trial aimed at reducing employee sedentary time with a socio-ecological approach. Dietary intake was assessed through the online ASA24 24-hr dietary recall, while self-reported appetite was assessed with an ecological momentary assessment measure. Using baseline and 3-month time-point data, linear mixed models, accounting for clustering of individuals within the 24 worksites, were built for each outcome (self-reported total energy intake, macronutrient and fiber intake, and feelings of hunger). Model covariates included age, BMI, ethnicity, gender, education, and income. **RESULTS**: 641 men and women were available for analyses, with mean age (± se) = 44.5 ± 0.44 yr, and 69% overweight or obese. Worksite-level energy intake decreased over time by 132 kcal/day (95% CI: 8 - 256; p <.05). There was a trend towards decreased feelings of hunger over time (p = 0.20). While macronutrient and fiber intake appeared to decrease over time, no differences were observed in macronutrients or fiber after adjusting for energy intake.
CONCLUSIONS: Self-reported energy intake decreased among sedentary workers participating in the 'Stand & Move at Work' intervention over the first three months. Results from fiber and macronutrients suggest the decreased energy intake was not explained by a change in diet quality. Future analysis will incorporate a relative comparison of the intervention arms to explore any differential effects on energy intake, diet composition, and subjective feelings of hunger.

638 Board #7 May 30 3:15 PM - 5:15 PM

Cardiometabolic Effects of Interrupting Sitting with Resistance Exercise Breaks

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(No relevant relationships reported)

Research indicates prolonged occupational sitting may have detrimental effects on cardiometabolic health. This may suggest that interrupting prolonged sitting with physical activity may have an acute beneficial effect on cardiometabolic health. However, it is unclear if brief resistance exercise bouts would result in these acute benefits.
PURPOSE: To examine the acute effect of hourly, brief resistance exercise bouts that disrupt prolonged sitting on cardiometabolic health outcomes over a 4-hour simulated work period.
METHODS: Fourteen adults (age 53.4±9.5 years, BMI 30.9±4.8 kg/m^2) completed two 4-hour simulated work conditions in random order and on separate days: prolonged sitting (SIT) and sitting combined with hourly resistance exercise breaks (REX). Prior to the SIT or REX conditions the participants were fed a standardized breakfast. REX consisted of a brief exercise session (approximately 3 minutes) performed at 0.5, 1.5, 2.5, and 3.5 hours post-meal. Glucose, triglycerides, and blood pressure were measured at baseline 1, 2, 3, and 4 hours post-meal. Pulse wave velocity (PWV) was measured before and following each condition. Linear mixed models evaluated overall condition effects and differences at each hour that was Boneferroni adjusted for multiple comparisons. Cohen's d estimated the magnitude of effects.
RESULTS: Average glucose across the simulated workday did not differ by condition (β= -0.35 mmol/L, p=0.278, d=0.51). However, pairwise comparisons demonstrated an attenuation of postprandial glucose at 1 hour (β= -0.69 mmol/L, p=0.004, d=1.02) in REX compared to SIT, but not at the other time points. Blood pressure, triglycerides, and PWV did not differ significantly across conditions (all p ≥ 0.102, d = 0.01 to 0.21) or at any time point. **CONCLUSIONS**: Disrupting sitting with a brief resistance exercise bout performed at 0.5 hours after consuming a meal may have beneficial effects on 1-hour postprandial glucose. However, this initial benefit does not appear to be sustained beyond that time point. Moreover, these findings do not support an acute benefit of brief resistance exercise bouts compared to sitting on other cardiometabolic outcomes. Additional research is needed to assess optimal strategies for disrupting sedentary behavior that may have cardiometabolic benefits.

639 Board #8 May 30 3:15 PM - 5:15 PM

Association between Weather Condition, Ambient Temperature and Objectively Measured Sedentary Time in Chinese Adults

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(Sponsor: STANLEY SAI-CHUEN HUI, FACSM)
(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the association between weather condition, ambient temperature and objectively measured sedentary time in Chinese adults.
METHODS: 3,426 Chinese (2,116 men and 1,310 women) users of a brand of smart bracelet from July to October in 2015 were recruited in this study. Witha novel algorithm, the gravity component of the acceleration signal collected by the activity monitor was extracted from the raw data to identify different types of activities and determine sedentary time. Using the information of GPS and time, the data of ambient temperatures and weather condition were collected from the meteorological data released by China Central Meteorological Observatory.
RESULTS: Compared with the days with rain, shower, haze and clouds, Chinese adults spent less time in sedentary behaviors in sunny days. There is no significant difference in sedentary time in rainy days in adults with different weight status. However, obese adults had significant longer sedentary time in non-rainy days than their counterparts with normal weight. Chinese women have shorter daily sedentary time when the mean ambient temperature lower than 20 °C, as compared with 20-24°C, 25-29°C and ≧30°C groups, whereas no difference was found in Chinese men.
CONCLUSIONS: Weather condition and ambient temperature are important factors associated with sedentary behaviors. Sedentary time in Chinese adults is longer in rainy days and high ambient temperature as compared with non-rainy days and cool weather. Long sedentary time especially in non-rainy days could be one of the factors contribute to the development of obesity in Chinese adults.

B-37 Thematic Poster - Health Technology for Physical Activity: Just Do It!

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100C

640 **Chair:** John M. Jakicic, FACSM. *University of Pittsburgh, Pittsburgh, PA.*
(No relevant relationships reported)

641 Board #1 May 30 3:15 PM - 5:15 PM

Evaluation of Free Exercise Apps and Ability to Promote Physical Activity

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate free exercise apps and the potential for promoting physical activity. METHODS: Study investigators identified 153 free exercise apps. Written descriptions posted by the app developers were evaluated by two investigators using enabling and reinforcing components of the Precede-Proceed Health Promotion Model as a guide. Six factors (three enabling and three reinforcing) were evaluated, with one point recorded for each factor included in an app. RESULTS: Enabling scores ranged from 0 to 3. One hundred and thirty-

four (87.6%) apps included videos or pictures, while 123 apps (80.4%) included written instructions on how to perform exercises. Thirty-eight apps (24.8%) included the ability to track daily exercise. Reinforcing scores also ranged from 0 to 3. Fifty-five (36%) apps interfaced with a social networking site, while thirty-three (21.6%) provided feedback and support from a personal trainer. Fifteen (9.8%) included rewards for daily exercise. Total scores ranged from 0 to 5. No apps included all six factors. CONCLUSIONS: The present study suggests that the majority of free exercise apps include videos, pictures, or written instructions on how to exercise. Many free exercise apps do not include basic features that may help to maintain an exercise program, including social support, feedback from a personal trainer, or rewards. Additional research is needed on how exercise apps can be utilized to promote physical activity and what features might be most important for success.

642 Board #2 May 30 3:15 PM - 5:15 PM

The Feasibility of a Gender- and Culturally-Sensitive Weight Loss Intervention Plus Mobile Health Technology for Hispanic Males

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(No relevant relationships reported)

Background: Hispanic males suffer disproportionate rates of overweight and obesity compared to other racial/ethnic groups. However, few weight loss interventions have been developed for this high-risk group. Further, the use of mobile health (mHealth) technologies to support lifestyle behavior changes in weight loss interventions for Hispanic men are untested. **Purpose:** This pilot study examined the feasibility and acceptability of integrating mHealth technology into a 12-week gender- and culturally-sensitive weight loss intervention (GCSWLI) for sedentary, overweight/obese Hispanic males. **Methods:** Eighteen Hispanic males (age: 38 ± 11 years; BMI: 34 ± 5 kg/m²; 56% Spanish monolingual) received a GCSWLI including weekly in-person individual sessions, a daily calorie goal, and prescription of ≥225 minutes of moderate-intensity physical activity/week. mHealth technology support included tailored text messaging and behavior and weight self-monitoring support using the Fitbit Charge 2, a consumer-wearable physical activity tracker, and a Fitbit Aria Wi-Fi Smart Scale. Participants were encouraged to use the Fitbit tracker during all waking hours and weigh themselves daily using the provided scale. Participants received biweekly SMS customized to address self-reported barriers to behavior change and in response to objective data collected via tracking tools. Changes in weight from baseline to 12-weeks were estimated using a paired t-test. Descriptive analyses characterized use of the Fitbit and the smart scale. **Results:** Sixteen of 18 participants completed 12-week assessments; overall attrition rate was 11.1%. Mean weight loss at week 12 was 4.7 kg (95% CI [-7.1, -2.3], $p < 0.001$). Participants wore the Fitbit 71.6% of intervention days and logged body weight using the smart scale 30.5% of intervention days. Participants identified barriers for use of the technology, including strenuous work activities prohibiting them from wearing the Fitbit. In addition, reliable internet access was cited as a barrier to using the smart scale. **Conclusions:** While significant weight loss was achieved integrating mHealth technology into a GCSWLI, the use of technology was modest. Addressing barriers identified in our work may help to refine an mHealth intervention approach for Hispanic men.

643 Board #3 May 30 3:15 PM - 5:15 PM

Metabolic Cost and Exercise Intensity during Active Virtual Reality Gaming

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(No relevant relationships reported)

PURPOSE: Sedentary behavior remains a critical health promotion target because it increases risk of morbidity and mortality. Virtual reality (VR) exergaming is a new avenue of physical activity that may be preferred over "traditional exercise" in historically inactive populations. Use of active VR games (AVRGs) could be an effective strategy for meeting the ACSM exercise guidelines. To investigate the efficacy of AVRGs, we assessed the intensity of three games on a VR system by measuring oxygen consumption (VO_2) and rating of perceived exertion (RPE) during gaming sessions. A secondary purpose was to compare the exercise intensities of the three games to current ACSM exercise guidelines using percent oxygen consumption reserve ($\%VO_2R$) and metabolic equivalents (METs). **METHODS**: Forty-one [male (n=21); female (n=20)] healthy volunteers [age: 25.2±4.4y; BMI 24.4±3.7kg/m²] were assessed for body composition, completed a graded exercise test to determine maximal VO_2 and familiarization period 3 VR games (Thrill of the Fight [TOF], Audioshield [AS], and Holopoint [HP]) during visit one. At least 48-hrs later, VO_2 and RPE were measured during 10-min supine rest and 10-min sessions of each game. Data was analyzed by gender and gaming experience and no statistical difference were found by category. **RESULTS**: Compared to resting values (4.5±0.6ml/kg/min), VO_2 was higher during TOF, AS, and HP (30.5±7.1, 19.1±5.8, and 24.8±6.6ml/kg/min, respectively; $p \leq 0.05$). Using $\%VO_2R$ 95% Confidence Interval (95%CI), TOF was classified as vigorous, HP was moderate, and AS was light intensity depending on gaming experience. Using METs (95%CI), TOF was classified as vigorous, HP ranged from moderate to vigorous, and AS was moderate intensity. Using RPE (95%CI), TOF was classified as moderate, whereas HP and AS were light intensity. **CONCLUSIONS**: Our data suggests the three VR games examined can elicit least a moderate exercise intensity based on ACSM guidelines. Participants perceived the physical exertion to be lower during the games than their measured exertion, which might allow participants to continue playing AVRGs for longer durations before feeling fatigued. Data on metabolic cost for movement specific games may aid consumers and health/fitness specialists in developing exercise programs with AVRGs.

644 Board #4 May 30 3:15 PM - 5:15 PM

Interest in Virtual Reality for Injury Rehabilitation and Performance Enhancement Among Collegiate Soccer Athletes

Leilani Madrigal, Makenna Henry, Alison Ede, Tiffanye Vargas. *California State University Long Beach, Long Beach, CA.* (Sponsor: Diane L. Gill, FACSM)

(No relevant relationships reported)

Interventions using virtual reality (VR) in three or two-dimensional, multi-sensory, synthetic worlds have been used to enhance rehabilitation and performance (e.g., combat PTSD in military personal, increase motor control in stroke-recovery patients). VR also has potential as a method for rehabilitation from sporting injuries.
PURPOSE: To assess athletes' interest in VR as an intervention to enhance performance and injury rehabilitation, and to identify preferred components within a VR world. We also explored gender influences on these preferences. We focused on one collegiate sport, soccer, at three levels (NCAA, NAIA, Junior College).
METHODS: Sixty-eight collegiate soccer (25 male; 43 female) athletes completed an electronic survey which included demographics, as well as the virtual reality interest survey created to assess VR use, interest and specific factors athletes may find useful in a VR environment.
RESULTS: Participants' responses on a 10-point Likert-type scale from not interested (1) to extremely interested (10), indicated strong interest in using VR, both in recovery from injury (M=7.06, SD=2.67), and to improve sport performance (M=7.89, SD=2.59). Additional items asked about interest in specific forms of VR with the same 10-point response scale. Athletes indicated strong interest in viewing sport-specific scenarios (M=7.26, SD= 2.66), sport-specific skills (M=6.89, SD=2.73), and physically touching a soccer ball while submerged in a virtual world (M=6.89, SD=2.83). Other items, such as seeing a crowd in the stands, presence of an avatar coach, or viewing a teammates perform a sport skill unsuccessfully, were rated of less interest. In terms of gender, men were more interested than women in using VR both for injury recovery (Male: M=8.24, SD=2.18; Female: M=6.34, SD=2.70) and to enhance performance (Male: M=9.00, SD=1.84; Female: M=7.21, SD=2.77)
CONCLUSION: VR interest is high among collegiate soccer athletes, both for injury recovery and performance enhancement. The athletes were particularly interested in a VR environment that incorporates sport-specific scenarios and physically touching a soccer ball. Men had stronger interests in VR, but both men and women athletes at all levels indicated interest in engaging in VR to assist in injury recovery and performance enhancement.

645 Board #5 May 30 3:15 PM - 5:15 PM

Playing Pokemon Go is Associated with Higher Daily Total Energy Expenditure

Tyler Langford. *Middle Tennessee State University, Murfreesboro, TN.*

(No relevant relationships reported)

PURPOSE: To compare daily energy expenditure (DEE) of Pokémon Go (PoGo) players to non-player counterparts. **METHODS:** Upon arrival, a self-reported PoGo usage questionnaire was used to identify "players" and "non-players". Participants then received a SenseWear Armband (SWA), with clear instruction to wear the device for 7 consecutive days. After 7 days, participants returned the SWA and completed an additional set of questionnaires. Mean differences in DEE between players and non-players were examined using a one-way between groups ANCOVA ($p \leq 0.05$). Control variables included in the ANCOVA were on-body time and body weight. Inclusion criteria for use of data included at least 4 days of wear time, with at least 12 hours of data per day. **RESULTS:** Data for 5 participants were excluded based on the previously mentioned criteria. leaving a final sample of 9 players and 11 non-players. Players demonstrated a significantly greater DEE than non-players when controlling on-body time [$F(1, 17) = 5.556$, $p = 0.031$] (Figure 1). There was a significant effect

on DEE for on-body time [F (1, 17) = 4.892, p = 0.041]. When weight was included in the model, there was a trend towards a significant effect on DEE [F (1, 16) = 4.366, p = 0.053]. However, weight was not used for analysis in the main ANCOVA model as it is outside the significance level. **CONCLUSION:** Pokémon Go players exhibited a significantly greater DEE than their non-player counterparts (Players: 2735 ± 666 kcal vs non-players: 2274 ± 474 kcal, p = 0.031).

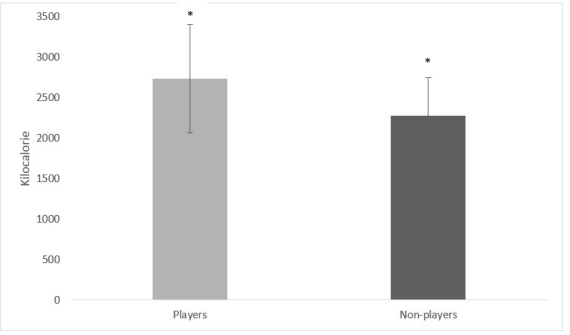

Figure 1. Differences in daily energy expenditure between Players and Non-players. * indicates significant difference (p ≤ 0.05)

Table 1. Demographic data.

	Players	Non-players
Age (yrs)	27.89 +/- 6.62	25.73 +/- 3.85
Weight (kg)	78.99 +/- 16.00	73.02 +/- 12.35
BMI (Kg/m²)	27.66 +/- 4.20	24.73 +/- 3.69

646 Board #6 May 30 3:15 PM - 5:15 PM

Home-basedexergaming For Preschoolers' Cognition And Health Outcomes: A Randomizedcross-over Study

Zan Gao, FACSM[1], Jung Eun Lee, 55812[2], Zachary Pope, 55455[1], Nan Zeng[1], Xianxiong Li[3], Ying Zhang[4]. *[1]University of Minnesota, Minneapolis, MN. [2]University of Minnesota, Duluth, MN. [3]Hunan Normal University, Changsha, China. [4]Zhejiang Normal University, Hangzhou, China.*

(No relevant relationships reported)

Purpose: The effects of exergaming physical activity (PA) interventions on preschoolers' cognition and health outcomes remain largely unexplored. Therefore, the purpose of this study was to discern the effectiveness of a home-based exergaming intervention on preschoolers' cognition and health outcomes in a randomized cross-over trial.
Methods: Participants were 32 preschoolers (16 girls; 59.4% Asian; M_{age} = 4.72, *SD* = ± .73) recruited from the Twin Cities area in MN. During baseline testing, preschooler's cognition, cardiovascular fitness, body fat percentage (BFP), and daily energy expenditure (EE) were assessed via validated instruments. Participants were then randomly assigned to 1) an intervention (INT) condition: engaged in home-based LeapTV exergaming at least 30 minutes/session 5 times/week for the first 12 weeks and then resumed their regular PA patterns without exergaming during the second 12 weeks; or 2) a delayed-intervention control (DIC) condition: maintained their regular PA patterns for the first 12 weeks, and participated in the same dose of home-based exergaming during the second 12 weeks. Identical assessments were conducted at the end of the 12th and 24th weeks.
Results: Data were analyzed with PROC GLM in SAS. Results suggested significant interaction effects of treatment by period for cognition, F(1,28) = 2.02, $p = 0.04$; and BFP, F(1,28) = 16.90, $p < 0.01$. Significant carry-over (period) effects emerged for fitness, F(1,28) = 15.24, $p < 0.01$; and EE, F(1,26) = 4.48, $p = 0.04$. In addition, there was a significant order (sequence) effect for BFP, F(1,28) = 16.90, $p < 0.01$. No other effects were identified. Detailed descriptive data are shown in table.

	INT group			DIC group		
	0 week	12 week	24 week	0 week	12 week	24 week
Cognition	50.89	59.39	61.65	59	62.36	62
Fitness	10.22	7.56	14.47	10.64	10.57	14.58
BFP	19.20	20.36	19.25	20.12	20.20	19.83
EE	361.70	363.42	340.64	337.69	384.59	392.41

Conclusions: Home-based exergaming may positively impact cognition, fitness, and BPF for some preschoolers, with slight positive effects on EE possible for most preschoolers. Therefore, an exergaming program might be a good option for home-based PA interventions.

647 Board #7 May 30 3:15 PM - 5:15 PM

Effects of Exergaming on College Students' Mood and Energy Expenditure Compared to Traditional Treadmill Exercise

Wenxi Liu[1], Zachary Pope[1], Nan Zeng[1], Jung Eun Lee[2], Zan Gao, FACSM[1]. *[1]University of Minnesota Twin Cities, Minneapolis, MN. [2]University of Minnesota Duluth, Duluth, MN.* (Sponsor: Zan Gao, FACSM)

(No relevant relationships reported)

Purpose: To date, no known research concerning exergaming on young adults' affect is available. Thus, this study examined exergaming's effect on college students' mood and energy expenditure compared with traditional treadmill exercise.
Methods: Sixty college students (30 female; M_{age} = 23.6) participated in three separate 20-minute exercise sessions: 1) Xbox 360 Kinect Reflex Ridge; 2) Xbox 360 Kinect Just Dance; and 3) moderate-intensity treadmill walking (4.0 mph). Mood was assessed via the Brunel Mood Scale (BRUMS)—a 24-item questionnaire containing six subscales: anger, confusion, depression, fatigue, tension, and vigor. Participants completed the questionnaire following each exercise session.
Results: The data indicated participants in treadmill session (M = 174.21) had more energy expenditure (in calories) than Just Dance (M = 91.70) and Reflex Ridge (M = 110.20). Significant differences between the three sessions for mood was only observed for fatigue (F (2, 118) = 12.28, $p < 0.01$, $\eta_p = 0.172$), with post hoc Bonferroni comparisons indicating that participants' perceived fatigue levels were significantly lower during Just Dance compared to Reflex Ridge ($p = 0.02$) and treadmill walking ($p < 0.01$). However, Reflex Ridge and treadmill walking were not observed to have significantly different levels of fatigue ($p = 0.07$). It is also notable that feelings of vigor and depression approached significance (F (2, 118) = 2.694, $p = 0.07$ and F (2, 118) = 3.18, $p = 0.06$, respectively), with Reflex Ridge promoting the greatest feelings of vigor and treadmill walking resulting in the greatest feelings of depression.
Conclusion: Findings revealed that even though traditional treadmill exercise performed more energy expenditure, however, exergaming may lead to less perceived fatigue and potentially higher vigor among college students compared to traditional exercise. This finding has important implications as college students may be more likely to participate and maintain in PA when less fatigue is perceived and feelings of vigor upon cessation of gameplay are experienced. Future research should examine other exergames to discern what genre of exergaming is most effective in promoting positive affect among young adults.

648 Board #8 May 30 3:15 PM - 5:15 PM

Effectiveness of Combined Smartwatch and Social Media Intervention on Breast Cancer Survivor Outcomes: Randomized Trial

Zachary Pope, Nan Zeng, Rui Zhang, Hee Y. Lee, Zan Gao, FACSM. *University of Minnesota-Twin Cities, Minneapolis, MN.* (Sponsor: Zan Gao, FACSM)

(No relevant relationships reported)

PURPOSE: Promoting physical activity (PA) among breast cancer survivors (BCS) can improve this population's health and quality of life (QoL). Yet, innovative technology-based PA interventions among BCS remains understudied. This study evaluated the effectiveness of a combined smartwatch and social media PA intervention on BCS's health outcomes.
METHODS: Thirty BCS ($\bar{X}_{age}$ = 52.6 ± 9.3 years; $\bar{X}_{Wt}$ = 80.2 ± 19.6 kg) participated in this 10-week, 2-arm randomized trial, with BCS randomized into: 1) intervention group (n = 16): received Polar M400 smartwatch for daily PA tracking and joined a Facebook group where social cognitive theory-related PA tips were provided twice weekly, with a weekly workout program being posted; and 2) comparison group (n = 14): only joined separate, but content-identical Facebook group. Outcomes included PA, physiological, psychosocial, and QoL variables. Specifically, PA and energy expenditure (EE) was assessed by ActiGraph GT3X+ accelerometers, and physiological, psychosocial (e.g., self-efficacy, social support, etc.), and QoL were examined via validated instruments at baseline and post-intervention.
RESULTS: No baseline group differences were observed for any variable. Ten BCS dropped out of the study (intervention = 4; comparison = 6). Compared to completers, dropouts had less private insurance coverage, longer duration since diagnosis, and lower annual income, daily light PA (LPA), moderate-to-vigorous PA (MVPA), EE, and steps. Thus, a per-protocol analysis was performed, revealing significant group differences for changes in social support (t = -2.1, $p = 0.05$) and barriers (t = -2.2, p = 0.04). Interestingly, the comparison group demonstrated increases for both variables while the intervention group demonstrated slightly decreased social support and no change in barriers. Notably, both groups demonstrated similarly increased daily LPA, MVPA, EE, and steps of 7.7 min, 5.1 min, 25.1 kcals, and 339 steps, respectively, over time.

CONCLUSIONS: Despite extensive user training, several intervention BCS found the Polar M400 difficult to use—possibly decreasing intervention adherence. Future interventions should utilize simpler smartwatches to promote PA among middle-aged clinical/non-clinical populations.

B-38 Thematic Poster - **High Intensity Interval Training**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100H

649 **Chair:** Tom Hazell. *Wilfrid Laurier University, Waterloo, ON, Canada.*

(No relevant relationships reported)

650 Board #1 May 30 3:15 PM - 5:15 PM

Blood Lactate Steady state Level Sustained During Rest Time In Moderate Intensity Interval Training

Juan C. Mazza[1], Raúl R. Festa[1], Lisandro Ruffo[1], Patricia Cosolito[1], Sandra L. Prieto[2], Alvaro Gurovich, FACSM[3].
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(No relevant relationships reported)

Blood lactate steady-state level, sustained during rest time, in moderate intensity interval training

Juan C. Mazza[1], Raúl R. Festa[1], Lisandro Ruffo[1], Patricia Cosolito[1], Sandra Prieto[2] and Alvaro Gurovich, FACSM[3]
[1] Biosystem Institute Sports Sciences, Rosario, Argentina; [2] Colombia State University, Bogotá DC, Colombia; [3] The University of Texas at El Paso, TX, USA.

BACKGROUND: Important isotope studies related to lactate metabolism have pointed out that blood lactate level (BLa) is an expression of the balance between Production (RProd), Removal (Rt) and Oxidation (ROx) rates. Also, evidence shows that the relationship between BLa with Rt and ROx rates, is concentration-dependent, close 4 to 7 mmol/l.
PURPOSE: Analyze BLa in the first sec. (BLa-10s) and last sec. (BLa-50s) of 1-min passive rest, during steady-state moderate intensity interval training (IT), considering that BLa is a balance of RProd with Rt and ROx intracellular process. We want to demonstrate that (BLa-10s) and (BLa-50s) levels are similar, so Rt and ROx are maintained, in steady-state conditions, during IT workouts.
METHODS: Ten trained swimmers and eight trained track athletes (19.1±2.6 yr) performed a moderate intensity IT session (BLa: 4 to 7 mmol/l). Swimmer´s protocol was: 10 x 100m, with 60s rest; and Athlete's protocol was: 10 x 400m, with 60s rest. BLa during BLa-10s and BLa-50s were measured with Lactate Plus meter and heart rate (HR) was monitored. Measurements were collected every 2 reps. We compared BLa-10s vs. BLa-50s applying paired t-test with a $p<0.05$ level, and r between BLa-10s vs. BLa-50s, and BLa-10s vs. HR, in reps. 2-4-6-8 and 10.
RESULTS: We found no significant differences between BLa-10s and BLa-50s. BLa-10s ranged 5.05±1.51 - 6.61±1.10 mmol/l and BLa-50s ranged 5.03±1.80 - 6.71±1.07 mmol/l. Additionally, we found a low r between BLa-10s and HR values (r = -0.06). However, a high r between BLa-10s and BLa50-s values (r = 0.94) was observed.
CONCLUSION: BLa-10s and BLa-50s showed same metabolic steady-state conditions. These results support the evidence that moderate intensity IT produces physiological stress during the whole workout duration (exercise / rest). Also, we determine that HR is not a valid variable to control for physiological demands during IT.
Keyword: Blood Lactate; Endurance Training; Metabolic Stress

651 Board #2 May 30 3:15 PM - 5:15 PM

Impact Of The Fractioned Distance On Endurance Training In Soccer Players

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[1]Rosario Central Soccer Athletic Club, Rosario, Argentina. [2]The University of Texas at El Paso, El Paso, TX.

(No relevant relationships reported)

BACKGROUND: The distance covered by outfield players during a soccer match is approximately 11-12 km. However, most of the distance is covered by walking, jogging, or short periods of moderate / high intensity running. Endurance Training (ET) could improve oxidative metabolic profile making players to run these distances more efficiently. However, the training session design might play a role enhancing physiological stress.
PURPOSE: To determine if Endurance Interval Training (EIT) or Endurance Intermittent Training (EIntT) generates more physiological stress to improve the performance of oxidative system in soccer players.
METHODS: Fifteen male soccer players (17.9±0.6 yr) performed 2 sessions of ET with the same absolute volume and intensity but different design, with a 4-day rest period between sessions. Endurance protocols were: a) 8 x 400 m, at 4.5 m/s, with 60s rest between reps. (EIT volume: 3,200 m); b) 8 sets of 6 x 67.5 m (405 m per set), at 4.5 m/s, with 15s:15s work:rest ratio, and 60s rest between sets (EIntT volume: 3,240 m). Blood lactate (La) and heart rate (HR) were collected at the end of repetitions/sets 2-4-6 and 8. We compared La and HR values between EIT and EIntT, applying paired t-test with a $p<0.05$ level, and Pearson's correlation coefficient (r) between La and HR for each test.
RESULTS: The session average La and HR were different between EIT and EIntT. 4.55±1.46 vs. 1.28±0.41 mmol/l, respectively ($p<0.01$) and 182±7 vs. 152±10 bpm, respectively ($p<0.01$). In addition, La and HR at repetitions/sets 2-4-6 and 8 were different between EIT and EIntT: 3.28±0.86 vs. 1.53±0.55; 4.44±0.91 vs. 1.21±0.33; 4.94±1.31 vs. 1.19±0.32; 5.55±1.64 vs.1.18±0.34 mmol/l, $p<0.01$, respectively. And 179±6 vs. 153±9; 183±6 vs. 152±7; 186±7 vs. 152±9; 184±7 vs. 153±9 bpm, $p<0.01$, respectively. Additionally, there we found low r between La and HR, in each test (EIT: r= 0.26; EIntT: r= 0.42).
CONCLUSION: The present study showed that EIT is a more metabolic and cardiovascular stressful stimulus than EIntT. Same volume and intensity, but higher fractioned distance might not produce the same physiological adaptations. In addition, the low correlations between La and HR showed that HR might not be a valid and reproducible variable to control metabolic intensity during ET in soccer.
Keyword: Endurance training; Blood Lactate; Soccer.

652 Board #3 May 30 3:15 PM - 5:15 PM

Effects of Two Types of Exercises on Serum MG53 and Its Relationship with Metabolic Biomarkers

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(No relevant relationships reported)

Mitsugumin-53 (MG53), a membrane repair protein, acts as an E3 ligase to induce insulin resistance and metabolic syndrome.**PURPOSE:** To investigate effects of two types of exercises on serum MG53 level, and its relationship with related metabolic biomarkers (testosterone, cortisol, leptin, insulin, glucagon, TG, TC, HDL-C and LDL-C). **METHODS:** Sixteen healthy males (23.1±2.9 yrs, 169.5±6.0 cm in height, 63.2±5.9 kg in weight, 53.2±5.4 ml/min/kg in VO_{2max}) signed the Informed Consent and participated in this study. Subjects performed two trials, high intensity interval exercise (60s*10 with an interval of 4 min, HE) and endurance exercise (65% VO_{2max} for 90 min, EE) with a 3-wk washout before HE. Blood samples were collected at pre-exercise, immediately, 1h, 4h and 24h post-exercise for the measurement of serum MG53 and biomarkers above. **RESULTS:** (1) MG53 significantly elevated immediately post- than pre-exercise in HE, but no statistic difference between HE and EE immediately post-exercise (3.40±2.46 vs. 2.68±2.12 ng/mL, $P>0.05$). Moreover, serum MG53 showed significant difference among individuals, three ranks of average MG53 can be seen either at pre-exercise (low: 0.58±0.27 ng/mL, n=10; medium: 2.15±1.13 ng/mL, n=12; and high: 4.77±1.34 ng/mL, n=10) or at post-exercise (low: 0.71±0.51 ng/mL, n=40; medium: 2.35±0.90 ng/mL, n=48; and high: 4.95±1.63 ng/mL, n=40). Serum TG, TC, HDL-C and LDL-C demonstrated the maximum immediately post-exercise and then declined in both trails, which is similar to serum MG53 dynamics. (2)MG53 showed a positive correlation with testosterone (r=0.355, P=0.001 in HE; r=0.281, P=0.011 in EE), cortisol (r=0.267, P=0.017 in HE) and TG (r=0.523, P=0.0005 in EE). However, a negative correlation with body mass was seen both in HE and EE (r=-0.459~-0.582, P=0.0000). **CONCLUSION:** High intensity interval exercise, not endurance exercise, induced significantly increased serum MG53. Serum MG53 demonstrated significantly weak positive correlation with some of metabolic biomarkers (testosterone, cortisol, and TG) in HE and/or in EE, a significantly negative correlation with body mass.*Supported by NSFC Grant 31371205 and General Administration of Sport Grant 2011B006

653 Board #4 May 30 3:15 PM - 5:15 PM

Increased Metabolic and Cardiorespiratory Stress with Isoenergetic Long vs. Short-Bout High-Intensity Interval Exercise

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(No relevant relationships reported)

Studies usually compare high-intensity interval exercise (HIIE) protocols of the same exercise bout duration and different exercise-to-interval ratios. Comparisons of HIIE protocols differing in bout duration while having the same exercise-to-interval ratio are missing. **PURPOSE**: To compare the metabolic and cardiorespiratory responses to isoenergetic HIIEs of different bout duration. **METHODS**: Eleven healthy males (age, 28 ± 6 y; height, 1.77 ± 0.07 m; body mass, 70 ± 11 kg; body fat, 9 ± 2 %, all mean ± SD) performed four trials in random, counterbalanced order, one week apart. Trials included 20 min of cycling with equal mean power output, performed either continuously (CON) or intermittently with 10 s (HIIE10), 30 s (HIIE30), or 60 s (HIIE60) bouts at an intensity corresponding to 100% of VO_2max. Recovery intervals during the HIIE trials were 15, 45 and 90 s, respectively, of cycling at an intensity corresponding to 15% of VO_2max (exercise-to-interval ratio of 1:1.5). Expired air was measured during each trial and venous blood was obtained before, immediately after, and 1 hour post-exercise. Lactate was measured in capillary blood every 5 min during exercise. Results were analyzed using 2-way ANOVA with repeated measures (condition x time) and Tukey's post-hoc test. **RESULTS**: Average VO_2 was similar in the HIIE trials (2.29 ± 0.42, 2.20 ± 0.43, 2.12 ± 0.45 L/min, for HIIE10, HIIE30 and HIIE60, respectively), corresponding to 65-70% of VO_2max. However, respiratory frequency and pulmonary ventilation were significantly higher in HIIE60 compared to HIIE10 and HIIE30 (by 10-19% and 20-23%, respectively, $p < 0.01$) during the last 10 min of exercise. Blood lactate was higher in HIIE60 compared to HIIE10 and HIIE30 from the 10^{th} min onward ($p < 0.01$), reaching peak values of 12.5 ± 3.5, 7.2 ± 2.1 and 7.9 ± 2.9 mmol/L, respectively, at the end of exercise. After exercise, white blood cell count (9.7 ± 2.8 x10^9/L), serum urate (0.35 ± 0.10 mmol/L), serum glucose (6.56 ± 1.44 mmol/L), and plasma volume change (-13.5 ± 4.4%) were greater in HIIE60 compared to all other protocols ($p < 0.01$). **CONCLUSIONS**: These findings highlight the importance of bout duration in HIIE, since a longer bout resulted in greater cardiorespiratory and metabolic stress compared to shorter bouts despite equal total work, duration, and work-to-rest ratio.

654 Board #5 May 30 3:15 PM - 5:15 PM

High Intensity Functional Training Improves Flexibility in Overweight and Obese Adults

Justin DeBlauw. *Kansas State University, Manhattan, KS.*

(No relevant relationships reported)

HIGH INTENSITY FUNCTIONAL TRAINING IMPROVES FLEXIBILITY IN OVERWEIGHT AND OBESE ADULTS

Justin A. DeBlauw, Pratik M. Patel, Jesse A. Stein, Thomas J. Barstow, FACSM, Craig A. Harms, FACSM, Katie M. Heinrich.
Functional Intensity Training Lab, Department of Kinesiology, Kansas State University, Manhattan, KS
Sponsor: Craig A. Harms, FACSM

High-intensity functional training (HIFT) has become a popular form of exercise training, however it is unknown how overweight/obese populations may benefit from this type of exercise prescription. **PURPOSE:** To compare the effects of HIFT versus ACSM recommended aerobic and resistance training (A-RT) on physical fitness characteristics in overweight/obese, physically inactive adults. **METHODS:** Twenty-three overweight/obese (BMI 30.3 ± 2.8) and physically inactive (< 30 minutes total activity per week) adults were recruited. Participants were randomized into either 8-weeks of: HIFT (3 d/wk for 60-minute sessions) or A-RT (3 d/wk of aerobic exercise for 50 minutes; 2 d/wk of resistance exercises). Physical fitness was assessed using the Eurofit fitness measures (sit and reach, standing broad jump, vertical jump, 30-seconds of push-ups and sit-ups), 40-meter dash, stork balance test, and peak oxygen consumption (VO_{2peak}) measured using a Modified Balke Protocol. Body composition was determined via dual energy X-ray absorptiometry, with all measures taken at baseline and post-training. Analysis of covariance was used to compare the change in physical fitness between groups while controlling for baseline scores. **RESULTS:** After adjusting for baseline values, there were no significant differences between groups for changes in physical fitness except for flexibility (HIFT = 1.1±2.3cm, A-RT: -0.1±1.1cm, $p = 0.05$). Additionally, the HIFT group spent 79.3% less time exercising per week than the A-RT group. **CONCLUSION:** Our results indicate that eight weeks of HIFT demonstrate improvements in flexibility in overweight/obese and physically inactive adults. However, longer duration interventions may result in greater adaptations in physical fitness and health parameters. Future investigations should aim to compare physical fitness adaptations between healthy adults and overweight/obese adults when using a HIFT exercise intervention while monitoring caloric intake.

655 Board #6 May 30 3:15 PM - 5:15 PM

Metabolic Effects of Two Novel High-Intensity Circuit Training Protocols

Tony P. Nunez[1], Fabiano T. Amorim[2], Nicholas M. Beltz[3], Christine M. Mermier[2], Terence A. Moriarty[2], Roberto C. Nava[2], Trisha A. VanDusseldorp[4], Len Kravitz[2]. *[1]Metropolitan State University of Denver, Denver, CO. [2]The University of New Mexico, Albuquerque, NM. [3]University of Wisconsin-Eau Claire, Eau Claire, WI. [4]Kennesaw State University, Kennesaw, GA.*

(No relevant relationships reported)

ABSTRACT

Circuit weight training (CWT) and high-intensity interval training (HIIT) are two popular exercise formats for stimulating both aerobic and anaerobic benefits in a time efficient manner. While some research has established the benefits of both formats, no research has determined if performing HIIT prior to CWT (HICWT) has a different acute response compared to integrated HIIT with mini-CWT (three-exercise clusters; TRIIT). **PURPOSE**: To examine the physiological effects [energy expenditure (EE), oxygen consumption (VO_2), heart rate (HR), blood lactate (BLa^-), blood pressure (BP), excess post-exercise oxygen consumption (EPOC)] and rating of perceived exertion (RPE) of the sequence order of HIIT with CWT. **METHODS**: Fourteen trained men (25.7 ±4.4 yr) completed two separate (by ≥72 hrs) resistance exercise protocols matched for time and load. Both protocols consisted of six HIIT bouts and three sets of nine exercises (50% one-repetition maximum) in a CWT or mini-CWT format. Oxygen consumption, HR and EE were monitored throughout the protocols, while EPOC, BLa^- (five time points), BP (four time points) and RPE were measured post-exercise. **RESULTS**: Oxygen consumption (1.991 ±0.224 vs. 1.923 ±0.225 L/min, p=.024), EPOC (62.0 ±7.8 vs. 57.0 ±6.2 kcal, p=.034) and EE (435 ±48.8 vs. 420 ±49.0 kcal, p=.012) was significantly higher during the HICWT compared to the TRIIT protocol. BLa^- was significantly higher at all post-exercise time points (immediate post, 5 min, 10 min and 20 min post-exercise) following the HICWT compared to the TRIIT protocol. Mean values for HR and RPE were similar (p>.05) for both protocols. **CONCLUSION**: Performing HIIT prior to CWT elicits higher metabolic perturbation compared to the integration of HIIT with mini-circuits. HICWT also required greater energy requirements during and after the protocol compared to TRIIT. However, there may not be a practical difference given the protocols only differed by ~25 kcal.

656 Board #7 May 30 3:15 PM - 5:15 PM

Comparison of Two HIIT Training Formats

Judith A. Ann Juvancic-Heltzel, Mackenzie Conrad, Laura Richardson, Brian Miller. *The University of Akron, Akron, OH.*
(Sponsor: Ronald Otterstetter, FACSM)

(No relevant relationships reported)

High intensity interval training (HIIT) is a safe and effective workout that can be modified to meet all fitness levels. During each session bouts of high intensity exercise are interspersed with active recovery periods. Music has been shown to increase an individual's enjoyment of exercise which may increase adherence. A new HIIT program (SZ) incorporates music with movement using reverse engineered music aligned to match movements. It has been suggested that using music synced with choreographed movement may motivate participants and increase exercise adherence. PURPOSE: To compare HR, RPE, lactate and PACES between two HIIT formats. METHODS: Participants attended two, sixty minute, counterbalanced HIIT sessions – Traditional (T) and SZ. Blood lactate was measured pre and 10 minutes post, while HR and RPE were measured pre, 15, 30, 45 and post session. Physical Activity Enjoyment Scale (PACES) was collected at the end of each session. A 2x2 cross-over design using a repeated measures ANOVA was employed to test for difference by program and pre-post assessment blood lactate, HR, RPE, and PACES with statistical significance set at $p \leq 0.05$. RESULTS: The overall ANOVAs for all factors reached statistical significance ($p<0.001$). For lactate there was a significant interaction between pre and post assessment by program [$F(1,12) = 6.724$, $p<0.001$] with SZ having an average adjusted difference of 2.76±3.84mmol/L less compared to T. For HR and RPE, there were no statistically significant differences between SZ and T ($p = 0.313$ and $p = 0.445$, respectively). However, there was an overall increase in HR and RPE from pre to post for both programs of 29.18±4.43bpm ($p<0.001$) and 2.61±0.67 ($p = 0.002$), respectively. The difference in PACES between programs did not reach statistical significance [$t(13) = 1.097$, $p = 0.293$] with mean scores of 93.36±16.52 and 87.93±17.47 for SZ and T, respectively. CONCLUSION: Understanding participants perceptions between T and SZ may provide insight for strategies and programming to enhance exercise adherence. The addition of synced music with SZ may motivate participants and promote exercise adherence. Future research on the long term effects of SZ on biometrics is warranted.

B-39 Thematic Poster - **Running Injuries**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100E

657 **Chair:** Allison H. Gruber. *Indiana University Bloomington, Bloomington, IN.*

(No relevant relationships reported)

658 Board #1 May 30 3:15 PM - 5:15 PM

Peak Braking Force as a Risk Factor for Running-Related Injuries

Christopher Napier[1], Christopher L. MacLean[2], Jack E. Taunton, FACSM[1], Jessica Maurer[2], Michael A. Hunt[1]. *[1]University of British Columbia, Vancouver, BC, Canada. [2]Fortius Institute, Burnaby, BC, Canada.* (Sponsor: Jack Taunton, FACSM)

(No relevant relationships reported)

Kinetic factors have been implicated in the development of several running-related injuries (RRIs). Most research has focused on measures of vertical loading, such as the average vertical loading rate (AVLR), instantaneous vertical loading rate (IVLR), and vertical impact peak (VIP), as they have all been associated with RRI in retrospective analyses. Less studied has been the horizontal braking force exerted on the body during running.

PURPOSE: To prospectively predict the capacity of vertical and horizontal loading variables on RRI risk.

METHODS: 74 healthy female recreational runners ran at their preferred speed on an instrumented treadmill while ground reaction force data and 3D joint kinematics were collected. Main kinetic outcomes were VIP, AVLR, IVLR, active vertical peak, vertical impulse, and peak braking force (PBF). After baseline testing, participants began a 15-week half-marathon training program. Pain and running volume were recorded via a weekly online log. Exposure time (hours of running) was calculated from the start of the training program until onset of injury (INJ) or right-censoring at non-RRI, loss to follow-up, or end of 15-week program (UNINJ). After converting kinetic variables from continuous to ordinal variables based on tertiles, Cox proportional hazard ratios were fit for each kinetic variable independently.

RESULTS: 65 participants were included in the final analysis. 22 were diagnosed with an RRI (mean exposure of 17.46+/-9.81 hours). 33 completed the program without injury (mean exposure of 43.46+/-10.48 hours). PBF was the only kinetic variable significantly associated with increased injury risk when compared to the middle tertile. Participants with a high PBF were injured at 4.87 (95% CI: 1.54-15.44) times the rate of those in the middle tertile of PBF. INJ participants also had a significantly greater (more negative) PBF than UNINJ (-0.27+/-0.04 BW vs. -0.24+/-0.04 BW; p=.002, ES=0.91). Finally, when analysed in a multivariable model, no other kinetic variables made a significant contribution to predicting injury beyond what had already been accounted for by PBF alone.

CONCLUSIONS: Findings from this study suggest PBF is associated with a significant increased risk of RRI in female recreational runners. Future studies should include this variable in their analysis.

659 Board #2 May 30 3:15 PM - 5:15 PM

A Comparison Of Ground Reaction Forces And Sagittal Plane Ankle Kinematics Between Runners With Achilles Tendinopathy And Healthy Controls

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(No relevant relationships reported)

Achilles tendinopathy (AT) is one of the most common injuries in distance running with a rate of 8% to 15% of all running injuries and a 52% lifetime incidence in male runners. The biomechanics of running gait associated with AT has not been well-studied.

PURPOSE: To compare the sagittal plane ankle angle kinematics as well as vertical medial, and lateral ground reaction forces and loadrates in runners with and without AT.

METHODS: 22 rearfoot strike (RFS) runners with AT (15M, 7F) and 22 matched healthy RFS runners (CON) ran on an instrumented treadmill, while sagittal plane video and ground reaction force data were collected. Foot angles (FA) and tibia angles (TA) were measured, and ankle dorsiflexion angles (DF) were calculated. Values were determined at the point of footstrike (FS) and peak, with total excursion also being calculated. Additionally, vertical average and instantaneous loadrates (VALR, VILR) were calculated. Finally, medial and lateral forces (MF, LF) and medio-lateral instantaneous loadrates (MLILR) were extracted. Comparisons between the AT and CON groups were made using independent t-tests ($p < 0.05$).

RESULTS: Overall, there were no differences in FA, TA or DF angle at footstrike or at peak, or in ankle excursions between the AT and CON groups (Table 1). Additionally, no differences were noted in VALR, VILR, MF, LF and MLILR between groups.

CONCLUSION: These preliminary data suggest that runners with AT do not exhibit ground reaction force differences or differences in sagittal plane ankle kinematics compared their healthy counterparts. Future studies need to include other measures such as frontal plane kinematics and ankle joint kinetics, as well as strength and flexibility measures of the ankle.

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Table 1. Ankle kinematics and GRF (mean±SD) in runners with AT and CON

	AT	CON	*P*
Foot angle @ FS (°)	12.0±3.8	11.2±3.9	0.496
Tibia angle @ FS (°)	5.1±2.5	5.1±2.7	0.979
Ankle angle @ FS (°)	6.9±2.2	6.1±2.6	0.286
Pk Ankle angle (°)	25.9±2.1	26.6±2.5	0.314
Ankle excursion (°)	18.9±3.1	20.5±2.8	0.095
VALR (BW/s)	65.6±18.6	61.2±23.7	0.493
VILR (BW/s)	75.1±20.9	70.7±25.7	0.543
VertStiffness (kN/m)	90.4±27.4	82.5±30.4	0.371
Med ILR (BW/s)	12.3±11.3	9.0±5.0	0.221
Lat ILR (BW/s)	12.2±8.3	11.1±7.8	0.638
Pk Med Force (BW)	0.11±0.06	0.12±0.05	0.543
Pk Lat Force (BW)	0.09±0.07	0.07±0.04	0.312

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Association Of Isometric Hip And Ankle Strength With Frontal Plane Kinetics In Females During Running

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(No relevant relationships reported)

Frontal plane mechanics have been associated with running-related injuries such as patellofemoral pain. Strengthening and gait retraining programs aimed at reducing hip adduction during running have been shown to be effective at alleviating symptoms, however evidence of their effect on running kinematics is equivocal. It is possible that such programs exert their benefits through altering kinetics rather than kinematics in the frontal plane during running. Further, the contributions of the ankle to frontal plane mechanics have not been well studied. **PURPOSE**: To determine if hip and ankle strength are associated with frontal plane kinetics in female runners.

METHODS: 64 healthy women running at least 16km per week participated in this study. Isometric hip abduction and ankle inversion strength were measured using a handheld dynamometer. 3D gait analysis was conducted as participants ran on an instrumented treadmill at 2.7 m/s. Participants were ranked in order of isometric strength of both the hip and ankle, and divided into tertiles of high, medium and low strength. 2-way MANOVA was used to determine the relationship between strength and peak moment, positive work and negative work in the frontal plane of the hip and the ankle. Tukey post-hoc tests were conducted where applicable (α=0.05).

RESULTS: There was no significant interaction effect, or main effect of hip strength. There was a significant main effect of ankle strength on frontal plane kinetics (p=0.024). Specifically, the strong ankle group compared to the weak ankle group had significantly greater magnitude of peak ankle inversion moment (0.95(0.32) vs 0.68(0.22) Nm/kg, p=0.033), hip abduction moment (-2.78(1.02) vs -1.88(0.24) Nm/kg, p=0.002) and hip frontal plane positive work (0.27(0.19) vs. 0.13(0.03) W/kg, p=0.006).

CONCLUSIONS: Isometric ankle but not hip strength is associated with kinetics in the frontal plane during running in females. Thus ankle strength should not be overlooked in clinical evaluation and treatment of runners.

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The Role Of Off-axis Force In Running-related Overuse Injury

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(No relevant relationships reported)

Running-related overuse injuries are endemic among active populations. During the stance phase of running, the ground reaction force vector (GRF) and shank are not always aligned. Thus, some portion of the GRF is directed perpendicular to the shank and causes a bending moment, which may be implicated in the etiology of injury. **PURPOSE:** To examine the portion of the GRF that is directed perpendicular to the shank in injured and uninjured runners. **METHODS:** Twenty-seven runners were followed for a minimum of 43 weeks. Fourteen sustained injury. Overground kinetic and kinematic data were collected at 4.0 m/s (normalized to body weight). Using the sagittal plane angle between the shank and the GRF (GRF/SK angle), the sagittal plane GRF was decomposed into two components: one parallel to the shank (on-axis GRF) and one perpendicular to the shank (off-axis GRF). Group differences were assessed with an independent-samples *t*-test ($\alpha = 0.05$). **RESULTS:** While impact peak was a prominent feature of the on-axis GRF, it was mostly absent in the off-axis GRF. Peak off-axis GRF occurred at midstance for all subjects (Figure 1). Off-axis GRF at impact was similar ($p = 0.52$, Cohen's $d = 0.25$) between injured (0.22 ± 0.13 BW) and uninjured groups (0.20 ± 0.10 BW). Peak off-axis GRF was also similar ($p = 0.11$, $d = 0.63$) between injured (1.24 ± 0.09 BW) and uninjured (1.31 ± 0.13 BW) groups. GRF/SK angle was highly variable (range -25.0° to 25.3°) during initial contact but means were similar between groups (injured 6.08 ± 13.5°; uninjured 7.97 ± 14.4°; $p = 0.73$, $d = 0.14$). **CONCLUSION:** Concerning running injury, the off-axis GRF may be 1) not a significant contributor to injury, 2) only important when combined with other factors, or 3) related only to specific injuries.

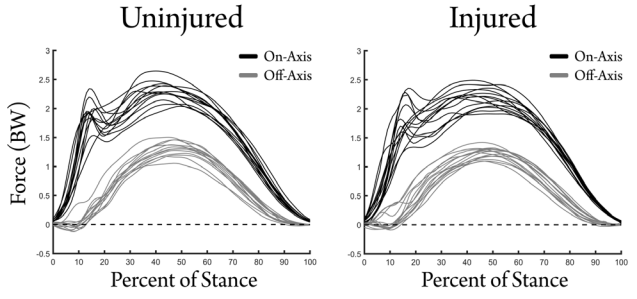

Figure 1. On-axis and off-axis components of GRF relative to the shank during stance in uninjured and injured runners. The impact peak is not a prominent feature of off-axis GRF. Neither off-axis GRF at impact nor peak off-axis GRF differ between groups.

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Effects Of A 4-week Intervention Using Semi-custom Foot Orthoses On Perceived Pain And Patellofemoral Loading In Targeted Sub-groups Of Recreational Runners.

Jonathan Sinclair. *University of Central Lancahsire, Preston, United Kingdom.*

(No relevant relationships reported)

PURPOSE The current study explored the effects of a 4-week intervention using foot orthoses on pain symptoms, psychological wellbeing and patellofemoral loading in recreational runners. **METHODS** Seventeen (10 males & 7 females) runners were firstly administered 6 clinical assessments, used to separate them into specific subgroups. They were then provided with a pair of semi-custom foot orthoses, which they wore for a period of 4-weeks. Lower extremity kinetics/ kinematics and patellofemoral loading during running at 4.0 m/s were obtained using an eight-camera motion capture system and force platform. In addition, participants self-reported knee pain was examined using the Knee injury and Osteoarthritis Outcome Score-Patellofemoral subscale (KOOS-PF). Data were collected before and after wearing the orthoses for 4-weeks. **RESULTS** The subgrouping revealed that 11 participants belonged to the strong subgroup and 6 to the weak and tight group. Patellofemoral loads were significantly reduced in both genders/subgroups (pre: male/strong=3.35BW, male/weak and tight=3.19BW, female/strong=3.50BW, female/weak and tight=4.17BW & post: male/strong=3.04BW, male/weak and tight=2.15BW, female/strong=3.17BW, female/weak and tight=3.56BW). Significant improvements were also shown for KOOS-PF in both genders/subgroups (pre: male/strong=62.99, male/weak and tight=53.79, female/strong=65.34, female/weak and tight=52.27 & post: male/strong=71.75, male/weak and tight=74.24, female/strong=71.03, female/weak and tight=71.21), although only improvements in the weak and tight group exceeded the minimum threshold required for clinical relevance. **CONCLUSION** The observations from this study indicate that it may be advisable for male and female recreational runners from the weak and tight subgroup of patellofemoral pain patients, to utilize foot orthoses as a mechanism to reduce their symptoms.

663 Board #6 May 30 3:15 PM - 5:15 PM

Patellofemoral Pain Lead to Greater Joint Motion and Coordination Variability during a Prolonged Run

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(No relevant relationships reported)

PURPOSE: To examine effects of patellofemoral pain (PFP) on lower extremity kinematics and joint coordination variability during a prolonged run. **METHODS**: Participants included 12 college-aged female runners in two groups: 6 with PFP and 6 healthy (CON), matched by age, height and body mass. Kinematic data was captured at sampling of 100Hz. Sixteen anatomical retroreflective markers, 7 tracking clusters, were placed on the participants' lower extremities for the static trial. Only the clusters remained for the running trial. Participants ran at a self-selected pace on a treadmill until they met exertion or pain criteria. Data for 20 steps from 3 time points (beginning, middle, and end) of the run were processed. Kinematic variability was assessed for each participant by calculating the standard deviation (SD) of peak knee flexion, internal rotation, and adduction angle and their velocities over 20 steps captured at the 3 time points. Continuous relative phase (CRP) mean values were calculated from normalized phase plots for coordination relationships between knee horizontal plane motion and hip sagittal, frontal, horizontal and ankle frontal plane motion. Coordination variability was calculated as the CRP coupling SD over 100% of stance for each time point for each participant. Statistical comparisons were assessed through a 2 (PFP vs CON) x 3 (beginning, middle, and end) repeated measures ANOVA. **RESULTS**: There was an increase in variability for peak knee adduction angle (PFP: 0.6, 0.6, 0.14; CON: 0.5, 0.9, 0.6, group X time interaction: $p < .05$), peak knee adduction velocity (PFP: 13.1, 14.7, 30.7; CON: 20.4, 13.1, 15.6, group X time interaction: $p < .05$), hip flexion / knee rotation CRP (PFP: 73.2, 56.7, 125.5; CON: 70.2, 70.0, 57.3, group X time interaction: $p < .05$), and knee rotation / rearfoot eversion CRP (PFP: 35.4, 47.2, 90.5; CON: 30.7, 27.6, 25.1, group X time interaction: $p < .05$) over time for the PFP group compared with healthy. **CONCLUSIONS**: The increase in joint kinematics and coordination variability over time observed only in the PFP group may indicate that pain and exertion experienced by the PFP group may decrease movement control towards the end of a prolonged run.

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The Effect of Base of Gait on Hip and Pelvis Frontal Plane Motion in Collegiate Cross Country Runners

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(No relevant relationships reported)

Increased hip adduction and contralateral pelvic drop have been correlated with several running related injuries including iliotibial band syndrome, patellofemoral pain, and tibial stress injuries. A narrow base of gait (BOG), defined as the mediolateral distance between the foot and the body's line of gravity has been suggested as a contributing factor to these increased frontal plane motions of the hip and pelvis. Despite limited investigation into this relationship, narrow BOG is routinely considered an injury risk factor in clinical practice when evaluating running mechanics.
Purpose: To identify the influence of BOG on peak hip adduction and peak contralateral pelvic drop in healthy, collegiate cross country runners at a range of speeds.
Methods: Whole body kinematics were recorded for 56 healthy runners (30 females) at 2.68, 3.35, and 4.47 m/s. The amount of variance in peak hip adduction and contralateral pelvic drop during stance explained by BOG was reported as the adjusted R^2 value using a linear regression model with significance at 0.05. Data across all speeds were included in the model with speed defined as a covariate to ensure validity. Sex was also included as a covariate due to its known effects on running mechanics.
Results: The final model used to predict peak hip adduction angle demonstrated an R^2 of 0.404 ($p < 0.001$) with coefficients as follows: BOG at midstance ($B = -0.491$, $p < 0.001$), sex ($B = -1.69$, $p < 0.001$), speed ($B = 0.7$, $p < 0.001$), and intercept ($B = 12.240$, $p < 0.001$). This indicates a negative association between BOG and hip adduction, with a decrease in BOG demonstrating an increased hip adduction angle. An R^2 of 0.013 ($p = 0.265$) resulted from the model used to predict peak pelvic lateral drop with coefficients for BOG at midstance ($B = 0.082$, $p = 0.436$), sex ($B = -0.242$, $p = 0.45$), speed ($B = -0.11$, $p = 0.29$), and intercept ($B = -5.071$, $p < 0.001$).

Conclusion: When controlling for sex and running speed, BOG accounts for 40% of the variance in peak hip adduction, while only predicting <1% of the variance in contralateral peak pelvic drop. The increased peak hip adduction that accompanied a more narrow BOG is likely due to femoral adduction, as contralateral pelvic drop was minimally affected by BOG.

B-40 Thematic Poster - **Vascular Function**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Lower level L100F

665 **Chair:** R Matthew Brothers. *University of Texas at Austin, Austin, TX.*

(No relevant relationships reported)

666 Board #1 May 30 3:15 PM - 5:15 PM

Physical Activity Modulates Blood Pressure Regulation During Controlled Low and High Salt Diets

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(No relevant relationships reported)

Purpose: Increased blood pressure (BP) reactivity and variability are predictive of future cardiovascular events. Excess dietary salt exaggerates neurally-mediated BP reactivity, and BP variability in salt-resistant rodents. Regular physical activity (PA) blunts BP reactivity in rodents. However, the interaction of salt and PA on neurovascular regulation has not been investigated in humans. Therefore, we sought to test the hypothesis that high habitual PA mitigates high dietary salt-induced increases in BP reactivity and BP variability in healthy, young adults. **Methods:** Nine participants (5F/4M, 27±2 yrs, BMI: 23.3±0.9 kg/m^2) completed randomized, controlled 10-day diets of low (2.6 g/day), and high (18 g/day) salt. Beat-to-beat laboratory BP was measured via photoplethysmography on day 10 of each diet. BP reactivity was assessed as ΔBP (mmHg) during the final minute of a 2-min hand grip exercise at 40% maximal voluntary contraction compared to a preceding baseline. Average real variability (ARV) index was used to assess BP variability derived from 24-hour ambulatory BP monitoring. Habitual PA was assessed via accelerometry (Actigraph GT3X). Differences in high vs. low salt BP reactivity (ΔBP reactivity) and ambulatory BP variability (ΔBP ARV) were correlated against PA. Twenty four-hour urinary sodium excretion was measured. **Results:** There were no differences in 24-hr mean arterial BP on the high vs. low salt diet (82.9±2.1 vs. 79.8±2.4 mmHg; $p > 0.10$). Urinary Na^+ excretion increased on the high vs. low salt diet (256.9±20.5 vs. 39.5±11.2 mmol/24 hours; $p < 0.05$). There was a trend for the high salt diet to augment systolic ($p = 0.08$), but not diastolic BP reactivity during hand grip exercise. Habitual PA was inversely correlated to Δ systolic BP reactivity (r = -0.74, $p = 0.03$), and there was a trend for an inverse correlation with Δ diastolic BP reactivity (r = -0.68, $p = 0.06$) during hand grip exercise. There was a trend for higher 24-hr systolic BP ARV on the high salt diet (10.6±0.8 vs. 8.9±0.6 mmHg; p = 0.09), but there was no correlation between PA with Δ systolic BP ARV (r = -0.29, $p = 0.48$) on the high vs. low salt diet. **Conclusion:** These preliminary data suggest that high habitual physical activity may offset some of the adverse neurovascular effects of high dietary salt in young, healthy, salt-resistant humans.

667 Board #2 May 30 3:15 PM - 5:15 PM

Particulate Matter Air Pollution and Vascular Function in Older Adults:A Natural Experiment

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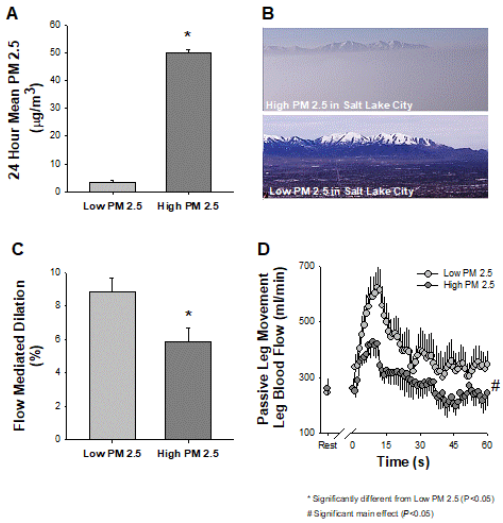
(No relevant relationships reported)

PURPOSE: The risk of cardiovascular complications in the elderly increases with acute elevations in ambient, fine particulate matter air pollution ($PM_{2.5}$), and may be related to pollution-induced vascular dysfunction. Therefore, the purpose of this study was to utilize the large, episodic swings in ambient $PM_{2.5}$, typical of the Wasatch Front in Utah, as a natural experiment to determine the extent to which acute exposure to ambient $PM_{2.5}$ affects vascular function in healthy, older adults.
METHODS: Vascular function (flow-mediated dilation, FMD; passive-leg-movement-induced hyperemia, PLM), and pulmonary function were measured in 10 old subjects (70.5±2.3 years) during acute episodes of >120 hours of low (3.4±0.8 μg/m^3) and 24-96 hours of high (50.0±1.2 μg/m^3), naturally-occurring ambient $PM_{2.5}$ (Figures A and B). Markers of systemic inflammation were also assessed in venous blood during each visit.
RESULTS: Notably, high ambient $PM_{2.5}$ exposure was associated with a 34% reduction in vascular function assessed by FMD (Low $PM_{2.5}$: 8.9±1.0%; High $PM_{2.5}$: 5.9±1.0%; $P<0.05$; Figure C), and a 78% reduction in vascular function assessed by PLM (area under the curve: Low $PM_{2.5}$: 145±38 ml, High $PM_{2.5}$: 31±25 ml; $P<0.05$, Figure D). Additionally, acute exposure to high ambient $PM_{2.5}$ was accompanied by an increase in markers of systemic inflammation (*e.g.* Plasma C-Reactive Protein, Low $PM_{2.5}$: 872±143 ml, High $PM_{2.5}$: 1365±220 ng/ml; $P<0.05$), which may contribute to the decrease in vascular function. Interestingly, natural exposure to high levels of $PM_{2.5}$ did not significantly affect pulmonary function (FEV_1/FVC: Low $PM_{2.5}$: 74±2%; High $PM_{2.5}$: 72±2%; $P>0.05$).
CONCLUSIONS: Despite a lack of detectable changes in pulmonary function, acute, natural exposure to elevated ambient $PM_{2.5}$ results in markedly impaired vascular function in older adults, possibly a consequence of pollution-induced systemic inflammation.



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Skeletal Muscle Microvascular Permeability After Eccentric Contraction-Induced Muscle Injury: Novel In Vivo Imaging Using Two-Photon Laser Scanning Microscopy

Kazuki Hotta[1], Brad J. Behnke[2], Kazuto Masamoto[1], Rie Shimotsu[1], David C. Poole, FACSM[2], Yutaka Kano[1]. [1]*University of Electro-Communications, Tokyo, Japan.* [2]*Kansas State University College of Human Ecology, Manhattan, KS.* (Sponsor: David C. Poole, FACSM)

(No relevant relationships reported)

Within injured skeletal muscle the capillary bed plays a crucial role in leukocyte invasion through modulations of the endothelial integrity, associated with increased permeability. However, direct observation of altered microvascular permeability and compromised capillary integrity has not been technically feasible. Two-photon laser scanning microscopy (TPLSM) allows three-dimensional *in vivo* imaging which, given the depth of penetration and high resolution of TPLSM, will facilitate measurement of microvascular leakage. **PURPOSE:** We hypothesized that the regulation of capillary permeability *in vivo*, as assessed by real-time TPLSM, is temporally related to acute inflammatory and regenerative processes following muscle injury. **METHODS:** Tibialis anterior muscles of anesthetized male Wistar rats (n=57) were subjected to eccentric contractions (ECC) via electrical stimulation. The skeletal muscle microcirculation was imaged by an intravenously infused fluorescent dye (rhodamine b isothiocyanate dextran, molecular weight 70,000 Daltons) to assess microvascular permeability via TPLSM 1, 3 and 7 days after ECC. Immunohistochemistry on serial muscle sections was performed to determine the percentage of VEGF-A positive muscle fibers in the damaged muscle. **RESULTS:** Compared with non-ECC control, the volumetrically-determined interstitial leakage of fluorescent dye had increased significantly on days 1 and 3 post-ECC (5.1±1.4, 5.3±1.2 vs. 0.51±0.14 μm^{3}x10^6, P<0.05 respectively days 1 and 3 vs. control). However, by post-ECC day 7 interstitial leakage had returned to control values. Damaged muscle fibers were evident on days 1 and 3 (% damaged muscle fiber: 11.7±4.7, 48.4±12.4% vs. 0% P<0.05 respectively days 1 and 3 vs. control). Percentage of VEGF-A positive muscle fiber in damaged muscle fiber was significantly higher on days 1 and 3 compared to control (24.9±9.8, 39.3±16.7 vs. 0%, P<0.05 respectively days 1 and 3 vs. control). Regenerated

skeletal muscle fibers were found only at 7 days post-ECC. **CONCLUSION:** *In vivo* TPLSM imaging represents a powerful investigative technique for skeletal muscle microcirculatory research. Microvascular hyperpermeability is associated with ECC-induced muscle damage and increased VEGF expression.

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Acute Ultraviolet Radiation Exposure Attenuates Nitric Oxide-Mediated Vasodilation in the Cutaneous Microvasculature

S. Tony Wolf, Anna E. Stanhewicz, Tyler B. Garner, Nina G. Jablonski, W. Larry Kenney, FACSM. *Pennsylvania State University, University Park, PA.* (Sponsor: W. Larry Kenney, FACSM)

(No relevant relationships reported)

The bioactive metabolite of folate, 5-methyltetrahydrofolate (5-MTHF), is degraded by ultraviolet radiation (UVR) *in vitro,* and UVR exposure to the skin may deplete bioavailable 5-MTHF in the exposed area. Adequate 5-MTHF is essential for full expression of nitric oxide (NO)-mediated vasodilation of the cutaneous microvasculature through its indirect role in enzymatic coupling of nitric oxide synthase (NOS). **Purpose:** To determine the acute effects of UVR exposure on NO-mediated vasodilation in the cutaneous microvasculature and the role of 5-MTHF on this response. We hypothesized that acute UVR exposure would attenuate NO-dependent vasodilation and that local delivery of 5-MTHF would augment NO-dependent vasodilation after UVR exposure. **Methods:** Two microdialysis fibers were placed in the ventral skin of both forearms in 11 healthy young adults (23±4 y; 5M/6F) for local delivery of lactated Ringers (control) or 5 mM 5-MTHF. One arm was randomly chosen for exposure to 300 mJ/cm^2 UVR while the other served as a non-exposed control (CON). Red cell flux was measured at each site by laser-Doppler flowmetry (LDF). Following a baseline period, a standardized local heating (42°C) protocol was used to induce cutaneous vasodilation. Once a stable skin blood flow plateau was achieved, 15mM NG-nitro-L-arginine methyl ester (L-NAME) was perfused at all sites to inhibit NOS. Cutaneous vascular conductance was calculated (CVC = LDF/MAP) and expressed for each phase of the local heating response (initial peak, plateau, NO-mediated vasodilation) as a percentage of maximum (%CVC$_{max}$; 28mM sodium nitroprusside + 43°C). **Results:** No differences were seen for %CVC$_{max}$ between UVR and CON for the initial peak ($p \geq 0.51$) or heating plateau ($p \geq 0.58$) across microdialysis sites. UVR exposure blunted NO-mediated dilation in the UVR exposed arm compared to CON (16.4±12.1 vs 33.4±17.9%; p=0.02). Local delivery of 5-MTHF augmented NO-mediated vasodilation compared to the control site in the UVR exposed arm (36.4±19.9 vs 16.4±12.1%; p=0.005). **Conclusion:** NO-mediated vasodilation is attenuated after acute UVR exposure, but is restored with local delivery of 5-MTHF. Acute UVR exposure may impair NO-mediated vasodilation through photodegradation of 5-MTHF.

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No Sex Differences in Arterial Stiffness and Hemodynamics Response to Resistance Exercise in Older Individuals

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(No relevant relationships reported)

Arterial stiffness (AS) contributes to high blood pressure and cardiovascular disease in both men and women. However, sex differences do exist in the incidences rates of stroke with aging, with older women having a greater risk. These sex differences in older individuals have not been fully explained and an acute hypertensive stimulus (e.g. resistance exercise (RE)) may provide a viable physiological stressor to elucidate potential differences. **PURPOSE:** To determine if sex differences exist for arterial stiffness following acute RE among older individuals. **METHODS:** Ten males (61 ± 6 yrs; 30.9 ± 4.4 kg/m^2) and 15 females (59 ± 6 yrs; 29.5 ± 6.3 kg/m^2) completed 3 sets of 10 reps of maximal isokinetic knee extension and flexion on a force dynamometer. Central AS was evaluated by pulse wave velocity (PWV), obtained from an automated ambulatory BP monitor at baseline, immediate and 30 min post-RE. Hemodynamic variables (cardiac output (Q), cardiac index (Qi), heart rate (HR), stroke volume (SV), mean arterial BP (MAP)), were also acquired from the brachial oscillometric BP waveforms. Local AS was determined by carotid measurements (β-stiffness index, pressure-strain elasticity modulus (Ep) and arterial compliance (AC)) using ultrasonography. **RESULTS:** See Table 1. PWV, Q, HR and MAP increased immediate post-RE similarly in both groups ($p<0.05$). However, females had an overall lower AC and Q compared to older males ($p<0.05$). **CONCLUSION:** No sex differences were observed in arterial stiffness following acute RE. Thus, the AS response to an acute RE bout did not provide insight regarding contributing factors as to why women are at a greater risk of cerebrovascular events.

	Group	Baseline	Immediate	30-min
PWV (m/s)*	Male	8.8 ± 0.9	9.6 ± 1.0	8.9 ± 0.8
	Female	8.5 ± 1.1	9.2 ± 1.1	8.5 ± 1.2
β-stiffness index	Male	10.9 ± 2.9	10.1 ± 2.6	11.2 ± 3.4
	Female	12.6 ± 2.5	12.1 ± 3.5	12.3 ± 2.1
Ep (kPa)	Male	141 ± 32	136 ± 33	147 ± 34
	Female	170 ± 42	168 ± 60	170 ± 30
AC (mm^2/kPa)#	Male	0.63 ± 0.15	0.68 ± 0.19	0.60 ± 0.12
	Female	0.47 ± 0.09	0.51 ± 0.18	0.47 ± 0.10
Q (L/min)*#	Male	4.9 ± 0.8	5.9 ± 1.5	5.1 ± 0.6
	Female	4.5 ± 0.4	4.9 ± 0.8	4.7 ± 0.5
Qi (L·min^{-1}·m^{-2})*	Female	2.3 ± 0.4	2.8 ± 0.7	2.4 ± 0.3
	Male	2.5 ± 0.3	2.7 ± 0.4	2.6 ± 0.3
SV (mL)	Male	76 ± 15	82 ± 17	75 ± 10
	Female	74 ± 9	71 ± 10	73 ± 10
HR (bpm)*	Male	65 ± 10	75 ± 12	70 ± 11
	Female	61 ± 8	72 ± 7	65 ± 8
MAP(mmHg)*	Male	107 ± 6	120 ± 10	109 ± 7
	Female	103 ± 10	116 ± 10	106 ± 10

Table 1. All data are mean ± SD, *Time Effect , #Group Effect, $p<0.05$

671 Board #6 May 30 3:15 PM - 5:15 PM

Moderate-to-Severe Sleep Apnea and Total Body Fat are Inversely Associated with Vascular Function Changes Following Exercise Training

Devon A. Dobrosielski[1], Christopher Papandreou[2], Susheel Patil[3], Hyunjeong Park[1]. *[1]Towson University, Towson, MD. [2]Rovira i Virgili University, Reus, Spain. [3]Johns Hopkins School of Medicine, Baltimore, MD.*

(No relevant relationships reported)

Obstructive sleep apnea (OSA) is associated with increased cardiovascular morbidity in middle-aged men due, in part, to impaired vascular function. Exercise confers cardioprotection by improving vascular health. Whether this beneficial effect is attenuated in the presence OSA is not known. **PURPOSE:** Examine the joint association of OSA severity and total body fat % with brachial artery flow mediated dilation (BAFMD) changes following exercise training in overweight men with and without OSA. **METHODS:** At baseline, all participants underwent overnight polysomnography to determine the presence of OSA, as defined by the apnea-hypopnea index (AHI). Total body fat was measured using dual energy X-ray absorptiometry. BAFMD was assessed using high- resolution ultrasonography before and upon completion of a 6-week (3 sessions/week; 1 hour/session) exercise training program. **RESULTS:** Five men with moderate to severe OSA (+OSA) and five men with no to mild OSA (*OSA) completed the study. Per study design, the AHI of the +OSA group was higher compared to the *OSA group (34 ± 12 events/hour vs. 8 ± 5 events/hour, p=0.009). While no baseline differences were observed between the groups in age (49 ± 6 years vs. 46 ± 9 years, p=0.528) or BMI (36.1 ± 6.2 kg/m^2 vs. 32.6 ± 3.8 kg/m^2, p=0.250), total body fat % was higher in the +OSA group (41 ± 3 % vs. 36 ± 3 %, p=0.009). Stepwise regression analysis revealed that an AHI above 15 events/hour and total body fat % above the median (joint category) [beta coefficient = -2.89, (95% CI -3.59 - -0.71), p=0.040] were significant and independent determinants of the change in BAFMD with exercise, after adjusting for baseline BAFMD, age and BMI. **CONCLUSION:** A combination of moderate-to-severe OSA and high total body fat % was inversely associated with the level of improvement in vascular function following exercise training.

672 Board #7 May 30 3:15 PM - 5:15 PM

Acute Influence of Caffeine on Arterial Stiffness and Central Blood Pressures Following Aerobic Exercise

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(No relevant relationships reported)

Caffeine ingestion alters blood pressure (BP), however, the interactive effect of caffeine and exercise on central BP is unknown. **PURPOSE:** Examine the acute influence of caffeine and moderate-intensity aerobic exercise on post-exercise

central BP and arterial stiffness. **METHODS:** Ten males (aged 55±5; range 31-71 years) completed two exercise trials after ingestion of caffeine (400 mg) or placebo. Peripheral (brachial) and central (aortic) BP were assessed via pulse wave analysis (PWA) and arterial stiffness via pulse wave velocity (PWV) obtained before and 30 min post-ingestion. Participants performed 40-min of cycling at 70% of HRmax using identical workloads between trials. PWA and PWV were collected again 10 and 30 min post-exercise. Data were analyzed via two-way ANOVA with repeated measures. **RESULTS:** Prior to exercise, compared to placebo, caffeine increased (P<0.05) brachial systolic blood pressure (bSBP) (+12mmHg), brachial diastolic blood pressure (bDBP) (+8mmHg), central systolic blood pressure (cSBP) (+11mmHg) and central diastolic blood pressure (cDBP) (+7mmHg). PWV was higher (0.75 vs. 0.22m/s) 30 minutes post caffeine ingestion, independent of trial (P<0.05) while there was a trend for an interaction (P=0.074), suggesting an increase in PWV with caffeine. Post-exercise, bSBP (-4.8 vs. -6.1mmHg) and PWV (-0.40 vs. -0.74m/s) were higher in caffeine (P<0.05), likely due to the influence of caffeine prior to exercise. cSBP (-5 vs. -6mmHg) and bDBP (-3.5 vs. -1.8mmHg) were lower after exercise, independent of trial (P<0.05) while bSBP (-4.8 vs. -6.1mmHg) and cDBP (-3.1 vs. -1.5mmHg) trended (P=0.07) to be lower after exercise, independent of trial. PWV (-0.11 vs. -0.06m/s) remained higher (P<0.05) after exercise in caffeine compared to placebo but was not influenced by exercise. Accordingly, AP (-2.7 vs. -1.1mmHg) and AIx (-5.5 vs. -1.2%) were lower (P<0.05) after exercise in placebo only. **CONCLUSION**: These findings suggest that the stimulatory effects of caffeine ingestion elevates central hemodynamics and arterial stiffness, which persists even after exercise, exerting a greater afterload on the heart.

673 Board #8 May 30 3:15 PM - 5:15 PM

Altered Vascular Function in Chronic Kidney Disease: Evidence from Passive Leg Movement

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(No relevant relationships reported)

Chronic kidney disease (CKD) is an independent risk factor for the development of cardiovascular disease, with both diseases characterized by reduced nitric oxide (NO) bioavailability and vascular dysfunction. Passive leg movement (PLM) has previously been shown to produce NO-mediated hyperemia in the lower extremity, however this technique has not yet been utilized to assess vascular function in patients with CKD. **PURPOSE:** To assess vascular function in patients with CKD using PLM, in addition to the traditional flow-mediated dilation (FMD) technique. **METHODS:** Assessment of vascular function via PLM and FMD was performed on 12 patients (CKD, 67±3 yrs) and 12 healthy controls (CON, 59±2 yrs). Hemodynamics and artery diameters during PLM and FMD were measured utilizing ultrasound Doppler of the femoral and brachial arteries, respectively. **RESULTS:** Patients with CKD had reduced peak leg blood flow (LBF) (CKD, 384±39 vs. CON, 626±93 mL/min, p<0.05) and a reduced change in LBF from baseline to peak (ΔpeakLBF) (CKD, 153±27 vs. CON, 274±41 mL/min, p<0.05) during PLM compared to CON. Additionally, ΔpeakLBF was significantly correlated with kidney function as assessed by estimated glomerular filtration rate for all participants (r=0.53, p<0.05). As anticipated, FMD was also significantly attenuated in CKD patients compared to CON. **CONCLUSION:** Vascular function as assessed by PLM and FMD is attenuated in patients with CKD compared to controls, supporting a reduction in NO bioavailability in this chronic disease state. Additionally, PLM appears to be a novel and feasible approach to assess NO-mediated vascular function in CKD and is associated with kidney function.

B-41 Free Communication/Slide - **Body Composition**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-Mezzanine M100D

674 **Chair:** Cheryl A. Howe, FACSM. *Ohio University, Athens, OH.*

(No relevant relationships reported)

675 May 30 3:15 PM - 3:30 PM

Influence of Multiple Indices of Body Composition on Cardiometabolic Risk Factors in Adults

Lyndsey M. Hornbuckle[1], Robert Buresh, FACSM[2], Yuri Feito, FACSM[2], Cassie Williamson[2], Brian Kliszczewicz[2], Ayles Herrington[2], Corrine Ellis[3], Leah Tsui[3], Anna Schlupp[3], Kelsey Shepard[3], Stella Volpe, FACSM[3]. *[1]University of Tennessee, Knoxville, Knoxville, TN. [2]Kennesaw State University, Kennesaw, GA. [3]Drexel University, Philadelphia, PA.*

(No relevant relationships reported)

Body composition is an established predictor of cardiometabolic risk. Novel body composition variables may also predict risk and therefore, warrant further examination. **PURPOSE:** To assess the influence of fat to muscle ratio (FMR), percent body fat (%BF), and body mass index (BMI) on cardiometabolic risk factors in healthy adults. **METHODS:** Data were analyzed from 78 women (29.9 ± 13.5 years) and 45 men (25.0 ± 8.5 years). Height, weight, %BF (via dual-energy X-ray absorptiometry), resting blood pressure, and resting heart rate (RHR) were measured. BMI and mean arterial pressure (MAP) were calculated. Fasting total cholesterol (TC), high-density lipoprotein cholesterol (HDL), TC:HDL ratio, low-density lipoprotein cholesterol (LDL), triglycerides (TG), glycosylated hemoglobin (A1c), glucose (GLU), and insulin (INS) were measured. A 2-hour oral glucose tolerance test was conducted, from which 2-hour glucose (2HR-GLU) and 2-hour insulin (2HR-INS) were measured. Insulin sensitivity index (ISI) and homeostasis model assessment for insulin resistance (HOMA) were calculated. The influence of FMR [visceral fat area (cc) · fat free mass $(kg)^{-1}$], BMI ($kg \cdot m^{-2}$), and %BF on markers of cardiometabolic risk was determined. **RESULTS:** Regression analysis showed that FMR was the strongest predictor of MAP, TC, TC:HDL ratio, LDL, TG, GLU, INS, and HOMA. %BF was the strongest predictor of RHR, 2HR-GLU, 2-HR INS, and ISI. BMI was the strongest predictor of HDL and A1c. One-way MANOVA (above- vs below-75th percentile) showed a significant multivariate (MAP, TG, HOMA) main effect for FMR. Wilks' Lambda = 0.628, F (4,96) = 14.24, $p < 0.001$, with univariate main effects for MAP (F=22.2, $p < 0.001$), TG (F = 8.39, p = 0.005), and HOMA (F = 16.27, $p < 0.001$). MANOVA also revealed a multivariate main effect for BMI (Wilks' Lambda = 0.695, F(4,96) = 10.55, $p < 0.001$), with univariate main effects for MAP (F = 18.7, $p < 0.001$) and HOMA (F = 19.5, $p < 0.001$). MANOVA showed a multivariate main effect for %BF (Wilks' Lambda = 0.770, F(4,96) = 7.17, $p < 0.001$), with univariate main effects for MAP (F = 13.8, $p < 0.001$) and HOMA (F = 10.6, p = 0.002). **CONCLUSION:** These data show FMR was a better predictor of several risk factors compared to %BF and BMI. This suggests that this method of calculating FMR may be effective for assessing cardiometabolic risk in adults.

676 May 30 3:30 PM - 3:45 PM

Changes in Total and Regional Body Composition during the season in Division 1 Football Players

Tyler A. Bosch, Christiana Raymond-Pope, Donald R. Dengel, FACSM. *University of Minnesota, Minneapolis, MN.* (Sponsor: Donald R. Dengel, FACSM)

(No relevant relationships reported)

Purpose: The purpose of this study was to determine the association between changes in weight to changes in total and regional fat and lean mass in a group of division 1 football players.
Methods: A total of 78 players completed a pre-season (June) and Post-season (December) body composition scan using dual x-ray absorptiometry. Absolute and percent (%) changes in total and regional body composition were calculated. Linear regression was used to measure the association between change in weight and change in total lean (TLM) and total fat mass (TFM) for the entire sample and for each position. Linear regression was also used to analyzed the association between %change in TLM and TFM with %change in regional lean and fat mass.
Results: Position did not have a significant effect on the association between change in weight and change in TFM or TLM (p=0.171, p=0.172 respectively). However, change is weight was strongly associated with change in TFM for the entire group (slope $\pm$ SE = 0.8 $\pm$ 0.06, p <0.001 R^2=0.72). Conversely, change in weight was weakly associated with change in TLM for the entire group (slope $\pm$ SE = 0.2 $\pm$ 0.06, p <0.001 R^2=0.14).

Change in TLM was not significantly associated with change in TFM (slope±SE = -0.1±0.06, p=0.125, R^2=0.03). Regionally, the strongest association was between %change in TFM with %change in Android fat mass (1.62±0.08, p <0.001, R^2= 0.84). For lean mass, both %change in Trunk LM and Leg LM had similar associations with %change in TLM (R^2= 0.43 & 0.38, p<0.001 for both). When comparing each position separately, only RB (n=6) had a strong positive association between change in weight and change in TLM (R^2=0.82, p<-0.001), but, no association between change in weight and change in TFM (R^2=0.006, p=0.879).
Conclusion: These data suggest that changes in weight during a competitive football season are largely driven by changes in fat mass, except for potentially RB. The slopes of the relationship suggest that on average from every 1kg (2.2lbs) of weight increase there is 0.8 kg (1.8lbs) increase in TFM. Additionally, there a higher proportion of fat increase is distributed to the android or abdominal region. Given the relationship between increased fat mass with both reduced performance and injury risk, teams should focus on closely maintaining athlete weight during the season.

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A Comparison of Preseason Body Composition and Phase Angle in NCAA Division I Female Athletes

Takudzwa A. Madzima, Svetlana Nepocatych, Daniel A. Baur, Kirtida Patel, Walter R. Bixby, FACSM. *Elon University, Elon, NC.*

(No relevant relationships reported)

Body composition has several implications for the overall health and performance of athletes. Phase angle, a marker of cellular integrity, nutritional status and distribution of intra- (ICW) and extracellular water (ECW) may indicate overtraining and poor nutrition. A phase angle less than 5° is used as a criterion of poor cellular integrity and nutritional status in non-athletic populations. However, limited phase angle, ICW and ECW data exists for collegiate athletes. **PURPOSE:** To evaluate the differences in measures of body composition between NCAA Division I female cross-country (XC), soccer (SOC) and basketball (BB) athletes. **METHODS:** Fifty female athletes (age: 19±1yrs; XC, n=19; SOC, n=19; BB, n=12) were assessed in the preseason. Body composition, including lean mass (LM), fat mass (FM), regional bone mineral density (BMD) of the lumbar spine (L1-L4), and hip (femur) were measured by DXA. Appendicular skeletal muscle adjusted by squared height (ASM index; kg/m^2), LM index (LMI; kg/m^2) and FM index (FMI; kg/m^2) were calculated to compare relative body composition. Bioelectric impedance analysis was used to assess phase angle, ICW (%) and ECW (%). ANOVAs were used to analyze the data. Significance was accepted at p<0.05. **RESULTS:** XC had significantly lower ASMI (6.83±0.5 vs. 7.42±0.5 and 8.07±0.9kg/m^2, p<0.001), FMI (3.85±1 vs. 6.04±2 and 6.07±0.9kg/m^2, p<0.001) and body fat % (18.5±5 vs. 25.5±5 and 27.4±9%, p=0.001) than SOC and BB. There were no differences in ASMI, FMI and body fat % between SOC and BB. LMI was significantly lower in XC (15.3±0.9kg/m^2) compared to SOC (16.2±0.9kg/m^2, p<0.001). XC had significantly greater ICW (58.8±2% vs. 54.3±2%, p<0.001) and lower ECW (41.2±2% vs. 45.7±2%, p<0.001) than BB. The average phase angle was 7.4±0.5° and did not differ between sports. BB had significantly greater lumber spine BMD (p<0.001), left femur BMD (p<0.001) and right femur BMD (p<0.001) than both XC and SOC. **CONCLUSIONS:** Our findings highlight the sport-specific differences in body composition measures that may inform strength and conditioning coaches and athletic trainers. Optimal body composition through quality nutrition and training programs improves performance, increases playing time, injury prevention and helps to assess overall health.

678 May 30 4:00 PM - 4:15 PM

Caffeine Consumption in Habitual Users Has No Impact on BIA-Derived Measurements of Body Composition

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(No relevant relationships reported)

Bioelectrical impedance analysis (BIA) is often used to estimate total body water (TBW), intracellular body water (ICW), extracellular body water (ECW), and body fat percentage (BF%). A common restriction for BIA analysis is abstinence from caffeine 12-hours prior to testing. However, research has yet to determine whether the consumption of caffeine influences BIA testing results. **PURPOSE:** The purpose of this study was to determine if the consumption of caffeine influences BIA-derived BF% and body water values in habitual caffeine users. **METHODS:** 20 apparently healthy males (26.6 ± 4.1 years) identified as habitual caffeine consumers (≥ one 95mg serving per day ≥ four days per week) participated in this study. Participants came to the lab on three occasions, the first visit serving as the control (CON) with no supplementation. The remaining two visits were performed in a randomized double-blind, cross-over fashion. Participants consumed 200mg of dextrose (PLA) or caffeine (CAF) in capsule form. During each visit, seven multi-frequency BIA measurements were conducted before (PRE) and after (15-min, 30-min, 45-min, 60-min, 75-min, 90-min) consumption. **RESULTS:** Repeated measures ANOVA revealed BF% for CAF was lower than the CON and PLA conditions at PRE and 15-min (p < 0.001, p = 0.004), but not statistically significant for the remaining time points (i.e., 30-, 45-, 60-, 75-, and 90-min). However, the effect size (ES) of the BF% differences were small. The CON, PLA and CAF conditions had higher PRE ICW values than their associated post time points (i.e., 15-, 30-, 45-, 60-, 75-, and 90-min). However, similar to BF%, the ES of the mean differences for ICW were all marginal. No other differences were observed. **CONCLUSION:** Caffeine consumption in habitual users produced trivial changes in TBW, ECW, ICW, and BF%. Therefore, the pre-testing guidelines for caffeine consumption may be too stringent in habitual caffeine consumers.

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Regional Variations in Physical Fitness and Activity in Ecuadorian Adolescents

Cheryl A. Howe, FACSM[1], Sharon L. Casapulla[1], Jay Shubrook[2], Pablo Lopez[3], Mario J. Grijalva[1], Darlene Berryman[1], L Benelcazar[3]. *[1]Ohio University, ATHENS, OH. [2]Touro University, Vallejo, CA. [3]Pontifical Catholic University of Ecuador, Quito, Ecuador.*

(No relevant relationships reported)

As obesity rates are related to physical inactivity, and physical inactivity is positively related to economic status, it is important to assess the lifestyle habits of adolescents in countries, like Ecuador, who are undergoing significant economic growth. **PURPOSE**: Assessed the physical fitness (PF) and physical activity (PA) levels of adolescents from two different regions of Ecuador and their relationship with peer/familial influence on PF and PA. **METHODS**: Adolescents (N=407) were recruited from 4 schools: 2 from a suburb of Quito (n=217; Northern Sierra region) and 2 from the smaller town of Cariamanga (n=214; Southern Sierra region). Height (cm) and weight (kg) measurements were used to calculate BMI for weight classification. PF was estimate using a post-exercise heart rate following a 3-min step test. A questionnaire was used to assess PA habits (moderate-vigorous PA and sedentary behavior) and perceived peer/familial support for being physically active. T-Tests and ANOVAs assessed differences in outcome variables by sex, weight status and location. Person correlations assessed relationships among PF, PA habits, and perceived peer/familial influence. **RESULTS**: According to IOTF standards, 12.3% of the adolescents were classified as overweight or obese. Overall, PF level was 43.4±8.9 ml/kg/min, with males significantly higher than females (48.3±9.4 vs. 41.1±7.5 ml/kg/min) and Southern Sierra adolescents significantly higher than Northern Sierra (47.1±9.6 vs. 39.7±6.1 ml/kg/min) adolescents. Overweight adolescents had significantly lower PF levels compared to healthy and underweight adolescents **only** in Southern Sierra region (42.3±8.5 vs. 46.9±8.6 vs. 50.5±11.1 ml/kg/min; p<0.0001). Most adolescents reported participating in <60 min/day of moderate-vigorous PA (91.6%) and spending >2 hours/day in sedentary behaviors (79.9%). While perceived peer/familial influence did not correlate well with PF or PA levels (r=-0.18 to 0.20; adj. p>0.05), males perceived greater peer influence for PA participation than females, regardless of weight status or location. **CONCLUSIONS**: While adolescents of Southern Sierra had higher PF levels, these values were impacted by sex and weight status, but not by PA levels or perceived peer or family influence.

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Comparison of Ultrashort Versus Short High-Intensity Interval Training for Body Composition, Anaerobic, and Aerobic Performance

Masoud Moghaddam, Tyler W.D. Muddle, Carlos A. Estrada, Mitchel A. Magrini, Nathaniel D.M. Jenkins, Bert H. Jacobson, FACSM. *Oklahoma State University, Stillwater, OK.* (Sponsor: Bert H. Jacobson, FACSM)

(No relevant relationships reported)

PURPOSE: This study compared the effects of ultrashort (UH) versus short (SH) high intensity interval training (HIIT) in conjunction with functional training on body composition, anaerobic, and aerobic performance. **METHODS:** Thirty-four recreationally active participants were randomly assigned to SH (8 males and 9 females) and UH (8 males and 9 females) groups and completed 6 cycles of 6 exercises at ~90% of maximal heart rate (i.e. kettle bell snatches; step-up jumps; jumping jacks; front squat; burpees; high knees) 3 days a week for 4 weeks. SH was performed with 20s:10s work-to-rest ratio, and a 2-minute recovery within cycles, while UH was completed with 10s:5s work-to-rest ratio, and 1-minute recovery. Fat mass (FM), fat free mass (FFM), vastus lateralis cross sectional area (VL CSA), Wingate anaerobic capacity (i.e. peak power [PP] and anaerobic power [AP]), and aerobic fitness (i.e. VO_{2max}) were measured before and after the training interventions and analyzed with 2-way mixed factorial ANOVAs. **RESULTS:** FM did not significantly (p>0.05) change, however, both groups significantly (p<0.05) improved FFM (UH: 60.8 ± 15.0 to 61.5 ± 15.2 kg, SH: 54.3 ± 11.5 to 55.5 ± 11.0 kg), as well as VL CSA (UH = 24.8 ± 6.2 to 27.1 ± 6.3 cm, SH = 25.6 ± 5.1 to 27.9 ± 5.5 cm). Additionally, anaerobic

(UH: PP = 913 ± 305 to 1033 ± 300 W; AP = 11.5 ± 1.1 to 12.6 ± 1.1 W/kg, SH: PP = 839 ± 162 to 887 ± 181 W; AP = 11.8 ± 1.1 to 12.5 ± 1.2 W/kg) and aerobic capacity (UH: VO_{2max} = 35.8 ± 6.9 to 38.9 ± 6.1 ml/kg/min, SH: VO_{2max} = 39.7 ± 9.3 to 42.6 ± 9.1 ml/kg/min) significantly (p<0.05) increased in both groups. There were no significant (p>0.05) differences between groups. **CONCLUSION:** Current literature has shown a 20s:10s work-to-rest ratio to be the shortest, most effective HIIT protocol, as performed by the SH group. However, in the present study, the UH group improved FFM, VL CSA, anaerobic, and aerobic fitness in a similar manner to the SH group. These findings suggest that individuals may be able to achieve similar health benefits as the SH protocol, despite exercising for less total time by performing HIIT with a 10s:5s work-to-rest ratio.

681 May 30 4:45 PM - 5:00 PM

23 Year Analysis Of Anthropometric Profiles And Long-Term Career Progression Of German Junior Female Rowers

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(No relevant relationships reported)

Standing height (SH) and body mass (BM) are well established determinants of rowing performance, which therefore typically included in most talent identification programs. However, it remains unclear if anthropometric profiles allow for differentiation between subsequent career progression levels already in junior female rowers. **PURPOSE**: We aimed to evaluate the relationship between anthropometric profiles of adolescent junior female rowers and their long-term career progression level. We furthermore described their anthropometric profiles and calculated normative requirements associated with a successful career progression on elite level. **METHODS**: SH, BM and BM-index (BMI) of 399 female rowers (age 17.6 ± 0.58 years) of the German Junior National Team between 1991 and 2014 were retrospectively analyzed using ANOVA with Post-Hoc test. Rowers were grouped exclusively according to their highest long-term career progression level, categorized as participation in U19-, U23-, Senior-World Championships (WCh), or Olympic Games (OG). Normative anthropometric requirements were defined as interquartile range (IQR) of the OG-group. **RESULTS**: We found significant small effects between career progression level and SH (P = .009; η2 = 0.03), BMI (P = .004; η2 = 0.04). Rowers, who never competed higher than U23-WCh were significantly smaller than those who competed in Senior-WCh (-1.30%; P = .036) or OG (-1.34%; P = .049). Differences in BM were not significant (P = .115; η2 = 0.02). Significantly higher BMI was identified for rowers who remained on U19-level compared to those competing in Senior-WCh (+3.87%; P = .003) or OG (+3.28%; P = .039). The same was found for U23-WCh vs. Senior-WCh (+3.32%; P = .034). IQR of SH and BM was 178 - 184 cm and 68 - 73 kg. **CONCLUSIONS**: Advanced anthropometric characteristics partly mirror long-term career progression levels in female Junior National Team rowers, underlining the relevance of anthropometric data for talent identification and development. Interestingly, female rowers tending to a more athletic body type (lower BMI, BM at higher SH) reached higher career progression level, probably due to a better power to body mass ratio. As talent identification and development is multi-dimensional and partly inherently, anthropometric data should not used exclusively.

682 May 30 5:00 PM - 5:15 PM

Telomere Length Of Middle-aged Sprinters And Endurance Runners: Relationships To Performance And Body Composition

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(No relevant relationships reported)

PURPOSE: The telomere length (TL) of middle aged master runners (RUN) (n = 23, 52.3 ± 8.6 yrs; 12 sprinters, SPT; 11 endurance runners, END) was compared to untrained controls (CON, n = 10; 43.7 ± 9.4 yrs), and the relationships between TL to both master athletes' performance and body composition were analyzed. **METHODS**: Participants had blood samples collected for biomolecular measures. Relative leucocyte telomere length (T/S) was measured through qPCR. ANOVA and unpaired t-tests were applied to compare TL between studied groups, and the Pearson's moment correlation was applied to verify relationships. **RESULTS**: The TL of all RUN (T/S = 1.24 ± 0.73) differ from CON (T/S = 0.515 ± 0.62) (p < 0.01), while the TL of SPT (T/S = 1.495 ± 0.85) trended to be longer than END (T/S = 0.954 ± 0.46) (p = 0.076) with a large effect size (d = 0.72). It was observed a significant correlation between TL and actual performance level as percentage of the current world record for RUN (r = 0.47, p < 0.01), and a negative correlation between TL and body fat for the entire sample (r = -0.447; p < 0.01). Furthermore, a negative correlation between TL and performance decline per decade was observed for the SPT (r = -0.651, p < 0.01). **CONCLUSIONS**: In conclusion, TL of studied master athletes was longer than their untrained peers, and seems to be not only a marker of health status, but also an indicator of sports longevity since both actual performance level, its decrease over years, and body composition were related to TL of studied sample.

B-42 Free Communication/Slide - Mitochondria and Metabolism in Health and Disease

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-101CD

683 **Chair:** Gordon Fisher, FACSM. *University of Alabama - Birmingham, Birmingham, AL.*

(No relevant relationships reported)

684 May 30 3:15 PM - 3:30 PM

Tumor Derived Factors Induce Muscle Mitochondria Hyperpolarization And Subsequent Superoxide Production

Megan E. Rosa-Caldwell, Jacob L. Brown, David E. Lee, Tyrone A. Washington, Nicholas P. Greene. *University of Arkansas, Fayetteville, AR.* (Sponsor: Dr. Stephen Crouse, FACSM)

(No relevant relationships reported)

Cancer associated muscle wasting (cancer cachexia) negatively affects the prognosis and treatment of cancer. Specifically, 20-40% of cancer deaths are attributable to cancer cachexia, however current treatments for cachexia are ineffective at reducing mortality. More so, it is currently postulated that once cachexia has developed, it may be impossible to halt its progression. Therefore, a more thorough understanding of the early mechanisms contributing to cachexia are necessary to develop effective therapeutics to halt cachexia before significant muscle loss occurs. Mitochondrial function is thought to largely mediate muscle health and may be a key contributor to the development of cachexia. **PURPOSE:** To examine the initial effects of tumor cell-derived factors on measures of mitochondrial function and subsequent cell proliferation. **METHODS**: C2C12 cells were treated with either CON media (1:1 ratio of DMEM to C2C12 conditioned media) or LLC media (1:1 ratio of DMEM to Lewis Lung Carcinoma conditioned media) for 4-72 hrs. Cells were then measured for mitochondrial polarization, superoxide production, and cell proliferation. Results were analyzed by blocked t-tests (CON v. LLC, blocked by experiment repeat). **RESULTS:** After 4 hrs of incubation with LLC media, cells had a ~12% greater mitochondrial polarization compared to CON (p=0.0002, Hedge's g effect size=1.08), with no difference in mitochondrial superoxide production (p=0.78, Hedge's g effect size= 0.10). After 24 hrs of incubation, mitochondrial polarization remained elevated by ~10% compared to CON (p=0.008, Hedge's g effect size =0.69) and mitochondrial superoxide production was increased ~12% compared to CON (p=0.009, Hedge's g effect size =0.99). However, LLC incubation for 24, 48 and 72 hrs did not alter cell proliferation (p=0.89, 0.13, and 0.45 respectively, Hedge's g effect size = 0.05, 0.53, and 0.27 respectively). **CONCLUSIONS:** Tumor-derived factors appear to have dramatic effects on muscle mitochondrial polarization and subsequent superoxide production. However, these alterations do not appear to affect muscle proliferative capacity.

This study was supported by The National Institutes of Health R15AR069913.

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The Impact Of HSP72 On Metabolism And The Mitochondrial Response To Exercise In Female Mice

Amanda J. Lin[1], Zhenqi Zhou[1], Timothy M. Moore[2], Brian G. Drew[1], Vicente Ribas[1], Darren C. Henstridge[3], Mark A. Febbraio[4], Andrea Hevener[1]. *[1]University of California, Los Angeles, Los Angeles, CA. [2]University of Southern California, Los Angeles, CA. [3]Baker IDI Heart and Diabetes Institute, Melbourne, Australia. [4]Garvin Institute of Medical Research, Sydney, Australia.*

(No relevant relationships reported)

Regular exercise improves metabolic health in men and women; however, the molecular adaptations critical for delivering health benefit remain unclear. Heat shock protein (HSP)72 is one of the most highly induced proteins in muscle during exercise, and we have shown that muscle overexpression of HSP72 is protective against diet-induced metabolic dysfunction. By contrast, global deletion of HSP72 promoted glucose intolerance and insulin resistance paralleled by impairment in mitochondrial (mt) function and oxidative capacity. All aforementioned studies were conducted in male animals exclusively.

PURPOSE: We studied the effects of HSP72 knockout (KO) on metabolism in female mice to determine whether sex plays a role in phenotypic outcome.
METHODS: We performed a standard metabolic phenotyping evaluation of WT and HSP72-KO female mice fed a normal chow diet (age 3 - 10 months). Additionally, to induce metabolic challenge, WT and HSP72-KO mice performed two exercise protocols. Protocol 1: Chronic voluntary wheel running for 30-days. Protocol 2: Acute treadmill running (90 min, 15 m/min, 5º incline). Comparisons of mean differences were by two-way ANOVA or t-test ($P<0.05$, *a priori*; values presented as mean ± SEM).
RESULTS: In contrast to male HSP72-KO mice, female KO animals were protected against aging-induced metabolic dysfunction and insulin resistance. Moreover, we observed no significant difference in grip strength, run time to exhaustion, latency to fall, or maximum running speed, between the genotypes. Although no differences in metabolic homeostasis or physical performance were detected between the genotypes of female mice, we did observe marked differences in expression of compensatory signaling nodes including transcription factors, the mt proteome, and mt fission-fusion-mitophagy dynamics in HSP72-KO compared with WT. Computational modeling and pathway analysis identified over 100 proteins differentially expressed between the genotypes. We found that ERα is strongly induced in muscle of female HSP72-KOs compared with WT, and we are currently testing whether ERα confers preservation of metabolic function in female vs. male HSP72-KOs.
CONCLUSIONS: Our findings show sex differences related to importance of HSP72 expression for the maintenance of metabolic health and exercise performance.

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Mitochondrial Fusion Is Essential For Regulation Of Adult Skeletal Muscle Mass And Protein Synthesis

Graham R. McGinnis, Zachary D. Bush, Margaret B. Bell, Glenn C. Rowe. *University of Alabama at Birmingham, Birmingham, AL.*

(No relevant relationships reported)

Purpose: Mitochondrial dynamics and the function and health of skeletal muscle are inextricably linked. To preserve proper function, muscle mitochondria undergo constant remodeling through fission and fusion events. Mitochondrial fission is regulated by fission 1 (Fis1) and dynamin-related protein 1 (Drp1), while fusion is regulated by three GTPases; mitofusin 1 and 2 (Mfn1, Mfn2) and optic atrophy 1 (Opa1). However, the role of mitochondrial fusion in adult skeletal muscle mass regulation is not fully understood. We hypothesized that genetic disruption of mitochondrial fusion in adult skeletal muscle will impair muscle function and growth. **Methods:** We therefore developed and characterized adult inducible skeletal muscle specific Mfn1/2 double knockout mice (MFNDKO). Genetic deletion was induced in adult mice and confirmed by qPCR and western blot. Body/muscle size and composition was analyzed gravimetrically and by QMR. Muscle function was assessed by grip test. Interrogation of pathways regulating muscle mass, including atrophy and autophagy were performed by qPCR and western blotting. *In vivo* and *in vitro* protein synthesis rates were evaluated using a puromycin incorporation assay. **Results:** MFNDKO mice exhibited a progressive decrease in body weight (~20% lower than CON, respectively; $p < 0.05$). This reduction in body weight was associated with a decrease in lean mass, confirmed by QMR, gastrocnemius wet weight and cross sectional area (50% and 36% reduction, respectively; $p < 0.05$). Gene profiling of pathways that regulate muscle homeostasis revealed upregulation of *FBXO30*, *FBXO32*, *MT1* and *CTSL* ($p < 0.05$, all) suggesting an activation of muscle atrophy. Furthermore, muscles from MFNDKO mice revealed increased markers of autophagy with increased *p62* mRNA and increased LC3II/I and p62 protein levels. Protein synthesis rates were decreased *in vitro* and *in vivo* (14% and 75%; $p < 0.05$, respectively) in MFNDKO muscle. **Conclusions:** Taken together, these observations suggest that normal mitochondrial fusion is required for maintaining normal adult skeletal muscle mass.

687 May 30 4:00 PM - 4:15 PM

Skeletal Muscle Mitochondrial Fusion is Required for Exercise Performance and Mitochondrial Oxidative Capacity

Glenn C. Rowe, Zachary D. Bush, Margaret B. Bell, Graham R. McGinnis. *University of Alabama at Birmingham, Birmingham, AL.*

(No relevant relationships reported)

PURPOSE: Endurance exercise has been shown to be a positive regulator of skeletal muscle metabolic function. Changes in mitochondrial dynamics (fusion and fission) have been shown to influence mitochondrial oxidative capacity. We therefore tested whether genetic disruption of mitofusins (Mfns) affected exercise performance in adult skeletal muscle.
METHODS: We generated adult inducible skeletal muscle-specific Mfn1 (iMS-Mfn1KO), Mfn2 (iMS-Mfn2KO) and Mfn1/2 knockout mice (iMS-MfnDKO). We assessed exercise capacity with a treadmill time to exhaustion stress test pre-deletion and up to 8-weeks post-deletion. We measured individual electron transport chain (ETC) complex activity of both the subsarcolemmal (SS) and intermyofibrillar (IMF) mitochondria by high resolution spectroscopy. We also performed qPCR and western blotting analysis to measure the expression of ETC subunits.
RESULTS: Analysis of either the iMS-Mfn1KO or iMS-Mfn2KO did not reveal an effect on exercise capacity, suggesting a possible functional redundancy between the two Mfns. However, analysis of the iMS-MfnDKO animals revealed a progressive reduction (66% reduction; $p < 0.05$) in time to exhaustion. The decrease in exercise capacity was associated with a reduction in ETC activity in both the SS and IMF mitochondrial fraction for Complex I (70% and 80% respectively; $p < 0.05$) and Complex IV (60% and 80% respectively; $p < 0.05$). Notably only the IMF fraction for Complex II and Complex V exhibited a significant reduction in activity (70% and 67% respectively; $p < 0.05$), while Complex III was completely unaffected. These changes in enzymatic activity was associated with a decrease in protein expression of ETC subunits for Ndufb8 (86%; $p < 0.05$) and MtCOI (50%; $p < 0.05$). We did not observe any significant changes in mRNA expression of nuclear encoded ETC subunits, while mitochondrial encoded subunits (ND2, ND5, CYTb, COX2 and ATP6) were all reduced (77%; $p < 0.05$). These data suggest that the decrease in exercise activity is the result of impaired ETC complex activity and expression.
CONCLUSION: Taken together these results suggest that mitochondrial fusion in adult skeletal muscle is required for normal exercise performance.
ACKNOWLEDGMENTS: We are grateful to the UAB DRC BARB Core P30 DK079626. This work supported in part by NIH AR062128 to GCR.

688 May 30 4:15 PM - 4:30 PM

Human Muscle Fiber-Specific Responses of Mitochondrial Fusion Proteins to Sprint Interval and Moderate-Intensity Continuous Training

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(No relevant relationships reported)

Mitochondrial dynamics, a process regulated by mitochondrial fission and fusion, is important for the maintenance of high quality mitochondria and healthy metabolic function. Low-volume sprint interval training (SIT) increases mitochondrial content to a similar extent as moderate-intensity continuous training (MICT); however, limited data are available regarding the effect of these diverse training approaches on mitochondrial dynamics proteins. Research has also relied primarily on whole muscle analyses which may mask fiber-type specific training adaptations.
PURPOSE: To examine changes in mixed whole muscle and fiber-type specific mitochondrial fusion protein abundance following 12 weeks of low-volume SIT and MICT.
METHODS: Sedentary adults performed 32 sessions of SIT (n=8) or MICT (n=9). SIT involved 3 x 20 sec 'all out' cycle sprints against 5% body mass (~500 W) interspersed with 2 min rest and MICT involved 45 min of continuous cycling at ~70% of maximal heart rate (~110 W). Biopsies (vastus lateralis) were obtained before training and 96 h after the final session. The protein contents of optic atrophy 1 (OPA1) and mitofusin 2 (MFN2) were measured in mixed muscle homogenates and pooled segments of type I and II fibers using Western blotting, normalized to total protein content within each sample.
RESULTS: Training increased the mixed whole muscle protein content of OPA1 [1.0 ± 0.3 to 1.5 ± 0.3 arbitrary units (AU)] and MFN2 (1.0 ± 0.2 to 1.1 ± 0.2 AU), with no differences between treatments ($p < 0.05$, main effect). OPA1 content increased after training ($p < 0.05$, main effect) in both type I (1.3 ± 0.6 to 1.9 ± 0.8 AU) and type II fibers (1.0 ± 0.4 to 1.4 ± 0.5 AU). MFN2 content increased after training in type I (1.4 ± 1.1 to 2.2 ± 1.5 AU, $p = 0.03$) but not type II fibers (1.9 ± 1.6 to 2.0 ± 1.1 AU; $p = 0.73$). Prior to training, OPA1 content was higher in type I versus type II fibers (1.3 ± 0.6 vs. 1.0 ± 0.4 AU, $p < 0.01$) but there were no fiber-type differences in MFN2 content.
CONCLUSIONS: Twelve weeks of low-volume SIT and MICT induces similar increases in mixed whole muscle and fiber-type specific mitochondrial fusion proteins. The potential of SIT to induce comparable skeletal muscle adaptations as MICT despite a reduced exercise volume may be related to a higher intensity per se and/or the intermittent contractile pattern.

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Exercise As An Intervention To Mitigate Mitochondrial Dysfunction And Impaired Glucose Tolerance Induced By Sleep-loss

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(No relevant relationships reported)

Sleep-loss is emerging as an important risk factor for the development of impaired glucose tolerance, insulin resistance (IR) and, subsequently, type 2 diabetes mellitus. While the mechanisms underlying these changes remain to be fully elucidated, in some instances their development may be associated with reduced mitochondrial function. This suggests sleep-loss may also impair mitochondrial function, but this has not been investigated. Given the possible relationship between mitochondrial function and IR, exercise could be used as a strategy to counteract the detrimental physiological changes induced by sleep-loss; however, this has not been demonstrated. **Purpose:** To investigate the effect of sleep-loss, with or without exercise, on skeletal muscle mitochondrial function and glucose tolerance. **Methods:** Twenty healthy male participants were allocated into one of three experimental groups: a control group (CON, n=7) (8 h sleep opportunity for 5 nights), a sleep-restricted group (SR, n=7) (4 h sleep opportunity for 5 nights), and a sleep restricted and exercise group (SR+EX, n=6) (4 h sleep opportunity for 5 nights and 3 x high-intensity interval exercise (HIIE) sessions). The HIIE bouts consisted of 10 x 60-s intervals at 90% peak power, interspersed by 75 s of active recovery. Oral glucose tolerance tests (OGTT) and muscle biopsies were performed pre- and post-intervention. **Results:** Mean sleep duration per night for CON, SR, and SR+EX was 448±25, 230±13 and 237±5 minutes, respectively. There was a significant reduction in mitochondrial respiratory function (O_2 flux - pmol/s/mg tissue) from pre- to post-intervention in the SR group (80 ± 16 vs 65 ± 24, $p<0.05$), but this remained unchanged in the CON (70 ± 5 vs 64 ± 12, $p>0.05$) and SR+EX (78 ± 20 vs 79 ± 28, $p>0.05$) group. OGTT total area under the curve increased post intervention in the SR group (692 ± 89 vs 832 ± 57 units, $p<0.05$), but remained unchanged in the CON (741 ± 202 vs 677 ± 184, $p>0.05$) and SR+EX (645 ± 51 vs 702 ± 83, $p>0.05$) groups. **Conclusion:** Sleep-loss was associated with a reduction in mitochondrial respiratory function and a decrease in glucose tolerance. However, these changes were mitigated by performing HIIE, demonstrating exercise as a potent and cost-effective strategy to alleviate some of the negative metabolic effects of sleep loss.

690 May 30 4:45 PM - 5:00 PM

Offspring of Mothers with Diabetes have Reduced Muscle Oxidative Capacity Measured by Near Infrared Spectroscopy

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(No relevant relationships reported)

Adult offspring of mothers with type 2 diabetes have been reported to have reduced skeletal muscle mitochondrial oxidative capacity (OXPHOS) using *in vivo* ^{31}P-Magnetic Resonance Spectroscopy (^{31}P-MRS). Near Infrared Spectroscopy (NIRS) also has the capability of measuring skeletal muscle OXPHOS, and provides indices of skeletal OXPHOS comparable to ^{31}P-MRS. Moreover, the cost of measuring skeletal muscle OXPHOS by NIRS is substantially less than by ^{31}P-MRS. **PURPOSE**: To determine whether NIRS could detect OXPHOS differences in adult offspring of mothers with type 2 diabetes (n=8) compared to controls (n=9). **METHODS**: Using continuous-wave NIRS (Artinis, Oxymon) coupled with transient arterial occlusions (~ 300 mm Hg, 5 on/5 off x 9, 10 on/10 off x 11), we measured muscle oxygen consumption (mVO_2) in the *vastus lateralis* following a 7 sec maximal isometric knee extension performed in the supine position. We express the mVO_2 as a percent per second (%/s), relative to an ischemic calibration. We fit the recovery mVO2 following the isometric contraction to an exponential curve using custom routines written in MATLAB by Terence Ryan to calculate the time constant (Tc) for the recovery of mVO_2, which is an index of mitochondrial OXPHOS. These routines also help correct for changes in blood volume that occur during the atrial occlusion. We also measured peak oxygen uptake (VO_2peak) using a standardized incremental exercise test with indirect calorimetry on a cycle ergometer. **RESULTS**: Age (21±1 vs. 21±2 y, $p>0.05$), BMI (24±3 vs. 23±2 kg/m^2, $p>0.05$), and VO_2peak (32±4 vs. 32±5 ml·kg^{-1}·min^{-1}, $p>0.05$) were similar between offspring and controls. In contrast, offspring had higher recovery Tc compared to controls (47±24 vs. 28±10 sec, $p<0.05$) suggestive of reduced OXPHOS. **CONCLUSIONS**: Our results support the use of NIRS to measure expected differences in skeletal muscle OXPHOS between offspring and controls. Of interest, we also found that the Tc measured in the offspring to have a greater degree of variability than controls suggesting the potential for prescribing therapeutic interventions early to possibly reduce incidence of type 2 diabetes. The present study was funded in part by the Robert and Patricia Hines Endowed Professorship in Kinesiology, LSU and a College of Human Sciences and Education Dean's Circle Grant.

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Skeletal Muscle DNA Methylation Changes following Gastric Bypass in Women with Type 2 Diabetes

Matthew D. Barberio[1], G. Lynis Dohm[2], Walter J. Pories[2], Evan P. Nadler[1], Monica J. Hubal, FACSM[3]. *[1]Children's National Medical Center, Washington DC., DC. [2]East Carolina University, Greenville, NC. [3]George Washington University, Washington DC., DC.* (Sponsor: Monica Hubal, FACSM)

(No relevant relationships reported)

Purpose: Bariatric weight-loss surgery can resolve or ameliorate type 2 diabetes (T2D). The cellular and molecular adaptations driving this response remain largely unknown, but some evidence points to epigenetic changes in skeletal muscle following surgery. We assessed global skeletal muscle methylation patterns prior to and 1 year after Roux en Y gastric bypass surgery (RYGB) in women with and without T2D to determine if diabetes modifies the response of the skeletal muscle methylome to weight-loss surgery. **Methods**: Global vastus lateralis methylation profiles were generated via Illumina 450k Arrays pre- and 1 yr post-RYGB in black adult females (N=12) with (D; n = 6, age = 51 ± 6 yr, BMI = 53.0 ± 5.8 kg/m^2) and without (ND; n=6, 43 ± 6 yr, 51.0 ± 9.2 kg/m^2) T2D. Clinical values for insulin, glucose, and HOMA were measured at each time point. RM ANCOVA (group*time with age covariate) assessed changes in skeletal muscle methylation profiles in Partek Genomics Suite. Resultant methylation probes were filtered at $p<0.001$ and uploaded into Ingenuity Pathway Analysis for biological interoperation. **Results:** RYGB reduced BMI ($P < 0.01$; -62.6% ± 28.3) and HOMA ($p = 0.01$; -1.9 ± 2.4) 1 yr following surgery; with no differences between groups. ANCOVA detected interaction effects in 9016 methylation sites in 6059 known genes. Overall, 7541 methylation sites in 4557 genes were altered 1 yr following RYGB in ND as compared to 4056 methylation sites in 3245 genes in diabetics. Biological pathway analysis of genes with differential methylation in diabetics identified key metabolic signaling pathways such as AMPK Signaling (80 genes; $p = 9.7 \times 10^{-8}$), PI3K/AKT Signaling (52 genes; $p = 2.7 \times 10^{-7}$), and P70S6K Signaling (44 genes; 9.82×10^{-4}). Our analysis also identified hypomethylation in the promoter region of key metabolic genes IRS1 (-4.8% methylated following surgery), SLC2A4 (GLUT4; -2.8% to -3.9%), and GSK3 (-3.4%) following surgery. **Conclusion:** Skeletal muscle DNA methylation 1 year following RYGB suggest epigenetic changes in key metabolic signaling genes that are modified by diabetes. Changes in gene and protein expression of these genes have previously been demonstrated with improved glucose homeostasis. These data identify DNA methylation patterns that may play an important role in diabetes resolution following surgery.

B-43 Clinical Case Slide - **Foot and Ankle**

Wednesday, May 30, 2018, 3:15 PM - 4:55 PM
Room: CC-200E

692 **Chair:** Stephen M. Simons, FACSM. *South Bend Notre Dame Sports Medicine Fellowship, Mishawaka, IN.*
(No relevant relationships reported)

693 **Discussant:** Adam S. Tenforde. *Spaulding Rehabilitation Hospital, Milton, MA.*
(No relevant relationships reported)

694 **Discussant:** David Smith. *University of Minnesota, Minneapolis, MN.*
(No relevant relationships reported)

695 May 30 3:15 PM - 3:35 PM

Ankle Injury - Rugby Union (7-players-a-side)

Victor Lopez Jr[1], Eric F. Soto[1], Mario A. Ortega[1], Richard Ma[1], Answorth A. Allen[2]. [1]*Rugby Research and Injury Prevention Group, Inc, Hospital for Special Surgery, New York, NY.* [2]*Hospital for Special Surgery, New York, NY.* (Sponsor: Robert C. Cantu, FACSM)
(No relevant relationships reported)

HISTORY: A 22-year-old men's club Division I Rugby-7s winger, injured his right ankle post a simultaneous opposing two-player tackle. Tackler-one locked the ball carriers foot in place wrapping the lower leg, and tackler-two changed the direction of the upper body of the player which overcame ankle mortise stability and strength, inducing an ankle inversion. Post-tackle, injured player complained of pain and inability to bear weight. History noted, no ankle supports/brace or tape used, and no previous ankle injury/surgeries. **PHYSICAL EXAMINATION**: Sideline emergency services removed injured foot cleat, found ankle deformity, which was secured for transport. ED exam revealed patient with a medially deformed right foot. Exam noted localized pain and tenderness, post palpation on right ankle deformity and lower leg, plantar flexed and supinated. Mild swelling, no lacerations or open wounds noted. Patient's limited exam secondary to pain, however, reflected no decreased right sided lower extremity sensation, reflexes or strength. Patient was able to flex and extend toes despite extreme pain of deformed limb. Injured limb had a noted palpable dorsalis pedis and posterior tibialis pulse. **DIFFERENTIAL DIAGNOSIS**: 1. Subtalar joint subluxation/dislocation 2. Open sub-talar dislocation 3. Tibial-talar dislocation 4. Fractures of the ankle/foot **TEST AND RESULTS**: Ankle anterior/posterior radiographs: -right posteromedial peri-talar dislocation. Ankle lateral radiographs: -navicular dislocation laterally from talus -rotary subluxation of calcaneus medially from the talus -no associated fractures of the tibia/fibula including malleoli. **FINAL WORKING DIAGNOSIS**: Closed right posteromedial peri-talar dislocation without associated fracture. **TREATMENT AND OUTCOMES**: 1. Emergency. Clearly seen on radiograph. 2. Immediate ED conscious sedation closed-reduction, entailing injured knee flexion to relax gastrocnemius, with traction to heel/forefoot of injured ankle to reduce joint. 3. Short-leg cast post-reduction, PWB for 4 weeks. Rehabilitation post-cast removal, with ROM and heel/calf stretches, progressing to strengthening. FWB at 7 weeks post-injury and cleared for sport. 4. 3-month follow-up, FWB, 7° dorsi-flexion, 32° plantar-flexion, 14° inversion, and 10° eversion with no restrictions.

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Toe Injury - Dance

Julie Han, Andrea Stracciolini, Pierre d'Hemecourt. *Boston Children's Hospital, Boston, MA.*
(No relevant relationships reported)

HISTORY: A 21-year-old female college dancer presented with right great toe injury that occurred in February 2017 when she twisted the toe while pivoting then felt a pop and severe pain. Xrays at the ED were negative for fracture. She was able to continue dancing despite pain and had multiple episodes of re-injury. She was first evaluated in the Sports Medicine clinic in April 2017 after a recent episode of re-injury of first toe medial deviation while dancing with a pop sensation and swelling. Xrays were negative for fracture and she was diagnosed with a first MTP joint sprain treated with a walking boot for 1 month, dancing with buddy taping, and intrinsic foot exercises. By the end of May 2017, she reported near-full recovery with progression back into dancing until suffering the same injury while dancing with subsequent 1st MTP pain and instability.EXAM: Right foot: Normal alignment. No edema. Painful passive end-range 1st MTP joint flexion & extension. Significant laxity with 1st MTP joint varus stress, asymmetric compared to contralateral MTP joint. Discomfort but no dorsal subluxation with 1st MTP joint drawer test. 5/5 great toe dorsiflexion & plantarflexion strength with discomfort. Lateral 1st MTP joint tenderness to palpation. Minimal fibular sesamoid tenderness to palpation. Intact distal sensation & dorsalis pedis pulse. DIFFERENTIAL DIAGNOSIS: 1. 1st MTP lateral capsule tear 2. 1st MTP lateral collateral ligament tear 3. Adductor hallucis brevis tear IMAGING: MRI right foot: Complete lateral collateral ligament tear of the first MTP joint at the metatarsal attachment. No bony avulsion, normal alignment, normal plantar plate. FINAL DIAGNOSIS: Tear of the first MTP lateral collateral ligament in a dancer with resultant joint instabilityOUTCOME:-Walking boot for 5-6 weeks, without dancing, and improvement of symptoms at follow-up in July 2017-Weaned out of boot, started physical therapy, progressed back into dancing with buddy taping-August 2017, noted 60% improvement of pain but continued 1st MTP joint instability-Referred to Orthopedic Surgeon Dr. Lyle Micheli for surgical opinion with consultation from Dr. William Hamilton, dance medicine expert in New York City-Per recommendations, she underwent two series of PRP injections of the LCL in August and October 2017, follow-up is pending

697 May 30 3:55 PM - 4:15 PM

Footloose

Julie Shelley. *University of Oklahoma Health Sciences Center, Oklahoma City, OK.*
(No relevant relationships reported)

History:
A 27 year-old minor league baseball player presents to the ER with right ankle pain after sustaining an injury landing on first base. After hitting a ground ball, the player ran to first base and inverted his right ankle after stepping on the first baseman's foot. He had immediate pain and an obvious deformity in the right ankle. He was not able to ambulate due to pain. He was neurovascularly intact. There was no obvious skin puncture. The patient's right foot and ankle were immobilized on the field in a SAM splint, and the player was sent to the ER. He denied any previous injury to this ankle.
Physical Exam:
Examination of the right foot and ankle revealed an obvious deformity of right ankle without laceration or skin puncture. Patient was able to move all toes but unable to move the ankle due to pain. He was neurovascularly intact. Exam was limited due to pain.
Differential Diagnosis:
1. Subtalar Dislocation
2. Talonavicular Dislocation
3. Talus Fracture
4. Tibia Fracture
Test and Results:
Right ankle and foot x-rays: Closed dislocation of the medial subtalar joint and talonavicular joint without obvious fracture.
Final/Working Diagnosis:
Right Medial Subtalar dislocation, Talonavicular Dislocation, Talus Fracture
Discussion:
Consent was obtained, and the patient was taken to the OR for reduction under general anesthesia. After reduction of the right ankle, CT was performed which showed a successful reduction of the medial subtalar and talonavicular dislocations. The CT also revealed a nondisplaced fracture of the medial border of the talus. He was placed in a posterior splint and stirrup and made non-weightbearing. It was not determined why this relatively low impact mechanism caused such rare and significant injuries. Proper reduction was critical in this case to avoid future equinovarus deformity, ankylosis, or severe degenerative arthritis warranting further intervention.
Outcome:
The patient was unable to play baseball for the remainder of the season. However, due to his successful reduction, he did not require further interventional treatment. He was transitioned to a short leg walking boot after being non-weightbearing for 6 weeks and participated in a physical therapy program to regain strength and function of his right ankle. His roster status was changed from "disabled" to "active" 8 weeks after his injury.

698 May 30 4:15 PM - 4:35 PM

The Bare Necessities of Foot Pain-Running

Alex B. Behar. *University of Illinois at Chicago, Chicago, IL.* (Sponsor: Terry Nicola, FACSM)
(No relevant relationships reported)

HISTORY: 35 year old female presents with left dorsal foot pain beginning 2 weeks prior to presentation noticed at mile 10 of a half marathon. She is an established barefoot runner with no previous injuries. Denies trauma or mechanism of injury to the foot. The pain is 8/10, sharp, and intermittent. It is exacerbated by weight bearing and relieved by non-steroidal anti-inflammatories (NSAIDS) and ice. The pain returns once the medication or modality wears off. She eats a well balanced diet and takes a multi-vitamin daily. Her last menstrual period was 10 days prior to presentation and states

it is regular. Denies changes to her running technique or mileage. X-rays performed prior to presentation demonstrate no fracture or deformities. She denies back pain, weakness, or paresthesias.
PHYSICAL EXAMINATION: Inspection of foot and ankle demonstrates edema on dorsal aspect of left foot without ecchymosis. No pes planus or pes cavus is observed. Tenderness over the left dorsal proximal 2nd metatarsal head is present. Full active range of motion of the ankle, foot, and toes in all planes with pain at the 2nd metatarsal during toe extension and flexion. Sensation intact to light touch in all dermatomes. Strength is 5/5 in all myotomes. Reflexs are 2/4 at L4 and S1.
DIFFERENTIAL DIAGNOSIS: 1) Lisfranc injury 2) Metatarsal stress fracture 3) Forefoot sprain 4) tibialis anterior strain/enthesopathy **TEST AND RESULTS**: **Ultrasound:** Evaluation of 2nd metatarsal using a linear probe demonstrates disruption of periosteum with no subcutaneous edema or disruption of soft tissue. **X-ray:** No evidence of fracture with mild degenerative changes at first MTP joint. **MRI:** Second metatarsal stress reaction without visible fracture line **FINAL WORKING DIAGNOSIS**: Left distal 2nd metatarsal stress fracture in an established barefoot runner.
TREATMENT AND OUTCOMES: Patient is educated on stress fractures in barefoot runners. Continue ice and NSAID's for symptomatic pain control and inflammation. Recommend a short leg off loading boot to decrease stress on the forefoot. She should wean out of the boot and progress to a barefoot running program. Physical therapy to work on foot intrinsic, barefoot gait analysis, and ankle stabilizers. DEXA scan ordered for bone density evaluation. Consider ultrasound instead of MRI for future monitoring of stress fractures.

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699 May 30 4:35 PM - 4:55 PM

Ankle Injury - Football

Sabrina P. Sawlani, Brian McCall. *Presence Resurrection Medical Center, Chicago, IL.* (Sponsor: Poonam Thaker, MD, FACSM)

(No relevant relationships reported)

HISTORY: A healthy Caucasian 12-year-old male presents with right ankle pain after slipping and twisting his ankle during a recreational football game at day camp. Hours after injury, he was seen by his PCP, who ordered plain films and referred him to orthopedic surgery for further evaluation.
PHYSICAL EXAMINATION: Examination in-office revealed mild swelling over the right lateral ankle with tenderness over the anterolateral tibia. Active range of motion was significantly decreased in all directions, and he was unable to bear weight on the right lower extremity. There was good peripheral perfusion, no open wounds or lacerations, and no erythema or ecchymoses.
DIFFERENTIAL DIAGNOSIS:
1. Lateral ankle sprain
2. Triplane fracture
3. Pediatric distal tibial fracture
4. Juvenile Tillaux ankle fracture
5. Incisural ankle fracture
6. Adolescent pilon fracture

TEST AND RESULTS:
XR Right Ankle 3+ Views: On AP view, the fracture is vertical through the epiphysis. On lateral view, the fracture extends posteriorly into the metaphysis.
CT Right Lower Extremity: Comminuted distal tibia fracture with intra-articular extension through posterior malleolus through metaphysis and 3 mm separation. Multiple fractures involving epiphysis. Approximately 3.5 mm separation anteriorly at fracture site. Nondisplaced fracture extending through medial malleolus. Tiny fracture fragment within tibiotalar joint space adjacent to fracture site.
FINAL WORKING DIAGNOSIS:
Triplane fracture of right distal tibia with intra-articular extension
TREATMENT AND OUTCOMES:
1. Open reduction internal fixation of the right distal tibia with intra-articular extension performed by orthopedic surgery under general anesthesia.
2. Intraoperative post-reduction ankle films demonstrated satisfactory alignment and position with postsurgical tissue changes of distal tibial metaphyseal and epiphyseal fractures.
3. 2-week postsurgical follow-up with repeat ankle films demonstrated the fracture to be anatomically reduced with hardware in optimal position. Physical exam had appropriate wound healing and excellent range of motion.
4. Toe-touch weight-bearing while in boot for 4 weeks post surgery.
5. Limited range of motion exercises out of boot during weeks 2 through 4 post surgery.
6. Weight-bearing initiated 4 weeks post surgery.

B-44 Clinical Case Slide - **Knee I**

Wednesday, May 30, 2018, 3:15 PM - 5:15 PM
Room: CC-200F

700 **Chair:** Holly J. Benjamin, FACSM. *University of Chicago, Chicago, IL.*

(No relevant relationships reported)

701 **Discussant:** Scott A. Magnes, FACSM. *Fort Belvoir Community Hospital, Fort Belvoir, VA.*

(No relevant relationships reported)

702 **Discussant:** Jason Pothast. *MedStar National Rehabilitation Network, Washington, DC.*

(No relevant relationships reported)

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703 May 30 3:15 PM - 3:35 PM

Knees - Skiing

Anna R. King[1], Surein Theivakumar[1], Ramin R. Tabaddor[2]. *[1]New York University, NY, NY. [2]The Warren Alpert School of Medicine at Brown University, East Greenwich, RI.*

(No relevant relationships reported)

HISTORY:
A previously healthy 14-year-old female presents with left knee pain, stiffness, and swelling for one year after hearing a "pop" during a dance move. She is a competitive alpine skier and attends boarding school in Maine to pursue this. She was able to finish her skiing season, though continued to experience symptoms. MRI at that time showed effusion without associated ligamentous damage. Two weeks ago, her right knee began having similar symptoms. Her pain and stiffness in both knees are worse in the morning, after sitting for prolonged periods, and with stairs.
PHYSICAL EXAMINATION:
Patient has an antalgic gait pattern. The left knee has a tense effusion, with no soft tissue swelling, ecchymosis, or skin lesions. She has diffuse tenderness to palpation, especially along the medial femoral condyle. The right knee has a mild effusion and is not quite as tender. Both knees have full ROM, negative Lachman's and Anterior Drawer, and are stable to varus/valgus stress. She has full strength and sensation. Exam is also notable for left elbow fullness, warmth, and decreased extension by 10 degrees, as well as B/L Achilles tendon fullness without associated tenderness.
DIFFERNETIAL DX:
1. Inflammatory arthropathy
2. Synovial chondromatosis
3. Osteochondral defect
4. Lyme disease
5. Autoimmune process

TESTS / RESULTS:
-B/L knee XRs: no obvious abnormalities or defects.
-MRI left knee: large joint effusion with extensive tiny loose bodies (typical appearance of "rice bodies"). No meniscal, chondral, or ligamentous pathology.
-Lyme negative
-CRP and ESR elevated
- (+) ANA
-RF negative
FINAL / WORKING DX:
Juvenile Rheumatoid Arthritis (JRA)
TREATMENT & OUTCOMES:
-Strict activity modification, anti-inflammatories, ice, elevation, pediatric rheumatology referral, arthroscopic debridement of B/L knees with synovial biopsies.
-Rheumatology performed an intra-articular steroid injection of B/L knee joints, initiated DMARD therapy with Methotrexate, and referred for expedited ophthalmology evaluation.
-On post-op f/u, pathology findings were reviewed, which were consistent with JRA.
-At 1 month post-op debridement and 2 months s/p initiation of DMARDs, patient has no swelling or pain and is undergoing progressive return to full activities (including skiing) as tolerated under the guidance of her athletic trainer.

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704 May 30 3:35 PM - 3:55 PM

Using Ultrasound To Diagnose Knee Pain

PATRICK CAREY. *Martin Army Community Hospital, FORT BENNING, GA.*

(No relevant relationships reported)

HISTORY:

16 year old male high school athlete was referred to sports medicine clinic with complaint of intermittent right knee pain exacerbated by cutting maneuvers. Pain began after feeling a strain and pop when pushing off a starting block in track season one year ago. Patient's mother stated that ice, compressions, use of hinged knee brace makes it better and working out without the knee brace makes it worse. The pain usually starts at the medial side of the knee and radiates to the lateral side and is associated with occasional buckling and locking. No change in character of pain after a course of physical therapy and relative rest during the summer. He just completed football season and is currently in middle of basketball season, participation has been limited at times due to pain.

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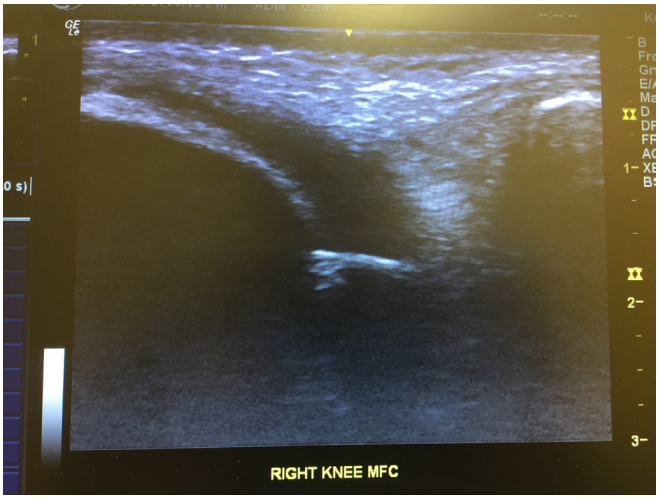
PHYSICAL EXAM:
Right knee exam reveals skin intact with minimal effusion. ROM-0-130 degrees with no pain at extremes. +JLT medially-this is more on the condyle then the meniscus. Medial joint line pain with McMurray and Thessaly; however, no palpable click. 1A Lachman. Stable knee to varus and valgus stress at zero and 30 degrees of flexion. Negative Posterior drawer and sag sign. Sensation intact to light touch on all distributions distally. 2+ distal pulses.
DIFFERENTIAL DIAGNOSIS:
1. Osteochondritis dissicans
2. Osteochondral lesion
3. Meniscus tear
TEST AND RESULTS:
The initial diagnostic test available was the ultrasound. There had been no prior imaging.
A limited ultrasound of the RIGHT Knee showed + mild joint effusion and a step off in the lateral portion of the medial femoral condyle.
Impression: + effusion and chondral defect of the lateral portion of the medial femoral condyle.
FINAL/WORKING DIAGNOSIS:
1. osteochondritis dissicans on the lateral portion of the medial femoral condyle
TREATMENT AND OUTCOMES:
He was given instruction to remain non weight bearing using crutches for 8 weeks pending results of imaging to determine stability of lesion.



705 May 30 3:55 PM - 4:15 PM

Knee Lesions - Treating The Athlete Not The Images

Spencer Kirk, Michael Ladewski. *Presence Resurrection Medical Center, Chicago, IL.*

(No relevant relationships reported)

HISTORY: A 33 year old male runner presented to clinic for evaluation of left knee pain. Pt has had intermittent pain since 14 years old when he was diagnosed with a left medial femoral condyle osteochondral defect. At that time he was a competitive runner and treated with 6 months of rest. He had nearly complete resolution of symptoms. He was able to resume competitive running throughout high school and college. He is currently extremely active with crossfit, marathons, and triathlons. He is seeking activity guidance in preparation for his first ironman triathlon. Current pain described as medial, sharp, 6/10, rarely present but felt after prolonged sitting or with weighted squats, associated difficulty fully extending knee, improves with manual manipulation.
PHYSICAL EXAMINATION: Gait: Normal appearance. Locks knee with heel strike of active phase of walking. Running gait without abnormality. Unable to perform left single leg squat.
Knee PROM: -10 to 140 degrees without subpatellar crepitance
Appearance: No effusion or ecchymosis
Patella: Tracks normally with negative apprehension and compression tests
Tenderness: Absent
Special Tests: Negative Valgus/Varus stress, Lachman's, McMurray's, Wilson's sign
DIFFERENTIAL DIAGNOSIS: 1. Osteochondral defect 2. Patellar Tendonitis 3. Patellofemoral Syndrome 4. Fat Pad Syndrome 5. Medial Plica
TEST AND RESULTS: Left knee MRI with 18.1 x 27.1 x 10.0mm osteochondral lesion of the medial femoral condyle with subchondral fluid consistent with Grade III lesion. Medial femoral condyle with bony edema and subchondral cyst. FINAL WORKING DIAGNOSIS: Osteochondral defect TREATMENT AND OUTCOMES: The worrisome appearance of the patient's MRI was discussed in detail. However, given the relatively benign physical exam and high functionality he was instructed to remain active and avoid surgical intervention as long as possible. He was advised that the traumatic nature of endurance running would likely lead to faster progression of the cartilage defect. Follow-up 6 months later, after completion of his triathlon, without change in symptoms. He remained extremely physically active but with a greater emphasis on swimming and biking.
This case exemplifies the importance of maintaining clinical perspective when treating individuals rather than the severity of their images.

706 May 30 4:15 PM - 4:35 PM

A Case of Bilateral Knee Pain in a Young Male Patient

Oluyemi Ajirotutu, Michael Fong. *Kaiser Permanente Los Angeles Medical Center, Los Angeles, CA.*

(No relevant relationships reported)

HISTORY: A 34-year old male with hypertension reports bilateral knee pain for 6-7 months. He describes the pain as achy and in his anterior knees. The pain is worse in the morning and after being on his feet all day at work. He reports some associated swelling. There was no trauma to his knees. He denies pain in any other joints. His pain is not improved with non-steroidal anti-inflammatory drugs however is improved with oral steroids. There is no family history of autoimmune conditions or joint disease.
PHYSICAL EXAMINATION: Exam performed in sports medicine clinic revealed moderate effusions of bilateral knees, limited flexion of both right knee to 90 degrees and left knee to 110 degrees, negative testing in the patellofemoral compartment, and negative meniscal/ligamentous testing. He was neurovascularly intact.
DIFFERENTIAL DIAGNOSIS:
1. Gout
2. Rheumatoid Arthritis
3. Osteoarthritis
TEST AND RESULTS:
XR Bilateral Knees: Mild bony degenerative changes with slight bilateral medial femoral tibial compartments marginal sclerosis and possible slight joint space narrowing.
ESR 3, RF<10
Aspiration of bilateral knees: 50-60ml of clear yellow fluid removed from each knee. Synovial fluid analysis demonstrated hazy fluid that was possibly inflammatory and was negative for infection or crystals.
MRI Left Knee: Moderate-sized joint effusion with synovitis. Frond-like synovial thickening in the anterior midline of the femorotibial joint that may be related to pigmented villonodular synovitis. Complex tear of the body of the medial meniscus.
MRI Right Knee: Medium-sized joint effusion with evidence of synovitis and possible foci of gradient echo dephasing which may be seen in association with pigmented villonodular synovitis. Complex tear of anterior horn and body of medial meniscus. Partial thickness chondral fissuring in medial patellar facet. Mild medial and lateral femorotibial compartment chondromalacia.
FINAL/WORKING DIAGNOSIS: Pigmented Villonodular Synovitis of Bilateral Knees
TREATMENT AND OUTCOMES:
Knee joint aspiration with intra-articular steroid injection
Rest, ice, compression, elevation
Non-steroidal anti-inflammatory drugs
Physical therapy/home exercise program
Future arthroscopic synovectomy and post-operative radiation

707 May 30 4:35 PM - 4:55 PM

Opening Kickoff Knee Catastrophe in High School Football

Ryan Hunt. *Ohio Health, Columbus, OH.*

(No relevant relationships reported)

Knee Injury – Football
HISTORY
18-year-old senior high school football linebacker sustained a knee injury during the opening kickoff of the season. As he was pursuing the ball, his left leg planted and

hyperextended while being contacted by an opponent, producing forced valgus and lateral rotation. He immediately fell to the ground, required on field medical attention, and was unable to bear weight.
PHYSICAL EXAMINATION
Sideline examination occurred within 5 minutes. Left knee examination revealed a moderate effusion, normal patellar tracking, and no bony deformity. Neurovascular examination normal. Able to perform straight leg raise against light resistance. Active ROM limited to 60° flexion and lacked 10° extension. No bony tenderness. Ligamentous examination revealed a positive Lachman and valgus stress in 30 degrees of flexion. Unable to tolerate compression testing. Left hip and ankle examination normal. Contralateral knee normal.
DIFFERENTIAL DIAGNOSIS
1. Acute ACL tear
2. Acute MCL tear
3. Meniscus tear
4. Patellar dislocation
5. Tibial plateau fracture or contusion
INTERVAL COURSE
Office visit 7 days after injury. Arthrocentesis of the left knee returned 35 mL of blood. Initial treatment included use of crutches, ice, hinged-knee brace, and quadriceps rehab. MRI ordered, however study was delayed about 6 weeks due to gap in parent's insurance.
TESTS AND RESULTS
o Left Knee Radiographs: Normal
o Left Knee MRI:- Marrow contusion of medial, lateral compartments, fibular head, nondisplaced posterior tibial plateau fracture, subchondral impaction injury of lateral femoral condyle and lateral tibial plateau- ACL rupture, acute sprain of MCL, IT band, and LCL- Complex lateral meniscus tear, large fragment from posterior horn flipped anteriorly- Complex medial meniscus tear, vertically through posterior horn
FINAL DIAGNOSIS
Left knee acute ACL rupture, MCL sprain, medial and lateral meniscus tears, bone contusion
TREATMENT/COURSE
1. Referred to orthopedics, underwent arthroscopic ACL reconstruction with hamstring autograft, lateral meniscus repair, and partial medial meniscectomy 8 weeks after initial injury.
2. Significant discussion on post-op rehab and long-term activity modification.

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708 May 30 4:55 PM - 5:15 PM

Unique Surgical Intervention for Patella Baja

Kevin MacIntyre, Christopher Mazoue, Andrea Taylor. *University of South Carolina, Columbia, SC.*

(No relevant relationships reported)

History: Patient is an active 41 year-old female (160 cm and 68 kg) who had a history of left, anterior knee pain with mechanical symptoms while playing tennis. Patient revealed a surgical history including: s/p partial lateral meniscectomy with lateral release, s/p lateral retinacula repair, manipulation under anesthesia (MUA), s/p open quadriceps tendon repair respectively, all within the last two years. Patient complained of continued pain, patella instability and functional deficits.
Physical Examination: Knee alignment and patella tracking was normal. She had 1+ joint effusion. She had significant restricted knee flexion (0-70 degrees). Ligament tests were stable. Neurovascular exam was normal.
Differential Diagnosis:
1.Patella tendon tendinopathy
2.Patellofemoral pain syndrome
3.Patella baja
Test and Results:
X-ray (February 2016): Insall-Salvati Ratio: 0.38; Blackburne-Peel Ratio: .31
MRI: Confirm patella baja; no patella tendon pathology; evidence of previous quadriceps tendon repair
CT: Confirm patella baja with no evidence of patella femoral syndrome
Post-op X-ray (February 2017): Insall-Salvati Ratio: 1.1; Blackburne-Peel Ratio: .98
Final Diagnosis: Patella baja with inadequate extensor mechanism
Treatment and Outcomes:
1.Surgical intervention included: left patella tendon Z-lengthening with patella tendon reconstruction with left hamstring autograft, left quadriceps tendon V-Y shortening and augmentation of medial patellofemoral retinaculum with a dermal graft.
2.Patient was fitted for a T-scope post-operatively with knee restricted to a maximum of 0-30 degrees of knee flexion for the first 2 weeks. The patient was restricted at 0-60 from weeks 2-4 then at 0-90 degrees from weeks 4-6.
3.At 6 weeks post-op, the patient had 65 degrees of active knee flexion.
4.Continued small improvements were present but by week 14 the patient only had 80 degrees of flexion.
5.An MUA was performed and within the first 4 weeks post-op and by October 2016, the patient had been discharged from physical therapy for meeting goals
and was going to the gym autonomously. The patient had 112 degrees of active knee flexion.
6.Patient and surgeon satisfaction were achieved, and patella positioning was maintained throughout the patient's recovery.

B-45 Clinical Case Slide - **Lumbosacral Spine**

Wednesday, May 30, 2018, 3:15 PM - 4:55 PM
Room: CC-Mezzanine M100F

709 **Chair:** Arthur Jason De Luigi. *MedStar NRH/Georgetown University Hospital, Olney, MD.*

(No relevant relationships reported)

710 **Discussant:** Joseph Ihm, FACSM. *Shirley Ryan AbilityLab, Chicago, IL.*

(No relevant relationships reported)

711 **Discussant:** Aaron Lee. *McNeal Hospital, Berwyn, IL.*

(No relevant relationships reported)

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712 May 30 3:15 PM - 3:35 PM

Unusual Cause of Postpartum Back Pain

Jacob Wessels. *Allina Health, St Paul, MN.* (Sponsor: Morteza Khodaee, FACSM)

(No relevant relationships reported)

HISTORY: A 27-year-old G5P0131 delivered an 1800g boy precipitously at 35 0/7 weeks. Her medical history was significant for gestational hypertension, hypothyroidism status post ablation, syphilis during pregnancy, and lumbar disc herniation. Twenty hours later she noted severe pain and inability to move her right lower extremity. She did have a fall or recent trauma. She had no numbness or tingling, normal bowel movements and urination. She did not have a fever, chills or any recent use of new medications.

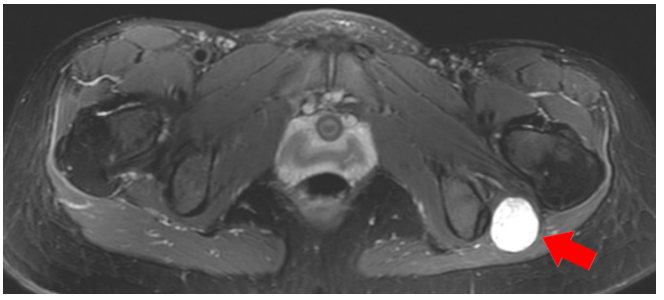
PHYSICAL EXAMINATION:
Vital Signs: afebrile, other vital signs were unremarkable
Musculoskeletal: Normal back and hip appearance. Not warm. Tender over sacral ridge, right SI joint, piriformis area and thigh. Pain in the sacral/gluteal region worse with hip external and internal rotation (FABER and FADIR positive for pain). Back flexion and extension reproduced pain.
Neurological: Normal sensation and strength testing in lower right leg.
DIFFERENTIAL DIAGNOSIS:
1. Piriformis syndrome
2. Disc herniation
3. SI joint dysfunction
4. Gluteal muscle strain
5. Septic SI joint
6. Sciatica
TEST AND RESULTS:
Post Partum Day 4:
CRP 27 mg/dL, ESR 105 mm/hr
CT abdomen and pelvis:
No ileus or obstruction; normal postpartum uterus, no endometritis or retained products; central disc herniation at L4-5 and subtle effacement of left L5 nerve
Post Partum Day 8:
MRI Spine/Pelvis:
L4-5 disc space annular bulge, mild canal compromise and bilateral recess narrowing. Findings compatible with septic arthritis of the right sacroiliac joint with a small adjacent pericapsular and intramuscular fluid collection, worrisome for an abscess.
Post Partum Day 9:
CT guided aspiration:
Fluid culture positive Group B streptococcus
FINAL/WORKING DIAGNOSIS: right SI joint septic arthritis and iliopsoas abscess due to Group B streptococcus
TREATMENT AND OUTCOMES:
She was initially treated with physical therapy and pain medication. Failing improvement, labs and CT were obtained. CT was unrevealing and patient declined further imaging. After four days, she was agreeable to an MRI that revealed septic arthritis. She was initiated on broad-spectrum intravenous antibiotics and narrowed to ceftriaxone. She continued therapy and antibiotics for five weeks. Her CRP and ESR normalized and she followed up with primary care clinic and infectious disease.

713 May 30 3:35 PM - 3:55 PM

A 37 Year Old Female Dance Instructor with Leg and Buttock Pain

John Franco, Cara Prideaux. *Mayo Clinic, Rochester, MN.*
(Sponsor: Dr. Karen Newcomer, FACSM)
(No relevant relationships reported)

HISTORY: A 37 year old female dance instructor with a history of stable multiple sclerosis presented with a 5 year history of left buttock and posterolateral thigh pain with radiation to the plantar surface of her foot that began during pregnancy. Pain was minimal at rest and aggravated by prolonged sitting and activities such as dancing, bicycling, and hiking. Pain progressed and now markedly limited activity. She reported tingling of the posterolateral calf and plantar surface of the foot. She denied weakness. Chiropractic care provided no relief. Previously obtained lumbar spine MRI was unremarkable and the patient completed 6 months of physical therapy without improvement.
PHYSICAL EXAMINATION: There was no appreciable deformity, malalignment, or rotation of the lumbar spine, hips, or knees. She walked with a non-antalgic gait, including normal heel and toe walking. Palpation of deep left gluteal muscles reproduced pain with radiation down the left lower limb. Range of motion of the lumbar spine and hips was grossly normal. Manual muscle testing of the lower limbs was normal. Passive hip flexion, abduction, and external rotation, as well as flexion, adduction, and internal rotation of the left hip reproduced pain. Remainder of provocative lumbar spine and hip maneuvers, including straight leg raise, were normal. She was neurovascularly intact.
DIFFERENTIAL DIAGNOSIS:
Chronic Piriformis Strain
Lumbosacral Radiculopathy
Hip Osteoarthritis
Multiple Sclerosis Flare
Sciatic, Tibial, or Peroneal Neuropathy
TEST AND RESULTS:



MRI Lumbosacral Plexus: 2.8 X 2.5 X 3.0 cm mass along the left sciatic nerve between the gluteus maximus and quadratus femoris with extension into the ischiofemoral space, consistent with cystic schwannoma
FINAL WORKING DIAGNOSIS: Left sciatic nerve tumor, concern for cystic schwannoma
TREATMENT AND OUTCOMES:
Neurosurgery evaluation
Underwent surgical resection of mass
16 weeks after surgery, reported 100% resolution of her symptoms

714 May 30 3:55 PM - 4:15 PM

Persistent Lower Back Pain In A Gaelic Footballer.

David Keohane. *Cork University Hospital, Cork, Ireland.*
(No relevant relationships reported)

History: A 27 year old, male, high-level, Gaelic Football and Hurling player presented to the Sports Medicine Clinic with a 3-year history of gradually deteriorating lower back pain rated 6/10. The pain was exacerbated by activity and improved by rest. He denied any history of trauma. He denied any radiation or radicular symptoms. Three years prior to presentation MRI had demonstrated a Scheuermann's kyphosis involving T12 with associated disc space narrowing at the T12-L1 level in addition to a transitional S1 vertebra.**Physical Exam**: Visual inspection was unremarkable. There was no pain on palpation over lumbar spine or paraspinal musculature. Lumbar flexion, extension and lateral side flexion were pain free and range of motion was within normal limits. Straight Leg Rise, Schobers and the Femoral Nerve Tension Test were normal. Examination of the hips revealed pain free but restricted internal and external rotation on the right but was otherwise normal. Neurovascular exam of lower limbs was normal.**Differential Diagnosis:** 1)Degenerative disc disease. 2)Lumber disc prolapse. 3)Spondylolisthesis. 4)Fracture of a lumbar vertebral body. 5)Hip pathology. 6)Inflammatory arthritis. 7)Seronegative spondyloarthropathy. 8)Infection.**Tests and Results:** Bloods were analysed to out rule inflammation or infection. MRI lumbar-sacral spine demonstrated L2-L3 facet joint hypertrophy but no significant thecal sac or nerve root compression and no evidence of sacroiliitis. X-ray of right hip showed significant acetabular dysplagia with uncovering of the femoral head. MRI right hip revealed oedema and multiple small cysts in the right femoral head with remodelling and fragmentation, features consistent with avascular necrosis.**Final/Working Diagnosis:** Idiopathic Avascular Necrosis of the Femoral Head.**Treatment and Outcomes:** The patient was advised to abstain from training and competition. NSAIDs were prescribed for pain and Alendronate 70mg once weekly was initiated to inhibit osteoclastic activity and reduce the risk of femoral head collapse. The patient was referred for an orthopaedic opinion where options included, observation, femoral head core decompression, non-vascularized bone grafting and hip arthroplasty. The decision was ultimately made to pursue a conservative medical approach as outlined above.

715 May 30 4:15 PM - 4:35 PM

Back Injury-Deadlift Weights

Amie Kim, Christopher Gentile, David Matherly, Ronald Alexander Horowitz. *Mount Sinai Icahn School of Medicine Beth Israel Medical Center, New York, NY.*
(No relevant relationships reported)

HISTORY: 35 year old transgender biologically female to male on 12-years high dose testosterone therapy presents with lower back pain for 2 weeks. He was deadlifting weights when noticed delayed left posterior thigh and calf pain. Pain was intermittently throbbing but responsive to acetaminophen. He went to an Urgent Care where a venous duplex was performed which was negative. He was diagnosed with paralumbar muscle strain, and cyclobenzaprine prescribed with little relief. One week later he presented to our emergency department with worsening pain and intermittent numbness in left foot and toes. He denies bladder or bowel changes. **PHYSICAL EXAMINATION:** Uncomfortable appearing. No bony lumbosacral tenderness. Tenderness to palpation left paralumbar muscles, left posterior thigh, calf. Active range of motion limited by pain including flexion/extension/lateral bend. Motor exam of nerve roots IP 4/5 Q 4/5 TA 4/5 EHL 4/5 GS 4/5 FHL 4/5. Sensory intact to light touch L2-S1. 2+ DP pulse. Gait antalgic and limited by pain. **DIFFERENTIAL DIAGNOSIS:** paralumbar strain, rhabdomyolysis, deep vein thrombosis, lumbar radiculopathy, conus medullaris, cauda equina syndrome **TEST AND RESULTS:** Serology including WBC, CPK and D-Dimer within normal values. Radiographs of pelvis / lumbosacral spine without findings. Calf venous duplex without acute thrombus. MRI lumbosacral spine with L4-L5 large left paracentral disc herniation displacing spinal canal with significant compression on the left S1 nerve root and thecal sac. Conus medullaris normal in signal. **FINAL WORKING DIAGNOSIS:** cauda equina syndrome **TREATMENT AND OUTCOMES:** Patient underwent emergent L5-S1 laminectomy with decompression of S1 nerve root, diskectomy with partial facetectomy. Discharged to outpatient therapy. Residual left lower extremity weakness, numbness, and perineal numbness treated with high dose methylprednisolone. Role of high dose testosterone in patient's presentation under evaluation.

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Back Pain-hockey

Melanie Kennedy, Anastasia Fischer, FACSM, Reno Ravindran. *Nationwide Children's Hospital, Columbus, OH.*

(No relevant relationships reported)

HISTORY:
A 17 year old male hockey goalie presented with acute left low back pain with radiculopathy after falling on his left side making a save a few days prior. He was unable to continue participation. A non-contrast MRI of his lumbar spine was performed to evaluate for disk pathology/sacroiliac joint inflammation and was negative. He completed 8 weeks of physical therapy to address poor hamstring flexibility and core strengthening with minimal improvement. He attempted to return to hockey but it worsened his pain. At follow up visits, he now had increased bilateral ischial tuberosity pain, and inflexibility of bilateral hamstrings. Pelvic radiographs were negative. Case discussed with PMR for extreme inflexibility but patient elected to continue with therapy transitioning to functional rehabilitation with an athletic trainer. After a few weeks with functional rehab, he had worsening low back and was referred back to clinic. He endorsed alternating between left and right posterior glutes, SI joint pain, quad and calf achiness and occasional shooting pain down left leg to posterior knee. Additionally pain woke him at night; he had morning stiffness, unintentional weight loss and no significant improvement throughout his 13 weeks of therapy. He did have prior issues with back pain in previous years managed by his PCP. Further imaging and lab work were obtained.
PHYSICAL EXAM: Tender within bilateral SI joints and right iliac crest. Poor flexibility of bilateral hamstrings, full range of motion of low back but evidence of somatic dysfunction.
DIFFERENTIAL DIAGNOSIS:
1. Herniated lumbar disk
2. Sacroiliac Joint Dysfunction
3. Functional back pain
4. Muscular strain
5. Spondyloarthropathy
6. SI joint infection/ Osteomyelitis
7. Metastatic Cancer
8. Psychologic Illness

TEST AND RESULTS:
7/5: Lumbar radiographs: Normal
7/11: MRI lumbar spine: Subcentimeter synovial cyst but otherwise negative
9/12: Pelvic radiographs: Normal
10/16: Sacroiliac MRI with/without contrast: Bilateral sacroilitis
Laboratory 10/13: CBC. CMP, ESR, CRP: Unremarkable
FINAL/WORKING DIAGNOSIS: Enthesitis related arthritis
TREATMENT AND OUTCOMES:
1. Prescribed Naproxen twice a day
2. Care transitioned to Rheumatology
3. Additional lab work up
4. Started on methotrexate and anti-TNF therapy
5. Plans to return to hockey next season

B-58 Free Communication/Poster - **Body Composition**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

740 Board #1 May 30 2:00 PM - 3:30 PM

Challenging The Testing Protocol Of The Bod Pod

Eric Shamus, PhD, DPT, Sarah Bengtson, DPT, Sierra Griffin, DPT, Ahmed Elokda, PhD, PT, Liza Malley, BS. *Florida Gulf Coast University, Fort Myers, FL.* (Sponsor: Mitchell L. Cordova, FACSM)

(No relevant relationships reported)

The BOD POD uses air displacement plethysmography to determine an individual's body composition as percentages of fat mass and fat free mass. The BOD POD presents potential use in a clinical setting, but the feasibility is currently unknown. There were no studies found examining the consumption of fluids and pre-urination prior to body composition testing utilizing the BOD POD. **PURPOSE:** The objective was to determine if the BOD POD protocol, as set forth by Life Measurement, Inc., needs to be followed in its entirety to ensure validity of body composition results, where urination and fluid consumption prior to testing were both independently tested. **METHODS:** Thirty-two division 1 male (15) and female (17) soccer athletes were recruited for this research study. Male soccer players weighed 162.6 pounds (± 19.03) and female soccer players weighed 133.8 pounds (+ 10.38). All athletes were between 18 and 22 years old (Male ± 1.37 & Female ± 1.17). Four separate measurements of body composition were taken: pre-urination, standard LMI protocol test re-test, and consumption of water equal to 10% of their body weight in ounces. **RESULTS:** A Pearson product moment correlation between the second condition (post urination) and the third condition (post urination retest) signified a good to excellent relationship between the standard test and the retest conditions (0.977, $p < .001$). A MANOVA analysis was performed comparing pre-urination and post-urination test/retest indicated that not urinating prior to testing had no significant effect on body composition measurements ($p > .05$). Consumption of water did have a significant effect on the results of the body composition measurements. It was found that post water consumption, male participants' measurement of fat mass on average had a significant difference of 0.6% and female participants' fat mass measurements on average had a difference of 1.4%, $p < .001$). **CONCLUSION:** Results did not support the need to urinate prior to BOD POD testing while supporting the need to refrain from water consumption directly prior to testing.

741 Board #2 May 30 2:00 PM - 3:30 PM

Assessing The Impact Of Body Fat Percentage And Lean Mass On Wingate Performance

Robert T. Sanders[1], Andy Bosak[1], Matthew L. Sokoloski[2], Hannah E. Nelson[1], James Kelly[1], Jared Feister[1]. *[1]Liberty University, Lynchburg, VA. [2]Texas Woman's University, Denton, TX.* (Sponsor: Dr. James Schoffstall, FACSM)

(No relevant relationships reported)

The Wingate test is commonly utilized to assess the anaerobic power capabilities of athletes across various sporting disciplines. Although prior studies have assessed the impact that body composition values have on anaerobic performance in above averagely fit populations, it appears that no study has evaluated the relationship between body fat percentage (BF%), lean leg mass (LLM), and trunk lean mass (TLM) on Wingate performance in no less than averagely fit males. **PURPOSE:** To investigate the relationship between BF%, LLM, and TLM on Wingate performance in no less than averagely fit college-age males. **METHODS:** After having descriptive data recorded, 38 no less than averagely fit college-age males had their BF%, LLM, and TLM assessed via a bioelectrical impedance analyzer. BMI was also calculated. Subjects participated in an 8 min dynamic warm-up on a leg cycle ergometer, followed by the completion of a maximal effort 30s sprint. Pearson Correlations were then performed between BF%, LLM, TLM, peak power (PP), and mean power (MP) with significant differences determined at $p \leq 0.05$. **RESULTS:** High to moderately high positive correlations existed between PP and TLM ($r = .834$, $p = .001$), LLM ($r = .773$, $p = .001$), BMI ($r = .657$, $p = .001$) as well as between MP and TLM ($r = .904$, $p = .001$), LLM ($r = .880$, $p = .001$), and BMI ($r = .619$, $p = .001$). However, no relationship occurred between BF% and PP ($r = -.064$, $p = .123$) while a low negative relationship occurred between MP ($r = -.234$, $p = .049$) and BF%. **CONCLUSIONS:** TLM, LLM, and BMI appear to have a strong positive relationship with Wingate performance in no less than averagely fit males, while BF% appears to have little to no relationship with Wingate performance. Further research may be necessary in order to determine if fitness level, sport specificity, or a different type of body fat percentage measurement technique may play a factor when considering if BMI, BF%, LLM, and TLM has a relationship with Wingate performance.

742 Board #3 May 30 2:00 PM - 3:30 PM

Comparison Of A-mode And B-mode Ultrasound For Measurement Of Subcutaneous Fat

Dale R. Wagner, Trenton Judd, Joshua Gordon, Casey McPherson, Adrianna Robison. *Utah State University, Logan, UT.* (Sponsor: Edward Heath, FACSM)

(No relevant relationships reported)

With lower cost devices and technological advancements, ultrasound has been undergoing a resurgence as a method to measure subcutaneous adipose tissue. Amplitude (A-mode) ultrasound produces a spike at the interface between subcutaneous fat and muscle, while brightness (B-mode) ultrasound produces an image of the underlying tissues. **PURPOSE**: This study aimed to determine if a low-cost, low-resolution A-mode ultrasound designed specifically for body composition assessment could produce subcutaneous fat thickness measurements comparable to an expensive, high-resolution B-mode device. **METHODS**: Subcutaneous fat thickness was measured on 41 participants (21 female, 20 male; 29.6 ± 11.0 y; BMI 25.3 ± 5.1 kg/m^2) at 7 sites (chest, subscapula, mid-axilla, triceps, abdomen, suprailiac, and thigh) with two devices: a 2.5 MHz A-mode ultrasound (BodyMetrix BX 2000), and a 12 MHz B-mode ultrasound (GE NextGen LOGIQ e R7). **RESULTS**: Pearson correlation coefficients between the two ultrasound devices exceeded 0.80 ($P < 0.001$) at all measurement sites. Mean differences in fat thickness were not significantly different between the devices ($P > 0.05$) with the exception of the triceps site ($P = 0.021$); however, the mean difference at this site (0.53 mm) was not clinically relevant. The variability between devices was greatest at the abdomen, the site with the greatest thicknesses. However, Bland-Altman plots revealed no systematic bias between

devices at any site. **CONCLUSIONS**: Given the strong relationships, insignificant mean differences, and lack of systematic bias, the low-cost, low-resolution A-mode ultrasound provides subcutaneous fat thickness measurements similar to the more expensive, high-resolution B-mode ultrasound.

743 Board #4 May 30 2:00 PM - 3:30 PM

Agreement in Fat and Muscle Estimation between Bioelectrical Impedance and Anthropometry in Youth Athletic Population

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(No relevant relationships reported)

PURPOSE: The purpose of this research was to measure the level of agreement in the assessment of the body fat and muscle masses between an anthropometry-based model and the bioelectrical impedance analysis in youth athletes.
METHODS: A sample of 252 subjects was studied (137 boys and 115 girls). The participants covered an age range from 12.5 to 16.6 years (Body mass = 59.1 ± 9.8 kg, BMI = 21.2 ± 2.4 $kg \cdot m^{-2}$; mean ± SD). Body composition was indirectly achieved by bioelectrical impedance analysis (BIA) and by the anthropometry-based model of De Rose and Guimaraes (1980) (DRG). DRG was updated using the simple regression equations of Withers *et al*. (1987, cited by Norton, 1996) to estimate body density, and Siri formula (1961) was then utilized to calculate the percentage of body fat. The mean values of the body fat and muscle masses given by the two methods were contrasted within each gender stratum, using the Student's *t*-test for correlated samples. The Bland-Altman analysis was employed to estimate 95% limits of agreement. Statistical significance was set at $p<0.05$.
RESULTS: The differences between DRG and BIA were statistically significant in both genders ($p<0.001$). In boys, the mean values were, respectively, 7.4 and 7.9 kg for the fat mass, and 28.9 and 31.0 kg for the muscle mass; the 95% limits of agreement were from -3.8 to 2.7 kg, and from -6.0 to 1.6 kg. In girls, the mean values were, respectively, 9.4 and 11.8 kg for the fat mass, and 22.4 and 23.3 kg for the muscle mass; the 95% limits of agreement were from -6.3 to 1.5 kg, and from -4.3 to 2.4 kg. The means for the variables expressed in percentage values were, in boys, 11.5 and 12.4 % for the fat mass, and 45.8 and 49.2 % for the muscle mass; the 95% limits of agreement were from -5.9 to 4.1 %, and from -8.9 to 2.1 %. And in girls, the means were 16.8 and 21.2 % for the fat mass, and 41.7 and 43.2 % for the muscle mass; the 95% limits of agreement were from -11.1 to 2.3 %, and from -7.2 to 4.1 %.
CONCLUSIONS: There was found a negative bias of DRG with respect to BIA for the two variables. In boys, the difference between methods was higher for the muscle mass, and in girls it was higher for the fat mass. The bias between DRG and BIA had a detrimental impact on the limits of agreement.

744 Board #5 May 30 2:00 PM - 3:30 PM

Normalization For Body Mass Affects The Correlation of Strength Tests To Speed And Agility Tests

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(No relevant relationships reported)

Previous research has explored the correlation between strength tests and speed-agility tests among athletes with varying results. Much of this can be attributed to differences in reported results based on absolute strength test values versus those normalized to body mass (BM). **Purpose:** This study was to compare the correlation between absolute strength, speed, and agility test results to those normalized using body mass. **Methods**: Varsity Division I male football players (n = 327) were tested during several seasons. Tests for strength included one repetition maximum (1RM) back squat (BS), power clean (PC), and push jerk (PJ). Results were recorded as absolute values as well as normalized values, calculated by dividing each 1RM by the athlete's BM. Tests for speed and agility included 40-yard dash (40YD), 10-yard dash (10YD), 20-yard shuttle run (SR) and standing vertical jump (VJ). A Pearson Product-Moment Correlation analysis was used to determine significant correlations between tests. **Results:** Results are presented below, with the first table displaying the absolute values of the strength tests and the second table showing the normalized values:

	Shuttle Run	10-yd Dash	40-yd Dash	Vertical Jump
Push Jerk	.22*	.11*	.25*	- .08
Power Clean	.09	.02	.12*	.04
Back Squat	.16*	.05	.13*	.00

	Shuttle Run	10-yd Dash	40-yd Dash	Vertical Jump
Push Jerk / Body Mass	- .63*	- .60*	- .66*	.62*
Power Clean/ Body Mass	- .71*	- .64*	- .76*	.68*
Back Squat/ Body Mass	- .59*	- .57*	- .68*	.62*

*$P \leq 0.05$
Conclusions: The results suggest that the correlations between 1RM strength test, and speed-agility test results are affected by normalizing to BM. There is a stronger significant correlation between tests when 1RM strength test values are normalized to BM.

745 Board #6 May 30 2:00 PM - 3:30 PM

Ability of the LeanScreen App to Accurately Assess Body Composition

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(No relevant relationships reported)

Waist-to-hip ratio (WHR) and percent body fat (%BF) are commonly used to assess body composition in health and wellness settings. While there is only one commonly used method for measuring WHR, %BF can be determined many ways. However, the accuracy, cost, and ease of use of these methods vary greatly. The LeanScreen app is a new method designed to determine WHR and %BF using photographs. **Purpose:** This study was designed to assess the accuracy of the LeanScreen app to determine WHR and %BF against laboratory-validated methods. Eighty subjects (40 males; 40 females) participated in this study. Waist-to-hip ratio was manually measured and %BF was determined using the BOD POD. Photographs of each subject were taken from the front and back with the LeanScreen app according to the procedures demonstrated by the program software. **Results:** There was no significant difference in WHR between the LeanScreen app (.81 ± .078) and manual (.81 ± .087) WHR measurement (r=.83). Additionally, it was found that 73 subjects (91%) were within one standard deviation (0.08) of the mean. Overall, %BF was significantly underpredicted by the LeanScreen app compared to the BOD POD (20.2 ± 7.74 vs. 21.6 ± 8.77). Although there was a high correlation between the two methods (r=.82), only 35 subjects (44%) were within ± 3% of BOD POD derived %BF and there was a high degree of variability between methods (SEE=5.1). **Conclusion:** Based upon the results of this study, the LeanScreen app accurately determines WHR, but does not accurately determine %BF on an individual basis.

746 Board #7 May 30 2:00 PM - 3:30 PM

Validation of New Skinfold Prediction Equation Based on Dual-Energy X-Ray Absorptiometry for Women.

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(No relevant relationships reported)

There is a high demand for affordable body composition assessments of body fat and fat free mass. Research has demonstrated that skinfold prediction equations recommended by the American College of Sports Medicine (ACSM) underestimate body fat percentage (%BF). **PURPOSE:** The purpose of this study was to validate an alternative equation for women created from dual energy x-ray absorptiometry (DXA). The DXA criterion (DC) equation is:
$\%BF = -6.40665 + 0.491946(S3SF) - 0.00126(S3SF)^2 + 0.12515(hip) + 0.06437(age)$;
(S3SF = sum of triceps, suprailiac, thigh; hip = circumference in cm; age = years).
METHODS: Anthropometrics (skinfolds and circumferences) and a DXA scan were completed on 78 women (mean ± SD) [age: 28.0 ± 10.1 yr., height: 165.1 ± 5.9 cm, mass: 63.5 ± 10.5 kg., BMI: 23.2 ± 3.2 kg/m^2]. The three Jackson-Pollock skinfold prediction equations (JP7, JP3a, and JP3b) and the DC equation were compared to DXA %BF. **RESULTS:** Two-way ANOVA with repeated measures detected significant differences ($p < 0.05$) in the %BF with post hoc-comparisons revealing significant differences among JP7 (21.4 ± 5.8), JP3a (22.3 ± 5.9), and JP3b (22.7 ± 5.7) as compared to the DXA (26.6 ± 5.4). No significant difference existed between DC %BF (26.6 ± 5.9) and DXA %BF (26.6 ± 5.4) ($p = 1.0$) and the two assessments were highly correlated ($R = 0.87$). The standard error of the measurement for the DC equation was low (2.98%). **CONCLUSION:** The DC equation more accurately predicted %BF across a general population of women than the recommended ACSM equations. Practitioners should consider its use and exercise caution when using older equations since they may yield lower %BF compared to DXA.

747 Board #8 May 30 2:00 PM - 3:30 PM

Evaluation of Regional Body Composition in Able-Body and Wheelchair Basketball Teams

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(No relevant relationships reported)

BACKGROUND: The differences in maximum oxygen consumption (VO_{2max}) and peak oxygen consumption (VO_{2peak}) between able-bodied athletes and wheelchair athletes has been well documented. Another relationship that has been well established is that of body composition and aerobic or cardiovascular fitness (VO_2).
PURPOSE: The purpose of this study was to evaluate the regional body composition, as measured by the dual energy x-ray absorptiometry (DXA), between the able-bodied (AB) men's and women's basketball teams and the men's and women's wheelchair (WC) basketball teams and its relationship to VO_2.
METHODS: 7 WC athletes with a spinal cord injury (SCI, age 21.29 ± 2.29 yrs), 7 WC non-SCI athletes (NSCI, age 20.14 ± 2.14 yrs) and 28 AB athletes (age 19.43 ± 2.57 yrs) participated in the study. The subjects underwent exercise tests to determine VO_{2max} or VO_{2peak}. The AB teams performed the Bruce protocol using a Parvo metabolic cart while the WC teams used their wheelchairs attached to a treadmill using a Cosmed K4b2 portable metabolic machine. Body composition measures, total and regional percent body fat (%BF), were conducted using a GE-Lunar DXA. The regional measures (arms and legs) allowed body composition comparisons between AB and WC teams. SPSS 24 was used to run a linear regression to determine what percent of VO_2 could be attributed to %BF.
RESULTS: DXA results were total (AB: 19.24 ± 16.06%; NSCI: 36.46 ± 14.34%; SCI: 31.70 ± 19.40%) and regional (AB: 20.40 ± 15.90%; NSCI: 25.67 ± 13.93%; SCI: 22.60 ± 14.70%). VO_{2max} results (AB 44.62 ± 14.98 ml/kg/min) and VO_{2peak} results (SCI: 25.80 ± 10.12 ml/kg/min; NSCI: 24.34 ± 5.51 ml/kg/min) were significantly different ($p < 0.05$). When evaluating WC users, specifically with a SCI, the R^2 value was 0.703 ($p = 0.018$) which showed this method does predict VO_{2max} significantly. When evaluating only the working limbs of the able body group, the R^2 value was 0.233 ($p = 0.009$).
CONCLUSION: Significant differences were found among the 3 groups (AB, SCI, non-SCI) when evaluating total body fat. However, there were no significant differences when evaluating %BF of the working limb. This suggests that there may be more to the VO_{2max} differences seen between AB and WC athletes than just muscle size and that regional %BF of the working limb should be taken into account with SCI.

748 Board #9 May 30 2:00 PM - 3:30 PM

Effects Of Menstrual Cycle On Body Weight And Intracellular And Extracellular Fluid

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(No relevant relationships reported)

Blood concentrations of ovarian hormones, such as estrogen and progesterone, change during each phase of the menstrual cycle. Ovarian hormones can have an effect on fluid retention. Therefore, it has been suggested that the body weight and body composition changes with different phases of the menstrual cycle. **PURPOSE**: The purpose of this study was to compare changes in body weight and intracellular and extracellular fluid levels during the menstrual cycle.
METHODS: The subjects were eight women (age, 21.6 ± 1.1 y) with regular menstrual cycle who volunteered to participate in this study. Subjects performed 30 min of cycling at an intensity of 60% VO_2 peak at three time points during the menstrual cycle: follicular phase, FP; ovulation phase, OV; luteal phase, LP). Blood samples were collected at rest (0 min), immediately after the exercise (30 min), 30 min after the exercise (60 min), and 60 min after the exercise (90 min). The duration of each menstrual cycle phase was estimated by assessing the levels of ovarian hormones. Blood analyses of ovarian hormones (estradiol and progesterone), renin activity, and aldosterone were conducted. Intracellular fluid and extracellular fluid from each site (upper limb, lower limb, and trunk) were measured before and after exercise.
RESULTS: Blood concentration of estradiol was greater during the OV and LP than during the FP at all time points (FP, 30.4 ± 12.3 pg/mL; OV, 186.6 ± 139.1 pg/mL; LP, 195.5 ± 118.0 pg/mL, $p < 0.05$). The body weight tended to greater in the LP when compared to the OV (FP, 57.8 ± 2.3 pg/mL; OV, 57.7 ± 2.4 kg; LP, 58.2 ± 2.2 kg, $p = 0.06$). The extracellular fluid from the trunk was significantly higher in the LP than in the FP and OV (FP, 5.49 ± 0.4 L; OV, 5.50 ± 0.4 L; LP, 5.55 ± 0.3 L, $p < 0.05$). A significant positive correlation was found between renin activity and progesterone levels ($r = 0.632$, $p < 0.05$).
CONCLUSIONS: The increase in body weight during the LP was induced by an increase in body fluid volume. This study was supported by the JSPS KAKENHI Grant Number 26350768 and Ministry of Education, Culture, Sports, Science and Technology-Japan, Female Athlete Development and Support Project.

749 Board #10 May 30 2:00 PM - 3:30 PM

Body Fat Percent and Relative Intensity in Walking at 2.5 mph among University Students

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(No relevant relationships reported)

Purpose: To better understand the relationship between body composition and aerobic capacity, this study examined how body fat percent (%BF) would be related to heart rate (HR), maximal HR% (%HRmax) and HR reserve% (%HRR) when walking at 2.5 mph among university students.
Methods: The three-site skinfold measure was administered to 176 university students (mean age: 20.82±1.49; 102 males and 74 females) in the US and converted to %BF using the conversion tables by Jackson et al. (1985). The ACSM %BF satisfactory ranges (2014, 10%-22%BF for men and 20%-32%BF for women) were used to divide participants into three %BF categories: Normal, Lean, and Obese. In addition, using HR monitors (Sigma PC26.14) resting HR (after lying on the floor for five minutes) was measured to calculate HRR, and HR at the end of a three-minute treadmill walking at 2.5 mph was also measured. One-way MANOVA was used to examine differences in HR, %HRmax, and %HRR at the end of the three-minute walking among the three %BF groups.
Results: There were 90 participants in Normal, 64 in Lean, and 22 in Obese group. No age difference ($p > .70$) was found among the three %BF groups (Normal 20.71±.90, Lean 20.94±2.79, Obese 20.95±1.50). However, significant differences (p values ranged from .000 to .012) were observed in HR, %HRmax, and %HRR at the end of the three-minute walking at 2.5 mph among the three %BF groups. Specifically, significant differences were identified in HR in all the three pairwise comparisons: Lean (89.90±10.00) vs. Obese (104.77±10.32), Lean vs. Normal (98.39±11.10), and Normal vs. Obese; in %HRmax in all the three pairwise comparisons: Lean (45.18±5.14) vs. Obese (52.64±5.19), Lean vs. Normal (49.37±5.57), and Normal vs. Obese; and in %HRR between Lean (18.71±6.60) and Obese (24.39±6.69) and between Lean and Normal (22.06±6.61).
Conclusion: Even walking at the threshold of moderate intensity (2.5 mph, a 3-MET activity), lean individuals demonstrate significantly lower HR, %HRmax, and %HRR than normal and obese individuals; and normal individuals show significantly lower HR and %HRmax than obese individuals. The %BF classified with ACSM %BF ranges has significant impact on relative intensity experienced among university students when walking at 2.5 mph.

750 Board #11 May 30 2:00 PM - 3:30 PM

Hyperhydration Acutely Increases Bioelectrical Impedance Analysis Body Fat Estimates

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(No relevant relationships reported)

Bioelectrical impedance analysis (BIA) is a common and non-invasive method to evaluate body composition by measuring the electrical impedance of the body. Altering blood electrolyte concentration or blood volume may impact BIA measurements by directly influencing the electrical conductivity of the body. While dehydration and sweat induced electrolyte loss certainly impacts BIA, it is unclear how simultaneous hyperhydration and electrolyte loading effects BIA measurements. **PURPOSE:** To examine the effects of acute hyperhydration and salt loading on the impact of BIA derived body fat estimates. **METHODS:** Each participant ate a standardized meal followed by ≥4hr fast, prior to the experimental visit. Adequate hydration (urine SG ≤1.020) of each participant was confirmed prior to the start of the visit. Tanita TBF-300A BIA and a blood sample were performed at baseline and every 30min for 3hr following the consumption of 3.8 grams of table salt dissolved into 466mL of deionized water (sodium: 1500mg, 140mmol). All urine produced during the 3hr follow-up was collected to assess volume and electrolyte excretion. **RESULTS:** Seven healthy participants (3M/4W, 29±2 years, 67.0±4kg, urine SG 1.007±0.001, hemoglobin 13.7±0.2g/dL, hematocrit 45±1%, serum sodium 140.0±0.5mmol/L) were studied. Participants excreted 646±55mL of urine containing 17.1±6.8mmol of sodium during the 3hr follow-up period. Consumption of the salt water solution increased plasma volume 7.0±0.7% and serum sodium 1.3±0.4% with each statistically elevated above baseline during the time points ≥60min and ≥120min, respectfully (all $p<0.05$). Both body mass (+0.4±0.1kg) and BIA estimated body fat percentage (+0.6±0.2%) (both $p<0.05$) increased immediately and returned to baseline levels by 90min. Leg to leg electrical impedance was not affected by the consumption of the salt water beverage ($p=0.660$). **CONCLUSION:** This preliminary data suggests that when starting in a hydrated state, concurrent consumption of salt and water temporarily increases body mass causing an increase in body fat estimates. However, differences in temporal patterns suggest increased plasma volume with small elevations in electrolyte concentration does not directly affect body fat estimates when using bioelectrical impedance analysis.

751 Board #12 May 30 2:00 PM - 3:30 PM

Effects of a Six Week Weight Loss Challenge on Body Composition and Cardiovascular Health

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(No relevant relationships reported)

Regular exercise and a healthy diet are associated with significant changes throughout the body including improved body composition and enhanced cardiovascular health. A local gym recruits individuals to participate in a six-week twenty pound weight loss challenge and provides participants with a structured diet and exercise plan. **PURPOSE:** The purpose of this study was to determine if a primarily weight loss driven program would also result in an improvement in body composition and enhance cardiovascular health. **METHODS:** Total weight, body fat, lean muscle mass, waist and hip circumference, resting metabolic rate (RMR), total cholesterol (TC), high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, fasting plasma glucose (FPG), triglycerides (TG), resting blood pressure (BP), and resting heart rate (RHR) were assessed before and after the six-week program in thirty four sedentary adults (M_{age} =38.24, SD=9.93). Subjects were required to participate in a vigorous boot camp program a minimum of five days per week for fifty minutes and follow a structured diet plan. **RESULTS:** There was a significant decrease in total body weight following the six-week challenge (197.1 ± 7.76 lbs vs. 187.8 ± 7.16 lbs; $P < 0.001$). There was a decrease in body fat (38.6 ± 1.52% vs. 36.2 ± 1.52%; $P < 0.001$) as lean muscle mass increased (61.4 ± 1.52% vs. 63.8 ± 1.52%; $P < 0.001$). Participants successfully lost 1 inch off their waists and hips ($P < 0.01$). A significant decrease in TC (189.2 ± 6.81 mg/dL vs. 173.4 ± 6.65 mg/dL, $P < 0.001$) and LDL (115.0 ± 7.25 mg/dL vs. 107.0 ± 6.05 mg/dL, $P < 0.05$) were seen following the weight loss program. Unfortunately, neither RBP nor RHR were significantly altered by the program. **CONCLUSIONS:** These data suggest that this particular weight loss driven program is effective in significantly improving body composition and reducing TC and LDL. However, this program did not statistically improve resting metabolic rate or decrease resting cardiovascular measures. While this study emphasizes the health-related advantages of incorporating physical activity and a healthy diet into a sedentary lifestyle, further research can contribute to training specificity and the impact both cardiovascular and weight training have in junction with a structured weight loss program.

752 Board #13 May 30 2:00 PM - 3:30 PM

Evaluation Of Body Composition Measurements Obtained Using Whole-body Plethysmography

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(No relevant relationships reported)

Purpose: Body composition assessments provide important health information, as excess body fat percentage (BFP) in relation to lean body mass can increase risk of cardiovascular disease and diabetes. While dual-energy x-ray absorptiometry (DXA) is a gold standard measurement of body composition, faster alternatives that do not expose participants to radiation, such as bioelectrical impedance (BIA), can promote awareness and be used to determine training efficacy. In this study, we compared body composition measurements obtained using whole-body plethysmography by the Airmetrix Whole-Body Self-Service Analyzer to those obtained via multifrequency BIA analysis and DXA scanning.
Methods: Twenty-six volunteers (17 female, 36.7 ± 12.3 years of age) were tested on two visits. On the first visit, body composition was assessed under fasted conditions by one Biospace InBody 770 analysis, one DXA scan (GE Lunar iDXA), and at least two Airmetrix tests. The second visit was performed at least 24 hours later, at a different time of day, and after the participant had consumed a meal. Body composition was assessed by one InBody analysis and at least two Airmetrix tests. For all tests, participants wore clothing that was tight and minimal with long hair tied up to minimize extra volume that may interfere with measurements. Shoes, keys, jewelry, and other accessories were removed.
Results: The Airmetrix system showed good precision, with a within-visit retest mean range of 0.04 lbs and 0.51% for weight and BFP, respectively. Although there were statistically significant absolute changes in weight and BFP between visits, there was no systematic direction and was therefore likely due to normal physiological fluctuation. Comparing devices, InBody and average Airmetrix BFP measurements were significantly lower than DXA BFP measurements for both visits ($p<0.001$). Although the Airmetrix system had slightly greater absolute mean percent error compared to InBody (18.8-19.4% vs. 16.8-17.1%, respectively), the difference in errors between devices was not statistically significant ($p=0.067$).
Conclusion: The Airmetrix system assess weight and BFP with good precision. Overall, the Airmetrix and InBody devices produce similar results, and both significantly underestimate BFP compared to DXA.

753 Board #14 May 30 2:00 PM - 3:30 PM

Large Exercise-induced Weight Loss on Fat Distribution and Metabolic Risk Factors in Young Obese Males

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(No relevant relationships reported)

There has been a lack in research on the effects of large exercise-induced weight loss of more than 10 kg on fat distribution and metabolic profile of obese males. **PURPOSE:** To examine large exercise-induced weight loss on fat distribution and metabolic risk factors, and their improvements associated with coronary heart disease. **METHODS:** A total of 20 obese males (age: 19.3 ± 1.30 yrs) completed in the institutionalized regimented training (IRT) held over 16 weeks. Anthropometric, dual x-ray absorptiometry scan and resting metabolic rate (RMR) measurements were taken in the laboratory, while computerized tomography scan, fasting venous blood samples, and a 2-hour oral glucose tolerance test were completed at a local hospital. Daily activities and dietary habits were self-recorded over 2 weekdays and 1 weekend day. **RESULTS:** IRT resulted in an average weight loss of 13.4 ± 3.70 kg ($p < 0.001$), significantly reducing body fat percentage and body mass index ($p < 0.001$). There were significant reductions in total cholesterol (Pre: 4.79 ± 0.92 $mmol.L^{-1}$, Post: 4.12 ± 0.82 $mmol.L^{-1}$, $p < 0.001$), triglycerides (Pre: 1.19 ± 0.57 $mmol.L^{-1}$, Post: 0.74 ± 0.30 $mmol.L^{-1}$, $p < 0.001$), low density lipoprotein cholesterol (LDL-C) (Pre: 3.04 ± 0.83 $mmol.L^{-1}$, Post: 2.51 ± 0.74 $mmol.L^{-1}$, $p < 0.001$), Plasma Apolipoprotein (Apo) A-1 (Pre: 133.3 ± 13.1 $mg.dL^{-1}$, Post: 120.4 ± 14.5 $mg.dL^{-1}$, $p < 0.001$), Apo B (Pre: 88.1 ± 25.7 $mg.dL^{-1}$, Post: 70.1 ± 18.2 $mg.dL^{-1}$, $p < 0.001$), Total/high density lipoprotein cholesterol (HDL-C) (Pre: 4.00 ± 1.01, Post: 3.26 ± 0.81, $p < 0.001$), and LDL/HDL-C (Pre: 2.54 ± 0.82, Post: 2.00 ± 0.72, $p < 0.001$). A 45% decrease in the insulin area/glucose area ratio was compatible with an increase in insulin sensitivity. Daily RMR decreased by 138.0 ± 164 $kcal.day^{-1}$ ($p < 0.05$). RMR/Weight increased (Pre: 20.5 ± 3.30, Post: 21.9 ± 2.70, $p < 0.01$) while RMR/Fat free mass ratio decreased (Pre: 30.70 ± 4.5, Post: 29.10 ± 3.20, $p < 0.05$) after training. Reported total daily physical activity increased by 33%, which was associated with reductions in body weight ($r = 0.39$, $p < 0.05$). **CONCLUSION:** Large exercise-induced weight losses significantly reduced metabolic risk factors for disease and abdominal fat in young obese males. Therefore, large weight losses through exercise may be an effective strategy for maximizing health benefits to obese individuals.

754 Board #15 May 30 2:00 PM - 3:30 PM

Sport-Specific Changes to Bone and Lean Mass Proportionalities among College Athletes

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(No relevant relationships reported)

Interest in the morphological characteristics of athletes has been growing in recent years. A Darwinian model suggests that some athletes may naturally gravitate to a sport based on their specific morphological characteristics. However, comparisons between male and female athletes in similar sports have not been fully explored. **PURPOSE**: To compare morphological distributions of regional bone mineral content (BMC) and lean mass (LM) between men and women athletes in comparable sports.
METHODS: NCAA Division-II male (n = 87) and female athletes (n = 60) in four sports [soccer (SOC), basketball (BB), cross-country (XC), and baseball/softball (BS)] were measured for regional BMC and LM using dual-energy X-ray absorptiometry (DXA). Inactive men (n = 23) and women (n = 27) served as a control group (CON). Ratio of BMC to LM for arms, legs, and trunk was calculated to indicate regional proportionalities.
RESULTS: Men were taller and heavier than women and had lower %fat ($p<0.001$). BB was taller ($p<0.05$) than other sports and CON. Men had significantly greater total LM/Ht (35.3 ± 4.4) than women (26.5 ± 2.6). LM/Ht was significantly greater in BS and BB than in XC, CON, and SOC which did not differ significantly among those groups. Sex x sport multivariate ANOVA revealed women had a greater arm BMC:LM than men ($p<0.005$) but total body, trunk, and legs BMC:LM were similar. Leg BMC:LM was greater in SOC (6.6 ± 0.5) and BB (6.5 ± 0.5) than in BS (6.1 ± 0.5), XC (6.4 ± 0.3), or CON (6.2 ± 0.7), which were not different. Trunk BMC:LM was significantly lower for XC (3.3 ± 0.2) and CON (3.5 ± 0.5) that for SOC (3.8 ± 0.4), BS (3.8 ± 0.5) and BB (3.9 ± 0.4. Total and arm BMC:LM was not significantly different among groups. Sex x sport interactions were not significant.

CONCLUSIONS: Sports and sport-specific training appears to impact LM and BMC accrual differently. Men and women athletes in sports that required more intense running and perhaps more weight lifting had greater legs BMC:LM than sports that apparently do not place the same degree of stress on bones and/or LM. The degree of stress on bones for the arms does not seem sufficient to differentiate among these sports or inactive individuals, but may be more related to differences in regional LM and specific strength training programs.

755 Board #16 May 30 2:00 PM - 3:30 PM

Body Fat Differences Between Skinfold, Impedance, And Dexa Measurements

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(No relevant relationships reported)

Measurement of body fat can be performed using two, three, and four compartment models. Determining which technique to use in different populations is still being debated based on reliability, validity, ease of use, and subject safety.
PURPOSE: To determine the differences between percent body fat measured by Dual X-ray Absorptiometry (DEXA), leg-to leg bioelectrical impedance, and 7-site skinfold techniques in college age students. **METHODS:** Students were recruited from undergraduate exercise science and dietetics classes, and graduate athletic training, exercise science, and nutrition classes. Sixty-one students (M age 21.7 ± 2.5 y, M wt. 71.1 ± 14.9 kg) (43 females (M age 21.3 ± 2. 5y, M wt. 67.1 ± 13.4 kg), 18 males (M age 22.4 ± 2.2 y, M wt. 80.7 ± 14.3 kg) provided informed consent and completed the DEXA Screening Questionnaire, then had their body composition measured by the three different techniques. Subjects were asked to dress in t-shirts and shorts, and on the day of the appointment to do no vigorous physical activity, take no vitamin or mineral supplement, be well hydrated, not to eat 4-5 hours prior or consume alcohol or caffeine 24 hours prior. Females were screened for pregnancy. Once height and weight were measured, a 7-site skinfold measurement, a leg-to-leg electrical impedance measurement, and a whole body DEXA scan were performed. Comparisons between the techniques were done using repeated measures ANOVA, with Fisher's least significant differences post hoc test to determine differences. Significance was noted if $p<0.05$. **RESULTS:** Significant differences in percent body fat were noted between the three techniques ($p<0.0001$). DEXA (26.7 ± 7.5%) was significantly greater ($p<0.0001$) than both impedance (24.9 ± 7.5%) and skinfolds (20.1 ± 6.9%). Impedance was significantly greater ($p<0.0001$) than skinfolds and significantly lower ($p<0.0001$) than DEXA. Skinfolds were significantly lower ($p<0.0001$) than both DEXA and impedance.
CONCLUSION: With the significant differences noted, care should be used when measuring and interpreting body fat composition.

756 Board #17 May 30 2:00 PM - 3:30 PM

Characterization Of Fat-free Mass Index And Body Fat Mass Index: Relationship To Strength Performance In Resistance-trained Females

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(No relevant relationships reported)

Fat free mass index (FFMI) and body fat mass index (BFMI) are valuable tools to compare body composition in individuals that differ in height. Currently there are no published ranges for FFMI or BFMI in trained females. **PURPOSE**: To characterize FFMI and BFMI in resistance trained females. A secondary aim evaluated the relationship between FFMI, BFMI, and lean mass (LM) with strength performance in females with normal, overweight, and obese body mass index (BMI). **METHODS**: Forty-seven resistance-trained females (Mean ± SD; Age: 20.4 ± 2.2 yrs; Height: 165.4 ± 6.0 cm; Weight: 66.7 ± 11.0 kg) participated in the study. Body composition was determined using dual energy X-ray absorptiometry (DEXA) and used to calculate FFMI. FFMI (kg/m^2) was calculated by dividing the sum of lean mass (kg) and bone mineral content (kg) by height (m) squared. BFMI (kg/m^2) was calculated by dividing fat mass (kg) by height (m) squared. Performance was evaluated by one repetition maximum testing on the leg and bench press (LP1RM and BP1RM, respectively). Participants were stratified by BMI classification (normal (18.5-25 kg/m^2), overweight (25-30 kg/m^2), and obese (>30 kg/m^2)). **RESULTS**: Average FFMI in this sample was 16.7 ± 2.2 kg/m^2, with a range of 13.3-25.5 kg/m^2. Average BFMI was 7.5 ± 2.2 kg/m^2, with a range of 4.8-15.2 kg/m^2. In females with a normal BMI (n=33), FFMI and LM were both significantly correlated with LP1RM ($R=0.873$, $p<0.001$; $R=0.779$, $p<0.001$) and BP1RM ($R=0.838$, $p<0.001$, and $R=0.791$, $p<0.001$), respectively. For the overweight cohort (n=9), FFMI and LM were significantly correlated with LP1RM ($R=0.730$, $p=0.025$; $R=0.747$, $p=0.021$) and BP1RM ($R=0.883$, $p=0.002$; $R=0.757$, $p=0.018$). In the obese cohort (n=5), FFMI neared significance for both LP1RM ($R=0.846$, $p=0.071$) and BP1RM ($R=0.862$, $p=0.060$); LM was not significantly correlated with LP1RM ($R=0.845$; $p=0.072$) or BP1RM ($R=0.666$, $p=0.219$). BFMI was not significantly related to performance for any BMI cohort ($p>0.05$).
CONCLUSIONS: FFMI may be an adequate predictor of strength performance across all BMI ranges. LM was also significantly correlated with performance in both normal and overweight BMI cohorts, indicating that height may not be a moderating factor in this population.

757 Board #18 May 30 2:00 PM - 3:30 PM

Body Composition Varies by Position in Female NCAA Division 1 Lacrosse Players

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(No relevant relationships reported)

There is limited scientific literature on women's lacrosse players, especially for body composition measurements. Understanding the relationship between body fat percentages and player position can benefit both the team and individual players.
PURPOSE: To determine if body composition in female NCAA Division I lacrosse players differs between player position.
METHODS: 58 female NCAA D1 lacrosse players underwent whole body DEXA scans. Height and body mass of each player were measured on a stadiometer before each scan. A linear mixed effects model was used to determine whether body fat percentage differed by player position. Position was entered as a fixed factor, and height and body mass were included as covariates into the full factorial model
RESULTS: The final model demonstrated significant main effects for position ($p=0.015$), body mass ($p=0.001$), height ($p=0.001$), and the interaction between position and body mass ($p=0.009$). Post-hoc analyses revealed attack (30.8 ± 4.2%) had significantly greater body fat than defense (29.8 ± 3.3%, $p=0.021$) and midfield (28.5 ± 3.9%, $p=0.045$). There were no other statistically significant differences in body between positions. Attack (61.8 ± 7.7 kg) had a statically significant lower body mass than goalies (76.0 ± 4.1kg, $p=0.012$). Midfielders (60.4 ± 14.8kg) had a significantly lower body mass than defense (67.3 ± 6.2kg, $p=0.044$) and goalies ($p=0.007$).
CONCLUSIONS: Positions differed in mean body composition, with the attack position having the greatest body fat percentage. Body mass was also significantly different by position. It was unexpected that the attack position had a greater body fat percentage, despite having one of the lower mean weights (although only statistically less than goalies). There were few data points for goalies (n=4), which may have limited statistical power. It is a limitation that these data are from one university team across multiple seasons. The style of play for this team influences aerobic demand and may differ from that of other teams. Because there is limited data on body composition in women's lacrosse, further comparisons across other teams is needed.

758 Board #19 May 30 2:00 PM - 3:30 PM

Does the Body Composition of Collegiate Male Lacrosse Players Differ by Position?

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(No relevant relationships reported)

There are distinct roles for each playing position in men's lacrosse, which often results in apparent anthropometric differences between playing positions. However, little research has examined whether body composition, namely body fat percentage, differs by playing position.
PURPOSE: To determine whether or not the body composition of collegiate male lacrosse players differs across playing positions.
METHODS: 71 NCAA Division I competitive male lacrosse players (age 18-23y) participated in the study. Athletes underwent a whole body dual energy x-ray absorptiometry (DEXA) scan to measure whole body lean and fat mass. Total body fat percentage was then computed. A linear mixed effects model was used to determine whether body fat percentage differed by playing position. Playing position was entered as a fixed factor, and height and body mass were included as covariates into the full factorial model.
RESULTS: Mean ± standard deviations were: height 180.5±6.6cm, body mass 84.3±8.2kg, and body fat percentage 18.2±3.5%. Body fat percentage did not differ by position (main effect: $p=0.318$; attack: 18.9±4.4%, midfield: 18.2±3.7%, defense: 18.3±2.8%, goal: 17.0±2.5%). However, body fat percentage was dependent upon height ($p<0.001$) and body mass ($p<0.001$). Further analysis revealed no significant differences across playing positions for height ($p=0.087$; attack: 177.3±3.9cm, midfield: 180.2±6.6cm, defense: 183.4±6.8cm, goal: 179.4±6.9cm) or total body mass ($p=0.072$; attack: 79.6±8.2kg, midfield: 85.0±8.5kg, defense: 86.9±6.6kg, goal: 81.2±8.0kg).
CONCLUSIONS: Although not statistically significant, there were trends for height and body mass to differ between positions. It is possible that there was insufficient

statistical power to detect position-specific differences between these parameters. This data might be slightly skewed because the sample included more midfielders (n=34) than attack (n=11), defense (n=19), or goal (n=7) players. Nonetheless, no clear position-specific trends were observed for body fat percentage. However, statistically significant covariates indicate that heavier and shorter players tended to have greater body fat percentages. Further research is needed to determine if body composition differs between lacrosse players across a larger cohort from multiple teams.

759 Board #20 May 30 2:00 PM - 3:30 PM

Effects of an Acute Strength and Conditioning Bout on Dual Energy X-ray Absorptiometry Results

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(No relevant relationships reported)

Dual Energy X-ray Absorptiometry (DXA) scans to assess body composition have become increasingly popular, especially in athletic populations. Acute factors, such as hydration status and food intake have been shown to alter DXA results (Tinsley, MSSE 2016). It is currently not known if prior strength and conditioning bouts may alter fat mass, lean mass, and bone density results.
PURPOSE: To determine if a strength and conditioning (S&C) bout, similar to what athletes regularly engage in, will alter the fat mass, lean mass, and bone content results of a DXA scan. **METHODS:** Fourteen strength-trained subjects (10 men, 4 women, age 24 ± 2 yrs, height 176.7 ± 8.1 cm, weight 88.8 ± 14.7 kg) who were enrolled in an athletic strength and conditioning course volunteered to participate in this study. Each subject underwent two DXA scans on the same day. The first scan was performed prior to the S&C bout. The second scan was completed within 45 minutes after completion of the S&C bout. Participants were instructed to consume their normal, free living breakfast prior to scan one. A food and water log was distributed during the informed consent process and was maintained by the participants for 24 hours prior to all DXA scans. Nutritional information was analyzed via a commercial nutrition software for macronutrients, micronutrients, and hydration status. All DXA scans were performed and analyzed by the same trained technician. After the first scan, subjects were instructed to avoid all food intake until completion of the second scan. Subjects were encouraged to drink water ad libitum during the S&C bout from individually assigned 1-liter bottles; the volume consumed during the bout was measured by weight. **RESULTS:** No significant difference was found (correlated t-test $\alpha = 0.05$) on any of the body composition measures between pre and post DXA body composition measurements after a S&C bout (changes pre to post: fat mass 46.5-46.0 kg, lean mass 64.8-64.9 kg, bone content 3.3-3.3 kg). **CONCLUSION:** Based on the results of the present study, S&C bouts do not need to be considered to ensure accuracy when performing DXA scans. The physiological changes that occur in response to a single S&C bout do not affect body composition analysis of DXA scans.

760 Board #21 May 30 2:00 PM - 3:30 PM

The Effect of Pretest Instructions and Between Day Test-Retest Reliability of Air Displacement Plethysmography

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(No relevant relationships reported)

Air displacement plethysmography (ADP) is considered a valid estimate of body composition. However, pretest instructions are often not followed by the general population which is imperative for tracking body composition via multiple testing sessions**. PURPOSE**: To determine the reliability of ADP measurements with and without pretest instructions both between days and on the same day.
METHODS: Participants (n=19; 14 females, 5 males, age 20.8±1.4 years, weight 69.2±12.5 kg) completed four testing sessions across two days. ADP testing on day one occurred in the morning (T1) and afternoon (T2) and 48-hours later another morning (T3) and afternoon (T4) test were completed. For T1, participants were not provided with pretest instructions and were asked to maintain normal activities. Standard pretest instructions were provided for all subsequent visits. At each session, a standard ADP measurement was completed with participants wearing manufacturer-approved clothing and lab-issued swim cap. Data were analyzed using paired samples t-tests to determine the effect of pretest instructions and Pearson correlations to determine test-retest reliability with an alpha level set at 0.05.
RESULTS: Pretest instructions did not change body volume (BV; T1 66.3±12.4 vs. T2 66.2±12.4 L; p=0.33) or body fat (BF; T1 23.4±6.9 vs. T2 23.6±7.1 %; p=0.54) across same day measures. However, differences were detected for BV (T1 66.3±12.4 vs. T3 65.7±12.2 L; p<0.01) and BF (T1 23.4±6.9 vs. T3 22.7±7.3%; p=0.04) for measures completed on different days. Test-retest reliability for BV and BF was high across different days (r≥0.97, p<0.01).
CONCLUSIONS: Pretest instructions did not change ADP measures on the same day, suggesting they may not be necessary to attain measurements within standard error of estimate for ADP. However, differences were found between scores across different days, although these were also within ADP standard error. Between day test-retest reliability was high for BV measurements and BF estimations, with greater variability noted in BF. Future research would be important to ascertain how varying amounts of food and fluid consumption, as well as participation in exercise prior to testing can affect the reliability of ADP measures. Quantifying these factors may provide insight on threshold measures to follow.

761 Board #22 May 30 2:00 PM - 3:30 PM

Relationship Between Sarcopenia Classification Methods, Relative Fat Mass, and Skeletal Muscle Mass

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(No relevant relationships reported)

Sarcopenia has been identified using muscle mass normalized by height squared (SMIh), similar to BMI, and by total mass(SMIm). As there is not a single agreed-upon definition, it is important to examine the relationships between the various methods of defining sarcopenia, body fat percentage (BFP), and skeletal muscle mass (SMM).
PURPOSE: The purpose of this study was to examine the relationships between skeletal muscle index (SMI) normalized for SMIh, SMIm, BFP, and SMM.
METHODS: Participants (n = 62, 42 F, 20 M; 26.4 +/- 8.3 yrs) were tested using bioelectrical impedance analysis (BIA). The BIA provided information on fat mass, fat-free mass, BFP, and SMM. Skeletal muscle mass index (SMI) was calculated by dividing SMM (kg) by height squared (m^2) (SMIh) and by dividing SMM (kg) by total mass (kg) (SMIm). Data were analyzed using standard spreadsheet and statistical analysis software. Pearson product-moment correlations were calculated using statistical analysis software. Significance was set at $p < .01$ to control for the number of tests.
RESULTS: There were significant correlations between SMIm and SMIh ($r = 0.49$, $p = 0.00$), SMIm and BFP ($r = -0.93$, $p = 0.00$), SMM and SMIm ($r = 0.50$, $p = 0.00$), SMM and SMIh ($r= 0.95$, $p = 0.00$). The correlation between SMIh and BFP was not significant ($r = -0.20$, $p = .11$).
CONCLUSIONS: It is important to look at both muscle mass and body fat. Both methods of identifying sarcopenia should be used as using a single method gives an incomplete picture. Ideally body fat percentage and both methods of determining sarcopenia would be used to account for individuals of differing leanness.

762 Board #23 May 30 2:00 PM - 3:30 PM

A Comparison Of Methods Used To Determine Percent Body Fat And Minimum Wrestling Weight

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(No relevant relationships reported)

The accurate measurement of percent body fat (%BF) is important in the determination of a wrestler's minimum wrestling weight (MWW) under the National Collegiate Athletic Association (NCAA) Wrestling Weight Management Program (WMP). Currently, skinfold measurements (SF), air displacement plethysmography (ADP), and hydrostatic weighing are the only approved methods of assessing body composition for the WMP. While dual energy x-ray absorptiometry (DXA) is considered a criterion method and type-A ultrasound (US) may serve as an alternative method, to our knowledge, no previous study has examined DXA or US in the determination of a wrestler's MWW. **PURPOSE**: To compare %BF and MWW determined using SF, ADP, US, and DXA. **METHODS**: Twenty-three college-aged men (21.1±0.8 yrs) participated. As per NCAA WMP guidelines, participants reported to the lab in a euhydrated state (Urine specific gravity/Usg<1.020). %BF was estimated using SF, ADP, DXA, and US and the wrestlers' MWW was calculated for each assessment method. **RESULTS**: Body mass and Usg values were 83.2±13.2 kg and 1.005 ± 0.004, respectively. There was a significant difference between methods for both %BF (p<0.001) and MWW (p<0.001). %BF values (SF=15.7±5.2%; ADP=18.1±6.4%; DXA=21.2±6.2%; US=15.2±5.2%) and MWW (SF=73.3±8.4kg; ADP=71.1±7.5kg; DXA=68.5±8.2kg; US=73.8±8.9kg) were significantly different between all methods except SF and US (p=0.594 and p=0.586, respectively). When comparing the MWW determined by DXA to those determined by SF, the use of DXA would have allowed 57% of participants to reach one weight class lower and an additional 30% of participants to reach two weight classes lower. Compared to ADP, DXA would have allowed 48% of participants to reach one weight class lower and an additional 9% of participants to reach two weight classes lower. **CONCLUSION:** These data indicate that US may provide an alternative to the SF procedure when determining the MWW of a wrestler. However, when compared with two WMP-approved methods of assessment, DXA would permit approximately 57% (ADP) to 87% (SF) of wrestlers the opportunity to certify at a lower weight class. Given these preliminary

findings, future research should further examine if the currently approved methods of assessment during the NCAA WMP put a wrestler at a disadvantage by restricting weight loss.

763 Board #24 May 30 2:00 PM - 3:30 PM

Comparison of Methods Assessing Body Composition in Young Adults

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(No relevant relationships reported)

Maura L. Jegerski, Baruch Vainshelboim, Gabrielle M. Brennan, Henry Piascik, Sara D. Dieterich, Patricia Fitzgerald, Stephen LoRusso, Kristofer S. Wisniewski, Saint Francis University, Loretto, PA.

Previous studies have shown that bioelectrical impedance analysis (BIA) is a simple and reliable noninvasive way to measure body composition. However, the results differ in accuracy compared to other methods. **Purpose:** To compare the validity of different BIA devices against the Bod Pod (BP) for estimating percent body fat (%BF) and lean body mass (LBM) in young adults. **Methods:** Eighty-seven subjects (45 males, 42 females) aged 20.3 ± 1.6 years with BMI 25.1 ± 5.2 kg m^{-2} were assessed for %BF and LBM using BodPod, Tanita TBF-300A [both Athletic (TA) and Standard (TS) modes], and InBody770 (InB) in counterbalanced order in one session. Subjects followed the most stringent pre-testing instructions outlined for the InB. Pearson's correlations and Repeated measures ANOVAs were utilized. **Results:** Results for each method (mean ± SD) and correlations are displayed in Table 1. ANOVA showed TA significantly underestimated ($p<0.001$), and TS significantly overestimated ($p<0.001$) %BF compared to BP. There was no significant difference between BP and InB ($p=0.701$) %BF. ANOVA showed TA significantly overestimated ($p<0.001$) LBM, and the LBM from TS ($p=0.197$) and InB ($p=0.825$) were not significantly different from BP. **Conclusions:** The results show that each method is strongly correlated with the BP. However, there were significant differences between Tanita scale values and the BP. Therefore, BIA devices using both hand and feet sensors and multiple frequencies may be more accurate at estimating body composition than devices using feet and one frequency only.

	%BF	Correlation with BP (%BF)	LBM (kg)	Correlation with BP (LBM)
BP	21.1 ± 11.3		59.8 ± 14.2	
TA	18.3 ± 9.9	r=0.922, p<0.001	62.6 ± 14.8	r=0.928, p<0.001
TS	22.5 ± 9.3	r=0.925, p<0.001	59.0 ± 12.9	r=0.921, p<0.001
InB	21.3 ± 10.9	r=0.932, p<0.001	59.9 ± 14.4	r=0.956, p<0.001

Table 1. Comparison of Body Composition Methods

764 Board #25 May 30 2:00 PM - 3:30 PM

Lifestyle Behaviors and Body Composition in Young Adults

Stephen LoRusso, Gabrielle M. Brennan, Henry Piascik Piascik, Sara D. Dieterich, Maura L. Jegerski, Kristofer S. Wisniewski, Baruch Vainshelboim, Patricia I. Fitzgerald. *Saint Francis University, Loretto, PA.*

(No relevant relationships reported)

Physical inactivity, prolonged sitting and poor body composition are established cardio- metabolic risk factors. However, their association in young adults has not been well characterized. **PURPOSE:** To assess the association between physical activity, sitting time and body composition in young adults. **METHODS:** Ninety-four participants (20.2 ± 1.6 years, 46 men, 48 women) were assessed for weekly physical activity (PA), average daily sitting time (Global Physical Activity Questionnaire) (ST) and body composition measurements (BodPod). Pearson correlation and t-tests were performed. **RESULTS:** Means are: ST (M: 5.7 ± 2.7 hours/day, F: 6.8 ± 2.8 hours/day, p=0.059), PA (M: 10,977.6 ± 11,068.3 MET-min/week, F: 7,181.9 ± 4,481 MET-min/week, p=0.043), %Fat (M: 15.2 ± 9.2 %, F: 27.4 ± 9.9 %, p=0.000), and LBM (M: 69.9 ± 10.5 kg, F: 47.7 ± 5.7 kg, p=0.000). Sitting time was mildly correlated with body composition measurements, but not with PA in the total sample (Table 1). In subgroup analysis of men and women separately, the correlation between ST and LBM and %Fat were significant only among women (LBM: r=-0.478, p=0.001, %Fat: r=0.309, p=0.047). PA mildly correlated with LBM, but not with %Fat. No correlation between physical activity and body composition measurements was observed in the subgroup analysis. **CONCLUSION:** Prolonged sitting time is associated with higher %Fat and lower LBM in young women, suggesting a negative impact on body composition. Higher physical activity levels are associated with higher LBM in both genders, but were not associated with ST or %Fat. These results support the independent association between physical activity, sitting time and body composition, and their importance in evaluation of lifestyle behaviors for primary cardio-metabolic disease prevention.

Table 1.

	Sitting Time (hours/day)	Lean Body Mass (kg)	%Fat	Physical Activity (MET-min/week)
Sitting Time (hours/day)	1	r= -0.300 p= 0.006*	r= 0.310 p= 0.005*	r= -0.033 p= 0.767
LBM (kg)	r= -0.300 p= 0.006*	1	r= -0.365 p= 0.001*	r= 0.276 p= 0.011*
%Fat	r= 0.310 p= 0.005*	r= -0.365 p= 0.001*	1	r= -0.162 p= 0.143
Physical Activity (MET-min/week)	r= -0.033 p= 0.767	r= 0.276 p= 0.011*	r= -0.162 p= 0.143	1

*=significant

765 Board #26 May 30 2:00 PM - 3:30 PM

Validation Of The Inbody 770 For The Assessment Of Percent Body Fat In Young Adults

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(No relevant relationships reported)

Multi-frequency bioelectrical impedance analysis (MFBIA) is a rapid, non-invasive, and relatively inexpensive method of assessing body composition that has been suggested as an alternative to laboratory methods including dual energy X-ray absorptiometry (DXA) and hydrostatic weighing. **PURPOSE**: To determine the accuracy of a commercially-available MFBIA analyzer for the assessment of percent body fat (%BF) in young adults.
METHODS: Three hundred eighty-four (209 women; 175 men) subjects volunteered to participate in this study (age = 20.8 ± 2.1 years). %BF was assessed using MFBIA (InBody 770, Biospace Co.) and DXA (GE Lunar Prodigy) within the same visit. **RESULTS**: When compared to DXA, MFBIA significantly ($p<0.001$) underestimated %BF (men = 16.8 ± 6.5% *vs.* 19.4 ± 8.0%; women= 28.8 ± 7.8% *vs.* 32.7 ± 8.3%). Linear regression analyses revealed significant correlations (men = 0.92, women = 0.93; $p<0.001$) and standard error of estimate values (men = 3.2%; women = 3.1%) rated as 'very good' between methods. However, Bland-Altman plots revealed a weak bias for %BF ($r = 0.36$, $p<0.001$) and a large percentage of the subjects (women = 53%, men = 41%) were outside the ± 3.5% minimally acceptable standard for accuracy. **CONCLUSIONS**: When compared to DXA, the InBody 770 underestimated %BF by greater than 3.5% in approximately half of the subjects tested in this study. Given this consistent underestimation, we recommend interpreting the %BF values produced by the InBody 770 with caution.

766 Board #27 May 30 2:00 PM - 3:30 PM

Association between Segmental Lean Body Mass and Muscular Strength

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(No relevant relationships reported)

Previous studies have shown lean body mass (LBM) is positively correlated with muscle strength in older and younger individuals. Studies have also shown a strong correlation between grip strength when muscle mass is adjusted for height. However, previous studies have not looked into young adults. **Purpose:** The purpose of this study was to examine the relationship between segmental LBM and various measures of muscular strength in healthy young adults. **Methods:** 48 subjects (23 females, 25 males) aged 20.4 ± 1.9 years underwent bioelectrical impedance analysis using the InBody770 to determine total LBM, legs LBM (sum of both legs), right arm LBM, left arm LBM, and arms LBM (sum of both arms). Strength tests included 1RM bench press, 1RM leg press, maximal voluntary contraction (MVC) handgrip, and MVC deadlift. Standard 1RM protocols were used to assess 1RM for bench press and leg press. Maximal handgrip scores were measured for each arm independently and added together for the summed handgrip strength. MVC deadlift was measured using a Baseline Back, Legs, and Chest Dynamometer. **Results:** Correlation analyses showed a moderate correlation between total LBM and MVC deadlift ($r = 0.557$, $p < 0.001$), legs LBM and 1RM leg press ($r = 0.520$, $p < 0.001$), right arm LBM and right handgrip strength ($r = 0.428$, $p < 0.001$), left arm LBM and left arm handgrip strength ($r = 0.425$, $p < 0.001$), and arms LBM and summed handgrip strength ($r = 0.441$, $p < 0.001$). A

strong correlation was observed between arms LBM and 1RM bench press (r = 0.763, p < 0.001). **Conclusion: S**egmental LBM assessed using the InBody770 showed a moderate-to-strong correlation with various measures of muscular strength. The findings suggest segmental LBM may play a significant role in overall body strength and arm LBM may have a significant role in 1RM bench press.

767 Board #28 May 30 2:00 PM - 3:30 PM

Alphabet Soup: BMI, WC, ADP - What Measures Provide Adequate Estimates Of Obesity In Aging Adults?

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(No relevant relationships reported)

It is well accepted that body fat increases with aging, and that obesity contributes to a number of negative health concerns. Clinically, body mass index (BMI) and waist circumference (WC) are the preferred measures for a quick estimate of adiposity, but it is not clear if these measures are accurate estimates in aging individuals. **PURPOSE:** The purpose was to investigate if BMI or waist circumference (WC) are adequate measures of adiposity in those aged 50 and older. **METHODS:** Participants were 38 men (60±7.7 years) and 62 women (57±7.3 years) who reported to the laboratory on one occasion. BMI was calculated using height and weight (kg/m^2). WC was measured using a Gulick tape at two anatomical points; narrowest waist (WCN) and the umbilicus (WCU). Percent fat was analyzed via air-displacement plethysmography (ADP; Bod Pod, COSMED) and bioelectrical impedance (BIA; InBody 230, Biospace Inc). ADP was used as the criterion measure of body composition. Correlations were calculated to examine relationships between all measures (of weight related health risk and body composition). Sensitivity and specificity analyses were conducted to classify participants into categories (true positive, true negative, false positive, and false negative) to assess if WC and BMI provide correct categorization when compared to body composition by ADP. **RESULTS:** Correlations indicated moderate to strong relationships between ADP and WCN (r=0.408), WCU (r=0.527), BMI (r=0.565), and BIA (r=0.888, p<0.05 for all). For the measures of WC, sensitivity was considerably higher for WCU (All=70%, W=86.2%, M=47.6%) than WCN (All=46% all, W=58.6%, M=28.6%). For BMI, sensitivity was slightly higher in women (86.2%) than men (81.0%). **CONCLUSION:** These results suggest that, in addition to being easy to measure in the clinical setting, BMI and WC are also adequate indicators of obesity in adults aged 50 and over. Training and standardization of WC measurement techniques are warranted, since WCU was more strongly correlated with ADP than WCN, suggesting that the optimal site for WC measurement is the umbilicus.

768 Board #29 May 30 2:00 PM - 3:30 PM

Validity of Ultrasound and Skinfolds for the Measurement of Body Composition in Collegiate Basketball Players

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(No relevant relationships reported)

Body composition (BC) is a frequently assessed component of health-related fitness. Many different field methods are used to measure BC including bioelectrical impedance analysis and skinfolds (SKF). Recently, a portable computer based ultrasound (US) system has become commercially available for estimating BC. **PURPOSE**: The purpose of this study was to determine the validity of a portable computer based US system and skinfolds (SKF) for estimating percent body fat (%fat) in male collegiate basketball players. **METHODS**: Participants' %fat was estimated using US (3 site) and SKF (3 site), then compared to dual-energy X-ray absorptiometry (DXA), which served as the criterion estimate. Participants were 50 male collegiate basketball players [age = 20 (1) yrs., height = 1.89 (0.08) m., body mass = 87.9 (10.9) kg, and BMI = 24.5 (2.3) kg/m^2]. The ethnicity of the participants was 41 African Americans and 9 Caucasians. All participants were tested in the hydrated state [1.014 (0.009), Urine Specific Gravity]. The validity of the US and SKF %fat estimates was based on the evaluation of each method versus the criterion value from the DXA by calculating the mean, SD, coefficient of determination (r^2), and standard error of estimate (SEE) from linear regression analysis. To assess the average deviation of individual scores from the line of identity, total error (TE) was calculated for each field method. Paired sample t-tests determined pair-wise differences between measurements using an alpha level of <0.05. **RESULTS**: The mean %fat results were as follows: US = 12.5 (4.0), SKF = 9.2 (4.5) and the DXA = 12.5 (5.1). %fat differences [mean (95% CI)] were observed between DXA and SKF [3.3 (2.5, 4.1), p=0.001] but not between DXA and US [-0.04 (-1.4, 1.4), p=0.951]. The r^2 values were 0.159 for US and 0.699 for SKF; SEE values for %fat were 4.7 for US and 2.8 for SKF; and total error (TE) values for %fat were 5.03 for US and 4.36 for SKF. **CONCLUSIONS**: In this study, neither the US nor SKF estimates provided a valid assessment of %fat. When compared to the criterion (DXA), both SKF and US produced TE values outside of the acceptable range of 4%. Relative to the DXA, neither estimate can be recommended for estimating %fat in collegiate basketball players.

769 Board #30 May 30 2:00 PM - 3:30 PM

Efficacy Of Ketogenic Diet On Body Composition During Resistance Training In Trained Men.

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(No relevant relationships reported)

Nowadays, ketogenic diet (KD) is widely used in body aesthetics for changing body composition, even though there is a lack of research regarding to the possible benefits on muscle hypertrophy.**PURPOSE**: The purpose of this study was to evaluate the efficacy of an 8-week KD during energy surplus and a resistance training protocol on muscle hypertrophy in trained men. **METHODS**: 24 healthy men (age 30 ± 4.7 years; weight 76.7 ± 8.2 kg; height 174.3 ± 19.7 cm; > 2 years of consecutive training experience) performed an 8-week resistance training (RT) program with similar hypertrophy training variables. Participants were randomly assigned to either a KD (10:20:70, *n*=9), or a non-ketogenic diet (55:20:25, *n*=10, NKD), or a control group (*n*=5, CG) in hypercaloric condition (39 kcal · kg^{-1} · d^{-1}). Body composition changes were measured by dual energy X-ray absorptiometry (DXA) before and after each nutritional intervention and training program in all participants. Compliance with the ketosis state was monitored by measuring urinary ketones weekly. Statistical evaluations to determine significant differences between groups and substantive significance were performed with paired t-test, where critical α was $p < 0.05$, and Cohen's d effect size (ES), respectively. **RESULTS**: There was a significant reduction in fat mass (Δ= -10.4%, p =0.030, ES = 0.46) and abdominal visceral adiposity in KD (Δ= -16.3%, p =0.008; ES = 0.84); while no significant changes were observed in the NKD and CG groups. Muscle mass significantly increased after 8 weeks of RT program in the NKD group only (Δ=+2.1%, p <0.01, ES = 0.31). **CONCLUSIONS**: Our results suggest that KD can be helpful for decreasing abdominal visceral adiposity and fat mass, but not to increase muscle mass during positive energy balance in men undergoing RT. This study shows the relevance of macronutrient manipulation in RT programs, in order to improve body composition parameters focusing on training goals (fat reduction and/or increase of muscle mass) in trained men. Supported by University of Málaga (Campus of International Excellence Andalucía Tech).

770 Board #31 May 30 2:00 PM - 3:30 PM

Bioelectrical Impedance Analysis Versus Dual-Energy X-ray Absorptiometry Body Fat Percentage Measurements in Collegiate Basketball Players

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(No relevant relationships reported)

Body composition (BC) is an important component of health-related fitness and is also related to athletic performance. There are many quick, cost efficient, accessible, and user-friendly ways to assess BC. Field measurement methods, including body mass index, waist circumference, skinfolds, and bioelectrical impedance analysis (BIA). Criterion methods for measuring BC, which are more expensive and generally less accessible, include techniques like dual-energy X-ray absorptiometry (DXA). DXA is commonly used to assess body fat percentage (BF%) (i.e., fat vs. lean mass) in clinical settings due to its standard deviation (±2-4%). The manufacturer of the Direct Segmental Multi-frequency InBody230 BIA, which uses eight separate contact points with two electrical frequencies, claims a similar BF% accuracy range to DXA. **PURPOSE:** To assess the reliability of the InBody230 BIA to DXA BF% values in college-aged, male basketball players. **METHODS:** Participants were 72 male collegiate basketball players (age=20.51±1.32 yr; wt=89.35±10.68 kg; ht=183.96±5.97 cm; BMI=27.50±3.02 kg/m^2). The participants had BF% assessed, in the early morning, using the InBody230 BIA in the standing position followed by a total-body DXA scan which served as the criterion value. **RESULTS:** A paired samples t test revealed a significant difference in BF% between the InBody230 (31.22±14.64) and DXA (20.55±6.13) ($p<0.001$). **CONCLUSIONS:** While the two modes of BF% were significantly different, the standard deviation (SD) (i.e., reliability) of the InBody230 BIA was more than double the DXA. This SD difference is supported by past research using athletes of similar age and BMI. However, research finding significant differences between modes with lower SD values have utilized varying sample sizes of non-athletes, including both genders and children. Future research needs to be conducted comparing the InBody230 BIA to DXA using various populations to assess the InBody230 manufacturer accuracy claim of (98±3-5%).

771 Board #32 May 30 2:00 PM - 3:30 PM

Anthropometric and Performance Statistics Comparisons in Baseball Batters: A Longitudinal Study

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(No relevant relationships reported)

Appropriate stature and adequate somatotype is believed to be some of the most important prerequisites for sports participation and success. In baseball, there is scarce evidence on players' anthropometric profiles, such as body weight (BW), body height (BH), and body fat % (BF%) and their association with baseball performance statistics (PS) which has led to form anecdotally based beliefs. **PURPOSE**: To compare BW, BH, and BF% and selected baseball-specific PS, such as batting average % (b/avg%), slugging % (slg%), and on-base % (ob%) in NCAA Division I batters; to examine the relationship between BW, BH, BF% and baseball-specific PS. **METHODS:** During a 5-year period, 232 collegiate batters (age 19.7 $\pm$ 1.3 yr; weight 87.9 $\pm$ 7.7 kg) were assessed for body weight (BW), body height (BH), and body fat % (BF%). Batters' respective specific-baseball PS were collected with regards to b/avg%, slg%, ob%. BW, BH, BF%, and PS were normalized to z-scores. Missing data were estimated from least squares prediction from non-missing variables. Forward multiple stepwise regression was used to evaluate the relative impact of BW, BH, and BF% on PS (JMP® Pro 13). **RESULTS:** From the selected anthropometric variables, only BF% is significantly negative correlated with both b/avg% (r=-0.19, p=0.0043) and slg% (r=-0.17, p=0.0103). Slg% was selected as the independent variable with the highest goodness of fit significantly correlating with BF% (p=0.0007) and BW (p=0.0151) with adjusted R^2=0.04. **CONCLUSIONS:** The results indicate that leaner batters have higher b/avg% and slg%. BF% and BW appeared to provide the greatest predictive power of slg%. Slg% is a measure of the batting productivity of a hitter and only 4% of this productivity can be explained by anthropometric variables, such as BF% and BW. The common anecdotal belief that heavier players are better batters, no matter their motor skill abilities, is not justified from the results of this study. Practitioners want to improve their batters' hitting productivity. Therefore, they may need to focus on other factors than anthropometrics, for instance agility, speed, power, and lower-body performance.

772 Board #33 May 30 2:00 PM - 3:30 PM

Comparison of Overall and Segmental Body Composition in Collegiate Track Athletes Using BIA and DXA

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(No relevant relationships reported)

Anthropometric and body composition measurements can offer insight into athletes' health as well as assist in developing training or diet regimens to enhance competitive potential. Valid and reliable assessments of these measures are vital. **PURPOSE**: The purpose of this analysis was to compare overall and segmental body composition data of collegiate track athletes using bioelectrical impedance analysis (BIA) and dual energy X-ray absorptiometry (DXA). **METHODS**: Participants visited the Human Performance Laboratory once for measurement of anthropometric data (ht via stadiometer) and body composition assessment by BIA (via InBody 570) and DXA (via GE Healthcare Lunar Prodigy Advance). Contraindications were addressed and jewelry was removed prior to testing. Athletes were instructed to remove their socks; thereafter, they followed verbal instructions provided by the InBody 570. Body weight (lbs.) determined by the InBody 570 was converted to kilograms (kg) and used in the DXA analysis, for consistency. Relative body fat (%BF) and regional lean mass in the arms (ArmsLean), legs (LegsLean), and trunk (TrunkLean) (kg) were compared between methods, by sex, using paired-samples t-tests. **RESULTS (females)**: Twenty-four females (age: 19.6±1.0 yr, ht: 168.8±7.9 cm, and wt: 65.0±13.7 kg) volunteered for testing. There were statistical differences (ordered by BIA and DXA) for %BF [19.8±6.4 vs. 25.0±7.9%, $p < 0.0001$] and TrunkLean [22.10±3.72 vs. 21.11±2.42 kg, $p = 0.038$]. No statistical differences were found for ArmsLean [5.18±1.23 vs. 5.03±0.92 kg, $p = 0.163$] or LegsLean [15.73±2.33 vs. 16.32±2.35 kg, $p = 0.070$]. **RESULTS (males)**: Thirty males (age: 20.5±1.9 yr, ht: 179.9±5.7 cm, and wt: 80.2±16.8 kg) volunteered for testing. There was a statistical difference (ordered by BIA and DXA) for ArmsLean [8.02±1.54 vs. 8.65±2.17 kg, $p = 0.026$], while %BF was at the statistical cut-point [11.2±4.7 vs. 13.0±6.7%, $p = 0.05$]. No statistical differences were found for LegsLean [21.23±2.53 vs. 22.31±4.95 kg, $p = 0.115$] or TrunkLean [30.36±4.42 vs. 29.87±3.65 kg, $p = 0.231$]. **CONCLUSIONS**: Clearly, differences exist in the estimation of overall and segmental body composition depending on the method utilized. If pre-post or serial evaluations are to occur, switching assessment methods would not be appropriate.

773 Board #34 May 30 2:00 PM - 3:30 PM

Longitudinal Changes In Skinfold Thicknesses In Relation To Body Fat Changes Assessed with DXA

Juan R. Lopez-Taylor, Roberto Gabriel Gonzalez-Mendoza, Alejandro Gaytan-Gonzalez, Juan Antonio Jimenez-Alvarado, Marisol Villegas-Balcazar, Edtna Elvira Jauregui-Ulloa, Francisco Torres-Naranjo. *Universidad de Guadalajara, Guadalajara, Mexico.*

(No relevant relationships reported)

The assessment of skinfold thicknesses is a widespread anthropometric technique to evaluate body composition. However, little is known about the relation between the changes through time in body fat assessed with only skinfolds compared with DXA. **PURPOSE**: To determine the relation between changes in body fat through time assessed with DXA and the changes of skinfold thicknesses.
METHODS: We analyzed the data for 66 professional male soccer players. Subjects' body composition was evaluated two times with a time difference of one to five years between them. Ten skinfold thicknesses (10SKF, triceps, subscapular, biceps, chest, mid-axilla, iliac crest, supraspinal, abdomen, thigh, calf) were evaluated by anthropometry, and body fat (BF) by a DXA scanning (Hologic QDR4500). The changes between evaluation 1 and 2 were calculated for both 10SKF and BF for every subject. Then the determination coefficient (assuming a zero intercept), slope and SEE for the slope were calculated, where the changes in 10SKF predicted the changes in BF. We also calculated the changes in BF related to initial BF (CBF= [BF evaluation 1 - BF evaluation 2]/ BF evaluation 1). The mean ±SD, [min-max] is reported.
RESULTS: The 10SKF (in mm) at evaluations one and two were 84 ± 31 and 89 ± 27 respectively (Δ 5 ± 22 [-57 to 74]). The BF (in kg) at evaluation one and two were 10 ± 3 and 11 ± 3 (Δ 1 ± 2 [-6 to 8]). The %BF at evaluation one and two were 14 ± 3 and 15 ± 3 (Δ 1 ± 3 [-7 to 9]). The CBF (expressed as percentage) was 14 ± 25 (-40 to 92). There were a strong relationship between the changes in skinfold thicknesses and the changes in absolute and relative BF, but the best estimation was observed with Δ%10SKF - %CBF.
CONCLUSIONS: The changes in BF (kg, % and CBF) were well estimated with the changes in 10SKF and %10SKF through time. The Δ%10SKF had a ≈1% of change for every 1% in %CBF, which is an easier relationship to remember. However these changes had an error estimate threshold to overcome for increasing the chance to assess a significant change.

Table 1. Determination coefficient and slope for skinfold thicknesses and body fat changes

	R^2	Slope	SEE
Δ10SKF - ΔBF	0.81	y=0.11x	0.93
Δ%10SKF - ΔBF	0.78	y=0.08x	1.16
Δ10SKF - %CBF	0.66	y=1.11x	11.95
Δ%10SKF - %CBF	0.80	y=0.94x	10.44
Δ10SKF - Δ%BF	0.78	y=0.11x	1.19
Δ%10SKF - Δ%BF	0.76	y=0.09x	1.36

Δ10SKF: Changes in the sum of 10 skinfolds (mm).
Δ%10SKF: Percentage of changes in the sum of 10 skinfolds.
ΔBF: Changes in body fat (kg).
%CBF: Percentage of changes in body fat relative to the initial body fat.
Δ%BF: Changes in body fat percentage.

774 Board #35 May 30 2:00 PM - 3:30 PM

Hydration and Electrolyte Status of Brazilian Olympic Athletes

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(No relevant relationships reported)

Weight based sports categories induces detrimental behaviors on health and perfomance. Dehydration and nutritional deficiencies may lead to acute and chronic risks, deteriorating fitness level and health integrity. **Purpose:** The purpose of this study was to evaluate hydration and electrolyte status of elite athletes of Judo and Boxing fron the Olympic National Team. **Methods:** Blood samples were taken from 27 Boxing and Judo elite athletes (18 males and 9 females; 26.4±3.7years) pre and post maximal specific protocol (3x3 minutes round/1minute interval for Boxing and 5 minutes of Handori for Judo) for hydration and eletrolyte status: Osmolality (Osmol), Haematocrit (Ht), Sodium (Na^+), Potassium (K^+) and Calcium (Ca^{++}) levels. **Results:** Before tests were performed, 100% of the athletes would be considered dehydrated: Osmol 304±62mOsmol.kg^{-1} (Normal range: 285-295mOsmol.kg^{-1}) and Ht 45.9±6.1%. Sodium, Potassium and Calcium values were 143,3±12.7mmol.L^{-1}; 6,4±1.6mmol.L^{-1}; 9,9±2.3mg.dL^{-1}. After specific sport protocol, Osmol, Ht, Na^+, K^+ and Ca^{++} levels were 302.4±73mOsmol.kg^{-1}, 44,7±3.2%, 142,4±14.6mmol.L^{-1}, 6,1±1.1mmol.L^{-1} and 10,1±3.3mg.dL^{-1}. **Conclusions:** Weight based category sports athletes should focused

on acquiring ideal body weight on a long-term period to avoid dehydration and others short-period strategies that may lead to detrimental aspects of physical fitness and health risks. Re-Hydration must be guided by electrolyte status to avoid major risks issues such as cardic arrhythmias, hyponatremia and aedema. These strategies should be encourage by coaches leagues and federations worlwide.

B-59 Free Communication/Poster - **Contact Sports**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

775 Board #36 May 30 2:00 PM - 3:30 PM

Injury Monitoring and Player Education, a Survey of Current Practices in Irish Amateur Rugby Union

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(No relevant relationships reported)

Rugby Union is one of the most played and watched collision sports worldwide, with high injury incidences widely reported in the literature. Participation rates in Rugby Union are rising with increasing popularity, particularly in Ireland with 224 amateur clubs and approximately 190,400 players currently registered. Internationally, the Irish men's team is currently ranked in the top five in the world. **PURPOSE**: To evaluate injury monitoring and player education practices in Irish amateur Rugby Union. **METHODS**: A survey was designed and distributed to coaches and medical staff of 58 clubs. These clubs represent the highest level of amateur Rugby Union in Ireland. The survey consisted of 27 questions, with five sections: 1) Club demographics, 2) Monitoring, 3) Education, 4) Staffing and 5) Injuries. **RESULTS**: Forty-nine clubs responded to the survey. Five surveys were incomplete and excluded from analysis. The overall response rate was 75.9% representing current practices of 4,843 amateur players (mean 110±57 players per club). Injuries were monitored in 91% of clubs, with medical staff recording data in 75% of cases, using paper records (52.5%), Excel spreadsheets (37.5%) or online resources (7.5%). Training load was monitored in 36% of clubs mainly by the strength and conditioning coach (37.5%). All clubs operated return to play protocols, with 64% for all injuries and 36% for concussion only. Twenty-three% conducted pre-season concussion screening and 82% educated players on concussion. Seventy-one% educated players about injury prevention. **CONCLUSIONS**: Injury monitoring is crucial in collision sports such as Rugby Union, where injury risk is substantial. While comprehensive monitoring systems are prevalent in professional sport, injury monitoring is often infrequent and inconsistent in amateur settings. In order to minimize injury risk, it is the duty of care of governing bodies to implement monitoring systems in both amateur and professional cohorts. In Ireland, 91% of clubs monitor injuries by various means. The implementation of a centralized monitoring system in Irish amateur Rugby would allow injury trends to be effectively tracked and used to guide evidence-based injury prevention strategies. **Funding:** The Irish Rugby Injury Surveillance Project is funded by the Irish Rugby Football Union**.**

776 Board #37 May 30 2:00 PM - 3:30 PM

Optimal Cooling Periods For Rugby League In Hot/humid Conditions

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(No relevant relationships reported)

PURPOSE: The current extreme heat policy for the National Rugby League (NRL) recommends 1-min cooling breaks mid-way through each half to permit greater fluid ingestion as the primary strategy to mitigate heat stress. The present study aims to assess the effectiveness of the current policy relative to an extended halftime break for mitigating thermal strain.**METHODS**: Six trained males (age: 24±4 y, height: 177±11 cm, weight: 90.8±14.2 kg) undertook four counterbalanced experimental trials in a climate chamber simulating hot/humid conditions (36.5±0.4°C, 51±2% RH), consisting of 80 min of intermittent running on a treadmill matching the demands of a professional rugby league game. Participants completed a regular game (RG) with a 12-min half-time break, an extended (20-min) half-time break (EH), a regular game with a 1-min (R1C) cooling break and an extended game with a 1-min cooling break (E1C) 20 mins into each half. Change in core temperature (ΔT_c), change in thermal sensation (TS) and whole-body sweat rate (WBSR) were measured. **RESULTS:** End-trial ΔTc were RG: 1.90±0.14ºC, R1C: 1.75±0.52ºC, EH: 1.70±0.18ºC, E1C: 1.68±0.36ºC, with the ΔTc from the start to end of halftime reported as: RG: 1.11±0.20ºC, R1C: 1.09±0.36ºC, EH: 0.97±0.15ºC, E1C: 1.00±0.23ºC. The length of in-play break duration (i.e. 1-min or 3-min) had no influence on rise in core temperature by the end of the first half (p=0.88) or the second half (p=0.66). However, there was a greater reduction in core temperature during EH compared to RG (p=0.05). This blunted rise in core temperature with EH persisted to the end of exercise with lower end-trial values in EH compared to RG (p=0.02). TS was also cooler at end-trial after EH (p=0.02) with no additive effect of in-play breaks (p=0.96). There were no differences (p=0.40) in WBSR between trials (RG: 1.25±0.25 L/h, R1C: 1.17±0.19 L/h, EH: 1.19±0.18 L/h, E1C: 1.23±0.25 L/h). **CONCLUSIONS**: Preliminary data indicate that extending halftime from 12 to 20 min in Rugby League is effective at reducing thermal strain whereas in-play cooling breaks of up to 3 minutes may not provide any additional benefit. These findings may also be applicable to all field based team sports (e.g. American football, soccer and Australian football (AFL)).**FUNDING:** This research was funded by the National Rugby League (NRL), Australia

777 Board #38 May 30 2:00 PM - 3:30 PM

Wearable Sensors to Quantify Performance and Fatigue during Tournament Competition among Elite Developmental Ice Hockey Players

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(No relevant relationships reported)

At the highest performance levels of ice hockey (e.g. senior/professional), rules govern the number of successive competition days and prevent multiple competitions on a single day. Yet, some youth leagues run weekend showcase events that include multiple competitions per day. It is generally assumed that multiple competitions per day and several competitions over multiple days will impart excessive fatigue and impair performance, but there is no evidence directly related to ice hockey. **PURPOSE**: Use player-worn sensors (PWS) to compare accelerations (ACC) and heart rate (HR) over 4 games in 3 days among elite youth ice hockey players in order to establish changes in cardiovascular stress and physical exertion associated with fatigue. **METHODS**: 33 elite, youth ice hockey players in two age categories (18U: N=17, 18.2 yrs ± .92 & 16U: N=16, 16.4 yrs ± 1.1) on two teams in a league showcase consented to procedures approved by the EMU-HSRC. Bioharness-3 (Zephyr, MD) recorded HR and ACC at 1 Hz over the 4 games (G1-G4) in the 3- day event. Peak ACC across multiple time frames (10, 15, 20, 30,··· 90, sec and 2, 2.5, 3, 5, 10, ···, 45 min) were quantified and analyzed and HR was quantified and used in conjunction with ACC to determine exertion profiles for each on-ice session. MANOVAs for peak ACC and HR at each time point across G1 -G4 with Bonferoni *post hocs* and multiple games per day (M1, M2) for magnitude and time as main effects were performed using SPSS 23.0 (IBM, NY; α=0.05). **RESULTS**: HR (bpm) decreased G1 v G4 at 3 (187.5 ± 2.8 v 176.1 ± 2.8), 5 (178.7 ± 3.0 v 165.7 ± 3.0), 10 (170.4 ± 3.1 v 157.6 ± 3.1), 15 (167.1 ±3.0 v 153.3 ± 2.9) and 20 min (164.3 ± 3.0 v 150.5 ± 2.9)(p<.05). In addition, HR also decreased G1 v G3 for 10 (170.4 ± 3.1 v 158.5 ± 3.0), 15 (167.1 ±3.0 v 154.5 ± 2.9) and 20 min (164.3 ± 3.0 v 152.4 ± 2.9)(p<.05), although ACC were not different. Peak ACC (g's) were lower for M2 vs M1 at 60 (0.632 ± 0.012 v 0.592 ± 0.012), 90 (0.551 ± 0.01 v 0.520 ± 0.01), 120 (0.495 ± 0.009 v 0.469 ± 0.009) and 180 sec (0.412 ± 0.009 v 0.386 ± 0.009)(p<.05). **CONCLUSIONS**: The decline in HR, but not ACC across games over 3 days indicates a cardiovascular adaptation as opposed to overt fatigue. On the other hand, the reduced ACC from 60 - 180 sec between games 1 and 2 in a day indicate reduced shift capacity and an overall decline in performance indicative of fatigue during the second contest.

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Movement Deficiencies in Division II Male Football Athletes as it Relates to Class and Position

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(No relevant relationships reported)

The NCAA Division II Student-Athlete population may be subject to numerous mobility and stability deficiencies as it relates to sport and training requirements. Deficiencies must first be identified prior to prescription of sport performance training modalities. **PURPOSE:** Identify movement deficiencies in Division II male football athletes and investigate differences among specified groups. **METHODS:** Forty-three athletes (weight 103.1 ± 19.9 kg, height 183.3 ± 6.6 cm) underwent 11 screening exercises assessing deficiencies in 15 evaluation areas. Data was collected by trained evaluators who scored athletes on a pass/fail system with failure defined as compromised mobility or stability during exercises. Scores were compiled into evaluation areas determining deficiencies. For analysis, athletes were dichotomized into Upperclassmen (UC) n = 22 and Lowerclassmen (LC) n = 21 and stratified into position groups: Skill (n = 15), Big Skill (n = 15), and Bigs (n = 13). Descriptive statistics and comparative analysis, T-Test and ANOVA, were performed using SPSS (version 22.0) with significance set at $p \leq 0.05$. **RESULTS:** All athletes displayed deficiencies, but comparative analysis identified significant differences between UC

and LC in lower body strength (UC = 1.9 ± 1.4, LC = 3.1 ± 0.9; F = 11.9, p = 0.001) and single leg strength (UC = 3.8 ± 1.9, LC = 5.1 ± 1.2; F = 6.5, p = 0.02). Within position groups, Bigs (6.9 ± 1.7; 13.2 ± 2.8; 2.6 ± 0.5, 1.9 ± 0.9) presented greater deficiencies in posterior chain (F = 6.4, p = 0.004), core stability (F = 5.4, p = 0.01), hip girdle endurance (F = 3.6, p = 0.04) and posterior shoulder girdle strength (F = 3.6, p = 0.04) compared to Skill (3.7 ± 2.7, p = 0.001; 9.9 ± 3.3, p = 0.01; 1.8 ± 0.9, p = 0.01; 1.3 ± 0.9, p = 0.06) and Big Skill (4.3 ± 2.9, p = 0.01; 10.0 ± 2.8, p = 0.01; 1.8 ± 0.9, p = 0.37; 1.1 ± 0.8, p = 0.01). **CONCLUSION:** Identification of individual and group deficiencies allows for utilization of targeted training protocols with the goal of enhancing overall performance.

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Physical Demands of NCAA Division I Hockey Training and Competition Using Microtechnology

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(No relevant relationships reported)

PURPOSE: Wearable technology has gained popularity to measure external workloads during practices and games in sport. Most often a tri-axial accelerometer, combined with a magnetometer and gyroscope measures directional movement in three planes of motion. This study investigated the external loads of collegiate hockey practices and games by period. **METHODS:** External workload (i.e. Player Load™ [PL]) and workload intensity, PL per minute (PL/m), were measured in 18 NCAA Division I Hockey athletes [11 forwards (FWD) and 7 defenders (DEF)] using OptimEye S5 monitoring devices (Catapult Sports, Melbourne, Australia) during the 2016-2017 season. Measurements were recorded during games and practices. Linear mixed effects models with random intercepts for player and date were used to test the effect of position on each variable. Effect sizes were calculated to determine the magnitude of differences between groups. **RESULTS:** The PL for Period (PD) 1 was 2.27 PL higher than PD 3 (95% CI: 0.61, 3.93; p = 0.007; d = 0.48). The PL/m for PD 1 was 0.13 PL/m higher than PD 2 (95% CI: 0.09, 0.17; p < 0.001). The PL/m for PD 1 was 0.18 PL/m higher than PD 3 (95% CI: 0.14, 0.23; p < 0.001). The PL/m for PD 2 was 0.05 PL/m higher than PD 3 (95% CI: 0.01, 0.10; p = 0.0147). There were no differences within PD by position (p = 0.198). The PL for practices was 19.43 PL lower than games (95% CI: -35.19, -3.69; p = 0.018). The PL/m for practices was 0.28 PL/m higher than games (95% CI: 0.20, 0.36; p < 0.001; d = 0.9). The PL for FWD was 29.2 PL higher than DEF during practice (95% CI: 12.6, 45.8; p = 0.003; d = 1.65). There were no differences in PL between FWD and DEF during games (p = 0.167). The PL/m for FWD was 0.36 PL/m higher than DEF across practice and games (95% CI: 0.18, 0.55; p = 0.002). **CONCLUSION:** Within this study we observed: 1) player workload intensity decreasing as the game progresses; 2) higher PL/m for practice compared to games; and 3) higher PL for FWD compared to DEF during practice. However, these differences are relatively small in absolute terms and may not be meaningful considering individual variation between players. Playing time, penalties, and minor injuries may affect positional averages throughout the course of a game. Future studies should examine the effect of individual variation within and between weeks and by drill type.

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Physical Skills of Teen Student-Athletes of Combat Sports: A Comparative and Correlational Analysis

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(No relevant relationships reported)

PURPOSE: To analyze comparatively the performances of elementary and high school athletes of combat sports in a set of tests of conditional abilities.
METHODS: Data from 518 male and female teenagers who took part in inter-provincial competitions of Judo, Taekwondo and Wrestling were studied (age range: 11.9 to 14.9 years). A battery of field tests was carried out: Handgrip strength (HAST), Abalakov, Countermovement and Squat jumps (ABJ, CMJ and SQJ), 0-10 m Sprint acceleration (0-10SA) and Sit and reach flexibility (SARF). Pearson's r was used to test correlations among the physical skills. ANCOVA models were run to evaluate the performances in HAST, ABJ, 0-10SA and SARF, which included Gender, Sport and their interaction, and Age as a covariate. Feasible weighted least squares was applied on HAST and ABJ, to account for heteroscedasticity. *Post hoc* Tukey-Kramer tests were conducted for multiple comparisons. The statistical significance level was fixed at $p<0.05$.
RESULTS: The correlations were high among the jumps (0.82 to 0.91; $p<0.001$), and from moderate to marked among HAST, 0-10AS and any of the jumps (0.50 to 0.65; $p<0.001$). SARF showed very low correlations (0.05 to 0.15; $0.0007\leq p\leq 0.25$). The interaction term was not statistically significant in the models analyzed. Gender was a significant factor in the four models, and Sport was significant in the models for ABJ and SARF. Boys exhibited higher performances than girls in HAST, ABJ and 0-10SA, and lower in SARF. *Post hoc* comparisons between sports revealed that judokas and taekwondists had higher values than wrestlers in ABJ, and that taekwondists had higher values than wrestlers in SARF. In boys, the mean responses of HAST (kgf), ABJ (cm), 0-10SA ($m \cdot s^{-2}$) and SARF (cm) were 28.8, 31.7, 4.7 and 5.1 for judokas; 28.0, 32.8, 4.7 and 5.7 for taekwondists; and 27.0, 29.9, 4.7 and 3.0 for wrestlers. And in girls, the mean responses were, respectively, 23.9, 25.4, 4.1 and 9.4; 23.6, 25.3, 4.0 and 10.8; and 23.6, 23.6, 4.0 and 8.2.
CONCLUSIONS: Flexibility evidenced the lowest associations with the rest of the physical skills. The differences between boys and girls appeared to remain constant across sports. Averaged over both genders, martial arts athletes showed higher performances in ABJ, and taekwondists revealed to be more flexible than wrestlers.

781 Board #42 May 30 2:00 PM - 3:30 PM

Differences in Velocity Output in the Back Squat, Bench Press, and Deadlift Among Collegiate Hockey Players

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(No relevant relationships reported)

Resistance-training loads are commonly assigned as a percentage of an individual's one-repetition maximum (1-RM). Unfortunately, repetition maximums do not account for an athlete's current state of readiness (training state). The use of velocity-based training (VBT) provides objective data about training state, and is an effective and reliable method of examining an athlete's movement efficiency. Currently, there is insufficient evidence regarding velocity profiles of exercises that are body-weight dependent (BWD) such as the free-weight back squat (BS) and deadlift (DL) compared to non-body-weight dependent (NBWD) such as the barbell bench-press (BP).
PURPOSE: To determine velocity profiles for the BS, BP and DL in Division III collegiate male hockey players.
METHODS: Fourteen Division III male collegiate hockey players, (age 21.3 ± 1.5 years; height 181.2 ± 5.0 cm; mass 88.6 ± 8.8kg) completed this study. Prior to velocity testing, body composition via air displacement plethysmography (BodPod) and one repetition maximum (1RM) for the BS, BP, and DL were measured. On separate days, subjects performed nine repetitions each of the BS, BP and DL (10, 20, 30, 40, 50, 60, 70, 80, and 90% of their 1RM). Average velocity was measured with a Tendo Power Analyzer (Tendo Sports Machines, Slovak Republic). A repeated measures ANOVA was used to investigate the impact of exercise on mean velocity (alpha level of $p \leq 0.05$).
RESULTS: Subject anthropometric measurements included: BMI (26.95 ± 2.0 kg/m^2) and percent body fat (17.12 ± 3.4 %). 1-RMs for the BS, BP, and DL were 146.0 ± 13.1 kg, 103.7 ± 15.3 kg, and 156.84 ± 14.9 kg), respectively. A significant exercise x %1-RM interaction was found ($p < .05$). Mean velocity for the BP was significantly greater at 10%, 20% and 30% of 1-RM compared to the BS and DL and 90% compared to the DL ($p <.017$). There were no significant differences in mean velocity between the BS and DL.
CONCLUSIONS: The BS and DL, BWD exercises, demonstrated significantly slower average velocities at various levels of %1-RM compared to the BP, a NBWD exercise. While the differences were not seen throughout the entire range of %1-RM, practitioners should account for body-mass when using VBT with BWD exercises.

782 Board #43 May 30 2:00 PM - 3:30 PM

Evaluation Of The Health And Physical Fitness And Factors Influencing Retention Of Scholastic Sports Officials In The Sport Of American Football

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(No relevant relationships reported)

PURPOSE: As the competitive level and skill level of the athletes increases, so does the demand and elevation in expectation of that official's performance. There is currently a dearth of information and data as it relates to the official's capacity and ability to perform their job. The purpose of this study was to evaluate the health and physical fitness status as well as job satisfaction of officials in the sport of American football.
METHODS: Eighteen National Federation of High Schools certified officials in the sport of American football participated in the study. Participants completed an Adult Health History Questionnaire to risk classify for cardiovascular disease (CVD) according to American College of Sports Medicine (ACSM) standards (ACSM, 2017). Also, each participant completed a Minnesota Satisfaction Questionnaire (1977) related to their current officiating responsibilities. In addition, each participant had body mass index (BMI) assessed using standard scales.

RESULTS: Descriptive statistics showed that the mean age of the participants was 47.7±13.2 years old with a mean BMI of 29.0±5.0 kg/m^2. 50.0% of participants were classified as High Risk for CVD, 27.8% Moderate Risk, and 16.7% Low Risk. A significant correlation was found between age and total sports officiated (r = -.505, p = 0.046) and while the correlation between BMI and extrinsic satisfaction (r = -.493, p = 0.062) was not significant, it did imply a moderate correlation. A one-way ANOVA exhibited a significant difference between ACSM risk classification and the number of sports officiated (p = 0.044). A post-hoc Tukey test indicates that individuals who are High Risk officiate significantly more sports (p = 0.046) than those who are Moderate Risk. However, High Risk was not significantly different from Low Risk and Low Risk was not significantly different from Moderate Risk (p > 0.05).
CONCLUSIONS: Based on the results of the current study, it appears that the data can confirm that as officials get older they tend to drop out of officiating. In addition, a large degree of officials (77.8%) were considered either Moderate or High Risk for CVD, implying that the physiological stress that officiating typically entails could place these individuals at an increased risk of experiencing a cardiovascular event.

783 Board #44 May 30 2:00 PM - 3:30 PM

Hydration Status in Division III Female Hockey Players Prior to Competition

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(No relevant relationships reported)

Voluminous sweating and collegiate athletes share an association, especially during competition. The accountability is on the athlete to arrive to the venue euhydrated and it is paramount for optimal performance. For the collegiate hockey player it has been reported that improper hydration will most likely cause headaches, dry mouth, sluggishness, malaise, and reduced performance. **PURPOSE:** To elucidate the hydration status in a group of DIII collegiate female hockey players prior to competition. **METHODS:** Sixteen intercollegiate athletes from a NCAA Division III Women's Hockey team (age = 19.9 ± 0.7 yrs, height = 168.7 ± 8.2 cm, mass = 62.6 ± 9.1 kg) participated in this investigation. During an eight week span over two seasons, 16 skaters randomly provided a sample moments before competition. Urine samples were collected in a sterile 4oz specimen container and measured with a pen refractometer (ATAGO model 3749-E04) to determine urine Standard Gravity (SG). Data were analyzed using a one sample t-test against established optimal hydration levels at or below 1.020 SG. **RESULTS:** Mean(x) SG score was 1.0239 ± 0.0027 ($p < 0.05$). Three out of sixteen subjects met the criteria of the 1.020 SG or lower number. Thirteen measured between 1.022 and 1.031. **CONCLUSION:** This reveals a significant difference above the population standards and indicates that the majority of athletes were slightly dehydrated in that, only 16.7% were properly hydrated by SG guidelines. Thus, revealing that the typical DIII female hockey player is not adequately hydrated prior to competition and would benefit from additional guidance and preparation.

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This Study Provides Quantification Of Positional Physical Demands Of Selected Positions

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(No relevant relationships reported)

Global positioning tracking comparisons of selected NCAA Division I football player positions during conference games
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Global positioning (GPS) tracking of Division I (DI) football players is a relatively new method of assessing total distance covered, velocities and accelerations during practices and games.
PURPOSE: To compare differences in distance traveled, maximum velocity, high accelerations, among DI football players during competition. **METHODS:** NCAA DI football players (N=21) wore GPSs monitors during four randomly assigned conference games to track selected variables of each athlete. Athletes were grouped by playing position; skilled = wider receiver (WR) and defensive back (DB) and line = offensive linemen (OL) and defensive linemen (DL). Dependent variables included total distance covered (m), maximum velocity m·s^{-1}), and high acceleration (>3ms^{-2}) distances. Oneway ANOVAs were used to compare differences among groups and Newman-Keuls post hoc tests to determine location of significant differences. **RESULTS:** For total distance, DBs traveled significantly (p<0.05) further than WR and OL, but not DL. There was no significant differences between DL and any other positions. DBs and WR had significantly greater maximum velocities than OL and DL and DL had significantly greater velocity than OL. There was no significant difference between DBs and WRs. For high acceleration, DBs had significantly greater distance than all other groups. WRs had greater distance than DL and OL. No difference was found between OL and DL. **CONCLUSION**: This study provides quantification of physical demands of selected DI football positions by determining that defensive player traveled further than offensive players did and that skilled players noted greater velocity and acceleration distances than linemen. Fatigue is related to duration and exertion, which is also associated with potential injury. With factual data regarding these variables, it may be possible to avoid over-reaching, hence reducing injury susceptibility.
Tracking, velocity, athletes

785 Board #46 May 30 2:00 PM - 3:30 PM

Relationship between Body Composition, Cardiorespiratory Fitness, and Position in DII Collegiate Male Rugby Union Players

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(No relevant relationships reported)

Different aspects of body composition such as fat-mass (FM), fat-free mass (FFM), percentage of body fat (BFP), and body mass (BM) have been identified as affecting cardiorespiratory fitness ($VO2_{max}$) in children and young adults. In the sport of rugby union, different positions have been found to benefit from different body compositions based on their roles. Forwards have been found to have greater FM, FFM, BFP, and BM than backs. **PURPOSE:** To determine if FM, FFM, BFP, and BM had any relationship with $VO2_{max}$ among positional groups in collegiate male rugby union players. **METHODS:** Twenty-nine participants (20.34 ± 1.52 years) agreed to perform a 20m multi-stage shuttle-run until volitional failure with the aim of estimating their $VO2_{max}$. FM, FFM, BFP, and BM, were estimated through air-displacement plethysmography via a BODPOD. Players were split into 2 groups based on their general position (forwards, n=16 and backs, n=13). **RESULTS:** An independent samples t-test comparing FM, FFM, BFP, BM, $VO2_{max}$, between forwards and backs revealed that the forwards had a significantly higher BM ($t(27) = 5.64$, $p < .001$), FM ($t(27) = 2.69$, $p < .05$), and FFM ($t(27) = 4.9$, $p < .001$). A Pearson correlation coefficient was calculated for the relationships between estimated $VO2_{max}$ and FM, FFM, BFP, and BM for each positional group. Strong negative relationships were found between $VO2_{max}$ and FM ($r(14) = -.767$, $p = .001$), BFP ($r(14) = -.740$, $p = .001$), and BM ($r(14) = -.699$, $p = .003$) in the forwards. As for the backs, no significant relationships were found between $VO2_{max}$ and FM, FFM, BFP, or BM.
CONCLUSION: The higher amounts of FM, FFM, and BM in forwards likely benefits them during play as they spend a large amount of time in contact with the opposition. However, the increased amount of FM, BFP, and BM may negatively affect the forwards' cardiorespiratory fitness as they are required to move a heavier amount of mass.

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Longitudinal Observation Of Cardiac Adaptation In Junior Rugby Players Using Echocardiography

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(No relevant relationships reported)

PURPOSE: The purpose of this study is to conduct a 3-year longitudinal study of cardiac adaptation in junior and senior high school athletes who play rugby with echocardiography in an effort to examine how continuous practice of rugby during the growth period affects ventricular volume expansion and ventricular septum thickening.
METHODS: Subjects were 34 male junior high and 79 senior high school rugby players with top-level game power. Subjects engaged in rugby-related training approximately 3 hours a day, 6 days a week continuously for 3 years. We measured height, body weight, blood pressure and took electrocardiogram and echocardiography measurements once a year for 3 consecutive years in these subjects. Echocardiography measurements were taken by portable ultrasonic measurement apparatus on B mode to measure left ventricular end-diastolic dimension (LVDd) and posterior left ventricle wall thickness (PWT). As a substitute for the control group, we estimated predicted values for each subject based on their height to make a cross-sectional comparison with the actual measured values.
RESULTS: A cross-sectional comparison of LVDd and PWT measured in junior high schoolers exhibited a significant increase between the 1st and 2nd grade (equivalent of American 7th and 8th grades, respectively) ($p<0.01$). A cross-sectional comparison of the predicted and actual LVDd values for each year of junior high school revealed a significant difference in 2nd year students ($p<0.01$). In contrast, there was a significant difference between predicted and actual PWT values in the 2nd and 3rd (equivalent of American 9th) grade students ($p<0.05$). In senior high schoolers, LVDd increased significantly between the 1st and 2nd grade as well as between the 2nd and 3rd grade, and PWT increased significantly between the 1st and 2nd grade ($p<0.01$). In senior high school, there was a significant difference between actual and predicted values of

LVDd and PWT in all three grades (p<0.01). **CONCLUSIONS**: Continuous practice of rugby in junior and senior high school was associated with marked expansion of left ventricular volume and thickening of the left ventricular septum.

787 Board #48 May 30 2:00 PM - 3:30 PM

Characteristics of Female Collegiate Ice Hockey Players

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(No relevant relationships reported)

PURPOSE: The purpose of this research is to examine the physical characteristics and fitness levels of ACHA Division 1 collegiate female hockey players by examining data collected from various fitness tests including vertical jump, anaerobic step test, the Cooper Run test, anaerobic cycling (Wingate) and body composition testing (BodPod). **METHODS:** Twelve ACHA female hockey players visited the lab on three separate visits to complete the three day testing protocol. On the initial visit, percent body fat was assessed using the BodPod (BP). Also height as well as weight, blood pressure, age, sit and reach, vertical jump (using the Vertec), and anaerobic power output through the anaerobic step test were assessed. On day two, the athletes performed a 1.5 mile aerobic run (Cooper Run Test). On day three, an anaerobic cycling test (Wingate) was performed. **RESULTS:** Percent body fat as assessed by BP (29.7 $\pm$ 8.2; range: 19.6-43.3%), height (162.3 $\pm$ 6.2; 150-170cm), weight (70.6 $\pm$ 12.1; 50.1-95.2 kg), resting systolic blood pressure (119 $\pm$ 5; 110-130 mmHg), resting diastolic blood pressure (77 $\pm$ 6; 68-88 mmHg), age (21.3 $\pm$ 4.2; 18-34 years), sit and reach (32.5 $\pm$ 6.4; 23-41.5 cm), vertical jump (18.7 $\pm$ 3.1; 13.25-23.5 inches), anaerobic step test (46.5 $\pm$ 12.6; 31-74 steps; mean power 254 $\pm$ 72; 624-1295 watts), aerobic capacity (VO_2 max) as assessed by the Cooper Run Test (46.6$\pm$ 10.3; 33-65.4 $ml^{-1}*kg^{-1}*min$). The Wingate mean power was (3743 $\pm$ 981; 4965-8057 Watts) and total repetitions were (45.7 $\pm$ 4.7; 38-53 repetitions). **CONCLUSION:** These tests present a unique fitness profile for an understudied group of athletes. This profile can be useful for coaches, players and trainers within this sport, ACHA Div.1 Women's Ice Hockey.

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Comparison Of Heart Rate, Speed, And Sprints Performed By A Division I College Female Field Hockey Team Using Game Data

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(No relevant relationships reported)

Heart rate (HR) monitoring, GPS tracking, and accelerometry are new techniques for evaluating players' activity levels during competition. Results from live tracking can help the coaches with practice schedules and game strategies. To date, there are few data available from these tracking modalities within NCAA varsity women's field hockey. **PURPOSE:** Our purpose was to determine descriptive information related to players' game performance, and analyze the results by player position. **METHODS:** A team HR monitoring system was used to evaluate in-game HR responses and movement patterns of women field hockey players from a single NCAA Division I team. Players were divided into 3 groups based on position (back, midfielder, forward). Data were collected and averaged among 15 women who played in 3 games, and 95% confidence intervals were computed. HR max was determined through a continuous graded treadmill test with increases in intensity every 2 min. Given that field hockey is fast-paced game, variables of interest in this preliminary investigation included time spent at HRzone 4 (80-90%HRmax) and HRzone 5 (>90%HRmax), maximum speed achieved, and number of sprints performed. **RESULTS:** On average, players spent 31.3% of game time in HRzone 4 and 49.2% in HRzone 5. Differences were seen according to player position as backs spent less time in HRzone 4 (22%) compared to midfielders (34.9%) and forwards (37.1%); P<0.05. In contrast, forwards spent less time in HRzone 5 (35.6%) compared to backs (57.6%) and midfielders (54.5%); P<0.05. Midfielders spent significantly more time >80%HRmax (89.4%) compared to forwards (72.7%); P<0.05. Max sprint speed was not statistically significant by position, midfielders (435±56.2 m/min), backs (401±42.2 m/min) and forwards (393±31.9 m/min). Backs engaged in fewer sprints (0.4±0.08 sprints/min) compared to midfielders (0.7±0.27 sprints/min) and forwards (0.6±.58 sprints/min); P<0.05. **CONCLUSIONS:** Heart rate data show clearly that field hockey is played under very intense aerobic conditions, with high burst interval runs being performed throughout the competition. Our data suggest that backs achieve their HR values using less short bursts and likely, more constant movement, while overall aerobic intensity (according to HR response) appears greatest among the midfielders.

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Validity & Reliability Of A New Hockey-Specific Test In Elite Ice Hockey Players

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(No relevant relationships reported)

A valid and reliable method of assessing hockey-specific physiological performance is warranted as elite hockey players compete for scholarships and professional contracts. The Hockey-Specific Test (HST) is an on-ice, position-specific assessment that integrates competition specific, multi-planar movement patterns and is generalizable to hockey players at the highest level of competition. Generalizability in the use of published on-ice tests is problematic due to small sample sizes and the use of recreational youth and non-elite players. More importantly, they don't include hockey-specific movement patterns (e.g., turns, deceleration, skating backward). **PURPOSE:** The purpose of this study was to determine the validity and reliability of the new assessment. **METHODS:** 54 male players (National Hockey League = 16; American Hockey League = 23; Under 17 USA National Team = 15) gave informed consent and minor assent to participate in both the HST and a 30-second Wingate Test (WAnT) with a resistance of 0.075 kg/kg body weight. The HST consists of 6 on-ice trials interspersed with 30-seconds active rest. All players wore full gear and carried a stick. Measurements included 15 m peak acceleration (m/s^2), 166 m total trial speed (m/s), percentage of age-predicted maximum heart rate ($APMHR_{\%}$), and post-exercise blood lactate (BLA_{post}) as markers of maximal effort and physiological capacities. **RESULTS:** A strong correlation exists between WAnT peak power and HST trial speed ($r = .765$, $p < 0.001$) and 15 m acceleration ($r = .716$, $p < 0.001$) in elite players, demonstrating construct validity. Intra-class correlation coefficients (*ICC*) for all participants verified within and between trial reliability for 15 m acceleration, $F(50) = 0.67$, $p < 0.001$ and trial speed, $F(50) = 0.85$, $p < 0.001$. Multinomial logistic regression for predicting WAnT peak power (w) from results of the HST = 27.98 - (18.05 x trial 1 time) + (11.04 x weight) + (25.69 x age). Adjusted peak power, $APMHR_{\%}$, and BLA_{post} were 1023±108, *SEE* = 26±6; 89.3±3.6 and 91.2±4.5; 10.6±2.0 and 11.2±1.7 for the WAnT and HST, respectively. These values coincide with a test that sufficiently taxes the glycolytic energy pathway. **CONCLUSION:** The HST appears to be a valid and reliable test for determination of physiological performance in elite hockey players.

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Updating the Skating Multistage Aerobic Test for VO_2max Prediction Including Skating Economy in Ice-Hockey Players

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(No relevant relationships reported)

Purpose: In ice hockey, the aerobic metabolism is responsible for up to 30% of total energy expenditure and thus, is considered as an important performance factor. Recently, a number of field tests, including the Skating Multistage Aerobic Test (SMAT) have been developed to predict VO_2max in hockey players. When it was developed, the SMAT determined energy expenditure using the retro-extrapolation of the O_2 recovery curve at time 0 method. With the development of portable metabolic analyzers, it would be relevant to update the VO_2 values using this more precise device. In addition, the SMAT, like most field tests, assumes that participants who reach a given stage have the same oxygen cost, which is not usually true. Thus, the objectives of this research are to update the VO_2 values during the SMAT using a portable breath-by-breath metabolic analyzer and to propose a simple index of skating economy to improve the prediction of O_2 uptake. **Methods:** Twenty-six elite hockey players (age 15.8±1.3 years) participated in this study. The oxygen uptake was assessed using a portable metabolic analyzer (K4b2) during an on-ice intermittent maximal multistage shuttle skate test. During the test, participants had to skate back and forth over a distance of 45m at a velocity dictated by an audible signal. The initial skating velocity was set to $3.5 m \cdot s^{-1}$ and at each stage, speed increased by $0.2 m \cdot s^{-1}$. In order to develop an index of skating economy (SSI = # Strides · Body $Mass^{-1}$), the number of skating strides was compiled for each stage of the test. **Results:** The SMAT enabled the prediction of the VO_2max ($ml \cdot kg^{-1} \cdot min^{-1}$) from the maximal velocity ($m \cdot s^{-1}$) and the SSI (at Stage 4, which corresponds to $4.1 m \cdot s^{-1}$) using the following regression equation: $VO_2max = 13.86 \cdot (maximal\ velocity) + (3.23 \cdot SSI) - 19.95$ (r=0.95, SEE=1.96). **Conclusion:** This research allowed for the update of the oxygen uptake values of the SMAT test and proposed a simple measure of skating efficiency for a more accurate evaluation of VO_2max in elite hockey players. By comparing the highest and lowest observed SSI scores in our sample for a given stage, it was noted that the VO_2 values

can vary by up to 5 ($ml \cdot kg^{-1} \cdot min^{-1}$). Our results suggest that movement economy should be included in the prediction of VO_2max in field tests requiring high technical skills in order to improve prediction accuracy.

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Do Metrics Between Back-to-Back National Hockey League Away Games Indicate a Presence of Fatigue?

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(No relevant relationships reported)

PURPOSE: The purpose of this investigation was to estimate the fatigue caused by game one of a set of back-to-back games (away) as indicated by play-by-play metrics.
METHODS: The R package, nhlscrapr, was used to acquire the 2015-2016 National Hockey League play-by-play database. First, the database was filtered for all regular-season, full-strength events with no pulled goalies. Next, all back-to-back games were identified and coded as being either away-away, home-home, home-away, and away-home. Only away-away back-to-back games were analyzed. Finally, the data were filtered so each back-to-back team had a frequency count for games one and two of the following variables: goals for, goals against, shots on goal for, shots on goal against, missed shots for, missed shots against, shots for blocked, shots against blocked, hits for, penalties against, and penalties for. All metrics were analyzed using mixed models, with random effects for team and fixed effects for game number. Goals, penalties, and blocked shot models were fit using Poisson distributions, and all other models were fit using Gaussian distributions. Alpha was set at 0.05.
RESULTS: 186 away-away pairs of games were identified; teams had anywhere from 1 to 10 pairs. There was a significant effect of game number on goals for (game 1=1.8±1.3; game 2=1.5±1.2; p=0.035), shots against (game 1=20.8±5.5; game 2=22.0±6.2; p=0.04), and missed shots against (game 1=8.9±3.7; game 2=9.9±4.0; p=0.011). There was no significant effect of game number on goals against (game 1=1.8±1.2; game 2=1.7±1.3; p=0.46), shots on goal for (game 1=20.8±6.0; game 2=19.9±5.5; p=0.14), missed shots for (game 1=8.8±3.6; game 2=8.8±3.7; p=0.95), shots for blocked (game 1=10.9±4.5; game 2=11.4±4.7; p=0.13), shots against blocked (game 1=10.4±4.2; game 2=10.5±4.7; p=0.92), penalties against (game 1=2.9±1.5; game 2=2.8±1.4; p=0.86), penalties for (game 1=2.8±1.5; game 2=2.6±1.5; p=0.10), and hits for (game 1: 21.4±8.9; game 2 20.7±7.6; p=0.31).
CONCLUSIONS: Hit data indicates that physicality is likely not as affected by game 1 fatigue. However, teams give up a greater number of total shot attempts in game 2's and score fewer goals in game 2's. Thus, game 1 fatigue may result in lower-quality shots for and generally poorer defensive play by skaters.

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Comparison of Muscular Strength and Reactive Strength Index between Football Linemen and Backs

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(No relevant relationships reported)

Ability to generate force quickly is a primary evaluation protocol for assessing athletic potential. Jumping indices have become major indicators of potential or judging training improvement. However, there is limited information concerning these indices for college football players. **PURPOSE:** To compare two forms of reactive strength index (RSI) between college football linemen and backs. **METHODS:** Linemen (n = 11) and backs (n = 12) from an NCAA D-II program were tested for one-repetition maximum (1RM) squat (SQ), paused squat jump (SJ) and drop-jump vertical jump (DVJ) determined from reach height. Flight time during SJ and ground contact time (GCT) were measured using an automated contact mat. Each player performed 3 trials of each jump. Relative 1RM SQ was expressed allometrically ($SQ/kg^{0.67}$). RSI was calculated as a ratio of DVJ to GCT (RSI-1) and Ft/GCT (RSI-2). Data were analyzed with ANOVA and significance was accepted with $p<0.05$. **RESULTS:** Linemen were significantly taller (186.7 ± 3.6 cm) and heavier (117.3 ± 15.7 kg) than backs (180.1 ± 6.0 cm and 90.1 ± 5.3 kg, respectively). 1RM SQ was greater in linemen (200.0 ± 26.7 kg) than backs (182.7 ± 28.4 kg), but relative SQ was similar (linemen: 8.20 ± 1.05; backs: 8.99 ± 1.32). Reliability for GCT (ICC = 0.922), Ft (ICC = 0.990), DVJ (ICC = 0.960), and SJ (ICC = 0.991) was high. RSI-1 (2.12 ± 0.52) was greater than RSI-2 (2.04 ± 0.54), although they were highly correlated (r = 0.93). RSI-1 and RSI-2 were greater in backs (2.33 ± 0.38 and 2.42 ± 0.46, respectively) than in linemen (1.67 ± 0.49 and 1.91 ± 0.48, respectively) with large effect sizes (ES = 1.52 and 1.07, respectively). Relative SQ was moderately correlated with RSI-1 (r = 0.63) and RSI-2 (r = 0.59), but there was no relationship with 1RM SQ (r = 0.06 and 0.13, respectively). RSI-1 and 1RM SQ correctly classified 80% of linemen and 85% of backs to the proper position. **CONCLUSION:** Ratios utilizing contact time appear more effective at evaluating reactive strength than measurements of strength or simple jump performance (jump height). The relationship between relative strength and reactive jumps suggests that players who have greater relative strength can move more effectively in reactive situations which may more accurately identify performance potential in college football players.

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Effect Of Rapid Weight Loss On Strength In Mma Fighters

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(No relevant relationships reported)

PURPOSE: The aim of this study was to verify the effect of the rapid weight loss (RWL) induced by the restriction of fluids at different moments on the manual grip strength in mixed martial art (MMA) athletes.
METHODS: Twenty-seven male amateur MMA athletes (age 24.0 ± 5.3 years, height 175 ± 8.2 cm, body mass 76.0 ± 14.66 kg) and twenty-three women (age 19,0 ± 6,9 years; height 164,0 ± 6,1 cm; body mass 66,0 ± 6,70 kg) participated in this study. All athletes had BM, handgrip strength, and hydration status assessed at baseline (10 days before the onset of RWL), the official match weigh-in, and again 24 h later (match time).
RESULTS: A repeated measures ANOVA showed for men and women, basal body weight (male: 75,0 ± 2,0; female: 66,1 ± 6,7) was significantly higher than at the time of weighing (male: 65,2 ± 2.1; woman: 56,9 ± 4,9) and match time (male: 68,5 ± 2,1, female: 59,6 ± 6,1). Density for males was higher at baseline (1.039 ± 0.1) compared to 24 h later (1.018 ± 0.1). However, women presented a difference in density for the three moments (baseline: 1,040 ± 0,2 > 1,030 ± 1,0 > 1,017 ± 0,1). In the handgrip for men it was evidenced difference between baseline (44,2 ± 13,8) and weighing (40,3 ± 17,7); however for women not found difference.
CONCLUSIONS: Rapid weight loss showed to reduce significantly manual grip strength. In addition, was observed that this technique leads the athlete to dehydration. This would possibly interfere in a negative way in the performance of the athletes. In this way, the subjective criterion of a supposed advantage in the reduction and supercompensation of the weight must be well planned so that there is no deleterious effect on the performance and health of the athlete.

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Changes In Elite Canadian Collegiate Hockey Player'S Body Compositions And Physiologic Tests Across Playing Careers

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(No relevant relationships reported)

The combined athletic and academic demands place a significant burden on collegiate hockey players. Numerous cross-sectional studies have been conducted with professional hockey players assessing body composition and skeletal fitness; yet, no research has investigated the longitudinal physiologic changes among elite collegiate athletes. **PURPOSE**: To examine changes in body composition and physiologic tests across a player's collegiate hockey career. **METHODS:** Over three seasons, six elite male Canadian university hockey players (age = 21.35 ± .28 years, weight = 84.53 ± 7.26 kg , height = 179.48 ± 7.60 cm, body fat percentage = 15.55 ± 1.68% at baseline) participated in the study at the beginning of their hockey seasons. All participants underwent physical testing (as outlined in the 2016 NHL combine) and a day after testing, one total body dual energy x-ray absorptiometry (DXA) scan to measure body composition. **RESULTS:** A repeated measures ANOVA was used to track body composition and physiologic performance variables over a three-year period. Players gained body weight (1.66 ± 1.96 kg), total body fat percentage (2.83 ± 1.91%), visceral adiposity (.16 ± .15 kg), upper fat mass (1.57 ± 1.20 kg), and lower fat mass (.52 ± .36 kg) ($p < .05$ for all comparisons). Total and regional lean tissue mass stayed relatively constant throughout their careers. There were no significant changes in agility scores, left grip strength, long jump distance or impulse generated in the vertical jump as all of these assessments stayed relatively consistent throughout the seasons. As players progressed through their careers, they achieved significantly more bench press repetitions, pull-ups, and had higher Wingate peak power scores ($p < .05$ for all comparisons). **CONCLUSIONS:** Pilot findings suggest that as players progress through their collegiate hockey careers, they gain weight, total and regional body fat, and are typically stronger in respects to some fitness tests. With this knowledge, strength and conditioning coaches can work in tandem with food scientists

and nutritionists to optimize meal plans in an effort to prevent weight and adipose tissue gain which may enhance on-ice play and player health across their three-year university careers.

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The Association Among Body Composition, Explosive Leg Power and Aerobic Capacity in Male Varsity Hockey Players

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(No relevant relationships reported)

The Association Among Body Composition, Explosive Leg Power and Aerobic Capacity in Male Varsity Hockey Players.

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Abstract:

Fitness testing and body composition assessments in sports are ubiquitous and rapidly becoming an indispensible resource for strength and conditioning coaches. Previous research has shown that higher amounts of lean tissue mass have been associated with increased power outputs and lower levels of body fat percentage have been associated with improved aerobic fitness. **PURPOSE**: To examine the relationship between body composition and lower body power and aerobic fitness in elite collegiate hockey players. **METHODS:** Sixteen elite male Canadian university hockey players (age = 22.194 ± 0.99 years, weight = 85.74 ± 5.80 kg, height = 182.25 ± 6.67 cm), participated in the study at the beginning of their hockey season. All participants completed the long jump and the beep-test and a day after testing, one total body dual energy x-ray absorptiometry scan to measure body composition. Simple linear regression was used to explore the relationship between body fat percentage, visceral adipose tissue, and abdominal adipose tissue with aerobic fitness evaluations and leg lean with lower body power. **RESULTS:** On average body fat percentage was 16.6 ± 3.0%, fat mass 13.7 ± 2.8 kg, abdominal adipose tissue 0.9 ± 0.3 kg, leg lean mass 23.8 ± 1.97 kg, long jump 2.67 ± 0.16 m, beep test 12.8 ± 1.32 min. Visceral adipose tissue explained 24.5% of the variance in the test of aerobic fitness (p .05), while other adiposity measures were non-significant. Body fat percentage and lower lean mass did not significantly contribute to aerobic fitness and lower body power respectively (all p > .05). **CONCLUSIONS:** Despite a lack of inter-relationships among field tests and body composition, these variables should remain part a test battery to allow strength and conditioning coaches to better tailor training programs for elite hockey players.

Keywords: body composition, hockey, Fitness testing

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Comparison Of Direct And Indirect Vo_{2max} Test In Mexican College Football Players.

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(No relevant relationships reported)

Football is considered an anaerobic sport, therefore anaerobic evaluations are usually the main tests performed. Nonetheless, due to the number of plays and the duration of the game, the evaluation of the aerobic system through the measurement of the maximum oxygen consumption (VO_{2max}), becomes an important variable in the sport performance. The direct evaluation of the VO_{2max} can be expensive due to the equipment and special laboratory conditions needed to perform it.Normally, most Mexican coaches perform indirect estimation of the VO_{2max}, through field test. **PURPOSE**: To determine direct VO_{2max} of a sample of a Mexican College football team and compare the measurements with two different indirect methods. **METHODS**: Twenty voluntary Mexican College football players participated in the study. Informed consents were signed. Athletes were divided according to their play position into two groups: Lineman (LM) and No-Lineman (NL). Direct VO_{2max} was measured through open-circuit spirometry by indirect calorimetry during a maximal graduated exercise test, using the Bruce protocol. The first indirect measurement (FIM) was performed using the Bruce protocol equation [VO_{2max} (mL . kg^{-1} . min^{-1}) = 14.8 - 1.379 (time in min) + 0.451 (time^2) - 0.012 (time^3)] for a maximal graduated exercise test. The second indirect measurement (SIM) was taken using the ACSM´s running metabolic equation [VO_{2max} (mL . kg^{-1} . min^{-1}) = 0.2 (speed) + 0.9 (speed) (fractional grade) + 3.5)] in the 1.5-mile run test. VO_{2max} comparisons were made using Sperman´s correlation coefficient test. **RESULTS**: **:** LM´s direct VO_{2max} (34.77 ± 10.41 mL . kg^{-1} . min^{-1}) was lower than NL´s direct VO_{2max} (46.82 ± 4.41 mL . kg^{-1} . min^{-1}). Regarding, FIM of LM (32.56 ± 7.67 mL . kg^{-1} . min^{-1}) and SIM of LM (36.87 ± 5.18 mL . kg^{-1} . min^{-1}) both of them were lower than FIM of NL (42.56 ± 3.74 mL . kg^{-1} . min^{-1}) and SIM of NL (45.96 ± 4.84 mL . kg^{-1} . min^{-1}). Correlations between direct VO_{2max} and indirect VO_{2max} were as follows: LM´s FIM= 0.79 (p<0.05), LM´s SIM= 0.63 (p<0.05), NL´s FIM= 0.78 (p<0.05) and NL´s SIM 0.73 (p<0.05). **CONCLUSIONS**: Indirect measurements of VO_{2max} can be used reliably to determine Mexican College football player's aerobic capacity when it is not possible or feasible to measure VO_{2max} direct.

797 Board #58 May 30 2:00 PM - 3:30 PM

Relationship between Acceleration Profiles and Game Statistics among Members of a National U18 Ice-Hockey Team

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(No relevant relationships reported)

The use of player-worn sensors (PWS) has become increasingly common in team sports. We have previously shown a relationship between PWS metrics during on-ice sessions and laboratory measures in ice hockey. It is not clear, though, if metrics derived from PWS are indicative of player performance in terms of performance results based metrics (e.g. goals, assists, etc.). **PURPOSE**: **:** To determine if on-ice measures obtained from PWS relate to player in-game statistics: plus/minus, goals, assists, or shots on goal. **METHODS**: 19 members of the US National Team Development Program ice hockey team (17.5+.21 y, 1.82+0.8 m, 83.1+7.6 kg) consented to procedures approved by the EMU-HSRC. Zephyr Bioharness-3 (Zephyr, MD) PWS measured triaxial accelerations and heart rate for games. Data was downloaded to Omnisense (Zephyr, MD) and exported to database for mean maximal acceleration (MMA) determination. MMA from 10 - 90 sec at 10 sec intervals and from 2 - 60 min were calculated and used to determine relationships to game statistics. Game statistical data for each player for 10 games was obtained from USA Hockey, including plus/minus, goals, assists and shots on net. Pearson product correlations for game statistics and linear stepwise regressions were performed for game statistics vs. MMA using SPSS 22.0 (IBM, NY; α=.05). **RESULTS**: Goals were correlated with shots (r = .35; p<.01), while plus/minus was correlated to goals (r = .24; p<.01) and shots (.14; p<.05). Linear regressions showed that goals were significantly related to 3 min MMA (β= .139; p =.02). Assists were related to 2 min (β= .135), 30 min (β= -.37), and 60 min (β= .226) MMA (p<.05). Shots were related to 3 min MMA ((β= .135; p<.05). No variables were accepted into the regression for plus/minus vs MMA. **CONCLUSIONS**: Some metrics derived from PWS during on-ice sessions are related to game performance statistics. In particular, 2 and 3 min MMA would be indicative of a combination of anaerobic and aerobic energy system contributions and appear important for all scoring metrics.

B-60 Free Communication/Poster - **Perception**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

798 Board #59 May 30 2:00 PM - 3:30 PM

Lowest Perceived Exertion In The Late Morning Due To Effects Of The Endogenous Circadian System

Saurabh S. Thosar, Maya X. Herzig, Sally A. Roberts, Alec M. Berman, Noal A. Clemons, Andrew W. McHill, Nicole P. Bowles, Miki Morimoto, Matthew P. Butler, Jonathan S. Emens, Steven A. Shea. *Oregon Health & Science University, Portland, OR.*

Reported Relationships: S.S. Thosar: *Salary; NIH F32 award.*

INTRODUCTION

There are daily variations in the rate of perceived exertion (RPE) during exercise, with lower RPE in the beginning of the night as compared to the early morning. Whether these variations are caused by effects of the internal circadian system or daily variations in the environment or behavioral patterns is not known. It is important to determine whether the endogenous circadian system affects RPE as this could influence sports performance when athletes experience prior jetlag.

METHODS

10 healthy adults (6 females, aged 52±2years [mean ± SEM]) participated in a protocol in dim light where all behaviors, including exercise, meals and sleep periods were evenly spread across the circadian cycle. After a normal night of sleep and baseline testing, participants underwent ten recurring 'behavioral cycles' of 2-h 40-min sleep opportunities and 2-h 40-min of standardized waking episodes. Approximately one hour after each sleep episode, participants performed cycle-ergometer exercise for 15-min at 50% predicted maximal heart rate (Karvonen's formula). The speed and resistance were identical across each cycling bout. Participants rated their exertion

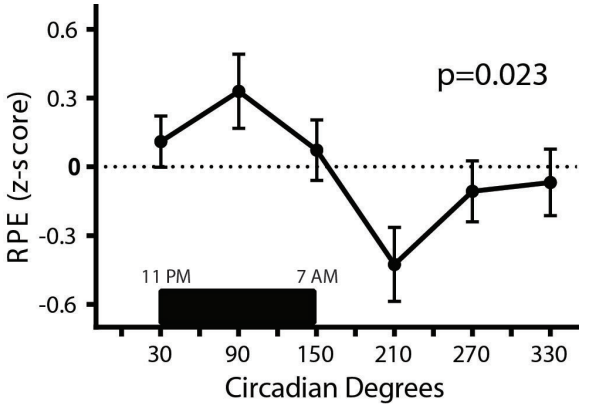
using Borg RPE scale after 3, 8 and 13 minutes of exercise. Salivary melatonin was used as the circadian phase marker (0º = the dim-light melatonin onset). RPE data were normalized within each participant (Z-scored), sorted into 60º (~4 h) circadian phase bins and compared across phases using repeated-measures ANOVA.

RESULTS

The circadian system significantly affected RPE, with lowest RPE in the late morning (circadian phase 210º, ≈10:45 AM) and highest RPE during the biological night (90º ≈3:45 AM).

CONCLUSION

We have uncovered an endogenous circadian effect on RPE with least perceived exertion in the late morning. This finding leads to the intriguing possibility of shifting the circadian phase of athletes (e.g. with bright light) to maximize performance, and has great relevance to athletes who experience jet lag.



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Time Perception, Pacing And Exercise: Intensity Distorts The Perception Of Time

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(No relevant relationships reported)

Currently there are no data examining the impact of exercise on the perception of time which is surprising as optimal competitive performance is dependent on accurate pacing using knowledge of time elapsed. **PURPOSE:** The purpose of this study was to examine whether or not differential, self-selected exercise intensities influenced the perception of time elapsed during both short duration and endurance exercise. Specifically, the experiment tested the hypothesis of whether maximal exercise distorts the perception of time. **METHODS:** With institutional ethics approval, 12 recreationally active adult participants (f=7, m=5) undertook both 30s Wingate cycles and 20min (1200s) rowing ergometer bouts as short and long duration self-paced exercise trials, in each of three conditions on separate occasions: 1) light exertion: RPE 11, 2)heavy exertion: RPE 15, 3) maximal exertion: RPE 20. Participants were unaware of exercise duration and were required to verbally indicate when they perceived (subjective time) 1) 25%, 2) 50%, 3) 75% and 4) 100% of each bout's measured (chronological) time had elapsed. **RESULTS:** In response to the Wingate task, there was no difference between durations of subjective time at the 25%, nor at the 50% interval. However, at the 75% and 100% intervals, the estimate for the RPE 20 condition was shortest (P<0.01). In response to rowing, there were no differences at the 25% interval, but there was some evidence that the RPE 20 condition was perceived shorter at 50%. At 75% and 100%, the RPE 20 condition was perceived to be shorter than both RPE 15 (P=0.04) and RPE 11 (P=0.008) conditions. **CONCLUSION:** This study is the first to empirically demonstrate that exercise intensity distorts time perception, particularly during maximal exercise. Consequently external feedback of chronological time may be an important factor for athletes undertaking maximal effort tasks or competitions.

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Establishment of a Non-Exercise Questionnaire Using Physical Activity Exertion Perception to Predict Maximal Oxygen Uptake in Adults

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(No relevant relationships reported)

Maximal oxygen uptake (VO_2max) is an important diagnostic variable for health and fitness status. ACSM has published several sub-maximal VO_2max prediction equations. Non-exercise VO_2max prediction equations currently exist, often requiring variables obtained by a fitness professional. The equation published by Uth *et. al* (USOP) is often used to predict VO_2max from age and RHR measures. No validated models incorporate perceived exertion of physical activities. Non-exercise predictions of VO_2max may provide a quick, valuable alternative to sub-maximal assessments for healthcare providers in order to stratify disease risk and prescribe aerobic exercise. **Purpose**: The purpose of the study was to explore the efficacy of a non-exercise VO_2max assessment using a combination of perception of activities, body mass index (BMI), gender, and age. **Methods**: Twenty-seven subjects (ages 19-49) performed a maximal graded exercise test (GXT) and the Forestry Step Test (FST). Subject anthropometrics were assessed and all subjects completed a questionnaire in which perceived exertion was estimated for 15 well known physical activities. VO_2max estimations were derived from each of the activity items by dividing the metabolic equivalent by the percentage of perceived exertion. The USOP prediction of VO_2max used both RHR and the Tanaka MHR equation. Data was entered into a statistical software package where five activity items with the highest correlation to GXT VO_2max were used in a linear regression model to create a prediction model (PEQ). This was then compared to both the FST and USOP prediction equations. **Results**: Mean GXT VO_2max were 48.50 ± 1.74 ml/kg/min^{-1}. PEQ correlated most strongly with GXT ($F_{(8,18)}$=6.159, r=0.856, p=.001), followed by FST ($F_{(1,25)}$=28.635, r=.0731, p<0.001) and USOP ($F_{(1,25)}$=8.575, r=0.505, p=0.007). A model using age, gender, and BMI alone yielded a Pearson correlation of 0.791. **Conclusion**: The inclusion of exertion perception in VO_2max prediction models may strengthen the validity of non-exercise estimations. Future research should elucidate the most predictive activity items across populations. Given their ability to be self-administered, VO_2max prediction surveys can provide valuable information to large populations where traditional evaluation methods are impractical to perform.

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Perceived Exertion As A Monitoring Strategy During Crossfit®: Useful Or Useless?

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(No relevant relationships reported)

Perceived Exertion as a Monitoring Strategy during CrossFit®: Useful or Useless?

Facing harsh criticism of potentially causing injury, CrossFit® (CF) may benefit from the inclusion of appropriate monitoring strategies. Rate of perceived exertion (RPE) is a monitoring strategy commonly used for both quantification and modulation of workloads during exercise and sports training. Despite its widespread use in CF investigations, the validity of RPE as a monitoring strategy in CF training remains untested. **PURPOSE:** To assess the utility of RPE as a monitoring strategy during CF training. **METHODS:** Six males (height, 182.8±8.6 cm; weight, 84.3±12.4 kg; and age, 25.0±5.4 years) participated in three weeks (5 days/week) of CF training. Following each training session, RPE, workout duration (Dura), and immediate post-exercise heart rate (THR) were recorded. Dura and THR were used to quantify the workload (WL) for each session. Means for RPE, Dura, THR, and WL were calculated for week 1 and week 3 of training. The Profile of Mood States (POMS) questionnaire was administered pre-week 1 and post-week 3. A repeated measures MANOVA with Tukey post-hoc adjustments was used to assess differences in training session variables between weeks 1 and 3. Linear regression of mean RPE and WL were compared between weeks 1 and 3. POMS outcomes were compared between weeks 1 and 3 using magnitude-based inferences of each subscales' minimum clinically important difference (MCID). **RESULTS:** There are increases in mean session THR (%Δ=+6.2%; F=1.19, p=0.324), Dura (%Δ=+17.3%; F=4.55, p=0.086), and WL (%Δ=+23.9%; F=8.14, p=0.036) from week 1 to 3. In contrast, mean session RPE decreased (%Δ=-4.9%; F=1.42, p=0.183) between these weeks. RPE was a better predictor of WL during week 3 compared to week 1 (week 1: r=0.364, R^2=13.5%, p=0.048; week 3: r=0.614, R^2=37.7%, p=0.001; ΔR^2=+24.2%). For POMS outcomes, total mood disturbance (2.69 foldΔ; 87.6% likelihood), tension-anxiety (3.13 foldΔ; 90.7% likelihood), and vigor-activity (3.25 foldΔ; 94.9% likelihood) subscales most likely highlight meaningful negative changes. **CONCLUSION:** RPE has the potential to be a useful monitoring strategy for incorporation into CF training. Questions still remain as to whether or not RPE is sensitive enough to detect early signs of overreaching during CF training.

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Effect Of Progressive Fatigue On Session Rpe

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(No relevant relationships reported)

Introduction: The Session Rating of Perceived Exertion (sRPE) is an accepted surrogate measure of exercise intensity. The purpose of this study was to examine the effect of progressive fatigue from heavier than normal training on sRPE. **Methods**: Twelve moderately fit college age students completed 30-min or 60-min interval

workouts on a cycle ergometer, with the sequence of sessions designed to test the hypothesis that sRPE for a given exercise bout would increase with progressive fatigue, whether from a longer bout, or from successive days of harder than usual bouts. The workouts were Monday through Thursday for two weeks. The first week was three 30-min sessions (e.g. normal training) followed by a 60-min session (30-min session repeated 2x) (e.g. heavier than usual training). The second week was three 60-min sessions followed by a 30-min session. sRPE was measured 30-min post exercise, and RPE and HLa were measured at 10 min intervals during exercise. **Results**: The 30-min sessions in week 1 had sRPE that was significantly less than the 60-min session (4.3±1.7, 4.3±1.4, 4.5±1.7 & 5.3±1.8). During week 2 the 60-min sessions became progressively harder, before the recovery 30-min session on day 4 (5.3±1.4, 5.9±1.6, 6.0±2.1 & 4.5±1.6). The mean RPE/HLa during the exercise bouts, a potential index of glycogen depletion mediated fatigue, followed a relatively constant course in week 1 (0.7±0.2, 0.9±0.4, 0.8±0.4 & 0.9±0.4) and an increasing course in week 2 (0.8±0.4, 0.9±0.4, 1.0±0.4 & 0.9±0.4). **Conclusion**: The results suggest that in addition to being a surrogate of exercise intensity, sRPE reflects accumulated fatigue during periods of increased training.

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Perceptions of Employers of Personal Trainers: A Pilot Survey

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(No relevant relationships reported)

The American College of Sports Medicine (ACSM) developed its certified personal trainer (CPT) exam based on a job task analysis (JTA) of a trainer's day-to-day job-related tasks. To competently perform the duties of a personal trainer, one should possess certain knowledge, skill, and abilities (KSAs) identified by the JTA. **PURPOSE**: The purpose of this study was to determine employer perceptions of the importance of various KSAs identified by ACSM's JTA. **METHODS**: A 42 item survey was developed based on ACSM's 153 KSAs and also included questions regarding demographics and hiring preferences. Selection of KSAs was based on their generalizability to personal trainers working in various settings. Employers were asked to use a 1-5 Likert scale (1= not important and 5 = very important) to rank their perception of how important it is for personal trainers to possess the KSAs. The survey was distributed online and in person to approximately 80 employers. A total of 20 surveys were completed and returned. The KSAs in the survey were divided into the eight ACSM categories. Qualtrics was used to determine mean responses to each of the survey items and provided frequency data for demographics and hiring preferences. **RESULTS**: Overall mean for each category and KSA was determined. The category with the highest overall mean (4.63) was Safety, Injury Prevention, and Emergency Procedures. The category with the lowest overall mean (4.24) was Human Behavior and Counseling. The KSA with the highest overall mean (4.76) was the ability to modify exercises based on age and physical condition (1.7.29). The KSA with the lowest overall mean (3.65) was the ability to determine training heart rate (1.7.25). Only 50% of respondents stated that personal trainers should possess a degree in Exercise Science or a related field. Sixty-five percent stated personal trainers should be certified through a nationally recognized certifying agency. The top two preferred certifying agencies were ACSM and NSCA. **CONCLUSIONS**: Employers are most concerned with knowledge and abilities related to safety, injury prevention, and emergency procedures and least concerned with knowledge and skills associated with behavior change and counseling. Respondents emphasized professional certification over a degree in Exercise Science or related field when hiring.

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Relationship between Self-Regulation of Perceive Exertion and Heart Rate using Games Concept Approach

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(No relevant relationships reported)

There is a lack of research on the use of OMNI Rate of Perceived Exertion (RPE) scale with Heart Rate (HR) during Physical Education (PE) lessons. **PURPOSE**:To examine the relationship between OMNI RPE scale and HR on primary school children in Singapore using the Games Concept Approach (GCA) of teaching during PE lessons. **METHOD**: A total of 18 healthy subjects, 9 boys (age: 10 ± 0.00 yrs, height: 138 ± 5.94cm, weight: 34.56 ± 7.30kg) and 9 girls (age: 10 ± 0.50 yrs, height: 135 ± 8.00cm, weight: 33 ± 10.45kg) were randomly separated into experimental (EG) and control group (CG) with 9 subjects each. The intervention was conducted over 6 weeks, each lasting 45 minutes. Every session comprised of a warm up, modified game (MG) and cool down. The MG was conducted using GCA for the EG and skills based approach (SA) for the CG. HR and RPE were recorded every 15 minutes of each session. Parental consent was obtained and orientation procedures on the use of OMNI RPE scale were administered prior to intervention. Self-regulation of RPE by subjects was at RPE 1-3 for both warm up and cool down, and RPE 4-6 for the MG. A 1.6km fitness run test was conducted pre- and post- intervention to assess their aerobic fitness. Physical activity was kept constant throughout the intervention by a physical activity questionnaire, verbal emphasis and monitoring.
RESULTS: HR values were significantly different during MG (EG: 159.03 ± 12.22beats.min^{-1} , CG: 129.99 ± 17.23beats.min^{-1}, p = 0.001). Percentage of HR_{max} was higher in EG (75.73%) than CG (61.9%). No significant difference was observed between the RPE values during the MG for both groups (EG: 4.30 ± 1.16, CG: 3.73 ± 1.72, p = 0.426). Significant difference was observed between EG and CG in the pre- (EG: 693.67 ± 98.03sec, CG: 817.11 ± 92.98sec, p = 0.015) and post- (EG: 614.89 ± 74.18sec, CG: 712.00 ± 68.51sec, p = 0.011) 1.6km run timings.
CONCLUSION: Improvement in aerobic fitness was reflected in the 1.6km post-test results for EG and CG. HR recorded from EG was slightly higher than 50-70% of HR_{max} but range of RPE during MG was kept consistent within the ventilatory breakpoint of RPE 4-6, which suggests their ability to self-regulate within the safe intensity. The GCA approach is recommended to PE teachers for students to work at a higher HR to achieve aerobic fitness while having fun utilizing motor skills.

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Comparison of Borg Rpe and CR-10 Scales in Incremental Exercise

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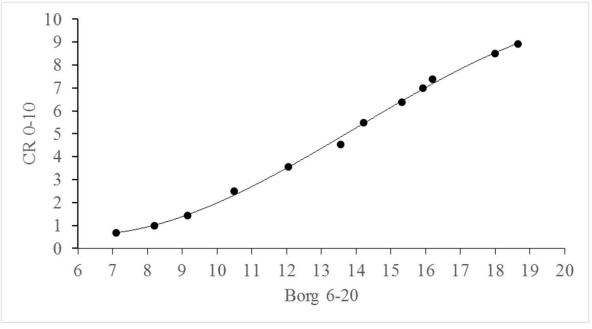
(No relevant relationships reported)

The Borg Rating of Perceived Exertion (RPE) and Category Ratio (CR-10) scales are the most well-known and frequently used scales for quantifying subjective intensity during exercise. However, limited data exists comparing the intra-individual correlations among the Borg RPE and CR-10 scales. **PURPOSE:** To evaluate the intra-individual variability between the Borg RPE and CR-10 scales during incremental exercise. **METHODS:** 5 males (20.4±1.14 years) and 5 females (22.0±0.71 years) completed two graded exercise tests (GXTs) on an electronically-braked cycle ergometer with a 48-hour interval in between. Each GXT included 2-minute stages with increments of 25 Watts/stage to volitional fatigue. Heart rate (HR), oxygen consumption (VO_2) and power output (PO) were measured. Subjective responses were recorded at the end of each stage using Borg RPE and CR-10 scales with a randomized order between the GXTs. Pearson's correlation with 95% Coefficient Intervals (95% CI) was used to examine the relationship between the Borg RPE and CR-10 scales. **RESULTS:** Maximal values during GXT were: VO_2max = 48.0±8.13 ml/kg/min, HRmax = 191.0±6.65 bpm; Peak PO = 238.1±56.83 Watts; RPEmax = 18.7±0.95; CR-10max = 9.1±1.28). There was a significant ($p<0.0001$) and very strong correlation coefficient (r=0.94, 95% CI: 0.91-0.96). **CONCLUSION:** Results from this study showed that the Borg RPE and CR-10 scales are related in a highly regular and predictable way.



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Self-Confidence is Positively Related to Rating of Perceived Exertion During a Maximal Squat Test

Colby A. Sousa[1], Michael H. Haischer[1], Daniel M. Cooke[1], Joseph P. Carzoli[1], Amber M. Shipherd[2], Trevor K. Johnson[1], Edward P. Davis[1], Dan J. Belcher[1], Robert F. Zoeller[1], Michael Whitehurst, FACSM[1], Michael C. Zourdos[1]. *[1]Florida Atlantic University, Boca Raton, FL. [2]Texas A&M University-Kingsville, Kingsville, TX.*

(No relevant relationships reported)

Often, rating of perceived exertion (RPE) is assessed during a one-repetition maximum (1RM) strength test to validate that a true 1RM has been reached. Recently, data have indicated variance in reported RPE at 1RM across individuals. However, it is not known what accounts for this variation. Two proposed traits which may affect an individual's RPEs are self-confidence and acute anxiety. **PURPOSE**: Therefore, the purpose of this investigation was to examine the relationship between self-confidence, somatic anxiety, and cognitive anxiety with RPE at a 1RM in the back squat. **METHODS**: Fifty-eight resistance-trained males (n=41) and females (n=17) (age: 23±3yrs; body mass: 80.64±16.49 kg) completed the Revised Competitive State Anxiety Inventory-2 (CSAI-2) questionnaire prior to performing a 1RM back squat. Additionally, participants completed a perceived self-efficacy (PSE) questionnaire in which participants stated what they believed they were 100%, 75%, and 50% confident they could squat for a 1RM. Next, following a 5-minute dynamic warm-up, subjects completed a validated 1RM back squat protocol. At all 1RM attempts subjects recorded an RPE value using the repetitions in reserve (RIR)-based RPE scale. Pearson's product moment correlations were then utilized to determine the relationship between the self-confidence, somatic, and cognitive anxiety subscales of the CSAI-2 with RPE at 1RM. **RESULTS**: Self-confidence was positively and significantly related to RPE at 1RM (r=0.26, p=0.05). However, neither somatic anxiety (r=0.01, p=0.97) nor cognitive anxiety (r=0.19, p=0.16) were significantly related to RPE at 1RM. **CONCLUSIONS**: These results indicate that increased self-confidence is associated with higher reported RPE during a 1RM squat test, while heightened anxiety does not alter the perceptual response during a maximal strength test. It is possible that those with high self-confidence chose higher loads and reached a true 1RM accounting for the high RPE.

807 Board #68 May 30 2:00 PM - 3:30 PM

Effects of Performance Foam on Perceived Exertion and Recovery in High-Intensity Functional Exercise

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Reported Relationships: J.M. Goins: *Contracted Research - Including Principle Investigator; Funded by Avadim Technology - C0-PI Toni M. Torres-McGehee.*

Performance foam, when used as an adjunct to training, may positively affect thresholds within the muscle allowing for more intense training, longer training sessions, possible muscle recovery, and a decrease in delayed onset muscle soreness symptoms. **PURPOSE:** To evaluate the effectiveness of a performance foam on perceived exertion and self-reported recovery on performance in adults participating in a high-intense functional exercise program. **METHODS:** Thirty adults (age: 31.2 ± 8.1; males: n = 12, 176.9 ± 6.2 cm, 89.5 ± 15.1 kg; females: 164.7 ± 7.1 cm, 69.9 ± 11.1 kg) participated in a randomized counter-balanced and double blind trial over a 2-week period. Randomized experimental conditions (ExCon) consisted of performance foam (PF) or placebo (P) foam. Participants completed 5 workouts each week and applied either PF or P to the primary muscles used before and after each daily workout and before going to bed. Rating of perceived exertion (RPE) was assessed after each workout, and self-reported recovery was assessed using the perceived recovery scale (PRS) the following day. Four repeated measure ANOVAs examined differences in PRS and RPE between experimental conditions (PF and P) for all participants and across gender. **RESULTS:** A main effect was revealed for **RPE** and ExCon (F_1=4615.2, $P < 0.01$, n^2=0.0.99) for all participants. Interactions existed between days ($P \leq 0.01$) with no interaction found between ExCon and days. A main effect was revealed for **PRS** and ExCon (F_1=1624.6, $P \leq 0.01$, n^2=0.98) for all participants with no interactions between days and ExCon and days. Across gender, a main effect was revealed for **RPE** and ExCon (F_1=4279.9.8, $P < 0.01$, n^2=0.0.99) with no interactions between days and ExCon and days. Similarly, a main effect was found for **PRS** and ExCon (F_1=1579.8, $P < 0.01$, n^2=0.0.98) with no interactions between days and ExCon and days. **CONCLUSIONS:** RPE declined at the end of 5-day regimen using PF compared to P and participants' average PRS was higher throughout the week using the PF compared to P. Participants felt more recovered from the previous workout when using PF and felt as if they were not exerting as much effort the following workout. The decrease in RPE allows for one to continue exercising longer at the same intensity or increase their intensity levels, leading to a greater improvement in training results.

808 Board #69 May 30 2:00 PM - 3:30 PM

Comparison Of HR And RPE During Self-selected And Prescribed Exercise Bouts In College Students

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine if there were differences in heart rate (HR) and ratings of perceived exertion (RPE) between self-selected and calculated exercise intensities. **METHODS:** Subjects (n=47) were instructed to complete moderate (M) and vigorous (V) intensity exercise bouts for 20 minutes each on a treadmill ergometer. Subjects selected M and V speed and grade, and kept intensity constant throughout each bout. Subjects next completed a graded maximal exercise test using one of five Boer treadmill protocols. Finally, subjects completed exercise bouts at 60% and 80% of their calculated VO_2 reserve for 20 minutes. HR (Polar FT1) and RPE (OMNI scale) were collected at minute 2 and 20 of each bout. A repeated measures ANOVA was completed with Bonferroni post hoc comparisons to evaluate differences between corresponding intensities (Mx60% and Vx80%) by time and between minute 2 and 20 for each bout. **RESULTS:** There were no statistically significant differences ($p>0.05$) for HR between M and 60% (2min: 126.3±25.8 and 134.2±27.8; 20min: 142.5±31.2 and 161.7±5.8, respectively) or between V and 80% (2min: 154.1±28.1 and 153.6±28.6; 20min: 179.8±26.9 and 184.7±24.6, respectively) There were no statistically significant differences ($p>0.05$) for RPE between M and 60% (2min: 2.9±2.7 and 1.9±1.1; 20min: 4.3±2.8 and 4.8±1.8, respectively) or between V and 80% (2min: 4.3±2.1 and 3.1±1.6; 20min: 7.2±1.8 and 7.8±1.5, respectively). HR and RPE increased significantly from minute 2 to 20 during each bout ($p<0.0001$). **CONCLUSION:** HR and RPE did not differ between self-selected and calculated exercise bouts, but drifted significantly within all sessions. While subjects showed aptitude at selecting proper intensities, caution must be used when prescribing exercise based on HR or RPE.

809 Board #70 May 30 2:00 PM - 3:30 PM

Effect of Spotters on State Anxiety and Self Confidence During Maximal Squatting Among Male High School Athletes

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(No relevant relationships reported)

The ideal performance state is manifested by optimal psychological and physiological efficiency. The effects of anxiety and self-confidence have been shown to alter psychological and physiological efficiency and hence performance. **PURPOSE:** This study attempted to identify the state anxiety and self-confidence of high school athletes just prior to a one repetition maximum (1-RM) back squat and determine if the number of spotters affects an athlete's level of state anxiety and/or self-confidence. **METHODS:** Male high school athletes (10^{th} and 11^{th} grades) were randomly separated into two experimental groups who performed the 1-RM back squat (BSQ) with either 1 spotter (1SG: n=52) or 3 spotters (3SG: n=54). Following a dynamic warm-up period and several progressive BSQ warm-up sets, and just prior to attempts at a 1-RM BSQ, the participants completed the revised Competitive State Anxiety Inventory-2 (CSAI-2R). The CSAI-2R included the number of spotters (1 or 3) that would be present during the subsequent 1-RM BSQ attempts. The CSAI-2R is a17-question instrument with three subscales (self-confidence, somatic anxiety, and cognitive anxiety). The subscale scores were compared between the 1SG and 3SG with an independent t-test (alpha≤0.05). **RESULTS:** Competitive State Anxiety Inventory-2 scores were 1SG (self-confidence=30.2±6.1, somatic anxiety=17.0±4.7, and cognitive anxiety=20.1±5.6) and 3SG (self-confidence=28.4±6.8, somatic anxiety=16.5±5.1, and cognitive anxiety=19.0±5.7). None of the subscales (self-confidence, somatic anxiety, and cognitive anxiety) were significantly different between the 1SG and 3SG experimental groups ($p>0.05$). **CONCLUSION:** Within the parameters of this study, the number of spotters present during the execution of the 1-RM BSQ had no practical or statistical impact on self-confidence, somatic anxiety, and cognitive anxiety. Coaches and athletes could use this information in the training environment in order to make best use of personnel (assigned to spotting tasks), physical resources (ex. squat racks), and time management.

810 Board #71 May 30 2:00 PM - 3:30 PM

Comparing Training Load and Intensity Perceptions Between Female Distance Runners and Their Coach

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(No relevant relationships reported)

The ability of athletes and coaches to adapt training in order to improve athletic performance and prevent injuries is the cornerstone of modern sports medicine. Overtraining syndrome occurs when training consistently occurs at or above lactate threshold without appropriate recovery. It is critical that the coach's perceptions of effort and intensity of training are similar to what the athlete experiences. **PURPOSE:** The purpose of this study was to evaluate the training regimen fidelity and quantify training load and intensity in female division I collegiate distance runners. **METHODS:** An observational descriptive longitudinal design was utilized. The duration of the data collection was 14 weeks. The subjects were six collegiate female track and field distance athletes (≥18yrs of age) who ran >800 meter events. Baseline pre-training heart rate and blood lactate levels were recorded during a custom six stage treadmill test. Blood lactate, duration, rate of perceived exertion (RPE), average heart rate for each training session and hours slept nightly were recorded. **RESULTS:** Average training intensity (duration x RPE) over the course of the competitive season as prescribed was 159.56. The mean value was 144.5 and results ranged from 126.21 to 156.62. Coach intended training load (duration x blood lactate average) was 170.75; athletes ranged 73.25 to 140.66; mean = 109.36. Hours of sleep averaged 7.8 the day before a meet and 7.3 the day after. Easy training days (intended RPE of 1.5 out of a possible 10) showed a discernible difference with actual RPE higher than the target value (mean 3.4 ±1.2, range 2.7- 4.26). Intermediate training days (intended RPE of 4.3) had a lower RPE than target with a mean of 3.9 ±1.6 (range 3.0 - 4.8). Hard training days (intended RPE of 8.16) showed the most marked difference from target with a mean of 6.24 ±1.4 (range 4.94 - 7.25). **CONCLUSIONS:** Similar to male athletes, female athletes perceived easier workouts as more difficult and harder workouts as easier than their coaches intended. Average training intensity and training load (duration x blood lactate average) were measurably less than their coach intended. The combination of poor adherence to their coach's training regimen and potentially inadequate recovery may be some of the etiologies for increased overuse injuries in female athletes.

811 Board #72 May 30 2:00 PM - 3:30 PM

Rating Of Perceived Exertion In The Squat Until Muscle Failure Versus Non-failure In Women.

Wanderson Divino Nilo dos Santos[1], Carlos Alexendre Vieira[1], Ronyson Camilo Soares[1], João Felipe Mota[1], Alcides Corrêa de Morais Junior[1], Martim Bottaro[2], Paulo Gentil[1]. *[1]Federal University of Goias, Goiânia, Brazil. [2]University of Brasília, Brasília, Brazil.*

(No relevant relationships reported)

PURPOSE: The objective of this study was to compare the rating of perceived exertion (RPE) and the volume of repetitions in women performing the parallel squat in the Smith machine in two different situations, repetitions until failure or non-failure. **METHODS**: A randomized, crossover trial was performed, involving twelve women (24.93 ± 5.04 years, 59.29 ± 11.28 kg) with previous experience in strength training (4.5 ± 4.23 years). Participants were randomized to either muscle failure (MF) or non-muscle failure (NF) groups. The RPE (OMNI-RES 0-10) and the total volume of session repetitions in the MF and NF situations in the parallel squat in the Smith Machine were evaluated. The protocol consisted of: 4 sets of 10 RM (determined by the 10 RM test), with 2 min rest interval between sets, at the highest intentional movement speed, until muscle failure or until loss of 20% of the median propulsive velocity (MPV). All participants performed the two methodologies with interval of two to three days of rest. Movement velocity control was provided by the linear transducer T-Force® System (Ergotech, Spain). Descriptive analyzes were given by mean and standard deviation, using repeated measures ANOVA (2:4) with Tukey post hoc and independent t test for the total volume of repetitions. **RESULTS**: A higher RPE was observed in the MF versus NF (1 set: 9.67 ± 0.78a vs 5.91 ± 1.68c; 2 set: 10a vs 6.75 ± 1.86bc; 3 set: 10a vs 7.33 ± 1.72bc, 4 set: 8.08 ± 1.16b, p <0.0001), respectively. No differences were observed between the total volume of repetitions (MF vs NF: 26.25 ± 3.47 vs 24.5 ± 3.65, respectively, p = 0.19). **CONCLUSIONS**: In women, performing the parallel squat on the Smith Machine, at the highest intentional speed, until 20% drop in MPV produced similar total volume of repetitions and lower RPE when compared to its execution until muscle failure.

B-61 Free Communication/Poster - **Blood Flow**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

812 Board #73 May 30 3:30 PM - 5:00 PM

Effects of High-Intensity Interval Training on Plasma Volume

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(No relevant relationships reported)

High-intensity interval training (HIIT) has been shown to be an effective form of training to improve aerobic fitness. Plasma volume shift has the potential to contribute to acute fatigue via temporary reduction of blood volume. There is a lack of data regarding the acute effects of HIIT on plasma volume shifts over the course of an HIIT protocol. **PURPOSE:** The purpose of the study was to determine the effects of a bout of HIIT on changes in plasma volume during and after the protocol. **METHODS:** Eight participants (1 female, 7 males) completed a preliminary session to collect anthropometric data and determine cardiorespiratory fitness, followed by an experimental session. During the experimental session, a modified Tabata HIIT protocol on a cycle ergometer was completed: six 15-second sprints at maximum effort against a resistance proportional to lean body mass with two minutes of active recovery between sprints. Hematocrit was determined using a microhematocrit method and hemoglobin was determined using a hemoglobin meter. Plasma volume shifts were determined using hematocrit and hemoglobin concentrations. **RESULTS:** A repeated measures ANOVA was used to determine changes in oxygen consumption (VO_2), mean arterial pressure (MAP), heart rate (HR), and minute ventilation (V_E); t-tests were used for post-hoc analysis. Additionally, shifts in plasma volume were compared using a paired T-test. A significant ($P < 0.05$) change from pre- to mid-HIIT occurred for HR (80.625±4.52 to 173.50±3.78 b/min), VE (26.75±2.87 to 69.85±6.95 L/min), VO2 (11.68±1.45 to 27.49±3.59 ml/kg/min), MAP (93.08±1.65 to 122.75±2.86 mmHg), and plasma volume shift (-12.28±2.14%) with significantly ($P < 0.05$) greater changes in HR from mid- to post-exercise (173.50±3.78 to 181.00±3.15 b/min) but not VE, VO2, MAP or plasma volume shift (-2.69±1.85%). **CONCLUSION:** Findings revealed that 13 min of HIIT increases cardiorespiratory stress and results in large plasma volume reductions from pre- to mid-exercise with smaller reductions from mid- to post-exercise. These acute reductions in plasma volume are similar to reductions that have been reported after running a marathon.

813 Board #74 May 30 3:30 PM - 5:00 PM

Cardiovascular Responses to Blood Flow Restriction and Very Low Load Resistance Exercise in the Upper Body

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(No relevant relationships reported)

Blood flow restriction (BFR) applied as a percentage of arterial occlusion pressure (AOP) combined with low load resistance exercise in the upper body elicits a cardiovascular response that, compared to high-load resistance exercise, appears dependent upon the load as well as the cuff pressure. The response to very low load resistance exercise (15% 1RM) combined with BFR is unknown. **PURPOSE**: To investigate the cardiovascular and hemodynamic responses to very low load resistance exercise combined with BFR, and compare these to high load resistance exercise in the upper body. **METHODS**: Sixty-six (50% men) participants (18-35 yrs) were recruited and, following 1RM testing, were randomly assigned to either high load (HL) at 70% 1RM or very low load at 15% 1RM. Very low-load conditions were no restriction (VLL0), 40% AOP (VLL40), or 80% AOP (VLL80) applied using a 5cm cuff. Four sets of unilateral biceps curls were performed to failure or 90 repetitions, whichever occurred first. Blood pressure (SBP/DBP) was taken before and after. Ultrasound measures of blood flow (BF) were taken at rest, following Set 2, and 1 minute after exercise. Repeated measures ANOVA tests were performed to determine whether differences occurred across time and condition. Results presented as mean (SD). **RESULTS**: Participants were 1.72 (0.1) m tall, weighed 72.0 (13.8) kg, with a 1RM of 15.9 (7.4) kg, and AOP of 103 (73) mmHg. There were no interactions for SBP ($p = 0.416$), DBP ($p = 0.414$), but an interaction existed for BF ($p < 0.0005$). Main effects of time found that SBP [change of 10 (10) mmHg] and DBP [change of 6 (13) mmHg] increased. BF increased following Set 2 in all conditions except for VLL80 (p=0.129), which remained similar to pre until 1 minute post deflation [change of 378 (256) ml·min^{-1}]. Following set 2, BF was similar between VLL0 [547 (244) ml·min^{-1}] and HL [465 (269) ml·min^{-1}]; both were greater than VLL40 [365 (189) ml·min^{-1}]

and VLL80 [128 (75) ml·min^{-1}]. At 1 minute post, there were no differences in BF between VLL0: 438 (227), VLL40: 470 (248), VLL80: 464 (290), and HL: 364 (239) ml·min^{-1}. **CONCLUSIONS**: The hemodynamic response to very low load resistance exercise combined with BFR at different pressures is similar to high load resistance exercise when performed in the upper body, although the BF response differs per the cuff pressure.

814 Board #75 May 30 3:30 PM - 5:00 PM

Novel Gene Variant Associated with Exercise Pressor Reflex Responsiveness

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(No relevant relationships reported)

PURPOSE: Activation of thinly myelinated and unmyelinated afferents innervating contracting skeletal muscle elicits the exercise pressor reflex. We hypothesized that single nucleotide polymorphisms (SNPs) of genes encoding ionotropic and metabotropic receptors commonly found on skeletal muscle afferents might account for part of the typical variation in blood pressure responses to exercise. **METHODS**: 101 healthy, college age, men and women of European ancestry participated. Multivariate modeling of the mean arterial pressure response to post-exercise circulatory arrest following 3-min of static handgrip exercise (30% of maximum) was used to stratify subjects into quartiles. Subjects from the highest (N=33) and lowest (N=25) quartiles provided buccal mucosa cells. DNA was extracted, amplified, and analyzed for common (minor allele frequency >20%), non-synonymous SNPs of genes with functional associations to autonomic disorders. We evaluated selected variants of the TRP (N=18), ASIC (N=3) and P2X (N=4) receptor families (real-time PCR, custom OpenArray™) and used contingency table analysis to compare the frequency of homozygotes and trait allele carriers between the two groups. **RESULTS**: Trait allele carriers of rs8065080, a T-to-C missense mutation of TRPV1, were more frequent in the high response group (73% vs 48%, P<0.1). Frequencies of all other SNPs did not differ between groups. **CONCLUSIONS**: Data from this pilot investigation suggest that intra-subject variation in mean arterial pressure during post-exercise circulatory arrest may associate with SNPs of genes putatively linked to the metabolic component of the exercise pressor reflex. Additional work is warranted to confirm these observations and explore the mechanistic role of TRP channels in exercise pressor reflex responsiveness.

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815 Board #76 May 30 3:30 PM - 5:00 PM

Acute Hemodynamic Response to Very Low Load Resistance Exercise With or Without Blood Flow Restriction

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(No relevant relationships reported)

Although lifting a load at 30% one-repetition maximum (1RM) to failure elicits an increase in muscle size similar to high load resistance exercise, it is unknown if an individual can reach failure when lifting loads <20% 1RM. Applying blood flow restriction (BFR) can cause blood flow to be artificially reduced which may help create an environment necessary to induce fatigue when exercising with a load <20% 1RM. **PURPOSE**: To determine changes in blood pressure and blood flow following exercise with and without different levels of BFR (based on arterial occlusion pressure (AOP)) while using a very low load (15% 1RM) and compare those changes with high load (70% 1RM) exercise. **METHODS**: Sixty-nine participants were randomized into one of four conditions: 1) 15% 1RM, no BFR (15/0), 2) 15% 1RM, 40% AOP (15/40), 3) 15% 1RM, 80% AOP (15/80), and 4) 70% 1RM, no BFR (70/0). Following 1RM testing in one leg (randomized) and 10 min of seated rest, resting blood flow of the exercising limb was measured at the posterior tibial artery followed by blood pressure. AOP was determined using a 10cm wide cuff in the BFR conditions. Participants then exercised for 4 sets to failure (up to 90 repetitions) with 30 (15% 1RM) or 90 (70% 1RM) seconds of rest. Blood flow and blood pressure [Systolic (SBP), Diastolic (DBP)] were measured immediately after exercise. A repeated measures ANOVA with a between subject factor of group was used to determine differences between groups. Significance was set at $p \leq 0.05$ and data presented as mean (SD). **RESULTS**: There was an interaction for SBP. There were no differences between groups at pre (p=0.874) or post (p=0.064) and all conditions increased from Pre-Post [overall average change of 15 (10) mmHg]. However, the 15/80 condition [125 (14) mmHg] tended to have lower SBP values than the 15/0 [138 (14) mmHg] and 70/0 [136 (14) mmHg] conditions. There was no interaction for DBP (p=0.485) or blood flow (p=0.088) but there were main effects of time with an increase from Pre to Post [DBP: 3 (5) mmHg; blood flow: 3 (13) ml·min^{-1}]. **CONCLUSIONS**: Very low load exercise to failure with or without BFR induces a similar hemodynamic response (i.e. blood flow and blood pressure) compared to high load resistance exercise. This suggests that applying BFR does not augment the cardiovascular response over that observed with traditional resistance exercise.

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Comparison of Exercise-induce Endothelial Shear Stress Between Poiseuille'S Law and Womersley'S Approximation

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(No relevant relationships reported)

Purpose

Endothelial dysfunction is the first step for the development of atherosclerosis, and one protective regulatory mechanism is exercise-induced endothelial shear stress (ESS). To quantify ESS, most clinical studies employ Poiseuille's law rather than Womersley's approximation, although Poiseuille's law underestimate the dynamic properties of blood flow. The aim of this study is to compare ESS calculated by Poiseuille's law to EES estimated by Womersley's approximation during exercise.

Methodology

Twelve young healthy subjects (age 13-31, 10 males and 2 females) were recruited to perform two exercise tests on a cycle ergometer. The first test was a maximal incremental test to establish the workloads for the next test, according to lactate levels. The second one, performed at least 48 hours after the first exercise test, was a three 5-minute workload steady-state test at lactate levels of 0-2, 2-4, and >4 mmol/L. Blood flow patterns of the brachial artery were recorded via Doppler ultrasound. For Poiseuille's law ESS was determined during anterograde and retrograde blood flows using ESS=μ*SR and SR=2*V/D, where μ is blood viscosity, SR is shear rate, V is peak systolic or diastolic blood flow velocities, and D is artery diameter. For Womersley's approximation ESS=μ*SR and SR=2K*V/D were used, where K is a complex factor dependent on Womersley parameter (α), and $\alpha=(D/2)*(\omega/(\mu/\rho))^{1/2}$, where ω is the angular frequency of the flow pulsation (ω=freq*2π), and ρ is blood density. Statistical analysis included paired t test to compare ESS from both estimations.

Results

EES was significantly higher for Womersley's approximation in comparison to Poisueille's law at rest and during all exercise intensities for anterograde flow (basal: 34.7±5.8 vs. 13.1±2.6 dynes/cm^2; 0-2 mmol/L: 41.1±13.7 vs. 15.3±4.8 dynes/cm^2; 2-4 mmol/L: 44.1±17.2 vs. 16.5±7.2 dynes/cm^2; >4 mmol/L: 57.0±21.6 vs. 21.0±8.0 dynes/cm^2; all p<0.05) and retrograde flow (basal: 6.9±3.9 vs. 3.1±1.5 dynes/cm^2; 0-2 mmol/L: 11.5±5.6 dynes/cm^2 vs. 4.3±2.0 dynes/cm^2; 2-4 mmol/L: 17.4±9.2 vs. 6.4±.5 dynes/cm^2; >4 mmol/L: 19.6±8.4 vs. 7.2±3.0 dynes/cm^2, all p<0.05).

Conclusion

Exercise-induced ESS is underestimated by Poiseuille's law. Womersley's approximation might be a better approach to estimate ESS in resting conditions and during exercise.

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Influence of High-Intensity Exercise on Aortic Stiffness and Femoral Artery Shear Patterns

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(No relevant relationships reported)

Influence of High-Intensity Exercise on Aortic Stiffness and Femoral Artery Shear Patterns

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Aortic stiffness is linked to atherogenic retrograde and oscillatory shear patterns in peripheral arteries. High-intensity exercise may increase aortic stiffness. Whether such acute changes in aortic stiffness detrimentally affect peripheral shear patterns remains unknown. **PURPOSE:** Determine if acute changes in aortic stiffness negatively influences superficial femoral artery (SFA) shear rates (SR) and stiffness following high-intensity cycling. **METHODS:** 20 adults (27±5 yrs; 10 women) underwent arterial assessment at baseline (BL), after a 5-min time control period (TC), and following a 30-sec bike sprint against 7% body mass (POST). Aortic stiffness was measured using carotid-femoral pulse wave velocity (cfPWV). SFA diameter, blood velocity, and stiffness (β stiffness and Young's elastic modulus, ε) were measured via Doppler ultrasound. Diameters and blood velocities were used to determine SFA antegrade and retrograde SR as well as the oscillatory shear index (OSI). **RESULTS:**

BL and TC were not different for any measures ($p>0.05$). cfPWV increased POST compared with BL and TC ($p\leq0.01$). SFA retrograde SR and OSI were reduced POST compared with BL and TC ($p\leq0.001$). SFA stiffness was unchanged by exercise ($p\geq0.06$). The change in cfPWV from pre-exercise to POST was not associated with changes in retrograde SR (r = 0.03, p=0.90), OSI (r = 0.13, p=0.58), β (r = 0.07, p=0.78), or ε (r = 0.08, p=0.73). **CONCLUSION:** Acute high-intensity exercise increases aortic stiffness while concomitantly reducing oscillatory shear in the SFA. High-intensity exercise-mediated increases in aortic stiffness appear independent from downstream atherogenic shear patterns in the exercised vasculature.

Table 1. Arterial stiffness and shear patterns before and after high-intensity cycling exercise.

	Baseline	Time Control	Post
Stiffness Measures			
Aortic cfPWV ($m \cdot s^{-1}$)	5.8 ± 0.6	5.7 ± 0.6	6.8 ± 1.3†
SFA β Stiffness (aU)	11.2 ± 2.8	13.6 ± 6.0	13.8 ± 4.6
SFA ε (kPa)	135.1 ± 7.8	157.0 ± 19.9	168.5 ± 12.7
Shear Patterns			
Primary Antegrade Shear Rate (s^{-1})	216.1 ± 68.7	200 ± 58.7	255.4 ± 55.5†
Retrograde Shear Rate (s^{-1})	88.4 ± 30.4	89.9 ± 25.5	41.2 ± 25.9*
Secondary Antegrade Shear Rate (s^{-1})	43.9 ± 8.8	42.1 ± 7.8	47.4 ± 36.1
Oscillatory Shear Index	0.25 ± 0.05	0.27 ± 0.04	0.11 ± 0.08*
cfPWV, carotid-femoral pulse wave velocity; SFA, superficial femoral artery; †Significantly different from pre-exercise ($p<0.05$); *Significantly different from pre-exercise ($p\leq0.001$).			

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Acute Resistance Exercise Effects on Blood Flow in Resistance-Trained Versus Untrained Individuals

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(No relevant relationships reported)

Data suggests that an acute bout of resistance exercise (ARE) increases forearm blood flow (FBF) and vasodilatory capacity compared to rest. However, the effects of training status on FBF and vasodilatory capacity at rest and during recovery from ARE are uncertain. PURPOSE: To compare the effects of resistance exercise training status on measures of vascular function at rest and recovery from ARE. METHODS: Fifteen resistance-trained (RT) individuals, and seven untrained (UT) individuals volunteered to participate. Measurements were taken after a 10min supine rest and 20min after ARE, or a control. Venous occlusion plethysmography was used to measure FBF and vasodilatory capacity, with 5min of occlusion (220mmHg) to induce reactive hyperemia. Area under the curve (AUC) was utilized to determine differences in blood flow. The ARE consisted of 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) on the leg press, leg curl, leg extension, lat pulldown, and chest press, with 2min of rest between sets and exercises. A 2x2x2 repeated measures ANOVA was used to evaluate group (RT, UT) across condition (ARE, control) and time (rest, recovery). If the ANOVA was significant, t-tests were used for post-hoc comparisons. RESULTS: Groups were similar ($p>0.05$) for age, height, and BMI, but not for weight (RT: 74.5±13.0kg; UT: 61.9±10.8kg, p=0.04). The 1RMs for chest press, leg curl, leg press, and lat pulldown were significantly different between groups ($p<0.05$), but not for leg extension (p=0.26). The total volume of exercise for the ARE was similar between groups (p=0.10). There were no significant ($p>0.05$) group differences at rest for FBF or vasodilatory capacity. There were no significant ($p>0.05$) 3-way interactions for FBF or vasodilatory capacity. There was a significant condition by time interaction for FBF (RT: rest: 2.9±1.1ml/100ml of tissue/min, recovery: 8.9±4.0ml/100ml of tissue/min; UT: rest: 3.1±1.1ml/100ml of tissue/min, recovery: 8.9±2.9ml/100ml of tissue/min; $p<0.001$) and AUC (RT: rest: 56.8±20.2units, recovery: 139.0±66.5units; UT: rest: 53.8±20.2units, recovery: 116.6±25.1units; $p<0.001$). CONCLUSION: These data demonstrate that acute resistance exercise significantly increases forearm blood flow and vasodilatory capacity regardless of training status. <!--EndFragment-->

819 Board #80 May 30 3:30 PM - 5:00 PM

Chronic Effects Of Replacing Workplace Sitting With Upright Activities On Human Popliteal Artery Shear Rate

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(No relevant relationships reported)

Previous work has shown that a single bout (i.e, 10 min- 3hrs.) of static upright posture decreases lower-limb arterial peak shear rate (PSR). **Purpose**: To examine if long-term replacement of workplace sitting with short (10-30 min) intermittent standing and/or stepping bouts results in PSR adaptations in the popliteal artery. **Methods**: Sixty-six sedentary (SED) overweight office workers (mean ± SD: age= 45.3 ± 12.3 years, BMI= 32.4 ± 5.8 kg/m^2) were cluster randomized to a sitting control (C), a sit-to-stand desk (D), or a treadmill desk (T) group. Popliteal artery PSR was calculated from Poiseuille's Law as 4 x (mean blood velocity/internal diameter) using Doppler ultrasonography at baseline (B), and after 3 (M3), 6 (M6) and 12 months (M12). Daily SED, stand, and step time was measured over 7 days at each time-point with an ActivPal. Change (Δ) in PSR and physical behavior (PB) within groups across measurement time points were evaluated using mixed linear models ($p<0.05$). The PSR model was adjusted for demographics (age, gender, race, ethnicity) and systolic blood pressure, and PB models were adjusted for demographics, avg. daily monitor wear-time and total wear-days. **Results**: Between B and M3, both the D and T groups significantly reduced SED time [T: mean ± SD of Δ for daily proportion=-17.0% ± 3.2%; D: mean ± SD of Δ for daily proportion= -8.5% ± 3.0], and increased stand time [T: mean ± SD for Δ for daily proportion= 14.9% ± 3.3%; D: mean ± SD for Δ for daily proportion= 6.7% ± 3.1%]. Neither D nor T groups significantly increased step time. Changes in PB (B to M3) for D and T returned to baseline levels by M6. In conjunction with the PB change (B to M3), popliteal PSR decreased significantly between B and M6 in group D (mean Δ (95% CI)= -307.1 s^{-1} (-478.4 to -135.7) and T [mean Δ (95% CI), p: -210.0 s^{-1} (-378.3 to -41.7)]. These changes were sustained to M12. **Conclusions**: A few months of increasing workplace standing using workstation-based strategies may yield chronic reductions in PSR that extend beyond the duration of the PB change. Given the greater likelihood of atherosclerotic lesions developing in vasculature with low shear stress, increasing workplace standing may have a negative atherogenic effect. Further studies are needed to see if replacing sitting with stepping, rather than standing, increases shear rate.

820 Board #81 May 30 3:30 PM - 5:00 PM

Inferior Vena Cava Diameter Reductions Precede Changes in Traditional Vital Signs during Simulated Blood Loss

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(No relevant relationships reported)

Hemorrhage is a leading cause of trauma deaths. Many of these deaths could be prevented with early detection and appropriate treatment. Traditional vital signs such as heart rate (HR) and mean arterial pressure (MAP) can remain relatively normal despite the central hypovolemia that occurs during blood loss. Ultrasound measurements of the inferior vena cava diameter (IVCD) have been used clinically as gross indicators of central hypovolemia. However, it is not known if reductions in IVCD occur prior to changes in traditional vital signs during blood loss in humans. **PURPOSE**: To test the hypothesis that reductions in IVCD occur prior to changes in traditional vital signs during central hypovolemia.
METHODS: Blood loss was stimulated using lower body negative pressure (LBNP) in fourteen healthy men (22±2 years). Pressure within the LBNP chamber was reduced by 10 mmHg every four minutes until the pressure reached -80 mmHg or subjects experienced pre-syncopal signs. Sagittal view images of maximum and minimum IVCD were obtained using B-mode ultrasonography between minutes two and four of each stage. The mean HR (ECG), MAP, pulse pressure (PP) and stroke volume (SV) (photoplethysmography) were obtained during the last minute of each stage.
RESULTS: Maximum IVCD was lower than baseline (1.5±0.4 cm) at -20 mmHg (1.0±0.3 cm, $P<0.01$) and throughout LBNP ($P<0.01$). Minimum IVCD was lower than baseline (0.9±0.3 cm) at -20 mmHg (0.5±0.3 cm, $P<0.01$) and throughout LBNP ($P<0.01$). HR was only higher than baseline (70±16 bpm) at the final stage of LBNP (94±19 bpm, $p<0.01$). MAP was only lower than baseline (91±7 mmHg) at the final stage of LBNP (78±17 mmHg, $p<0.0001$). PP was lower than baseline (62±5 mmHg) starting at -40 mmHg (53±9 mmHg, P=0.03) and throughout LBNP ($P<0.03$). SV was lower than baseline (93±28 ml) starting at -50 mmHg (65±14 ml, P=0.01) and throughout LBNP ($P<0.01$). **CONCLUSIONS**: Reductions in maximum and minimum IVCD preceded changes in tradition vital signs during graded simulated blood loss. IVCD may be a useful tool to identify blood loss and guide treatment in patients prior to the development of vital sign abnormalities.

821 Board #82 May 30 3:30 PM - 5:00 PM

Calf Venous Compliance in College Age Male Smokers and Non-smokers

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(No relevant relationships reported)

Smoking causes endothelial damage and autonomic dysfunction which leads to decreases in arterial compliance. Similar to changes in arterial compliance with fitness and aging, calf venous compliance improves with higher fitness and declines with increasing age. While previous studies have compared smokers and non-smokers for changes in arterial wall properties, no research to date has investigated the impact of smoking on limb venous compliance. **PURPOSE**: To determine the calf venous compliance differences in college age smokers (S) versus non-smokers (NS). **METHODS**: 7 S's (2-12 years of smoking; mean of 4 pack years; age = 22 ± 4 yrs; mass = 83.7 ± 18.4 kg; ht = 181.1 ± 9.5 cm; BMI = 25.4 ± 4.4 kg/m^2; calf volume = 2485.4 ± 482.1 ml; VO_2 max = 34.3 ± 7.8 ml/kg/min) and 7 NS's (age = 23 ± 2 yrs; mass = 76.6 ± 5.8 kg; ht = 176.2 ±4.7 cm; BMI = 24.7 ± 2.0 kg/m2; calf volume = 2242.1 ± 450.8 ml; VO_2 max = 38.0 ± 4.1 ml/kg/min) volunteered for this project. Participants underwent anthropometric assessment, a graded exercise test, and assessment of calf venous compliance. Utilizing venous occlusion plethysmography, calf pressure-volume relations was determined using the quadratic regression equation [Δ limb volume) = $\beta_0 + \beta_1$*(cuff pressure) + β_2*(cuff pressure)^2]. Calf venous compliance was calculated as the first derivative of the pressure-volume relation during cuff pressure reduction [Compliance = $\beta_1 + (2 * \beta_2 *$ cuff pressure)]. Differences in anthropometric, fitness, and compliance variables between S & NS were analyzed with a simple ANOVA. **RESULTS**: There were no significant differences between S & NS in anthropometric variables or fitness except the smokers were significantly higher in body fat % (19.2 ± 6.5% vs. nonsmokers at 12.3 ± 2.7%). There were no significant differences between S & NS in calf volume or compliance [S; Δ volume = 0.8093 ± 1.401 + 0.1084 ±0.06123 * (cuff pressure) - 0.0010 ± 0.00082* (cuff pressure)^2 vs. NS; Δ volume = .0874 ± 1.39718 + 0.1211 ± 0.06413 - 0.0011 ± 0.00069 (cuff pressure)^2]. **CONCLUSIONS**: College age male smokers have similar calf venous compliance to non-smokers. It is likely that the chronic effects of smoking that would alter the vessel wall and subsequently decrease venous compliance have not had enough time to influence venous wall structure in men in their early 20's.

822 Board #83 May 30 3:30 PM - 5:00 PM

Combined Effects Of Heat And Altitude Exposure On Cutaneous Microvasculature Responses During Submaximal Exercise

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(No relevant relationships reported)

Exposure to hot environments augments cutaneous vasodilation during exercise, whereas exposure to hypoxia can have both direct vasodilator and indirect (reflex) vasoconstrictor influences in the skin. PURPOSE: To test the hypothesis that hypobaric hypoxia will have a modulating effect on forearm cutaneous circulation during steady state (SS) exercise in the heat. METHODS: Seven participants (2 F, 5 M) completed 30 min of SS exercise on a cycle ergometer at 50% of respective VO_{2peak} during four separate environmental conditions, 1) Sea Level Thermoneutral (SLTN; 250 meters (m), 20°C, 30-50% RH), 2) Sea Level Hot (SLH; 250 m, 35°C, 30% RH), 3) Altitude thermoneutral (ATN; 3,000 m, 20°C, 30-50% RH), and 4) Altitude Hot (AH; 3,000 m, 35°C, 30% RH). Skin blood flow was recorded using laser-Doppler flowmetry on the ventral forearm. SS cutaneous vascular conductance (CVC = laser-Doppler flow/mean arterial pressure; %max) was calculated as the average of min 20-25 during exercise. After exercise, participants completed 30 min of local warming (42°C) of the skin for calculation of maximal CVC. A one-way repeated measures ANOVA was performed comparing %max CVC during SS exercise across the four conditions. RESULTS: AH CVC (63±31%) and SLH CVC (52±19%) were significantly higher than both SLTN CVC (20±9%, $P < 0.001$) and ATN CVC (25±12%, $P < 0.05$), but were not different from each other ($P > 0.05$). CONCLUSION: As expected, ambient heat increased CVC during exercise; counter to our hypothesis, hypoxia appeared to have no net effect on CVC. Any potential local effects of hypoxia to cause additional cutaneous vasodilation during SS exercise may have been offset by simultaneous hypoxia-mediated activation of sympathetic vasoconstrictor nerves. Disclaimer: Authors views are not official U.S. Army or DoD Policy.

823 Board #84 May 30 3:30 PM - 5:00 PM

The Effects Of Cuff Width On Hemodynamics In The Legs During Blood Flow Restriction

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(No relevant relationships reported)

Blood flow restriction allows individuals to exercise with low loads while producing similar increases in muscle size as high load resistance training. It has been suggested that the pressure should be made relative to the individual (as a percentage of their arterial occlusion pressure), but it remains unknown if a given pressure results in a similar reduction in blood flow, and further, whether this differs based on the width of the cuff being applied. **PURPOSE**: To examine hemodynamic responses to various relative pressures in the supine position using two commonly used cuffs (10 cm and 12 cm). **METHODS**: Participants (men=17, women=14) came to the laboratory for two visits. One cuff (10 cm or 12 cm) was randomly applied to the right proximal thigh for each visit and arterial occlusion pressure was measured. Ultrasound measures of blood flow, mean blood velocity, peak blood velocity, and artery diameter were taken from the posterior tibial artery at rest and during the application of 10% increments of the arterial occlusion pressure. A repeated measures ANOVA was used to examine differences across conditions. **RESULTS**: There was no significant interaction or overall difference between the 10 cm and 12 cm cuff relating to blood flow [-0.501 (7.9) ml•min^{-1}, $p = 0.728$], mean blood velocity [-0.168 (1.7) cm•sec^{-1}, $p = 0.590$], peak blood velocity [0.586 (11.7) cm•sec^{-1}, $p = 0.783$], or artery diameter [0.003 (0.02) cm, $p = 0.476$]. There was a main effect of pressure for blood flow ($p < 0.05$), mean blood velocity ($p < 0.05$), peak blood velocity ($p < 0.05$), and artery diameter ($p < 0.05$), with each decreasing with increasing pressures. Peak blood velocity increased until 60% of arterial occlusion pressure before decreasing with increased pressure. The 80% and 90% arterial occlusion pressures reduced blood flow by 69.4% and 79.3% respectively when collapsed across the 10 cm and 12 cm cuffs. No other pressures differed significantly between the relative applied pressure and amount of blood flow restricted. **CONCLUSIONS**: Provided relative pressures are applied, cuff width appears to have little to no effect on the blood flow response at rest. Importantly, relative pressures may not indicate the magnitude of blood flow being reduced (e.g. 80% arterial occlusion may not reduce 80% of blood flow), particularly at higher arterial occlusion pressures.

824 Board #85 May 30 3:30 PM - 5:00 PM

Manipulation of Retrograde Shear in the Superficial Femoral Artery in Recreationally Active & Exercise-Trained Men

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(No relevant relationships reported)

Retrograde shear stress increases with age and contributes to atherosclerosis. Habitual exercise has been shown to ameliorate the effects of age on cardiovascular disease possibly due to favorable vascular remodeling and reductions in retrograde shear. **PURPOSE:** Examine whether the vascular remodelling from habitual exercise training affects retrograde shear at rest and during a manipulation designed to alter shear (lower limb compression) in young adults. **METHODS:** Doppler ultrasound was used to measure superficial femoral artery (SFA) diameter and retrograde shear rate in 11 exercise-trained men (Division I track athletes; 20 ± 3 years of age, body mass index 21 ± 2 kg·m^{-2}) and 18 recreationally active controls (23 ± 5 years of age, body mass index 23 ± 2 kg·m^{-2}). Measures were made at rest and during a shear manipulation: inflation of a pneumatic cuff applied to the calf to 5 mmHg (sham) and 60 mmHg (experimental) in a randomized order. **RESULTS:** All results are displayed in Table 1. SFA diameter was larger in exercise-trained men versus controls ($P < 0.05$). Retrograde shear was similar between the exercise-trained men and controls at baseline and during the sham condition ($P > 0.05$). Exercise-trained men had lower retrograde shear during the experimental condition ($P < 0.05$). Group differences during the experimental condition remained after co-varying for resting retrograde shear and body mass index ($P < 0.05$). **CONCLUSION:** Manipulation of retrograde shear using lower limb compression reveals differences in shear patterns not detected at rest. Exercise-trained men have a more optimal, anti-atherosclerotic shear pattern (i.e. less retrograde shear) in comparison to recreationally active men.

Table 1. SFA diameter and shear at rest and during lower limb compression.

	Exercise-Trained	*Control*
Rest Diastolic diameter (cm) Antegrade shear rate (s^{-1}) Retrograde shear rate (s^{-1})	0.64 ± 0.06 170.8 ± 41.2 75.6 ± 26.6	0.57 ± 0.06# 181.8 ± 41.7 84.4 ± 23.3
5 mmHg Condition (Sham) Diastolic diameter (cm) Antegrade shear rate (s^{-1}) Retrograde shear rate (s^{-1})	0.64 ± 0.04 172.1 ± 41.5 81.8 ± 14.6	0.58 ± 0.06# 174.8 ± 44.7 89.7 ± 18.2
60 mmHg Condition (Experimental) Diastolic diameter (cm) Antegrade shear rate (s^{-1}) Retrograde shear rate (s^{-1})	0.64 ± 0.06 208.1 ± 36.9 88.6 ± 17.1*	0.58 ± 0.06# 227.1 ± 46.9 106.4 ± 19.6#*

 # different from exercise-trained (p<0.05)
** different from rest (p<0.05)*

825 Board #86 May 30 3:30 PM - 5:00 PM

Various Cuff Pressures During Blood Flow Restriction Exercise on Blood Flow During and After Exercise

Tyler J. Singer. *Kent State University, Kent, OH.*

(No relevant relationships reported)

Title: Various Cuff Pressures During Blood Flow Restriction Exercise on Blood Flow During and After Exercise
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Blood flow restricted (BFR) exercise has emerged as an intervention that increases muscle size and strength during low intensity resistance training. Although the cuff pressures prescribed for this intervention are typically based on pressures required to occlude blood flow at rest, the impact on blood flow during and after exercise is unclear. **PURPOSE:** To determine how various cuff pressures impact blood flow and tissue perfusion during and post exercise. **METHODS:** Seven healthy male participants completed four sets of a knee extension exercise (30 reps per set at 30% of max torque, 15 minutes recovery between sets). Four different cuff pressures were used during each set (0%, 60%, 80%, and 100% of arterial occlusion pressure). Doppler ultrasound was used to measure superficial femoral blood flow and NIRS was used to measure tissue saturation index, oxygenated and deoxygenated hemoglobin at rest, during and post exercise. EMG was also recorded for the vastus lateralis during exercise. **RESULTS:** Blood flow during exercise decreased as cuff pressure increased however there was still blood flow during exercise at 100% AOP. Tissue saturation showed greatest decrease during the100% occlusion trial (62± 5, 39± 5; p=. 001) followed by 80% (62±8, 40±8; p=. 001), 60% (63±12, 45±12; p=. 012), and the control (66±9, 52±9; p=. 019). Deoxygenated hemoglobin increased the most at 100% occlusion (2.0±7, 31±7; p=. 001) followed by 80% (1.1±7, 27±7; p=. 002), 60% (-0.7±14, 15±14; p=. .029) and the control (-5.0±8, 11±8; p=. 02). Oxygenated hemoglobin decreased the most in the 100% condition (5.0±12, -14±12; p=. 002) followed by 80% (6.0±14,-12±14;p=.007), 60% (7.0±15, -9.0±15;p=.023) and the control (4.0±11, -7.0±11;p=.014). There was no difference in total hemoglobin during those time points. EMG showed the largest change in the 100% condition (10±9,23±9;p=.002) compared to the control followed by 80% (9±14,19±14;p=.002) and 60% (18±13,23±13;p=.03). **CONCLUSION:** This data suggests that during dynamic exercise 100% of AOP still allows some blood flow and tissue perfusion during and post exercise but it still results in the greatest fatigue compared to lower cuff pressures.

826 Board #87 May 30 3:30 PM - 5:00 PM

The Effects of Upper- and Lower-body Blood Flow Restriction Exercise on Vascular Function

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(No relevant relationships reported)

Previous studies indicate acute resistance exercise (ARE) improves vascular function, primarily forearm blood flow (FBF) and vasodilatory capacity. However, the effects of acute upper- and lower-body RE with blood flow restriction (BFR) on vascular function are unknown. **PURPOSE**: To determine the differences between UB and LB ARE with and without BFR on vascular function in resistance-trained individuals. **METHODS**: Twelve individuals were assessed on a one-repetition maximum (1RM) for the UB on the lat pulldown and chest press, and for the LB knee extension and knee flexion. Vascular function was assessed using venous occlusion plethysmography with five minutes of occlusion at 220mmHg to induce reactive hyperemia. Forearm blood flow and area under the curve (AUC) were assessed at Rest, and during recovery at 15 (R15) and 45 (R45) min. The BFR protocol consisted of 4 sets of 30, 15, 15, and 15 repetitions at 30% of 1RM. BFR was applied at a pressure of 40% of arterial occlusion pressure during each exercise, and was released for 2min between exercises. For the non-BFR protocol, participants performed 4 sets of 8 repetitions at 70% 1RM. A 2x2x3 repeated measures ANOVA was used to examine the effects of condition (BFR, non-BFR) and group (UB, LB) by time (Rest, R15, R45) on vascular function. **RESULTS**: There were no 3-way interactions for any variable, and no effect of condition. There was a significant (p=0.001) group by time interaction for FBF (UB: Rest: 2.8±1.2ml/100ml/min; R15: 9.3±4.5ml/100ml/min; R45: 5.3±2.7ml/100ml/min; LB: Rest: 3.3±2.0ml/100ml/min, R15: 4.3±2.5ml/100ml/min, R45: 4.2±2.2ml/100ml/min) such that FBF was elevated at R15 compared to Rest, and was higher after UB than LB at R15. There was also a significant (p=0.02) group by time interaction for AUC (UB: Rest: 65.1±21.6ml/100ml/min, R15: 144.7±50.2ml/100ml/min; R45: 91.0±27.8ml/100ml/min; LB: Rest: 61.9±10.3ml/100ml/min; R15: 113.1±32.4ml/100ml/min, R45: 88.6±32.3ml/100ml/min) such that it was augmented at R15 and R45 compared to Rest, with greater augmentation at R15 after UB compared to LB. **CONCLUSIONS**: While there were no differences between BFR and non-BFR, our data demonstrate that acute upper-body resistance exercise has a greater effect than acute lower-body resistance exercise on forearm blood flow and vasodilatory capacity.

827 Board #88 May 30 3:30 PM - 5:00 PM

Examining Peripheral Hemodynamics During Handgrip Exercise in Varsity Rowers

Kevin Decker, Austin Hogwood, Jennifer Weggen, Ruhi Maniyar, Ashley Darling, Austin Michael, Ryan Garten. *Virginia Commonwealth University, Richmond, VA.*

(No relevant relationships reported)

PURPOSE: This study sought to examine the impact of upper arm aerobic training on peripheral hemodynamics during exercise. **METHODS**: Seven young male trained rowers (20±1 yrs) and seven male recreationally active controls (24±1 yrs) with no history of upper limb aerobic training were recruited for this study. Subjects performed three minute bouts of progressive rhythmic handgrip exercise (4, 8, and 12 kg). Brachial artery diameter and velocity (Doppler ultrasound), heart rate (ECG), and blood pressure (Tango M2) were continuously measured at rest and during each workload. **RESULTS**: Resting values for brachial artery diameter, blood flow, mean arterial pressure, and heart rate were not different between rowers and controls (p>0.05). During exercise, the rowers reported significantly reduced brachial artery blood flow [4 kg (146 vs 243 ml/min); 8 kg (249 vs 417 ml/min); 12 kg (356 v 536 ml/min) p<0.05] and shear rate [4 kg (289 v 470 s^{-1}); 8 kg (439 v 720 s^{-1}); 12 kg (478 v 797 s^{-1}) p<0.05] across all workloads when compared to controls. Brachial artery dilation, when normalized for shear rate, was significantly greater in rowers than controls during 8 and 12 kg workloads (p<0.05). Exercising heart rate and mean arterial pressure were not different between groups (p>0.05). **CONCLUSIONS**: The results from this study revealed rowers have improved vasoreactivity to a given shear rate stimulus when compared to untrained controls. These findings suggest that upper limb aerobic training results in improved efficiency of blood flow regulation during exercise.

828 Board #89 May 30 3:30 PM - 5:00 PM

Muscle Oxygenation and Metabolic Regulations During Low and Moderate Intensity Exercise with Blood Flow Restriction

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(No relevant relationships reported)

A number of studies have shown that low-intensity exercise with blood flow restriction (BFR) increases oxygen uptake and heart rate during exercise compared to normal exercise without BFR. However, it is currently unknown about the influence of moderate-intensity exercise with BFR on systemic and peripheral metabolic regulations.
Purpose : To investigate the effect of endurance exercise with BFR under either low (25% of VO_2max) or moderate (40% of VO_2max) intensities on muscle oxygenation, energy metabolism and endocrine responses.
Methods : Ten male subjects conducted three trials on different days (with a cross over design). All subjects performed three different trials consisting of moderate intensity (40% of VO_2max) exercise without BFR (NORMAL) or with BFR (MOD) and low intensity (25% of VO_2max) exercise with BFR (LOW). The exercise was designed as a 15 min of pedaling exercise. During the exercise in MOD and LOW, 2 min of cuff pressure (160mmHg) was applied repeatedly for proximal cites of both legs followed by 1 min of release. Muscle oxygenation for vastus lateralis muscle was evaluated using near-infrared spectroscopy (NIRS). Respiratory and venous blood samples were also collected during exercise.
Results : The oxygen consumption (VO_2) did not differ significantly between NORMAL and MOD, but LOW revealed significantly lower VO_2. Carbohydrate

oxidation rate was significantly elevated in MOD (Mean±SD, 25.6 ± 8.6 mg/kg/min), with no difference between NORMAL and LOW (10.6 ± 4.8 and 8.7 ± 2.8). There were no significant differences among three trials for blood glucose and serum growth hormone levels. Blood lactate and serum cortisol levels were significantly higher in MOD than those in the other two trials. Oxyhemoglobin (oxy-Hb) for vastus lateralis muscle was significantly lower in MOD than the other two trials. In addition, deoxyhemoglobin (deoxy-Hb) was significantly increased in both MOD and LOW (vs. NORMAL), and MOD showed highest value of total hemoglobin among three trials. **Conclusion :** Moderate intensity (40% of VO_2max) exercise with BFR caused profound elevations of deoxy-Hb with lower oxy-Hb and augmented carbohydrate oxidation. Furthermore, carbohydrate oxidation during low-intensity (25% of VO_2max) exercise with BFR was similar moderate intensity exercise without BFR.

B-62 Free Communication/Poster - **Cardiac**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

829 Board #90 May 30 3:30 PM - 5:00 PM

Usefulness Of Two-Dimensional Echo Strain In Evaluation Of Cardiac Function In Elite Athletes

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(No relevant relationships reported)

Purpose: Cardiovascular adaptation to sport training is influenced by many factors, including the intensity and the kind of sport practiced. The "Morganroth hypothesis" asserted that a static exercise characterized by a pressure load and dynamic (isotonic) exercise which involves a volume load to the heart lead to different myocardial adaptation patterns. More recent studies revisited this hypothesis, showing that left ventricular (LV) remodelling observed in both resistance and endurance trained athletes, presented similar aspects. Although morphological modifications secondary to exercise have been largely studied, less is known on myocardial systolic function in LV remodeling patterns in different elite athletes. Two-dimensional strain analysis allows a complete study of the contractile function in different myocardial regions of interest in left and right ventricle. In this study we aim to underline possible differences in contractile myocardial function with strain analysis in two groups of elite athletes, trained with different loads and playing different sports (football and cyclism). **Methods**: We enrolled 47 male athletes: 23 football players and 24 cyclists, belonging to same football or cyclism team (mean age in both groups 18±3 years old). The athletes were evaluated with echocardiography at the beginning of the sports season. We assessed LV contractile function using speckle-tracking echocardiographic global longitudinal strain (GLS) and global circumferential strain (GCS). We also analysed right ventricular function by strain echocardiography. **Results:** Cyclists showed a significantly augmented indexed LV mass and TAPSE**.** No significant differences were found in GLS data between the two groups (23.4±0.02 in football players and 24.1±0.02 in cyclists), whereas a significantly higher GCS was found in cyclists compared to football players (31.2±0.04 and 27.2±0.05 respectively, p< 0.005). The cyclist group showed a significant increase in right ventricular strain compared to football players (26.3±0.04 and 23.2±0.04, respectively, p< 0.05). **Conclusions**: Our preliminary data suggest that a dynamic exercise, which involves a volume load, like cyclism, lead to a sensible increase in systolic function in elite athletes especially in right ventricle contractility.

830 Board #91 May 30 3:30 PM - 5:00 PM

HR, %HRmax, %HRR, SPM In Moderate-Intensity Walking Among University Students By Sex And Resting HR

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(No relevant relationships reported)

PURPOSE: This study was intended to examine how heart rate (HR), maximal HR% (%HRmax), HR reserve% (%HRR), and steps per minute (SPM) would be related to sex and resting HR (HRrest) when walking at 2.5 mph among university students. **METHODS**: HRrest was measured after lying on the floor for five minutes to 186 university students (mean ages: 20.97±1.24; 108 males, 78 females) in the US. Males and females were divided into three equal-size groups respectively based on the ranking of the HRrest: low HRrest (LR), medium HRrest (MR), and high HRrest (HR). In addition, participants walked on treadmills for three minutes wearing HR monitors (Sigma PC26.14) and pedometers (Yamax SW-200), and HR and steps were recorded at the end of the walking. The HR, %HRmax, %HRR, and SPM in walking at 2.5 mph and the HRrest were compared between sexes and among the three HRrest groups for males and females separately with one-way MANOVA. **RESULTS**: While no difference was found in age between sexes (p > .05), significant differences (p values: .00 to .01) were identified between sexes in HR (M, 92.36±10.77 vs. F, 102.61±11.34), %HRmax (M, 46.42±5.49 vs F, 51.49±5.72), %HRR (M, 20.07±6.82 vs. F, 23.06±6.86), and SPM (M, 98.24±9.53 vs. 105.89±9.12) in walking at 2.5 mph, and in HRrest (M, 65.48±9.46 vs. F, 73.47±11.68). As for the three HRrest groups, significant differences were found in all the three pairwise comparisons for males (p values: .00 to .01) in walking HR (LR 85.89±9.01, MR 96.61±8.15, HR 100.80±9.43), in walking %HRmax (LR 43.07±4.65, MR 46.56±4.07, HR 50.75±4.77), and in HRrest (LR 55.78±4.73, MR 65.11±2.44, HR 75.83±6.30); and for females as well (all pairwise p values < .01) in walking HR (LR 93.12±9.18, MR 103.6±8.76, HR 111.04±8.27), in walking %HRmax (LR 46.68±4.61, MR 52.07±4.43, HR 55.69±4.19), and in HRrest (LR 60.84±5.13, MR 72.81±3.48, HR 86.77±5.96). No differences were found in age or other variables among the HRrest groups for either sex.
CONCLUSIONS: Sex is closely related to HR, %HRmax, %HRR and SPM in walking at 2.5 mph and to HRrest as well with males having significant advantage over females. When comparisons are made among the HRrest groups, both male and female university students with lower HRrest have significantly lower HR and %HRmax in walking at 2.5 mph than those with higher HRrest.

831 Board #92 May 30 3:30 PM - 5:00 PM

Passive Heat Stress Attenuates the Rise in Blood Pressure During Face Cooling

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(No relevant relationships reported)

The rise in mean arterial pressure (MAP) during the cold pressor test is attenuated by passive heat stress (HS). However, it is not known if HS attenuates the rise in MAP during face cooling (FC). **PURPOSE:** Test the hypothesis that HS attenuates the rise in MAP during FC. **METHODS:** FC was performed on ten healthy subjects (23±2years, 1 woman) during thermoneutral (TN) conditions and during HS induced by a water perfused suit. Subjects rested supine for 10 min while 34°C water was perfused through the suits. Then a 0°C bag of water was placed on the forehead, eyes, and cheeks for 15 min (FC). Subjects were then given 10 min to recover from FC before 50°C water was circulated through the suit until intestinal temperature (telemetry pill) was 1.0°C greater than TN. Five min of data were collected before FC was repeated. Heart rate (ECG), MAP (photoplethysmography), and forearm skin blood flow (SkBF; laser Doppler) were continuously collected. Forearm cutaneous vascular resistance (CVR) was calculated. Face pain (0 = no pain, 10 = worst pain imaginable) was obtained immediately after FC. Change from TN and HS baseline data were analyzed across 1 min intervals for the first 3 min and every 3 min thereafter during FC. **RESULTS:** Baseline HR (71±14 vs. 93±17 bpm) and SkBF (22±14 PU vs. 127 ± 35 PU) were greater and MAP (88±14 vs. 81±6 mmHg) and CVR (4.9±1.8 vs. 0.7±0.3 mmHg/PU) were lower during HS (P<0.05 for all). FC caused a greater decrease in HR during HS (largest difference at 12 min of FC: -7±3 vs. -15±11bpm, P=0.02). FC caused a greater increase in MAP during TN (largest difference at 6 min of FC: 20±10 vs. 1±6 mmHg; P<0.01). FC did not change SkBF across time (P=0.31) nor was there a difference between TN and HS (P=0.61). FC caused a greater increase in CVR during TN (largest difference at 6 min of FC: 1.4±1.2 vs. 0.0 ± 0.0 mmHg/PU; P<0.01). Face pain was not different between trials (TN: 6±3 vs. HS: 4±3; P=0.06). **CONCLUSION:** Passive HS attenuates the rise in MAP during FC. The impaired ability to increase CVR appears to contribute to the attenuated rise in MAP during HS with FC.

832 Board #93 May 30 3:30 PM - 5:00 PM

Alcohol and Cardiovascular Health: Acute Alterations Versus Chronic Adaptations

Jennica Harrison[1], Grace L. Naylor[1], J. Mark VanNess[1], Michelle M. Amaral[1], Greg Roberts[2], 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)

Alcohol abuse is a risk factor for disease but moderate use may be beneficial. Mechanisms for this contrast remain speculative. Differences may be explained by acute alterations rather than chronic adaptations. **PURPOSE:** To compare cardiovascular health markers in patients with and without a history of heavy drinking, and patients who are currently intoxicated. **METHODS:** Health outcomes of patients treated at a U.S. hospital were analyzed; 2,033 were sober, 273 tested positive for alcohol, and 131 reported a history of alcohol abuse. Dependent variables were systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), hemoglobin, oximetry, and disease incidence. Independent variables were age, sex, anthropometry, and use of alcohol. Independent-samples t tests and chi-square tests evaluated differences between patients with and without a history of alcohol abuse. Linear and logistic regressions tested the effects of alcohol on dependent variables. **RESULTS:**

Among sober patients, each year of age predicted 0.3 mmHg higher SBP (p<0.001) but no change in DBP (p=0.137). Across the total sample, current intoxication predicted 8.6 mmHg lower SBP (p<0.001), 8.7 bpm higher HR (p<0.001), and 1.0 g/dL higher hemoglobin (p<0.001). Linear regression found patients who tested positive for alcohol to have 4.6 mmHg lower SBP (p=0.002; 95% CI: -7.6 to -1.6) holding confounders constant. Among sober patients, a history of alcohol abuse associated with an elevated HR (p=0.001), lower pulse pressure (p=0.002), lower oximetry (p=0.018), and a trend for reduced SBP (p=0.056) with no difference in DBP (p=0.404). Linear regression found a history of alcohol abuse to lower pulse pressure (p=0.009) and oxygen saturation (p=0.012) and raise HR (p<0.001). Among sober patients, a history of alcohol abuse did not affect the odds of having a myocardial infarction (p=0.805), congestive heart failure (p=0.712), peripheral vascular disease (p=0.997), stroke (p=0.691), diabetes (p=0.107), or dementia (p=0.905); it did associate with a 15-fold increase in the odds of cirrhosis (p<0.001). **CONCLUSIONS:** Sober patients with a history of alcohol abuse mimic the cardiovascular profile of intoxicated patients. This suggests that both short and long-term alcohol ingestion may confer modest cardiovascular benefits.

833 Board #94 May 30 3:30 PM - 5:00 PM

Cardiac Structure-function And Aerobic Capacity In Individuals With A Competitive Sports History

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(No relevant relationships reported)

Athletes (A) conduct intense physical training to attain peak performance. Intense training is associated with cardiac remodeling and electrical abnormalities. Although certain ECG abnormalities are considered benign, these changes have been linked to sudden cardiac death in A. **PURPOSE:** to investigate cardiac structure-function and electrocardiographic changes relative to aerobic capacity (Vo_2max). **METHODS:** A cross-section of individuals consented for this university IRB approved study. The population consisted of controls (C; n=21; high school sports (n=8 women, 9 men) or active, no organized sports (n=3 women, 1 man)), college A (CA, completed career <3 years ago; n=9, 5 women, 4 men), and A (presently competing, n=22, 6 women, 16 men). Measurements included anthropometric assessment (DEXA), resting 12-lead ECG, and graded exercise test (GXT) with echocardiography/Doppler ultrasound performed before and following the GXT. An incremental treadmill GXT was conducted (6 mph) to Vo_2max with respiratory gas measurements (open-flow, indirect calorimetry). **RESULTS:** CA and A had greater fat-free mass, but bone density was greater in A. While resting heart rate was lower in A and CA, blood pressure, stroke volume (A=87±19 ml; CA=83±23 ml; C=77±18 ml) and cardiac output (A=4.8±1.3 L·min^{-1}, CA=5.2±1.5 L·min^{-1}; C=4.8±1.3 L·min^{-1}) were similar among groups. Left ventricular (LV) end-diastolic dimension and posterior and septal wall thickness provided evidence of cardiac remodeling (eccentric hypertrophy-EH, concentric hypertrophy-CH, concentric remodeling-CR) in C (EH n=3, CR n=4), CA (EH n=1, CR n=2), and A (EH n=2, CH n=1, CR n=4). Overall, ECG analysis showed PVC's (n=3), LV hypertrophy voltage criteria (n=10), peaked T-waves (n=7), J-waves (n=4), U-waves (n=5), wandering pacemaker (n=4), early repolarization (n=5), short PR (n=1), Wenckebach (n=1), small Q waves (n=13). Vo_2max (C=44.7±9.8 ml·kg^{-1}·min^{-1}; CA=44.7±8.2 ml·kg^{-1}·min^{-1}, A=49.9±9.3 ml·kg^{-1}·min^{-1}) and maximal heart rate (C=187±91 b·min^{-1}; CA=194±7 b·min^{-1}, A=187±9 b·min^{-1} were not different. **CONCLUSION:** Given similar, moderate levels of Vo_2max and cardiac function, presence of cardiac remodeling and ECG abnormalities among each group raises questions regarding the genesis of these changes relative to training history.

834 Board #95 May 30 3:30 PM - 5:00 PM

Free-Weight Resistance Exercise Versus Weight Machines on Pulse Wave Reflection

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(No relevant relationships reported)

Acute resistance exercise (ARE) has a large effect on pulse wave reflection, but the data are limited when examining these responses after free-weight (FW) versus weight-machine (WM) exercises. **PURPOSE:** To evaluate alterations in pulse wave reflection after FW exercise compared to WM exercise in resistance-trained individuals. **METHODS:** Individuals volunteered to participate in either FW (n=25) or WM (n=16) resistance exercises. Data were collected at rest, and 10-15min after ARE. The FW group completed 3 sets of 10 repetitions at 75% 1-repetition maximum (1RM) on the squat, bench press and deadlift, while the WM group completed 3 sets of 10 repetitions at 75%1RM on the leg press, lat pulldown, leg extension, chest press, and the leg curl. A 2x2x2 analysis of covariance (ANCOVA) was used to analyze the effects of group (FW, WM) across condition (ARE, control) and time (rest, recovery) with workload as a covariate. **RESULTS:** The groups were similar for anthropometrics (p>0.05), but differed in years spent training (FW: 7±4 yrs; WM: 4±2 yrs, p=0.0001). There were no differences at rest for any measures of pulse wave reflection. Neither group nor condition had an effect on brachial or aortic blood pressure. There was a significant 3-way interaction for heart rate (FW: rest: 59±8bpm, recovery: 88±13bpm; WM: rest: 65±9bpm, recovery: 89±13bpm, p=0.04) such that it was augmented during recovery from resistance exercise in the FW group compared to the WM group. There were also significant 3-way interactions for the augmentation index (FW: rest: 116±8.4%, recovery:121.2±9.5%; WM: rest: 116.8±8.4%, recovery: 113.7±5.5%, p=0.006), augmentation pressure (FW: rest: 5.0±2.9mmHg, recovery: 8.4±5.9mmHg; WM: rest: 4.3±4.0mmHg, recovery: 3.8±3.6mmHg, p=0.029), and the augmentation index normalized at 75bpm (FW: rest: 4.9±8.1%, recovery: 24.1±14.5%; WM: rest: 8.7±12.3%, recovery: 16.8±8.2%, p=0.015) such that they were increased in the FW group compared to the WM group during recovery from ARE, which differed from the control. **CONCLUSION:** These data demonstrate that recovery from free-weight resistance exercises has significant effects on pulse wave reflection that supersede those of weight machine resistance exercises in resistance-trained individuals, despite no differences in brachial or aortic blood pressures.

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Accuracy of a Smartphone Application to Measure Heart Rate Variability in Adult Females

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(No relevant relationships reported)

Heart rate variability (HRV), a non-invasive measurement of the autonomic nervous system, has been associated with incidence of diseased states to overtraining in athletes. HRV monitoring has become popular due to the ease of measurement with a number of commercially available devices.
PURPOSE: The purpose of the study was to determine the accuracy of a smartphone app (APP) to measure resting HRV versus a commercially available bio-harness (BH).
METHODS: Forty-seven females (age = 23.5 ± 4.4 y; height = 1.6 ± .05 m; mass = 73.8 ± 18.5 kg) volunteered to participate in the study. After arriving in the laboratory, participants rested in a supine position for 20 minutes. A BH was used to measure indices of HRV during a five-minute interval while the APP was used during the last 3 minutes. Time measurements included R-R interval (NN), standard deviation of the NN intervals (SDNN), root mean square of the successive differences (RMSSD), and percent of NN intervals over 50 ms (pNN50).
RESULTS: There were no significant differences between the BH and APP with respect to NN (883.1 ± 126.1 vs 894.3 ± 129.8 ms; p = .12), SDNN (72.9 ± 29.9 vs 71.8 ± 29.9 ms; p = .77), and pNN50 (38.8 ± 21.9 vs. 40.8 ± 20.6 %, p = .24). HRM and APP RMSSD were significantly different (66.8 ± 33.0 vs 74.4 ± 30.1 ms; p = .014). Significant correlations were observed between BH and APP for all variables: NN, r = .93, p < .001, SEE = 48.8 ms; SDNN, r = .61, p < .001, SEE = 23.9 ms; RMSSD, r = .79, p < .001, SEE = 18.5 ms; and pNN50, r = .86, p < .001, SEE = 10.6%.
CONCLUSIONS: The APP provided an accurate assessment of HRV when compared to the BH in the supine position. Moderate to strong correlations were observed for all indices of HRV with no statistical differences between the variables with the exception of RMSSD. The APP could provide an economical, valid method of measuring HRV in adult females.

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Effects of AMPK α2 Gene Deficiency on Exercise Induced Cardiac Hypertrophy in Mice

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(No relevant relationships reported)

PURPOSE: The purpose of this study is to explore the role of AMPK α2 in exercise induced cardiac hypertrophy by using AMPKα2 knock out mice and treadmill running model.**METHODS**: AMPK α2 knock out(KO)and wild type (WT) mice were randomly divided into four groups as wild type control (WT+Ctr, n=6),wild type exercise (WT+EX, n=12), AMPK α2 KO control (KO+Ctr, n=6) and AMPKα2 KO exercise (KO+EX, n=12). WT+EX and KO+EX group mice were applied to treadmill running for 7 weeks at 20m/min for 90 minutes to induce cardiac hypertrophy. Cardiac fibrosis and myocyte size was evaluated by Sirius red staining and WGA staining separately. The protein expression in heart tissue was analyzed by Western blots.
RESULTS: 1. AMPKα2 gene deficiency had no effect on ratio of heart weight to body weight (HW/BW, mg/g, 3.89±0.22 vs 3.77±0.13, p>0.05) and cardiomyocyte cross section area (CSA, um2 , 220±36 vs 229±27, p>0.05) under control condition. After 7 weeks exercise training, WT+EX and KO+EX group mice had greater HW/BW (4.34±0.19, 4.52±0.21) and cardiomyocyte CSA (306±27, 355±11) as compared to their control mice (p<0.05), and KO+EX group were significant higher than WT+EX group(p<0.05).2. There were no significant difference on cardiac fibrosis among four groups (p>0.05).3. Seven weeks exercise training significantly increased cardiac tissue

AMPKα and p-ACC protein expression in both WT+EX and KO+EX as compared to their control groups($p<0.05$), while AMPKα2 protein expression only significant increase in WT+EX as compared with WT+Ctr group. 4. Seven weeks exercise training significantly increased cardiac tissue p-Akt protein expression in both WT+EX and KO+EX as compared to their control groups ($p<0.05$), and in KO+EX was significant decrease as compared with in WT+EX group ($p<0.05$). **CONCLUSIONS**: 1.Seven weeks treadmill running could induce cardiac hypertrophy in mice with increased heart weight and myocyte size. 2.AMPKα2 gene deficiency significantly amplified exercise induced cardiac hypertrophy in mice.3.Seven weeks treadmill running induced cardiac hypertrophy was not founded with cardiac fibrosis.4.AMPKα2 might play some important role in exercise induced cardiac hypertrophy through Akt signal pathway.

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Validation Of The Non-invasive Assessment Of Cardiac Output Via The Closed-circuit Acetylene Rebreathing Technique

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(No relevant relationships reported)

Accurate assessment of cardiac output (Qc) is critical to the diagnosis and management of various cardiac disease states; however, the clinical standards of direct Fick and thermodilution (THD) are invasive. Non-invasive alternatives, such as acetylene rebreathing (RB), warrant validation. **PURPOSE:** Validate the non-invasive, closed-circuit acetylene rebreathing (RB) technique for measuring Qc. **METHODS:** Acetylene is an inert, soluble gas that enters the blood stream via pulmonary diffusion but, does not bind to hemoglobin and thus its concentration decreases during rebreathing at a rate proportional to Qc**.** We retrospectively analyzed 10 clinical studies and all available cardiopulmonary exercise stress tests performed in our laboratory that included RB and either direct Fick or THD. Studies included healthy individuals and patients with clinical disease (mostly HFpEF). For accuracy and precision analyses, simultaneous Qc measurements were obtained under normo-, hypo-, and hypervolemic conditions, as well as submaximal and maximal exercise. **RESULTS:** A total of 3,198 measurements in 519 patients were analyzed (mean age 59 years, 48% women). The RB method was more precise than THD in healthy subjects with nearly half the typical error (TE)=0.34 l/min, Pearson r=0.92, and coefficient of variation (CV)=7.2% vs THD TE=0.67, r=0.70, and CV=13.2%. In healthy subjects during supine rest and upright exercise, RB correlated well with THD (supine r=0.84, TE=1.02; exercise r=0.82, TE=2.36). In patients with clinical disease during supine rest, RB correlated well with THD (r=0.85, TE=1.43). Sensitivity analyses showed the agreement of the RB method was similar to, or better than, THD compared to direct Fick in healthy adults (RB rest r=0.85 and TE=0.84, RB exercise r=0.87 and TE=2.39; THD rest r=0.72 and TE=1.11; THD exercise r=0.73 and TE=2.87). Additionally, RB had an excellent correlation with direct Fick in patients with clinical disease during upright exercise (r=0.89, TE=1.14). **CONCLUSION:** The acetylene rebreathing method is much more precise than, and as accurate as, the THD method in a variety of patients and under a range of conditions. These data support the clinical use of RB derived Qc.

838 Board #99 May 30 3:30 PM - 5:00 PM

Holter Ecg In Sports People: 20 Years Of Monitoring

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(No relevant relationships reported)

Purpose: Arrhythmias are a common finding in the population that practices sports activity and sometimes their clinical interpretation is not easy. Thus, we aimed to analyze and follow up the recordings in a group of subjects who underwent a 24-hour or weekly Holter ECG monitoring to assess the presence of arrhythmias in a large cohort of sportsmen.
Methods: Since April 1997 to April 2017, 6172 unselected and consecutive subjects (35±22 years) were enrolled. Revision analysis was performed by Holter Analysis System (Spacelabs Healthcare, LLC, California) on a sample of 10903 Holter ECG registrations, focusing on the ECG features, such as arrhythmias (origin, number, complexity), conduction delays and channellopathies. We then divided the population with follow ups by sex and into three age groups to follow the trend of arrhythmias (age<18; age=18-35; age>35).
Results: The subjects were 68,6% male and 31,4% female. The 27,8% of them (n=1716) had a semiannual or yearly Holter ECG follow-up, composing the 58,7% of the total amount of recordings. AV blocks were found 13,1% recordings (mainly AVB I and II-degree type 1) and other blocks in the 3,2%. Ventricular pre-excitation was recorded in 3,2% cases, whereas channellopathies in the 0,4% (BS or LQTS). Supraventricular arrhythmia was found in the 80% of recordings (<100 ectopic beats in 24h=76,0%), while ventricular arrhythmia in the 69,3% of exams (<100 ectopic beats in 24h=62,3%).
Conclusions: In the Holter recordings examined, we found that there was a clear prevalence of arrhythmias (91,4%) compared to conduction delays (16,3%) and channellopathies (0,4%). Analyzing in detail the features of the arrhythmias we observed that the 41,5% of the population of the study had more than 100 ectopic beats/24h and more than one fourth of the subjects had complex supraventricular (28,0%) or ventricular (23,9%) arrhythmias. Analyzing the follow ups, we found that older athletes had higher complexity and prevalence of arrhythmias, whereas younger people had higher frequency of arrhythmias in the 24h recordings. Arrhythmic peaks in each of the three age groups were found respectively at 14±2 years, 24±4,5 years and 58±11,1 yrs. These findings lead us to say that in sports population arrhythmias are a common event and they are often compatible with sports practice.

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The Effects Of High Intensity Interval Training On Heart Rate Variability In Physically Inactive Adults

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(No relevant relationships reported)

High intensity interval training (HIIT) is a type of exercise that involves repeated intense exercise with active or passive recovery. Heart rate variability (HRV) analysis has been widely used to measure cardio-autonomic functions. **PURPOSE**: The purpose of this study was to examine the effects of HIIT on heart rate variability (HRV) in physically inactive adults. **METHODS**: This study was conducted with a randomized and controlled design. Thirteen physically inactive male adults (27.5 ± 3.80 years) were randomly assigned to HIIT (N = 7) or moderate intensity continuous training (MICT, N = 6). The HIIT program consisted of 20 min of interval training with work to rest ratio (10/50 sec) at 90% HR_{peak} while the MICT program consisted of 40 min of continuous training at 60-75% HR_{peak}. Both groups completed 8 sessions of cycle training over a period of two weeks. Height, body weight, blood pressure, and body composition were measured. HRV was measured for 20 minutes in sitting position with Actiwave-Cardio (CamNtech, UK). Time domain (R-R interval, IBI, RMSSD) and frequency domain (high frequency, low frequency, and LF/HF ratio) variables were analyzed by actiwave analyzer. A natural logarithmic transformation of all frequency domain variables was performed to meet the assumptions of parametric statistical analysis. Rrepeated measures ANOVAs were applied to analyze interaction effects on HRV variables and the significant level was set at .05. **RESULTS**: Significant time effects on R-R interval ($F = 8.437$, $p < 0.05$) and IBI ($F = 9.611$, $p < 0.05$) were observed with both HIIT and MICT groups decreasing over time. lnLF/HF ratio was significantly decreased in the HIIT group while the MICT group did not change ($F = 4.875$, $p < 0.05$). **CONCLUSIONS**: The present study suggests that the HIIT program improves sympathovagal (lnLF/HF ratio) activity following only 8 sessions of HIIT. Health professionals or fitness trainers could consider this time efficient exercise program (HIIT) for improving cardio-autonomic function in adults who are physically inactive.

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Autonomic Modulation in Response to Three Different Autonomic Reflex Tests in Women with Fibromyalgia

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(No relevant relationships reported)

PURPOSE: To evaluate autonomic modulation in response to three different autonomic stressors, including isometric handgrip with post-exercise circulatory occlusion (IHG/PECO), the cold pressor test (CPT) and head-up tilt (HUT) in women with Fibromyalgia (FM) compared to healthy controls (HC). **METHODS:** Participants previously diagnosed with FM (n=37) and HC (n=25) were randomly assigned to an autonomic test. Baseline ECG recordings were completed during 5 minutes of seated (IHG/PECO and CPT) and supine rest (HUT). For IHG/PECO, participants completed 2 minutes of IHG at 30% maximal voluntary contraction followed by 2 minutes of PECO. For the CPT, circulated cold water hand immersion (10C) lasted for 2 minutes. For HUT, participants completed 5 minutes of 70-degree head-up tilt followed by 5 minutes of supine recovery. Heart rate variability measures included normalized low-frequency (LFnu) and normalized high-frequency (HFnu) powers as markers of sympathetic and parasympathetic modulation, respectively. A 2 x 3 repeated measures ANOVA was used to compare the effects of group (FM and HC) across time for IHG/PECO (rest, IHG, and PECO) and HUT (rest, HUT, and recovery). A separate 2 x 2 repeated measures ANOVA was used to compared of group (FM and HC) across time for the CPT (rest and CPT). Paired t-tests were used for post-hoc testing if the ANOVA was significant. **RESULTS:** Age, weight and height were similar ($p>0.05$) between groups. There were no significant differences between groups at rest for any measure of autonomic modulation. There were no changes in autonomic modulation in response to the IHG/PECO in either group. For the CPT, there were significant main

effects of time for LFnu (Rest: 42.5±20.9%; CPT: 61.1±20.6%, p=0.003) and for HFnu (Rest: 50.4±26.8; CPT: 37.3±20.0, p=0.03) such that they increased and decreased, respectively, during the CPT. During the HUT, there were significant group by time interactions (p=0.041) such that LFnu increased (FM: 136%; HC: 64.3%) and HFnu decreased (FM: 51.0%; HC: 24.0%). Measures of autonomic modulation during the recovery from the HUT were similar between groups. **CONCLUSION:** These data suggest that perhaps the hypotensive stress elicited by HUT is a stronger predictor of autonomic dysfunction then either IHG/PECO or the CPT in women with FM.

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Heart Rate Variability Response To Altitude Exposure In College-aged Students In Nepal

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(No relevant relationships reported)

Altitude places a burden on cardiovascular homeostasis, and heart rate variability (HRV) may serve as a biomarker for altitude stress. PURPOSE: HRV was studied at different altitudes in college-aged students of varying fitness levels, trekking in Nepal. METHODS: 10 min resting HRV data and heart rate (HR) were measured in college aged students (n=17,9F age=20±1.7yrs, BMI 23±3kg•m2) at 300m in Oxford Ohio,1900m, and 4500m above sea level in Nepal. 1 min average oxygen saturation (pO2) was measured at 4500m via fingertip pulse oximetry. Root-mean-squared of the successive differences (RMSSD ms), percent of successive R-R intervals varying>50ms (pNN50), and Poincare-plot SD1(ms) and SD2(ms) describe time variation between adjacent R-wave-to-R-wave intervals. Low-Frequency and High-Frequency Power Spectral Analysis (LFP,HFP), which describe the balance of sympathetic and parasympathetic drive to the heart, were other HRV variables of interest. RESULTS: RMSSD and pNN50 were highly correlated (r=0.90). Most HRV variables responded similarly to altitude, decreasing at 1900m and partially returning towards baseline as the trek continued to 4500m. Initial graphical analysis revealed an apparent relationship between log(RMSSD) and heart rate at 1900m and 4500m, though the relationship was less pronounced at 300m. Linear mixed effects modeling of log(RMSSD) provided evidence of a fairly strong interaction between altitude and HR (p=0.005 for 1900m vs. 300m; p=0.002 for 4500m vs. 300m). This model predicts that for lower HR (e.g. 75 bpm) RMSSD increases as a function of altitude, while at median (82.5 bpm) and higher (90 bpm) HR, RMSSD is lower at 1900m than at the other two altitudes. Oxygen saturation mean was 87±3 at 4500m. CONCLUSIONS: Evidence of a substantial altitude by HR interaction on log(RMSSD) suggest that HRV is sensitive to an altitude stressor, but also that subjects with lower resting heart rates at altitude presented with more favorable HRV.

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Ageing Alters Right Ventricular But Not Left Ventricular Myocardial Mechanics

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(No relevant relationships reported)

Introduction: Ageing is associated with a progressive stiffening of the pulmonary vasculature that causes an increase in pulmonary vascular resistance and a decrease in compliance. It remains unclear if right ventricular myocardial mechanics adapt in response to age-related remodeling in the pulmonary vasculature. **Purpose:** Accordingly, this study examined global and transmural longitudinal myocardial tissue deformation (strain) in a cohort of healthy young and middle-aged men to characterize age-related changes in myocardial tissue mechanics. **Methods:** Two-dimensional echocardiography was used to measure left (LV) and right (RV) ventricular strain in 10 young men (YM; Age: 27 ± 2yr, BMI: 23.2 ± 2.4m^2) and 10 middle aged men (MAM; Age: 61 ± 7yr, BMI: 25.9 ± 3.2m^2). A transmural strain gradient was calculated as the difference between endocardial and epicardial strain as an index of regional non-uniformity. **Results:** Systemic blood pressure was similar in young and middle aged men (YM: 118 ± 4mmHg vs MAM: 122 ± 4mmHg, $p > 0.05$), while echocardiographic estimates of pulmonary blood pressure via the tricuspid regurgitation pressure gradient were greater in middle aged men (YM: 17 ± 4mmHg vs MAM: 25 ± 6mmHg, $p < 0.05$). LV and RV dimensions were similar ($p > 0.05$) in young (LV EDV: 118 ± 19mL; RV EDA: 18.3 ± 2.2cm^2) and middle aged men (LV EDV: 118 ± 17mL; RV EDA: 17.3 ± 3.8cm^2). LV global longitudinal strain (YM: -17.5 ± 1.0% vs MAM: -18.0 ± 1.0%, $p > 0.05$) was similar in young and middle aged men, while RV global longitudinal strain (YM: -27.3 ± 1.8% vs MAM: -22.5 ± 1.7%, $p<0.01$) was lower in middle aged men. LV transmural strain gradient (YM: -4.6 ± 0.4% vs MAM: -4.6 ± 0.4%, $p > 0.05$) was similar in young and middle aged men, while RV transmural strain gradient (YM: -1.1 ± 0.4% vs MAM: -5.5 ± 0.5%, $p<0.01$) was higher in middle aged men. **Conclusion:** Ageing was associated with global and regional alterations in RV myocardial mechanics, while LV function was unaltered. Specifically, ageing resulted in a decrease in RV global strain and an increase in transmural non-uniformity (i.e., increased transmural strain gradient). Differences in LV and RV myocardial architecture and age-related changes in the pulmonary vasculature are possible explanations for opposing LV and RV functional remodeling in response to ageing.

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Risk Factors of Hypertension Among Different Adult Groups in the Tujia-nationality Settlement of China

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(No relevant relationships reported)

PURPOSE: Hypertension as a well-known major independent risk factor for cardiovascular disease and stroke has had great impact on health outcomes. However, few studies focus on the different risk factors of hypertension among various age groups in the Tujia-Nationality settlement of China. The study aimed to investigate the different risk factors of hypertension among different adult groups in this area.
METHODS: Demographics questionnaires and fitness tests were utilized to identify the risk factors of hypertension among different adult groups in the years 2010 and 2014 in China's southwest province of Hubei.
RESULTS: Of the 5,646 individuals aged 20-69 years (age=42.7±13.7 years) people, 1,219 were classified as hypertensive, giving an overall prevalence of hypertension of 21.6%. The prevalence of hypertension was 13.5% in 2010, before doubling to 29.0% by 2014. For all age groups, testing time (i.e., 2014) and overweight/obesity were significant factors associated with hypertension. In addition, the risk factors for the young adult group (31.9±7.2 yr, n = 2039?) included age, gender (men>women), lower level of education, and lower cardiorespiratory function (CRF), with ORs of 1.214 (CI, 1.116-1.320), 0.365 (CI, 0.285-0.466), 0.720 (CI, 0.625-0.829), and 0.603 (CI, 0.498-0.731), respectively, and for the middle-aged group (51.7±4.3 yr, n = 1795), included Tujia nationality, white collar workers, and lower CRF, with ORs of 1.076 (CI, 1.056-1.095), 1.612 (CI, 1.390-1.871), and 0.780 (0.631-0.963), respectively.
CONCLUSIONS: The prevalence of hypertension increased dramatically in this area during 2010-2014. BMI was the common risk factor of hypertension in all adult groups. For both young and middle-aged adults, low CRF was a common risk factor associated with hypertension.

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Risk of Cardiovascular Disease in American Firefighters: An Intervention is Warranted

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(No relevant relationships reported)

Cardiovascular disease (CVD) is the most common cause of job-related mortality among firefighters in the United States. Although age, family history, and work environments cannot be controlled, other predictors are modifiable. If solutions are to be implemented, it is important to know which health parameters are responsible for the elevated CVD risk in this population. **PURPOSE:** To examine the cardiovascular health of California firefighters. **METHODS:** We measured physiological CVD risk factors in 35 firefighters from Northern California. Assessments were age, anthropometry, blood lipids, blood pressure, and blood glucose. Risk factors were summed according to the American College of Sports Medicine guidelines. We evaluated the frequency of individual risk factors and used regression analyses (logistic, negative binomial, and linear as appropriate) to test the effect of age on risk. **RESULTS:** Firefighters were 33.5 ± 11.8 years old, had a body mass index (BMI) of 26.6 ± 3.4, body fat percent (BF%) of 21.2 ± 6.0%, waist circumference (WC) of 90.3 ± 10.4 cm, and waist-hip ratio of 0.87 ± 0.10. Systolic blood pressure (SBP) was 122.5 ± 8.0 mmHg, diastolic pressure (DBP) was 78.1 ± 10.3 mmHg, fasted blood glucose (FBG) was 98.5 ± 14.3 mg/dL, LDLs were 128.9 ± 40.1 mg/dL, HDLs were 31.6 ± 12.5 mg/dL, triglycerides were 116.8 ± 90.3, and the average number of risk factors was 1.8 ± 1.2. There were 32 firefighters (91.4%) with ≥ 1 risk. The proportion of at-risk firefighters for each variable was: lipid profile (77.1%), obesity (65.7%), FBG (37.1%), blood pressure (34.3%), and age (14.3%). Most of the lipid profile was met by low HDLs (65.7% of all firefighters). Age was a significant predictor of BMI (p=0.001), BF% (p=0.003), WC (p=0.001), and waist-hip ratio (p=0.047), but not SBP (p=0.553), DBP (p=0.590), FBG (p=0.961), HDLs (p=0.369), LDLs (p=0.593), or triglycerides (p=0.688). Increased age significantly predicted an increased number of CVD risk factors (p=0.003). **CONCLUSION:** As firefighters advanced in age, they experienced elevations in CVD risk, mostly as a consequence of increasing adiposity. Weight loss interventions aimed at improving lipid profile, blood glucose, and blood pressure may help reduce job-related CVD mortality in American firefighters.

845 Board #106 May 30 3:30 PM - 5:00 PM

Effectiveness of Three-Dimensional Echocardiography for Asian Postural Orthostatic Tachycardia Syndrome during Exercise Therapy

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(No relevant relationships reported)

PURPOSE: Postural tachycardia syndrome (POTS) is a form of chronic orthostatic intolerance characterized by an excessive increase in heart rate in the absence of orthostatic hypotension. It is known that women are more likely to suffer from this disorder with 5:1 female to male ratio. Previous studies have reported that POTS is characterized by reduced stroke volume (SV) caused by reduced left ventricular (LV) mass due to cardiac atrophy. Moreover, previous studies indicated that exercise training for POTS patients improved their symptoms and increased LV mass and SV. In the clinical setting, magnetic resonance imaging (MRI) is widely accepted as the gold standard to quantify LV mass and SV. However, probably because it is too expensive to perform MRI very frequently, there have been few studies that intermittently evaluate LV mass and SV changes over exercise therapy. Recent development of three-dimensional transthoracic echocardiography (3D-TTE) may enable us to accurately measure LV mass and SV. The primary purpose of this study was to assess LV mass and SV changes in an Asian POTS patient over exercise therapy by using 3D-TTE.
METHODS: We diagnosed a 27-years-old Asian woman as POTS in Kyorin University Hospital. We prescribed exercise therapy in which she trained 3 times per week for 30 minutes per session by using a recumbent bike with target heart rate equivalent to 60% of maximum (130-140bpm). We performed 3D-TTE (EPIC 7C, Philips)and analyzed LV mass and SV by using 3D speckle-tracking software (Analysis 3.1, TomTec) before and every 3 months after exercise training.
RESULTS: Her symptom started to gradually improve 3 months after exercise training. LV mass and SV gradually increased during exercise training; LV mass was 90g, 98g and 114g, and SV was 39.3ml, 48.5ml, and 43.6ml before exercise, 3 and 6 months after exercise training, respectively.
CONCLUSIONS: We revealed that exercise training for an Asian POTS patient improved her symptom and increases in LV mass and SV were able to be assessed by using 3D-TTE, indicating the effectiveness of 3D-TTE to assess LV mass and SV for POTS patients.

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Left Ventricular Hypertrophy: New Indexation With Body Cell Mass

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(No relevant relationships reported)

Purpose Cardiac adaptation to intense physical training is determined by many factors. Eliminate the fat mass from the indexing of left ventricular parameters seems to better explain some heart modifications, characterizing the so-called "athlete's heart". Fat free mass also contains the extracellular mass which does not represent a metabolically active compartment. The aim of this study is to verify a new left ventricular indexation with the metabolically active tissue of the body as body cell mass in elite athletes. **Methods** 18 females (F) were matched with 18 elite male (M) soccer players (F=26.2±2.4 yrs, M=26.9±2.5 years; p=NS). An accurate body composition analysis (skinfold and bioimpedance) and an echocardiography were performed. **Results** Greater relationship were found between left ventricular mass and body cell (r=0.827, r^2=0.684, p<0.001) compared to fat free mass (r=0.822, r^2=0.676, p<0.001). Differences in body composition were confirmed (hip circumference/height: F=0.55±0.03, M=0.52±0.02, p<0.01; fat mass index: F= 3.7±0.7 kg/m^2, M=2.4±0.4 kg/m^2, p<0.001), no difference were found in extra cellular mass index (F=7.1±1.2 kg/m^2, M=7.6±0.4 kg/m^2; p=NS). There are no differences in systo-diastolic parameters between sexes. Left ventricular dimension show higher values in males also with body cell indexation (F=126.62±16.08 g/m^2, M=142.87±13.48 g/m^2 ; p<0.001). **Conclusions** Analyzing body composition in three compartments appears a solution that physiologically can explain some aspects of the athlete's heart. These results could be considered a preliminary data in order to create a new indexation.

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Parasympathetic Modulation At Rest, During Exercise And Recovery From Maximal Exercise, In Boys And Men

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(No relevant relationships reported)

PURPOSE: Assess heart rate variability (HRV) to examine the parasympathetic nervous system (PNS) response from rest to light- (LIE) to moderate-intensity exercise (MIE) and recovery from maximal exercise in pre- (n = 10; maturity offset (MO) = -3.0 ± 1.2 yrs; age = 10.1 ± 1.9 yrs), mid- (n = 9; MO = -0.1 ± 0.6 yrs; age = 13.7 ± 1.0 yrs), and post-pubertal (n = 10; MO = 1.9 ± 0.6 yrs; age = 15.6 ± 1.2 yrs) boys and men (n = 10; age = 24.1 ± 2.0 yrs). **METHODS**: Subjects completed seated rest, LIE (50% HR_{max}) and MIE (65% HR_{max}). Intensity was then ramped to elicit maximal HR, followed by a 25-min seated recovery. HRV (root mean square of successive differences [RMSSD] and high-frequency power [HF]) was assessed during the last 3 min of rest, LIE and MIE and 3-min epochs ending at 10, 15, 20 and 25 min in recovery. RMSSD and HF were natural log transformed (ln) due to non-normal distribution. Significance was established if $p \leq 0.05$. **RESULTS**: In each group, lnRMSSD and lnHF were similar at rest and decreased from rest to LIE to MIE. During LIE, lnRMSSD was greater in pre (3.4 ± 0.3 ms) than men (2.8 ± 0.5 ms) but similar to mid (3.1 ± 0.5 ms) and post (3.0 ± 0.5 ms). During MIE, lnRMSSD was similar between groups (pre = 2.1 ± 0.4 ms; mid = 1.9 ± 0.5 ms; post = 1.7 ± 0.5 ms; men = 1.8 ± 0.6 ms). Pre had greater lnHF than men during LIE (5.4 ± 0.7 ms^2 vs 4.0 ± 0.9 ms^2) and MIE (2.8 ± 1.0 ms^2 vs 1.4 ± 1.0 ms^2), but similar to mid (LIE = 4.8 ± 1.2 ms^2; MIE = 2.3 ± 1.7 ms^2) and post (LIE = 4.9 ± 0.9 ms^2; MIE = 2.2 ± 0.8 ms^2) at each intensity. In recovery, groups increased lnRMSSD from 10 (pre = 3.2 ± 0.8 ms; mid = 2.4 ± 0.6 ms; post = 1.8 ± 0.8 ms; men = 1.9 ± 0.5 ms) to 25 min (pre = 3.8 ± 0.6 ms; mid = 3.4 ± 0.6 ms; post = 2.8 ± 0.8 ms; men = 2.7 ± 0.8 ms). For lnHF, all groups increased from 10 (pre = 4.9 ± 1.8 ms^2; mid = 3.4 ± 1.2 ms^2; post = 2.2 ± 1.8 ms^2) to 25 min (pre = 6.5 ± 1.3 ms^2; mid = 5.6 ± 1.5 ms^2; post = 4.1 ± 1.7 ms^2), except men (2.5 ± 1.0 ms^2 vs 3.9 ± 1.6 ms^2; p = 0.09). At all points, lnRMSSD and lnHF were greater in pre compared to post and men. Also, mid and post had different lnRMSSD at 15 min (2.9 ± 0.7 ms vs 2.0 ± 0.7 ms) and lnHF at 20 min (5.5 ± 1.4 ms^2 vs 3.7 ± 1.2 ms^2). **CONCLUSIONS**: The primary findings were PNS withdrawal was reduced in pre-pubertal boys than men during LIE and MIE (HF only). Otherwise, MO did not affect PNS response from rest to MIE. Throughout recovery, PNS reactivation was greater in pre-pubertal boys compared to post-pubertal boys and men.

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Link Between Left Ventricle Mass And Body Composition In Young Male And Female Athletes

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(No relevant relationships reported)

Purpose Competitive sports induce gradual cardiac adaptations in young athletes. During growth, changes occur in their body composition. The purpose of this study is to provide the left ventricular parameters indexed for body composition during young athletes' growth. **Methods** 220 young athletes, 110 females and 110 males aged from 8 to 19 years old were enrolled. An accurate body composition analysis (skinfold and bioimpedance) and echocardiography were performed. The left ventricular parameters were then indexed to the body surface area formula with the data related to body composition (fat-free mass and body cellular mass). **Results** The left ventricular and body composition parameters increased continuously during growth and no differences between the sexes were found before puberty. Higher fat mass was found in females from 12 years old (Fat Mass Index: Female=4.8±1.8kg/m2, Male=3.6±0.9 kg/m2; p<0.05). Cardiac differences started at 13 years old, with a greater left ventricular mass in males (Female=128.7±23.7 g, Male=110.9±20.2 g; p<0.05). The indexing of the left ventricle to the body composition parameters increased the age of onset of these cardiological differences to 14 years old with fat-free mass (Female=91.8±18.7 g/m2, Male=105.0±19.5 g/m2; p<0.05), or to 15 years old with body cell mass (Female=124.3±17.9 g/m2, Male=145.8±28.5 g/m2; p<0.05). **Conclusions** Differences between the sexes appear to start after puberty. The above indexing was used in order to normalize the differences between the sexes according to body composition. This study reports the reference values for age and gender of the left ventricular parameters indexed for metabolically active mass.

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Sex Differences In Aortic Stiffness, 24-hour Blood Pressure, And Cardiac Deformation In Marathon Runners

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(No relevant relationships reported)

Endurance exercise reduces risk for cardiovascular disease. Excessive endurance exercise may be detrimental to cardiovascular health. Interestingly, these detrimental cardiac adaptations may be more prevalent in male marathoners. Sex differences in the effect of marathons on cardiac function may be related to differences in aortic stiffness and blood pressure (BP). **PURPOSE:** 1) Examine sex differences in aortic stiffness, BP and cardiac function; 2) Explore associations between aortic stiffness, BP and cardiac function in marathoners. **METHODS:** Sixteen experienced marathoners had peak aerobic capacity, aortic stiffness, BP and cardiac function measured on 3 separate days. Aortic stiffness was measured as carotid-femoral Pulse-Wave Velocity (cfPWV) obtained using applanation tonometry. An ambulatory oscillometric blood pressure cuff was used to measure 24-hr systolic blood pressure (BP). Cardiac function was measured using 3-dimensional deformation echocardiography (3DE). Left ventricular (LV), longitudinal, circumferential, area, and radial strain were used as indices of cardiac function. **RESULTS:** cfPWV and 24-hr aortic BP were higher and 3DE longitudinal and area strain were lower in males compared to females ($p<0.05$). cfPWV was associated with longitudinal ($r=0.58$, $p=0.04$), circumferential ($r=0.71$, $p=0.01$), area ($r=0.66$, $p=0.01$), and radial strain ($r= -0.66$, $p=0.02$). **CONCLUSION:** Among marathoners, males have higher aortic stiffness, BP and lower cardiac function when compared to females. Higher aortic stiffness may be associated with lower cardiac function in experienced marathoners.

Supported by: Sydney Young Student Research Award; Syracuse University School of Education, Creative Grant Competition.

Table 1	Males (n=7)	Females (n=9)	p-value
Age (years)	45±4	43±3	0.53
VO_2 max (ml/kg/min)	52.8±11.8	47±6.2	0.27
Resting Heart Rate (bpm)	52±7	56±9	0.31
Body Mass Index (kg/m^2)	29±5	22±3	0.00
Body Fat (%)	20.7±10	23±6	0.59
cfPWV (m/s)	8.1±1.0	6.5±1.2	0.02
Brachial 24-hr Systolic BP (mmHg)	124±4	112±7	0.01
Aortic 24-hr Systolic BP (mmHg)	113±4	104±8	0.05
3DE Longitudinal Strain (%)	-10±5	-16±4	0.04
3DE Circumferential Strain (%)	-11.3±4.2	-15.6±4.3	0.10
3DE Area Strain (%)	-18.8±7.1	-26.9±6.3	0.05
3DE Radial Strain (%)	29.2±12.2	46.0±17.1	0.07

Significance level, $p<0.05$. cfPWV, Carotid-femoral Pulse Wave Velocity; BP, Blood Pressure; 3DE, 3-dimensional Echocardiography

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Influence of Cuff Pressure on Cardiovascular Responses to Knee Extension Exercise with Blood Flow Restriction

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(No relevant relationships reported)

Blood flow restriction (BFR) exercise is a growing exercise modality in which blood flow to the muscle is occluded during low intensity exercise. Recent reports indicate that BFR training leads to increase muscle strength and hypertrophy, however the acute cardiovascular responses to BFR exercise are not as clear. **PURPOSE:** The purpose of this study is to examine the effects of various occlusion pressures on cardiac output (CO), mean arterial pressure (MAP), and heart rate (HR) before, during and post exercise. **METHODS:** Eight healthy male participants completed 4 sets of knee extension exercises. Participants performed 30 repetitions per set at 20% max torque with 15 minutes of recovery between each set. Four different cuff pressures were administered with each set (0%, 60%, 80% and 100% of arterial occlusion pressure). CO, MAP, and HR were analyzed across 5 time points: baseline, after cuff inflation (prior to exercise), last five seconds of exercise, 30 seconds post exercise (prior to cuff deflation), and two minutes post cuff deflation. **RESULTS:** Repeated measures ANOVA indicated a main effect of time point ($p<0.001$) and cuff pressure ($p=0.018$) on HR as well as a significant interaction ($p<0.001$). HR at the end of exercise was 97±22, 128±27, 135±24, and 148±24 bpm for 0%, 60%, 80% and 100% respectively. The 0% condition was significantly different than the other three occlusion pressures as well as 60% being different than 100%. There was a significant main effect of time point ($p>0.001$) on CO in that it was greatest during exercise, however there was no main effect of cuff pressure ($p=0.805$). Finally, MAP also significantly increased with exercise ($p>0.001$) but there was no main effect of cuff pressure ($p=0.058$). **CONCLUSION:** During BFR knee extension exercise greater cuff pressure resulted in greater HR response despite the fact that external workload was the same. This is likely due to the accumulation of metabolic by-products in the limb and greater exercise-pressor reflex with blood flow occlusion.

B-63 Free Communication/Poster - Cardiac Rehabilitation

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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Does UK Cardiac Rehabilitation Provide An Effective Stimulus For Change?

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(No relevant relationships reported)

Purpose: The efficacy of cardiac rehabilitation (CR) in reducing mortality and rehospitalizations has been questioned. UK CR typically consists of 6 weeks biweekly circuit-type exercise at 40-70% of heart rate (HR) reserve (HRR). This study aims to characterise the exercise performed in UK CR and explore relationships between exercise dose and changes in physiological variables.
Methods: 48 patients (35 M/13 F 33-80 y) were recruited following referral to local outpatient CR. HR was recorded continuously during exercise sessions throughout the programme (Table 1). Assessments of incremental shuttle walk test distance (ISWD), blood pressure (BP), brachial artery flow-mediated dilatation (FMD), carotid artery compliance, and habitual physical activity (PA) were measured prior to and following CR completion.
Results: ISWD increased following CR (439 ± 116 m vs 632 ± 213 m, $p < 0.001$) and was strongly associated with the change in peak HR achieved between tests ($r = 0.56$, $p < 0.001$), baseline ISWD ($r = 0.51$, $p < 0.001$) and age ($r = -0.51$, $p = 0.001$). Spending >1 min above 55% HRR at the start and middle of the programme was associated with greater change in ISWD ($\chi2 = 3.9$, $p = 0.047$; $\chi2 = 4.7$, $p = 0.03$). Time spent exercising > 55% HRR increased between the start and end (8.4 ± 14.1 vs 11.5 ± 14.7 min, $p = 0.02$) but not the middle and end of the programme (11.9 ± 13.6 vs 11.5 ± 14.7 min, $p = 0.87$). PA, body mass, diastolic BP, FMD and arterial compliance were unchanged following CR ($p > 0.05$). Systolic BP decreased following CR (129 ± 20 vs 124 ± 20 mmHg, $p = 0.01$), and correlated only with the volume of light activity performed at baseline and following CR ($r = 0.34$, $p = 0.04$ & $r = 0.41$, $p = 0.03$).
Conclusion: Patients in current UK CR may not accumulate sufficient exercise time above 55% HRR to drive health gain. Large improvements in ISWD do not reflect the lack of change in PA, FMD and arterial compliance. Strategies to increase the dose and progression of time spent above 55% HRR are needed to enhance UK CR effectiveness.

Table 1: % of participants achieving a total of 8 min above threshold			
HRR threshold	Start (n=44)	Mid (n=40)	End(n=39)
40%	66	77	74
50%	41	60	54
55%	27	42	38
60%	27	22	36
65%	23	22	31
70%	9	20	18

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Changes in Functional Capacity and Hemodynamic Responses in Costa Rican Cardiac Rehabilitation Patients

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(No relevant relationships reported)

PURPOSE: To examine changes in walking distance and hemodynamic responses (HED) following a 12-week exercise-based CR program in Costa Rican cardiac patients. **METHODS**: Six-min walking distance (6MWD) and HED variables - systolic blood pressure (SBP), diastolic blood pressure (DBP), post-6MWD heart rate (FHR), post-6MWD recovery heart rate (REC), post-6MWD SBP (PSBP), and post-6MWD DBP (PDBP) were measured before and after CR in three-hundred and eleven (237 males and 74 females) patients (age = 57.7 ± 13 yr.). Using age as a covariate, two by two (gender x measurement) ANCOVAs determined differences in 6MWD and HED variables. Pre-to-post CR intervention changes (Δ) in 6MWD and HED variables were correlated to the number of CR exercise sessions attended by age-quartile (Q_n) within genders. **RESULTS**: Patients underwent 33.0 ± 5.1 CR sessions. Males walked a longer distance than females (males = 493.5 ± 5.6 vs. females = 429.0 ± 9.9 m; $p \leq 0.001$) from pre-to-post CR program (males pre = 429.3 ± 6.2 vs. post = 557.6 ± 5.8 m, $p \leq 0.001$; females pre = 374.9 ± 11.2 vs. post = 483.2 ± 10.3 m, $p \leq 0.001$). Both genders reduced DBP following the CR program (males pre = 67.01 ± 0.7 vs. post = 65.6 ± 0.5 mmHg, p = 0.034; females pre = 69.2 ± 1.2 vs. post = 65.0 ± 1.0 mmHg, p = 0.001), and increased FHR following a 6MWD test after the CR program (males pre = 97.7 ± 1.2 vs. post = 112.7 ± 1.4 bpm, $p \leq 0.001$; females pre = 100.7 ± 2.1 vs. post = 110.2 ± 2.5 bpm, $p \leq 0.001$). Males increased SBP immediately after 6MWD test (pre = 122.8 ± 1.3 vs. post = 133.6 ± 1.3 mmHg; $p \leq 0.001$). Significant correlations between CR sessions completed were found in males in Q_1 (age ≤ 49.9 yr.) for ΔDBP (r = -0.328; p = 0.013), Q_2 (age 50 to 59.9 yr.) for ΔFHR (r = 0.407; p = 0.001), ΔREC (r = 0.286; p = 0.030), and Q_4 (age ≥ 67 yr.) for ΔREC (r = -0.310; p = 0.016), but none for males in Q_3 (age 59 to 66.9 yr.). For females in Q_4 (age ≥ 67 yr.), significant correlations were found between CR sessions and ΔDBP (r = 0.474; p = 0.040) and Δpost-6MWD SBP (r = 0.510; p = 0.022). No significant correlations were found between CR sessions on Q_1 (age ≤ 51.9 yr.), Q_2 (age ≤ 52 to 59.4 yr.), Q_3 (age ≤ 59.5 to 66.9 yr.) for 6MWD or any HED variable. **CONCLUSION**: Both men and women improved functional capacity as observed in the 6MWD and HED variable adaptations to exercise following a 12-week CR program.

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Comparison of Outcomes Related to Dietary Behavioral Changes in Phase II Cardiac Rehabilitation

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(No relevant relationships reported)

PURPOSE: Study aim was to compare pre and post dietary survey scores and waist circumference measurements of Phase II Cardiac Rehabilitation (CR) participants receiving an individual, one-hour dietary counseling session from a registered dietitian (RD). **METHODS:** A retrospective comparative design was used to compare 104 Phase II CR program participants who completed ≥ 12 sessions between May 2015 and August 2017 at a hospital-based nationally certified CR program. The Rate Your Plate (RYP) (target score ≥58), a general dietary assessment survey of usual eating habits prior to cardiac event, was administered to all participants during the initial session and two sessions prior to program discharge. Individual dietary scores were compared among participants receiving and not receiving a one-hour dietary counseling session. A medical record review was conducted to collect completed dietary survey scores, attendance of dietary session, waist circumference, gender, and age. ANOVA, paired T-tests and generalized linear model were used for analysis. **RESULTS:** 104 participants completed a pre and post RYP survey. Seventy-three males (mean age = 66.4 years) and 31 females (mean age = 66.9 years) participated. 78 participants met with the dietitian and 26 declined. Mean dietary scores for all participants significantly increased post program (mean pre = 54.8, mean post = 60.2; p<.001). Participants meeting with the RD significantly increased their RYP scores (mean pre = 54.4, mean post = 60.2, p<0.001). There was no correlation between dietary score and waist circumference. **CONCLUSION:** Preliminary data suggest CR participants meeting with a RD are more likely to improve dietary scores. There may be gender differences, but a larger female sample size is needed to further explore these differences. In previous studies, dietitian services are associated with improved diet related patient outcomes. Weight management intervention for male patients with waist circumference > 40 inches and > 35 inches in women supports a multidisciplinary approach in CR programs to achieve overall cardiovascular risk reduction.

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Influence of Metabolic Syndrome on Response to Cardiac Rehabilitation

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(No relevant relationships reported)

Metabolic syndrome (MS) and its hepatic manifestation non-alcoholic fatty liver disease (NAFLD), are independently associated with cardiovascular disease. The metabolic impact of these conditions may influence exercise tolerance and response to exercise interventions. This is relevant to patients undergoing cardiac rehabilitation (CR) who are expected to have high prevalence for MS and NAFLD. We compared performance measures and self-reports from patients receiving CR with/without MS to investigate whether those with MS had different baseline characteristics and CR outcomes.

Methods: We assessed the independent associations between MS, having met 3 criteria, exercise performance measures (peak METs), anthropometrics and self-reports (PROs) for patients pre and post CR. PROs included DASI METs (activity), CESD (depressive symptoms), COOP (motivation/well being). Anonymized data were collected from a CR registry; and an IRB approved protocol for personal health data from hospital medical records. We used parametric and non-parametric tests.

Results: 181 participants, 132 males, mean age 62, 76 STEMI, 91 had MS. Baseline means: BMI = 29, peak METs = 3.4, DASI = 7, CESD = 8, COOP = 19. At baseline, peak METs were significantly lower in those with MS as compared to non-MS patients (adjusted for age and gender, p=.003). For every unit increase in initial peak METs, the probability of having MS decreases by 64% (OR= 0.36, p =.001. Age (r=-.4), COOP(r=-.42), DASI(r=.37), diabetes (OR 4.3) and female gender (OR = 5.36, p <.001) were associated with lower baseline peak METs. The change in peak METs following CR was not significantly different between the two groups. Significant increases in peak METs were associated with number of sessions attended (r .27, p<0.01) and DASI (r=.4, p <.001. High initial COOP (r -.34, p<.001) and older age (r -.4, p<.001) were associated with less increase in peak METs.

Conclusion: Patients with MS receiving CR have lower peak METs and higher BMI at baseline than those without. PROs are not significantly different between groups. MS is not a risk factor for improvement in peak METs. Improvement in peak METs post CR is independently associated with the number of sessions attended and with increased daily activity (DASI). Clearly, program adherence is essential for improved exercise performance.

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Enablers, Barriers, And Intervention Strategies For Maintaining Exercise Following Cardiac Rehabilitation

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(No relevant relationships reported)

PURPOSE: A significant proportion of cardiac rehabilitation (CR) patients decline or cease regular exercise following the structured CR program. The purpose of this qualitative study was to identify barriers, enablers, and intervention strategies to maintain exercise post CR.

METHODS: We conducted five focus groups (3 to 5 participants in each group) in three North Carolina locations in 2017 with 22 current CR participants. Participants also completed a brief survey. Focus groups were transcribed verbatim and double coded, analyzed, and reconstructed to identify overarching themes using ATLAS.ti software.

RESULTS: Focus group participants were referred to CR after experiencing a myocardial infarction (36%), coronary artery bypass grafting surgery (36%), stents (9%), angina (5%), and heart failure (5%). Over half of participants were male (55%), the mean age was 72 years (standard deviation=7 years), and 82% were retired. Potential barriers to continuing exercise post CR included lack of motivation to exercise, lack of financial resources to stay active, health conditions, loss of group social support, and not enjoying exercise. Potential enablers to continuing exercise post CR included continued contact with CR staff after finishing the CR program, extending the number of weeks of CR, returning for a check-in CR session after discharge, having an exercise plan after finishing CR, and receiving social support from family and friends. The focus group discussion asked participants about their interest in using an activity tracker during and following CR. Most participants were positive about using activity trackers; however, some expressed concern about the complexity of using the tracker. In questions about specific activity tracker features, most participants expressed favorable views about tracking step counts, but had mixed views about sharing their tracking information with peers. Participants were asked about introducing peer support from CR alumni and this feature received positive feedback.

CONCLUSION: These findings can be used to design interventions that help CR participants maintain exercise following CR.

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Functional Capacity And Cardiac Self-efficacy Measures Are Associated With Health Literacy In Cardiac Rehabilitation

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(No relevant relationships reported)

PURPOSE: Health literacy (HL) defines the degree to which individuals can obtain, process, and understand basic health information and services needed to make proper health decisions. Low HL (LHL) is associated with reduced adherence to exercise, medications, healthy nutrition, and low utilization of preventive health services. Cardiac Rehabilitation (CR) is a secondary prevention program that improves functional capacity and risk factor profile, leading to improved health status. The purpose of the present study is to assess the how the effectiveness of CR, as measured by functional capacity and cardiac self-efficacy (CSE), may differ between patients with LHL and high HL (HHL) who attend CR.
METHODS: In a quality improvement project, we evaluated the impact of LHL versus HHL on change in functional capacity and CSE measures. HL of patients enrolling in CR was evaluated by the REALM-SF. HL was divided into two groups: LHL was less than 9th grade reading level and HHL was greater than 9th grade reading level. We assessed changes in functional capacity by six-minute walk distance (6MWD) in relation to scores from the 13 question CSE scale that measures controlling and maintaining cardiac symptoms.
RESULTS: 134 patients that completed CR were assessed: 42 LHL and 92 HHL. LHL patients had lower baseline 6MWD and CSE scores compared to HHL patients (**Table 1**). There were clinically significant gains in 6MWD (>30 m) and statistically significant improvements for CSE in both groups (**Table 1**). Additionally, LHL and HHL patients both had significant correlations between 6MWD and CSE (**Table 2**).

Table 1	Pre		Post		Change		P-Value (P) (PRE vs POST)		P
	LHL	HHL	LHL	HHL	LHL	HHL	LHL	HHL	(BETWEEN GROUPS)
6MWD (m)	272 ± 92	333 ± 86	326 ± 94	384 ± 93	54 ± 48	47 ±59	<0.001	<0.001	0.47
CSE	32.2 ± 12.9	33.1 ± 11.8	39.9 ± 10.9	40.7 ± 8.6	8.0 ± 14.4	7.6 ± 8.4	0.001	<0.001	0.84

Table 2	Pre		Post	
	Correlation Coefficient (R)	P	R	P
HHL 6MWD vs. CSE	0.26	<0.0001	0.34108	0.0009
LHL 6MWD vs. CSE	0.33	0.0001	0.378	0.01

CONCLUSIONS: This work indicates a positive correlation between improvements in functional capacity and CSE over the course of CR for both LHL and HHL groups, highlighting the utility of CR in overcoming some of the risks of diminished functional capacity and CSE associated with LHL. The study also reflects the importance of HL as a criterion of risk and associated management modification.

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Efficacy of a Newly Developed Phase II Cardiopulmonary Rehabilitation Program in the Rural Southeastern United States

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(No relevant relationships reported)

Healthy People 2020 has identified improving access to comprehensive, quality health care services, like cardiopulmonary rehabilitation (CR), as essential for reducing cardiovascular disease (CVD) burden in the United States (US). Yet, the utilization of CR programs in the US is low, especially among rural communities where patients experience additional challenges. Low levels of physical activity and higher prevalence of CVD risk factors in the southeastern US further exacerbate these issues. **PURPOSE:** To evaluate the efficacy of a newly developed phase II CR program in rural Alabama. **METHODS:** Medical records of 14 cardiac and pulmonary patients enrolled in CR at a small rural hospital between November 2016 and July 2017 were analyzed retrospectively. Patient demographics, cardiometabolic profile, and functional capacity (i.e., 6-minute walk test [6MWT]) were assessed at baseline and upon program completion. **RESULTS:** Nine of the 14 patients successfully completed CR (64%). On average, patients were (*M*±SD) overweight (body mass index: 29.3±10.4 kg/m^2), middle-aged and older (range: 31-81 yr) adults (66.7% women; 37.5% Black) with dyslipidemia, who were taking ≥1 antihypertensive medication for their high blood pressure (BP) (systolic/diastolic BP: 135.0±20.9/76.0±7.5 mmHg). Baseline characteristics were similar among Black and White patients, with the exception of age: Black patients participating in CR tended to be younger than White patients (48±15 vs. 68±15 yr, p=0.07). Overall, patients attended the CR facility 1.8±0.2 d/wk and completed the 36-session program in 19.3±2.1 wk. Patients significantly improved their 6MWT distance post-CR compared to baseline (p=0.007), an estimated increase of 1.6±1.4 ml/kg/min (≈12.6%) in peak oxygen uptake. Participation in CR also produced small reductions in body weight (-2.1 kg, p=0.07). **CONCLUSIONS:** These preliminary results demonstrate that a newly developed phase II CR program in rural Alabama elicited favorable changes in body weight and functional capacity (i.e., 6MWT). Additional research is warranted to determine how CR programs can be tailored effectively to address challenges unique to rural communities while targeting the disproportionate burden of CVD in the southeastern US.

858 Board #119 May 30 3:30 PM - 5:00 PM

Sedentary Behavior Characteristics in Cardiovascular Patients versus Healthy Controls.

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(No relevant relationships reported)

BACKGROUND: Time spent sitting is strongly and independently associated with an increased risk for adverse health outcomes, such as incident cardiovascular disease (CVD), diabetes, cancer and all-cause mortality. Previous studies mainly assessed sedentary behavior characteristics in the general population, whereas relatively little is known about this type of behavior in individuals with CVD.
PURPOSE: To compare sedentary behavior characteristics between CVD patients and healthy controls.
METHODS: Sedentary behavior patterns of 19 CVD patients and 18 age- and gender-matched controls were measured for seven consecutive days using the activPAL micro monitor. We used sedentary time (hours/day) as primary outcome, and the number of sedentary breaks (n/day) and sedentary bout duration (min/bout) as secondary outcomes.
RESULTS: CVD patients were sedentary for 11.1±1.5 hours/day, which was significantly more compared to healthy controls who reported 9.1±1.3 hours/day of sedentary behavior (mean difference 2.0 hours/day, 95%CI: 1.0 - 2.9). CVD patients broke up their sedentary behavior 32±7 times per day with a mean duration of each sedentary period of 15.5±3.7 minutes. In contrast, healthy controls had 42±8 breaks of sedentary behavior (p=0.016), whilst the average sedentary period only lasted 10.6±2.7 minutes (p<0.001). The mean difference for the number of sedentary breaks was -9.6 (95%CI: -14.5 - -4.7), and for sedentary bout duration 4.9 minutes (95%CI: 2.7 - 7.0).
CONCLUSIONS: CVD patients spent more time sedentary during wake hours compared with healthy controls. Specifically, CVD patients had sedentary bouts with a longer duration and less frequently broke up their sedentary behavior compared to healthy controls. These findings stress the importance of specific interventions that target sedentary behavior in CVD patients.

B-64 Free Communication/Poster - Metabolism, Mitochondria and Muscle Physiology

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

859 Board #120 May 30 2:00 PM - 3:30 PM

Seric Musclin is not Increased in Patients with Metabolic Syndrome and Insulin Resistance

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(No relevant relationships reported)

Skeletal muscle has now been recognized as an endocrine tissue, through the production and secretion of myokines. Musclin is a myokine mainly secreted by

fibers type II (FT-II) that induces insulin resistance (IR) in both cellular and murine models. We hypothesize that musclin could be involved in pathophysiology of metabolic syndrome (MS) in humans. **PURPOSE**: to evaluate the relationships among IR, seric musclin, area occupied by FT-II and muscle mass in adults with and without MS. **METHODS**: analytical study in adults with and without MS. Homeostatic model assessment (HOMA-IR) was used as indicator of IR, musclin was measured by ELISA, area of FT-II in right vastus lateralis muscle by proton magnetic resonance spectroscopy and both fat and lean mass of the body and the right thigh (absolute values in Kg, or indexes in Kg/m^2 and Kg/Kg body mass) by dual X-ray absorptiometry. Data presented as mean±standard deviation. **RESULTS:** 23 subjects with and 10 without MS, comparable in age (51.6±5.7 with MS vs 53.5±6.3 without MS; P>0.05) and gender were included. Subjects with MS had higher values of insulin (18.3±7.4 vs 6.7±2.5 µU/ml; P<0.05) and HOMA-IR (4.6±2.2 vs 1.6±0.6; P<0.05). There were no differences between groups regarding glycaemia (99.1±8.8 vs 93.2±12.7), musclin (609.9±203.4 pg ml^{-1} vs 657.9±240.5 pg ml^{-1}), area of FT-II (51.4±23.2% vs 49±26.7%) or absolute values or indexes of muscle mass. There were positive correlations between HOMA-IR and both body fat mass or thigh fat mass (r>0.46; P<0.05), between musclin and indexes of total lean mass (Kg m^{-2}, r=0.51; P<0.05) and thigh lean mass (Kg m^{-2}, r>0.54; P<0.05), also between area of FT-II and indexes of total lean mass (r>0.49; P<0.05). There was a negative trend between total lean mass and HOMA-IR (r=-0.34; P=0.07). We did not find correlation between HOMA-IR and musclin or area of FT-II. **CONCLUSIONS:** lean mass seems to determine seric musclin, however, this myokine was not associated to IR in our patients. These findings are in controversy with previous ones reported for cellular models. COLCIENCIAS 111562638757. CODI 2605. Interinstitucional 2016-1341. Colciencias doctoral scholarships 727-2015.

860 Board #121 May 30 2:00 PM - 3:30 PM

Ketone Bodies Induce Mitochondrial Biogenesis In Skeletal Muscle Cells

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(No relevant relationships reported)

Previous studies have shown that a long-chain fatty acid-rich diet as well as endurance exercise induce increase in muscle mitochondria and enhance endurance capacity in rodents. We previously showed that a medium-chain fatty acid (MCFA)-rich diet increases mitochondrial protein levels in the skeletal muscles of non-obese rodents. However, its mechanism remains unclear. Most MCFAs are converted to ketone bodies, which are thereafter released into the blood. **PURPOSE:** The purpose of this study was to examine whether β-hydroxybutyrate (β-OHB), a ketone body, increases the levels of mitochondrial proteins in muscles (Exp. 1). We also evaluated the binding of β-OHB to peroxisome proliferator-activated receptors (PPARs), which regulate the expression of mitochondrial genes (Exp. 2). **METHODS:** Exp. 1: C2C12 mouse skeletal muscle cells were grown in Dulbecco's modified Eagle's medium (DMEM) with 10% fetal bovine serum and 1% penicillin/streptomycin (PS), and differentiated in DMEM with 2% donor bovine serum and 1% PS. After 5 days, the cells were treated with different concentrations (0.05, 0.1, 0.25, 0.5, or 1 mM) of β-OHB for 24 h. The levels of voltage-dependent anion channel (VDAC) and complex-IV (COX-IV) were then measured by western blotting. Exp. 2: PPARs-ligand-binding domain were incubated with buffer containing either agonists or β-OHB, and then with fluorescein-labeled coactivator peptide and terbium-labeled anti-GST antibodies. The fluorescence intensity was measured using time-resolved fluorescence resonance energy transfer. **RESULTS:** Exp. 1: Treatment of the cells with 0.25 mM, 0.5 mM, and 1 mM β-OHB increased VDAC levels compared with those in the control (3.5-, 2.6-, 3.7-fold, $p < 0.05$, respectively). Similarly, treatment with 0.25 mM and 0.5 mM β-OHB increased COX-IV expression compared with that in the control (2.0-, 2.5-fold, $p < 0.05$, respectively). Exp. 2: GW7674, an agonist of PPARα (EC50; 6.2±0.4 nM), and GW501516, an agonist of PPARδ (EC50; 10.3±3.6 nM), increased the fluorescence intensity ratio (520/495 nm). Treatment with β-OHB, however, did not increase the 520/495 nm ratio for either PPARα or PPARδ. **CONCLUSION:** The results indicate that β-OHB induces the expression of mitochondrial proteins in skeletal muscle cells of mice via a pathway different from the one associated with PPARs.

861 Board #122 May 30 2:00 PM - 3:30 PM

Cancer-Related Fatigue and Mitochondrial Function in Cancer Survivors

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(No relevant relationships reported)

Cancer-Related Fatigue (CRF) is a commonly reported symptom of cancer survivors during or after treatment and can contribute to decreased quality of life (QOL). The cause of CRF is largely unknown and is likely multifactorial. CRF has long been hypothesized to result from decreased energy production due to impaired mitochondrial function. **PURPOSE**: To investigate if impaired mitochondrial function contributes to CRF. **METHODS**: Ten cancer survivors (CA, Prostate, Breast, Ovarian), reporting CRF to varying degrees and 5 control subjects with no history of cancer (C), participated in this pilot cross-sectional study. The following measurements were obtained from all subjects: CRF (FACIT-F), depression (CES-D), QOL (PROMIS Global Well-Being (GWB)). Physical function was indicated by handgrip strength (HG), 30 Seconds Sit-to-Stand (STS), timed 6 min walk test (6MWT), and Godin Leisure Time Questionnaire (Godin). Mitochondrial oxidative capacity of the wrist flexor muscles was indicated by the time constant (T_c) of muscle mVO_2 recovery measured with near-infrared spectroscopy (NIRS). The upper limb was chosen so to be relatively independent from ambulation or activity. Analyses were by unpaired T-tests. Pearson Correlations were obtained for variables that differed between groups. Sig. $p \leq 0.05$. Data are mean (SD).**RESULTS**: No significant group differences (all ≥ 0.3) were noted in age (CA = 53.8 (10.3), C = 48.6 (10.5) yr.), height (CA = 168.7(7.2), C= 166.6(9.0) cm), weight (CA=81.7 (13.2), C=73.8(13.6) kg), or body fat (CA=28.7 (4.45), C=33.14(8.6) %, bioelectrical impedance). Significant differences or trends were noted between CA and C groups in FACIT-F (Ca = 36 (11), C = 49 (2), p =0.01), CES-D (Ca = 11 (9), C = 4 (4), p = 0.05), PROMIS-GWB (CA = 37 (7), C =46 (3), p =0.02), HG (Ca = 27 (9), C = 38 (7) kg, p = 0.04), and 30STS (Ca = 15 (4), C = 22 (4), p =0.01)), and Tc (Ca = 46 (9), C = 36 (9) s, p = 0.07). Significant correlations were noted between: FACIT-F and CESD (r = -0.84), PROMIS-GWB (r = 0.90), STS (r = 0.72), and Tc (r = -0.52). PROMIS-GWB was also correlated to HG (r = 0.57), STS (r = 0.74), and CES-D (r = -0.93). **CONCLUSIONS**: Mitochondrial oxidative capacity (i.e. Tc) may be lower in Ca reporting fatigue compared to C and contribute to CRF (i.e. FACIT-F). Further, Tc may mediate QOL through CRF.

862 Board #123 May 30 2:00 PM - 3:30 PM

Impaired Mitochondrial Function May Contribute to Disability and Symptoms of Multiple Sclerosis

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(No relevant relationships reported)

Multiple Sclerosis (MS) is a neurological disease of autoimmune origin. Cognitive, physical, and psychosocial symptoms arise which can interfere with activities of daily living and decrease quality of life (QOL) of persons with MS (PwMS). The cause of MS is unknown, but mitochondria have been implicated in the pathogenesis of the disease and may otherwise affect symptoms of MS including muscle endurance and symptomatic fatigue. Mitochondrial function in leg muscles has been studied in PwMS, but not in arm muscles which may indicate systemic effects independent of ambulation or activity.**PURPOSE**: The purpose of this study was to determine if altered mitochondrial function is associated with MS disability or symptoms. **METHODS**: Six PwMS and 5 healthy controls without MS (C) took part in this pilot cross-sectional study. All subjects were ambulatory. Measurements included QOL (PROMIS Global Well-Being), depression (CES-D), fatigue (FIS), Handgrip Maximal Voluntary Contraction (MVC), Symbol Digit Modalities Test (SDMT), Six Minute Walk Test (6MWT). Disability status was indicated by the MS Functional Composite Measure (MSFC) comprising: 25ft walk test, 9-Hole Peg Test, and PASAT. Mitochondrial oxidative capacity was indicated by the time constant (Tc) for the recovery of forearm muscle mVO2 using near infra-red spectroscopy (NIRS). T-tests and correlations were used with significance at $p \leq 0.05$. Data are mean(SD). **RESULTS**: MS and control (C) groups were similar in age, height, and weight ($p \geq .25$ for all). Significant differences were noted between MS and C groups in QOL (MS=34.0(6.3), C=46.0(2.8)), CES-D (MS=15.3(8.2), C=3.8(4.0)), FIS (MS=60.3(37.8), C=4.2(5.0)), MSFC (MS=0.74(0.58), C=2.00(0.55)), and Tc (MS=54.4(9.8), C=36.0(8.8)s). For all participants, Tc was correlated with MSFC (r=-.751). In turn MSFC was also correlated with GWB (r=.774), CES-D (r=-.673), FIS (r=-.698), 6MWT (r=.767), and SDMT (r=.643). Forearm Tc was not correlated to 6MWT (r=-.496, p=.145) suggesting some independence of this measure from ambulatory function. **CONCLUSIONS**: Mitochondrial oxidative function is related to disability status due to MS which in turn is associated with cognitive, physical, and psychosocial symptoms of MS. The results are consistent with a role for mitochondria in the pathogenesis and symptoms of MS.

863 Board #124 May 30 2:00 PM - 3:30 PM

Insulin Receptor-WNK1 Signaling Targeting Glut4 Trafficking Are Blunted In Diabetic Skeletal Muscle

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(No relevant relationships reported)

PURPOSE: WNK1 kinase is a downstream effector of insulin receptor-phosphatidylinositol 3-kinase (PI3K) signaling and regulates ion homeostasis. Impaired insulin signaling in skeletal muscle disturbs trafficking of glucose transporter 4 (GLUT4) associated with the onset of type 2 diabetes (T2D). WNK1 is highly

expressed in skeletal muscle and is known to regulate trafficking of transporters including GLUT1. Here, we investigated if and how insulin receptor signaling cascade targeting WNK1 regulates cell surface abundance of GLUT4 in skeletal muscle and whether this regulation is altered in T2D.
METHODS: Insulin receptor-WNK1 signaling cascades targeting GLUT4 trafficking were examined using *in vivo* T2D *db/db* mice and *in vitro* C2C12 cell models.
RESULTS: Compared with control mice, T2D *db/db* mice exhibited significant insulin resistance and decreased WNK1 phosphorylation, TBC1D4 and GLUT4 expression. Insulin increased phosphorylation of the downstream kinase Akt as well as WNK1 in a PI3K-dependent mechanism. A biotinylation assay demonstrated that insulin stimulates GLUT4 surface expression by promoting its exocytosis suggesting that WNK1 is a novel regulator of insulin-stimulated GLUT4 trafficking in the skeletal muscle. **CONCLUSIONS**: These results provide a new perspective on WNK1 function beyond regulation of ion homeostasis and offer new insights for pathogenesis of hyperglycemia in T2D. [Supported by NRF-2015R1D1A1A01060454 & 2017R1D1A3B03031760]

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864 Board #125 May 30 2:00 PM - 3:30 PM

ALDH2 Restores Exhaustive Exercise-induced Mitochondrial Dysfunction in Skeletal Muscle

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(No relevant relationships reported)

Mitochondrial aldehyde dehydrogenase 2 (ALDH2) is highly expressed in heart and skeletal muscles, and is the major enzyme that metabolizes acetaldehyde and toxic aldehydes. The cardioprotective effects of ALDH2 during cardiac ischemia/reperfusion injury have been recognized. However, less is known about the function of ALDH2 in skeletal muscle.
PURPOSE: This study was designed to evaluate the effect of ALDH2 on exhaustive exercise-induced skeletal muscle injury.
METHODS: We created transgenic mice expressing ALDH2 in skeletal muscles. Male wild-type C57/BL6 (WT) and ALDH2 transgenic mice (ALDH2-Tg), 8-weeks old, were challenged with exhaustive exercise for 1 week to induce skeletal muscle injury. Animals were sacrificed 24 h post-exercise and muscle tissue was excised.
RESULTS: ALDH2-Tg mice displayed significantly increased treadmill exercise capacity compared to WT mice. Exhaustive exercise caused an increase in mRNA levels of the muscle atrophy markers, Atrogin-1 and MuRF1, and reduced mitochondrial biogenesis and fusion in WT skeletal muscles; these effects were attenuated in ALDH2-Tg mice. Exhaustive exercise also enhanced mitochondrial autophagy pathway activity, including increased conversion of LC3-I to LC3-II and greater expression of Beclin1 and Bnip3; the effects of which were mitigated by ALDH2 overexpression. In addition, ALDH2-Tg reversed the increase of an oxidative stress biomarker (4-hydroxynonenal) and decreased levels of mitochondrial antioxidant proteins, including manganese superoxide dismutase and NAD(P)H:quinone oxidoreductase 1, in skeletal muscle induced by exhaustive exercise.
CONCLUSIONS: ALDH2 may reverse skeletal muscle mitochondrial dysfunction due to exhaustive exercise by regulating mitochondria dynamic remodeling and enhancing the quality of mitochondria.

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865 Board #126 May 30 2:00 PM - 3:30 PM

Heavy Load Exercise Causes Mitochondrial Dysfunction and Increases Mitophagy

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(No relevant relationships reported)

Scientific Abstract
PURPOSE: To observe the effect of heavy load exercise on mitochondrial structure and function in skeletal muscle of rats and analyze the change of mitophagy protein of PINK1 and Parkin and related proteins, and to explore the role of PINK1/Parkin pathway in exercise-induced mitochondrial damage in skeletal muscle. **METHODS:** Male Sprague-Dawley rats were divided into quiet control group (C group, n=8) and exercise group (E group, n=40). Rats in the E group performed a running on a treadmill down a 16°incline at 16m/min for 90 min, and those were further divided into 0h,12h,24h,48h and 72h sub-groups (n=8), and at each time point the soleus muscle was collected under anesthesia. Mitochondrial ultrastructural changes in skeletal muscle were observed by a transmission electron microscope. The content of quatitative enzyme citrate synthase (CS) and the activities of mitochondrial respiratory chain Complex II and IV were measured by ELISA. Protein expression of skeletal muscle cytochrome c oxidease subunit I (COX I),PTEN-induced putative kinase 1 (PINK1) and mitochondrial Parkin,microtubule-associated protein 1 light chain 3 (LC3) were determined by western blot. Mitochondrial co-localization with Parkin,ubiquitin (Ub),p62/Sequestosome 1 (p62) and LC3 was measured by the immunofluorescence double labeling technique. One-way ANOVA was used to evaluate statistical significance. **RESULTS:** After heavy load exercise, the mitochondrial structure appeared to be abnormal and formed a lot of mitophagosomes; the CS content and Complex II activity significantly decreased, whereas the Complex IV activity and COX I protein level remained unchanged; the expression of PINK1 (E12=2.552±0.141),Parkin (E24=2.535±0.100),Ub (E24=2.501±0.191) ,p62(E12=2.662±0.240) ,LC3 (E12=2.757±0.180) significantly increased (C=1.000, $P<0.05$ or $P<0.01$).
CONCLUSION: A heavy load exercise may activate the PINK1/Parkin pathway and promote the combination of Ub,p62,LC3 and mitochondria, and result in mitophagy and mitochondrial damage within skeletal muscle.
Supported by Natural Science Foundation of China (31471133).

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866 Board #127 May 30 2:00 PM - 3:30 PM

Hypermetabolic Effects of Dietary Ketones are Independent of Changes in Skeletal Muscle Mitochondrial Respiration

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(No relevant relationships reported)

Dietary ketone-mediated increases in energy expenditure (EE) have been attributed to increased adipose thermogenesis; however, little is known regarding the contribution of skeletal muscle to the hypermetabolic phenotype. **Purpose:** Determine if dietary ketone esters increase mitochondrial respiration in skeletal muscle. **Methods:** Thirty 5-wk old male C57BL/6J mice were placed on an *ad libitum* high fat diet (HFD) for 10 weeks. Mice were then randomized to one of three groups (n = 10 per group) for an additional 12 weeks: 1) Control (CON, remain on HFD); 2) Ketone Ester (KE, 22% kcal from KE); 3) Pair-fed (PF, pair-fed to KE group). Body composition was measured during the final week of the study by Quantitative Magnetic Resonance (QMR) and EE was examined by indirect calorimetry. Skeletal muscle mitochondrial respiration was measured by high-resolution respirometry in permeabilized muscle fiber bundles. **Results:** Body weight in the KE group was 27% lower and total adiposity 54% lower than the PF group ($p < 0.05$ for both) despite comparable energy intake. Differences in body weight and adiposity were attributed to higher resting (REE) and total (TEE) energy expenditure in the KE group ($p<0.05$). Markers of mitochondrial biogenesis and thermogenesis were increased in brown adipose and a browning phenotype was observed in inguinal white adipose. However, there were no differences in skeletal muscle mitochondrial respiratory capacity between groups. **Conclusions:** These results provide further support that dietary ketone esters increase brown and white adipose thermogenesis but do not appear to have effects on mitochondrial respiration in skeletal muscle.
Supported by: UAB NORC Pilot and Feasibility Award (P30DK056336).

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867 Board #128 May 30 2:00 PM - 3:30 PM

Mitochondrial Respiratory Capacity and Coupling Control of Skeletal Muscle in Colon-26 Tumor-Induced Cachexia

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(No relevant relationships reported)

Cancer cachexia is a life-threatening, paraneoplastic syndrome featuring unintended weight loss and skeletal muscle atrophy. Mitochondria, the major providers of cellular energy, couple oxygen consumption to ATP synthesis (i.e. oxidative phosphorylation, OXPHOS). Impaired mitochondrial bioenergetics (e.g. respiration) is associated with the pathophysiology of multiple diseases. The control of mitochondrial respiration in skeletal muscle during the induction and progression of cancer cachexia is not well understood. **PURPOSE:** To investigate mitochondrial respiratory capacity and coupling control of skeletal muscle in the colon-26 model of cancer cachexia. **METHODS:** Balb/c males (10 wks) were assigned to control or colon-26 (C26). C26 mice were injected with $1x10^6$ tumor cells, and tissue collected on days 7, 14, and 21 post-injection. In this model, mice develop palpable tumors at day 7, and cachexia by day 21. Controls were injected with PBS and tissue collected on day 0. Respiration was measured in permeabilized fibers from the medial gastrocnemius via high-resolution respirometry. A substrate-uncoupler-inhibitor titration protocol was used to evaluate Complex I OXPHOS (CI_p), Complex I+II OXPHOS ($CI+II_p$), and electron transfer system capacity (ETS). Efficiency of the OXPHOS system was determined from the ratio $CI+II_p$/ETS (P/E). **RESULTS:** CI_p was significantly lower ($p<0.05$) at day 21 (4.8±1.6 pmol/s/mg) in comparison to day 0 (53.4±7.0), day 7 (57.4±6.5), and day 14 (60.0±2.9). $CI+II_p$ was significantly lower ($p<0.05$) at day 21 (22.3±2.3 pmol/s/mg)

in comparison to day 0 (65.5±7.8), day 7 (69.3±8.5), and day 14 (73.8±4.8). Maximal ETS was significantly lower ($p<0.05$) at day 21 (24.1 pmol/s/mg) in comparison to day 0 (83.7±13.8), day 7 (84.4±12.3), and day 14 (105.1±7.3). P/E was not significantly different across timepoints ($p>0.05$). **CONCLUSION:** Phosphorylating respiration with electron input from Complex I and I+II, and maximal electron transfer system capacity (i.e. non-coupled respiration) was significantly reduced at day 21 concomitant with cachexia, but not at earlier timepoints, suggesting that changes in oxidative metabolism occur as a consequence of cachexia rather than having a causative role. Loss of respiratory capacity may compromise muscle function and physical independence.

868 Board #129 May 30 2:00 PM - 3:30 PM

Localization Of Myoglobin In Mitochondria: Implication On Regulation Of Mitochondrial Respiration In Muscle

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(No relevant relationships reported)

PURPOSE: Mitochondria play a principal role for metabolism and have a primary role in regulating respiration and energy expenditure. Recently, we showed that the muscle-specific protein myoglobin (Mb) interacted with complex IV to augment mitochondrial respiratory capacity in skeletal muscles. However, the precise mechanism for the Mb-mediated upregulation remains under debate. The present study has focused on localizing Mb within the mitochondria.
METHODS: Muscle specimen from deep portion of m. Gastrocnemius in Wistar rat was homogenized. Crude mitochondria were isolated by differential centrifugations and washed with the mitochondrial isolation buffer. The isolated mitochondria were treated with proteinase K (PK), osmotic shock (OS), and SDS (or TriX) in order to digest proteins on the outer membrane and in the intramembrane. The final samples were subjected to SDS-PAGE and immunoblotting using antibodies to localize the proteins in the mitochondria.
RESULTS: Western blotting analysis revealed that the PK digests Tom20, which localized on the outer membrane of mitochondria. The Tom20 band intensity decreased with the amount of PK used. Other mitochondrial proteins such as cytochrome c (intermembrane space), COX-IV (inner membrane), and PDH (matrix), were not affected by PK treatment. PK treatment did not affect Mb. The results suggested that Mb did not localize on the outer membrane of mitochondria. The combined treatment of PK, OS and SDS (or TrX) allowed immunoblotting detection of the mitochondrial proteins in specific regions of the mitochondria. For example, cytochrome c disappeared with OS treatment. Timm22 disappeared with PK+OS treatment. However, Mb was detected with either PK or OS treatment. But it cannot be detected with a combined PK+OS treatment. The results suggest that Mb associated with the inner membrane (intramembrane side, not matrix side) of the mitochondria.
CONCLUSIONS: We conclude that Mb in muscle cells localizes in the cytosol and in the mitochondrial intermembrane space. Since exercise training increases Mb expressions of skeletal muscle, the increased Mb concentration may play a direct role in modulation skeletal muscle respiration and oxidative phosphorylation capacity.

869 Board #130 May 30 2:00 PM - 3:30 PM

Effects of PGC-1α Overexpression on Sirtuins, GCN5, and Mitochondrial Protein Acetylation in Aged Mouse Skeletal Muscle

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(No relevant relationships reported)

Mitochondrial dysfunction in skeletal muscle is well-documented in sarcopenia. Protein hyperacetylation in mitochondria is one of the emerging causes of the pathogenesis. The interplay between acetylases and deacetylases such as GCN5 and Sirtuins (SIRTs) plays an important role in maintaining mitochondrial quality, which is also controlled by PGC-1α. Thus, it is important to know how PGC-1α impacts on GCN5 and SIRT protein levels in aged skeletal muscle. **PURPOSE:** To investigate the effect of aging and PGC-1α overexpression (OE) on SIRTs and GCN5 protein expressions, global and mitochondrial protein acetylation in aged mouse muscle. **METHODS:** C57BL/6J mice at the age of 2 mo (young, Y; N=7) and 24 mo (old, O; N=7) were transfected *in vivo* with either PGC-1α DNA or GFP into the tibialis anterior (TA) muscle. For electroporation, mice were anesthetized, and a small incision was made through the skin covering the TA muscle. A 27-gauge needle was used to inject plasmid DNA solution into the proximal and distal ends of the muscle belly. Electric pulses were applied to proximal and distal myotendinous junctions. The incision was closed with surgical glue. **RESULTS:** Aging increased SIRT1 level by 1.9, and 2.4-fold ($P<.01$) in O and O/OE, respectively; PGC-1α OE enhanced this effect ($P<.05$). SIRT3 and 6 level were decreased by 70 and 80% with aging ($P<.01$), whereas this effect was attenuated with PGC-1α OE. GCN5 level was elevated by ~10-fold with aging ($P<.01$), and PGC-1α OE showed no effect. Total cytoplasmic and mitochondrial protein acetylation level was 1.5- and 1.2-fold higher in O vs. Y ($P<.05$), whereas no effect of PGC-1α OE was seen. **CONCLUSION:** GCN5 and global and mitochondrial protein acetylation levels were increased with aging in mouse skeletal muscle. PGC-1α OE exerted no effect on this aging phenomenon. However, PGC-1α OE upregulated SIRT1 and ameliorated age-associated reduction of SIRT3 and 6 protein levels.

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Comparison Between The Slow Components Of HR Kinetics And Of $V'O_2$Kinetics: Functional Significance

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(No relevant relationships reported)

PURPOSE: Aerobic exercise prescription is often based on a linear relationship between pulmonary oxygen consumption ($V'O_2$) and heart rate (HR). The aim of the present study was to test the hypothesis that during constant work rate (CWR) exercises at different intensities the slow component of HR kinetics occurs at lower work rate and is more pronounced that the slow component of $V'O_2$ kinetics, thereby negating the linear relationship mentioned above. **METHODS:** Seventeen male (age 27±4 yr) subjects performed on a cycle ergometer an incremental exercise to voluntary exhaustion (to determine peak O_2 uptake [$V'O_2$ peak] and the gas exchange threshold [GET]) and several CWR exercises: 1) moderate CWR exercises (MOD), below GET 2) heavy CWR exercise (HEAVY), at 45% of the difference between GET and $V'O_2$ peak (Δ); 3) severe CWR exercise (SEVERE), at 95% of Δ 4) "HR controlled" exercise in which work rate was continuously adjusted to maintain a constant HR slightly higher than that determined at GET. Breath-by-breath $V'O_2$, heart rate and other variables were determined. **RESULTS:** In MOD, no slow component of $V'O_2$ kinetics was observed, whereas a slow component was observed for HR kinetics. During HEAVY, the amplitude of the HR slow component was more pronounced than that for the $V'O_2$ slow component. During the HR-controlled exercise the decrease in work rate needed in order to maintain a constant HR was associated with a decreased $V'O_2$. **CONCLUSION:** The HR slow component occurred at a lower work rate and was more pronounced than the $V'O_2$ slow component. The absence of a linear relationship between HR and $V'O_2$ during CWR at different exercise intensities has implications on exercise prescription and tolerance.

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Oxidative Stress Impaired Irisin Synthesis and Mitochondrial Homeostasis in C2C12 Myoblast

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(No relevant relationships reported)

PURPOSE: In aging skeletal muscle, disrupted mitochondrial homeostasis and lower levels of Irisin were found to accompany with elevated oxidative stress. Recent research indicates that impaired mitochondrial homeostasis may lead to diminished Irisin biosynthesis during aging. In order to gain some insight into the role of Irisin in mitochondrial homeostasis, we investigated the effect of oxidative stress, induced by exogenous H_2O_2, on Irisin and its precursor FNDC5, as well as key markers of mitochondrial biogenesis and dynamics in C2C12 myoblasts. **METHODS:** Myoblasts were treated for 24 hours with prepared dilutions of H_2O_2 in culture medium resulting in a final concentration of 10, 20, 40, and 80 mM. Survival rate of cells was detected by MTT to determine the optimal concentration of H_2O_2. Flow cytometry was used to assess mitochondrial membrane potential and reactive oxygen species (ROS) generation. Confocal laser scanning microscopy was used to monitor the morphology of the mitochondrial reticulum. Protein content of Mfn1, Mfn2, OPA1, Drp1, FNDC5, PGC-1α, NF-κB and p38 MAPK were measured with Western blot. Content of Irisin in culture medium was determined by Elisa. **RESULTS:** Treatment of cells with 80μM H_2O_2 caused decrease in mitochondrial membrane potential (-65%, $p<0.01$), and Mfn1 (-41%, $p<0.01$), Mfn2 (-49%, $p<0.05$), OPA1 (-17%, $p<0.05$), Drp1 (-25%, $p<0.05$), FNDC5 (-36%, $p<0.01$), PGC-1α (-80%, $p<0.01$), and p38 MAPK (-22%, $p<0.05$). H_2O_2 exposure elevated MDA content (+107%, $p<0.01$), ROS generation (+71%, $p<0.01$), and NF-κB activation (+23%, $p<0.01$). H_2O_2 induced visible fragmentation of the mitochondrial reticulum. However, Irisin content showed no significant change. **CONCLUSION:** H_2O_2 -induced oxidative stress impaird Irisin biosynthesis, which may be caused by disruption of mitochondrial homeostasis in muscle cells. Unchanged Irisin level in the cell might result from a decreased export under oxidative stress. Supported by NSFC (No. 81370454, 31110103919).

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Exercise Training Induced Anti-inflammatory IL-6 in Aged Skeletal Muscle: Role of Mitochondrial Homeostasis

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(No relevant relationships reported)

Deleterious actions for IL-6 have been proposed, such as provoking aging-associated low-grade inflammation accompanied with pro-inflammatory cytokine TNF-α and IL-1β. However, anti-inflammatory effect of exercise may to some extent be associated with muscle-derived IL-6 through inducing anti-inflammatory cytokines such as IL-1a and IL-10. It is increasingly clear that mitochondria are directly involved in the activation of anti-inflammatory response. **PURPOSE:** To determine the relationship between mitochondrial homeostasis and biological effects of muscle-derived IL-6 in aging and exercise intervention. METHODS: Male C57BL/6J mice aged 3 months (young) and 16 months (aged) were randomly divided into four groups: young normal (YN), young exercise training (YT), aged normal (AN) and aged exercise training (AT). Trained animals were exercised on a treadmill for 12 weeks. ROS generation, ATP content, mitochondrial homeostasis protein, anti-inflammatory and pro-inflammatory cytokines were examined in gastrocnemius muscle. **RESULTS:** Aging elevated ROS generation (+175%, p<0.01) and protein content of IL-6 (+104%, p<0.01), TNF-α (+188%, p<0.01), IL-1β (+85%, p<0.01), and NFκB (+77%, p<0.01), when comparing AN vs. YN. Furthermore, AN mice showed decreased ATP content (-26%, p<0.01), protein levels of COX IV (-29%, p<0.05), Beclin1 (-27%, p<0.05), PINK1 (-23%, p<0.05), IL-1α (-26%, p<0.05) and PGC-1α (-43%, p<0.01). Compared with AN, AT increased ATP content (+30%, p<0.05), COX IV (+35%, p<0.05), Beclin1 (+100%, p<0.01), PINK1 (+116%, p<0.01), IL-1α (+90%, p<0.01) and PGC-1α (+41%, p<0.05) levels. Moreover, training decreased ROS generation (-55%, p<0.01), IL-6 (-42%, p<0.01), TNF-α (-49%, p<0.01), IL-1β (-28%, p<0.01), and NFκB (-28%, p<0.05) levels. **CONCLUSION:** Aging increased inflammatory cytokine expression and deteriorated mitochondrial function in mouse muscle. Exercise training promoted mitochondrial biogenesis and mitophagy, suppressed inflammatory cytokine production, and elevated anti-inflammatory cytokines, possibly due to upregulation of PGC-1α and inhibition of NFκB pathway.

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Overexpression of PGC-1α Modulates Mitophagy in Aged Mice Skeletal Muscle

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(No relevant relationships reported)

Mitochondrial dysfunction may contribute to age-related muscle atrophy known as sarcopenia. PGC-1α has been shown to regulate selective mitochondrial autophagy (mitophagy) in skeletal muscles. However, its role in aged skeletal muscle is currently unclear. **PURPOSE:** To investigate the effect of aging and PGC-1α overexpression on autophagy and mitophagy protein markers, as well as mitochondrial ubiquitination (Ub) and content in skeletal muscle. **METHODS:** C57BL/6J mice at the age of 2 mo (young, Y; N=7) and 24 mo (old, O; N=7) were transfected in vivo with either PGC-1α DNA (OE) or GFP into the tibialis anterior (TA) muscle. For electroporation, mice were anesthetized and a small incision was made through the skin covering the TA muscle. A 27-gauge needle was used to inject plasmid DNA solution into the proximal and distal ends of the muscle belly. Electric pulses were applied to proximal and distal myotendinous junctions. The incision was closed with surgical glue. **RESULTS:** LC3II level increased 30% in O (P<.05) compared to Y, whereas PGC-1α OE had no effect on Y or O. P62 level was increased in O (70%, P<.05) vs. Y; however, PGC-1α OE abolished this effect (P<.05). RheB level was ~5.5-fold higher in both O and O/OE (P<.01), and PGC-1α OE reduced it by 22% (p<. 01). Beclin-1 level increased with aging (p<.01) but no effect of PGC-1α OE was seen. Aging decreased Bnip3 level (p<.01), whereas the effect was abolished with PGC-1α OE. PGC-1α OE increased Mfn2 level by 8.2 fold in Y/OE and 3-fold (p<.01) in O/OE, and Drp1 by 73% in O/OE (P<.05). Aging increased Fis-1 level by 20.1, and 14.4-fold (P<.01) in O and O/OE, respectively; however, PGC-1α OE attenuated this effect (p<.05). Mt PINK1 and Parkin level were increased by 3.6, 1.4-fold with aging (P<.01), whereas this elevation was diminished with PGC-1. Mt Ub was increased 1.5-fold in O vs. Y (P<.05), and suppressed by 20% (P<.05) in O/OE vs O. COX4 level was decreased 85% in O vs. Y (p<.01), but PGC-1α OE restore the level by 65% (P<.05). **CONCLUSION:** Aging disrupted mitophagy flux, upregulated fission, and reduced Mt contents, while PGC-1α OE ameliorated Mt homeostasis and dynamics.

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Testosterone and Resistance Exercise Improved Body Composition and Basal Metabolic Rate after Spinal Cord Injury

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(No relevant relationships reported)

Spinal cord injury (SCI) results in a dramatic loss in lean mass and subsequent increase in fat mass (FM) with concomitant decrease in basal metabolic rate (BMR). These changes expose persons with SCI to lifelong chronic health comorbidities.
PURPOSE: To investigate the effects of testosterone replacement therapy (TRT) with evoked resistance training (RT) using neuromuscular electrical stimulation (NMES) on body composition and BMR in men with motor complete SCI.
METHODS: Twenty-two participants were randomly assigned to either TRT+RT (n=11) or TRT only (n=11) for 16 weeks. The TRT+RT group participated in a progressive ankle weight lifting program using NMES twice weekly while sitting in their wheelchairs. The TRT was provided via transdermal testosterone patches (4-6 mg/day) placed on their shoulders. Body composition (lean mass and %FM) using dual energy x-ray absorptiometry and BMR using indirect calorimetry were measured prior to-and post-training.
RESULTS: In the TRT+RT group, ankle weights (P< 0.0001) increased over the 16-week period for the right (19.6±6.5 lbs.) and the left (20±6.1 lbs.) legs. Serum testosterone decreased by ~ 34-36% (TRT+RT: 413.5±147 to 265±183 ng/dl and TRT: 435±177 to 288±258 ng/dl; P< 0.05) following both interventions. Total body (33±11% to 32±11%; P =0.025) and leg (33±11% to 32±9%; P= 0.037) %FM decreased by 1% in the TRT+RT group with no changes in the TRT group. Leg lean mass increased by ~1.8 kg (14.5±3.2 to 16.3±2.7 kg; P= 0.037) in the TRT+RT group with a concomitant increase in BMR by 218 kcal/day (P =0.03), but no changes in the TRT group.
CONCLUSIONS: TRT combined with RT may help to attenuate the decline in lean mass and BMR years after SCI. At this dose or vehicle of delivery, TRT only is ineffective in restoring lean mass or BMR in men with SCI.

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Key Glycolytic Metabolites In Paralyzed Skeletal Muscle Are Altered 7 Days After Spinal Cord Injury In Mice.

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(No relevant relationships reported)

Spinal cord injury (SCI) leads to rapid losses in muscle mass due to immobilization and loss of communication with the central nervous system. SCI is also associated with an oxidative-to-glycolytic fiber-type transition which likely results in muscle metabolic function. How paralysis affects the levels of major muscle metabolites in is not well-described. **Purpose:** The purpose of this study was to identify changes in metabolite levels in muscle paralyzed at 7 and 28 d following a complete SCI. **Methods:** Female C57BL6 mice aged 20 weeks underwent sham or complete SCI surgeries. The sham group (Sham) was sacrificed at 7 d and SCI animals were sacrificed at 7 d (7d SCI) or 28 d (28d SCI) post-surgery (n=5/group). Gastrocnemius muscles were removed at sacrifice and flash frozen. Primary metabolomics analysis was performed on the muscle samples using GC-TOF mass spectroscopy (West Coast Metabolomics, NIH). Statistical analyses of mass spectroscopy peaks was completed using Metaboanalyst 3.0 and R Software. Protein expression was determined using Western blotting.
Results: A principle components analysis identified muscle metabolites at 7 d SCI as a distinct cluster when compared to Sham and 28 d SCI. Metabolomic profiling identified 88 known metabolites with 8 being statistically different: lactate, glucose, maltose, oxoproline, sorbitol, tryptophan, maltotriose and pyruvate. Because glucose, lactate and pyruvate are key metabolites of glycolysis, the expression of key glycolytic proteins were probed. GLUT4 levels were upregulated in 7 d SCI animals compared to Sham and 28 d SCI animals. There was a strong trend (p=0.07) for reduced pyruvate kinase expression in 7 d SCI animals compared to Sham and 28 d SCI animals while pyruvate dehydrogenase was greatly reduced in 28 d SCI compared to 7 d SCI. The level of lactate dehydrogenase approached statistical reductions (p=0.09) at 28 d.
Conclusions: Paralysis following SCI leads to reductions in glucose, lactate and pyruvate at 7 d post-injury with levels recovering by 28 d. Reductions in levels of these are seen despite elevations in the expression of GLUT4 expression at 7 d, suggesting SCI leads to a disruption in glucose handling and glycolytic functioning in paralyzed muscle in the acute timeframe after injury. Funding was provided by a VA RR&D Service Center Award (B9212C) to W.A.B.

876 Board #137 May 30 2:00 PM - 3:30 PM

Type I Diabetes Suppresses Intracellular Calcium Ion Influx by Heat Stress in Rat Skeletal Muscle

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(No relevant relationships reported)

Intracellular Ca^{2+} ($[Ca^{2+}]_i$) homeostasis following muscle contractions is profoundly impaired in diabetic skeletal muscle. Because heat stress activates transient receptor potential vanilloid 1 (TRPV1) and promotes Ca^{2+} influx from the extracellular space in skeletal muscle we questioned whether TRPV1 might play a role in this pathological response. **PURPOSE:** To test the hypothesis that impaired muscle Ca^{2+} homeostasis in type I diabetic rats is due to attenuated heat stress tolerance (mediated via TRPV1). **METHODS:** Male Wistar rats were randomly assigned to 1 of 4 groups: 1. diabetes 40 ℃ (DIA40°C), 2. diabetes 30°C (DIA30°C), 3. control 40°C (CONT40°C), 4. control 30°C (CONT30°C). Heat stress of 40°C was selected because it represents the activation threshold of TRPV1. Spinotrapezius muscles of Wistar rats were exteriorized *in vivo* and loaded with the fluorescent probe Fura-2 AM. $[Ca^{2+}]_i$ was estimated over 20 min using fluorescence microscopy (340/380 nm ratio) in quiescent muscle held at the required temperature by means of a calibrated heat source applied to the ventral muscle surface. Western blotting was performed to determine the protein expression levels of TRPV1 in spinotrapezius muscle. **RESULTS:** After 20 min heat stress, the CONT40°C condition induced a 20.0 ± 7 % $[Ca^{2+}]_i$ ($P<0.05$) elevation that was markedly absent from the DIA40°C or other conditions. Thus there was no significant differences found over the 20 min observation period between DIA40°C, DIA30°C and CONT30°C ($P>0.05$). The expression of TRPV1 was significantly decreased 40 ± 7 % in DIA compared with CONT ($P<0.05$). **CONCLUSION:** This study revealed that the diabetic condition actually suppresses the expression of TRPV1 and inhibits Ca^{2+} influx evoked by heat stress. These findings do not support the notion that impairments of Ca^{2+} homeostasis during exercise result from increased Ca^{2+} influx due to thermal stress *per se*.

B-65 Free Communication/Poster - **Neuromuscular Physiology**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

877 Board #138 May 30 2:00 PM - 3:30 PM

Muscle Oxygenation Of The Quadriceps Femoris During Voluntary Or Femoral Nerve Stimulation Induced Fatiguing Contractions

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(No relevant relationships reported)

Fatigue of the superficial muscles in quadriceps femoris (QF), notably focusing on vastus lateralis (VL), has been evaluated using near infrared spectroscopy (NIRS). Our previous study (Akima & Ando Clin Physiol Func Imaging, in press) showed that muscle oxygenation of deep vastus intermedius (VI) muscle in QF was significantly higher, i.e. less fatigue, than the other superficial muscles after a fatiguing voluntary contraction. It is unclear that this higher oxygenation in VI at muscle fatigue was whether specific response induced by voluntary contraction or the other physiological characteristics.
PURPOSE: The purpose of this study was to compare oxygenation level of individual muscles of the QF at fatigue, which was induced by voluntary contraction or femoral nerve electrical stimulation elicited contraction.
METHODS: Eight healthy men (age, 27 ± 8 years; height, 175 ± 7 cm; weight, 73 ± 12 kg) performed isometric knee extension with knee joint angle of 90° at 50% of maximum voluntary contraction (MVC) for 50 sec induced by voluntary or femoral nerve electrical stimulation (frequency, 20 Hz; pulse duration, 200 μs). The oxygenation level of the VI, VL, vastus medialis (VM) and rectus femoris (RF) were measured using NIRS during the two types of fatiguing contractions. Tissue saturation (StO_2) of each muscle was calculated at -10, 0, 10, 20, 30, 40, 50 sec of the contraction time. A two-way (times x muscle) analysis of variance with repeated measures was used to compare parameters.
RESULTS: StO_2 of all four QF muscles were significantly decreased after voluntary contraction and nerve stimulation elicited contraction; however, StO_2 in VM during voluntary contraction at 40 and 50 sec was significantly lower than nerve stimulation elicited contraction. When comparison StO_2 among four individual QF muscles at the end of fatiguing contraction, VM was significantly lower than VI during voluntary contraction and RF was significantly lower than VI during nerve stimulation elicited contraction.
CONCLUSIONS: Muscle oxygenation in VI could be less fatigued during nerve stimulation elicited contraction as well as voluntary contraction, suggesting slower muscle fatigue in VI was the intrinsic characteristics of physiological response.

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mRNA Expressionin the Rat Spinal Cord Including Motoneurons Innervating Damaged Muscle

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(No relevant relationships reported)

PURPOSE: There are several methods to examine the morphological properties of spinal motoneurons, but it is difficult to evaluate their functional properties. In this study, we developed a method to evaluate motoneuron plasticity using real-time RT-PCR for the entire spinal cord in rats.
METHODS: Male Wistar rats (9 weeks old) were anesthetized and subjected to 100 repeated eccentric contractions (ECC) of their left plantar flexion muscles. The ECC were induced by direct electrical stimuli (45 V, 50 Hz) to the surface of the gastrocnemius muscle and simultaneous dorsal flexion of the ankle joint (150 degree/s, 0-40 degree). The lumbar spinal cord and medial gastrocnemius muscles on both sides were removed at 2 and 4 days after the ECC, and real time RT-PCR analysis was then performed using the muscle and spinal cord. The right gastrocnemius muscle and right half of spinal cord were used as the non-damaged control. Glyceraldehyde-3-phosphate dehydrogenase and Beta actin in the muscle and spinal cord, respectively, were used as housekeeping genes.
RESULTS: The mRNA expression of IL-6 was 50-times higher in the left muscles compared with in the right muscles, indicating marked muscle damage due to the ECC. The mRNA expression of the motoneuron-related factors Choline acetyltransferase, Osteopontin and Estrogen-related receptor gamma was significantly higher in the damaged left half than in the right control of the spinal cord. Furthermore, the mRNA expression of neurotrophic factors and their receptors, Calcitonin gene-related peptide and Brain-derived neurotrophic factor, was higher in the left half of the spinal cord. However, the mRNA expression of Nerve growth factor was significantly lower in the left half of the spinal cord. The mRNA expression of oxidative metabolism related factors, PPAR gamma coactivator 1 and Vascular Endothelial Growth Factor, was not significantly different between the left and right spinal cord.
CONCLUSIONS: These results indicate that reconstruction of some neuro-muscular systems is facilitated in the muscle and motoneurons by muscle damage induced by ECC. We concluded that this standard method for the spinal cord may be a useful tool to clarify the role of each neurotrophic and myotrophic factor in the muscle regeneration process.

879 Board #140 May 30 2:00 PM - 3:30 PM

Effects Of Post-activation Potentiation On Neuromuscular Parameters

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(No relevant relationships reported)

PURPOSE: The aim of this study was to the effects of post-activation potentiation protocol (PAP) on neuromuscular parameters post-performance of an advanced resistance training method.
METHODS: Seventeen (n = 17) men who were experienced in resistance training (4.6 ± 1.4 years) completed PAP isometric protocol on the horizontal bench press, in the consisted in 3 sets of 3 seconds of maximum voluntary isometric contraction (MIVC). After interval 4 minutes was performed at the intervention with the resistance training where the Tri-set methodology of resistance training directed to upper limbs. Average power strength (POWs) and MVIC were assessed pre-potentiation and post-training. *Statistical:* for data analysis, the descriptive statistics was used with the determination of average and standard deviation. The Kolmogorov-Smirnov test with Lilliefors correction was performed to verify the data distribution. For the comparison analysis among the PAP mechanisms, the t test of paired samples was used. In all the analyses, the significance level was $p<0.05$.
RESULTS: in the POWs, there was a significant decrease ($p < 0.05$) among the pre (712,96 ± 124,70 watts) and post assessments in both PAP stimuli (isometric: 559,13 ± 118,98 watts), in MVIC there was also a decrease without differences among PAP stimuli (control: 74.54 ± 19.48 kgf; isometric 62.72 ± 13.51 kgf).

CONCLUSIONS: We concluded that the PAP mechanism is ineffective after a tri-set method session, not showing plausible benefits that justify the daily routine in a gymnasium.
Financial Support: FAPEMIG- Fundação de Amparo à Pesquisa de Minas Gerais

880 Board #141 May 30 2:00 PM - 3:30 PM

The Effect of Caffeine on Peak Torque, Muscle Fatigue and Prefrontal Cortex Blood Flow

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(No relevant relationships reported)

Purpose: The purpose of this study was to assess the effect of caffeine consumption on prefrontal cortex (PFC) hemodynamics and muscular fatigue during maximal isokinetic exercise testing.
Methods: Six active (exercise ≥3x/week, >1 hour per bout for >3 months) individuals (age 20.6±2.3yrs, body weight 72.1 ±7.3kg, height 172.6 ± 14.5cm) participated in a double-blind placebo controlled study. Participants attended three separate exercise sessions on the Humac Norm Isokinetic Dynamometer. Each exercise session included three sets of 30 maximal knee extensions at 180° per second using their dominant leg. Exercise sessions were separated by one week and participants were instructed to refrain from consumption of caffeine 36 hours prior to testing. One hour prior to testing, participants were administered a placebo (NC), low caffeine (LC) (3mg/kg body weight) or high caffeine (HC) (6mg/ kg body weight) dose. Time-resolved near-infrared spectroscopy monitoring (TRS0-21, Hamamatsu) was utilized throughout testing to measure hemodynamics in the PFC. Peak torque and fatigue index were analyzed. **Results:** The fatigue index for HC (42.78%) and LC (42.82%) was lower when compared to the NC condition (47.39%; $p<0.05$). Peak torque per exercise session was found to increase during LC (124.17 N*m) compared to both NC (120.00 N*m) and HC (116.75 N*m). Additionally, LC showed a significant increase in total hemoglobin levels (141.21uM) compared to NC (101.05uM) and HC (97.618uM) in the PFC. **Conclusion:** The results of the study indicate that both high and low doses of caffeine were found to reduce fatigue across the bout of fatiguing exercise, but only LC resulted in increased peak torque and total hemoglobin to the PFC. Further examination of both PFC and local muscle hemodynamics should be explored to further understand the differential response between LC and HC.

881 Board #142 May 30 2:00 PM - 3:30 PM

Relationships between Motor Unit Behavior during Maximal Effort Contractions and Skeletal Muscle Phenotype

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(No relevant relationships reported)

It has long been hypothesized that the physical properties of the muscle are related to motor unit behavior. Indeed, recent investigations have reported a relationship between skeletal muscle phenotype of the *vastus lateralis* and motor unit (MU) firing parameters during submaximal contractions. However, the nature of this relationship during maximal contractions in unknown and warrants further investigation.
PURPOSE: The purpose of the current investigation, therefore, was to examine the relationships between motor unit firing behavior during a maximal voluntary contraction and Myosin Heavy Chain (MHC) isoform content of the *vastus lateralis* muscle in resistance-trained men. **METHODS:** Ten resistance-trained males (mean ± SD, age = 22 ± 2) completed a trapezoidal ramp contraction up to 100% of their maximal voluntary isometric strength (MVIC). During the contraction, surface electromyography was recorded from the VL using a multi-channel electrode array and decomposed to examine the firing characteristics of individual MUs. A skeletal muscle biopsy of the VL was also collected and the mean fiber area for type I and II muscle fibers was calculated for each individual subject. Regression analyses were performed to identify relationships between type II fiber area and the slopes or intercepts of the mean firing rate (FR_{MEAN}) vs. recruitment threshold (RT), max firing rate (FR_{MAX}) vs. RT, and RT vs. MU action potential amplitude ($MUAP_{PP}$) relationships. **RESULTS:** The mean type II fiber area was 65.8% (± 13.5%). Each subject displayed a significant ($p < 0.05$) relationship for the FR_{MEAN} vs. RT ($r = -0.95$ to -0.82), FR_{MAX} vs. RT ($r = -0.96$ to -0.81), and RT vs. $MUAP_{PP}$ ($r = 0.64$ to 0.91) relationships. There were significant inverse relationships between type II fiber area and the y-intercept of the FR vs. RT relationship ($p < 0.05$). Additionally, strong relationships ($r > 0.50$) were found between type II fiber area and FR_{MEAN} vs. RT slope and RT vs. $MUAP_{PP}$ slope and intercept. **CONCLUSION:** These data further support the hypothesis that skeletal muscle phenotype is strongly related to MU behavior during isometric contractions. However, our data, in concert with previous investigations, may suggest that these relationships are influenced by the intensity of the contraction.

B-66 Free Communication/Poster - Intervention Strategies

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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Music And Regular Physical Exercise:perception Of Practiitioners Regarding Duration And Performance.

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(No relevant relationships reported)

Regular PE practice with music can improve subjective effort perception, motivation, extend the activity time and increase performance. Music is used by practitioners of different modalities and it is considered important by the practitioner, and this can influence the way music can be used in the training plan in order to improve performance, duration, engagement and quality of practice. The objective of this study was (1) to evaluate the use of music during different PE practices and (2) to evaluate how important music is to the practitioner. We used a questionnaire of musical taste and PE practice. The questionnaire assessed the relationship of the regular PE practitioner with music. We asked if the practitioner used music during the exercise and what was his preferred and current practice. The sample consisted of 50 participants, 28 men and 22 women, with a mean age of 36 years (± 12.5). We used Google Forms to submit an electronic questionnaire, which was strictly forwarded to regular PE practitioners. Among the reported modalities we identified 28.6% resistance training, 18.4% running, 14.3% cycling and 10.2% walking. The level of physical activity of the participants was considered high, since most PE practices occurred either 2-3 times per week (46,9%) or 4 or more times per week (44,9%). The results show that 70% of the participants considered music necessary to perform the preferred PE, this result agrees with 71% of the participants that reported that listened music during their preferred PE. Also, 40% believed that music can change the PE session duration and 72.7% reported that music helps to improve performance during PE practice. Based on these results, we believe that music can stimulate greater engagement in PE practice, since most of the practitioners reported to listen to music during their PE practice. Also, according to the subjective perception reports of the participants, music became necessary for PE practice extension or it worked as a stimulant for PE performance improvement. These results suggest that music is an important factor for PE practice, especially in some modalities, and it should be included in the training program development (in a more elaborated way with the choice of musical style and rhythm) to improve the proposed training and not only as entertainment to be randomly chosen during PE.

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Providing Estimates Of Fitness May Influence Subjects' Exercise

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(No relevant relationships reported)

PURPOSE: We investigated if providing measurements of cardiorespiratory and muscular fitness would influence subsequent self-reported physical activity.
METHODS: The Exercise Vital Sign and current types of physical activity were obtained from 1315 individuals attending the 2014 and 2015 Minnesota State Fairs. The baseline mean Exercise Vital Sign was 213 min/week. Subjects were randomized in 1:1 fashion to control and intervention groups. The 656 intervention subjects were provided with personal measurements and age appropriate norms of cardiorespiratory fitness using a validated non-maximal step test to estimate VO2max and muscular strength using a hand grip dynamometer. All subjects were provided exercise recommendations based on current standards and follow up surveys conducted to determine subsequent physical activity. Follow up Exercise Vital Sign and physical activity type was obtained from 823 subjects (62.5%) over the following year.
RESULTS: No significant changes in the Exercise Vital Sign were noted in the control group or intervention group at 3 months, 6 months or 1 year of follow-up. At 3 months resistance training activity was reported to increase in the intervention group from 29.1% to 42.8% while unchanged in the control group (26.3% to 31.4%) ($p<0.05$). The increase in resistance training was driven by a significant increase in those with grip strengths below normative values. Lifestyle physical activity was also reported increased in the intervention group at both 3 months (27.7% to 29.1%) and 6 months (25%) whereas it declined in the control group from 24.4% to 20.1% at 3 months and 18.7% at 6 months($p<0.05$). Among the subjects who were less active at baseline (Exercise Vital Sign<150) we observed a significant increase in their Exercise Vital Sign from a baseline of 86 to 146 at 6 months ($p<0.05$).
CONCLUSIONS: Recording the Exercise Vital Sign and providing exercise recommendations appears effective in increasing physical activity in less active

individuals. In an already very active population measuring grip strength and estimating VO2max using a step test may have short term positive effects on lifestyle activity and resistance training. Wider adoption of these measures could be effective in promoting physical activity and resistance training.

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Associations Between The Physical Activity Vital Sign And Cardiometabolic Disease In High-risk Pediatric Patients

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(No relevant relationships reported)

Purpose: To determine the utility of the physical activity vital sign (PAVS), and its association with the cardiometabolic disease biomarkers of body mass index (BMI) and blood pressure (BP).
Methods: All patients in a high-risk family medicine clinic (>99% Medicare/Medicaid/Uninsured, n = 2710) were assessed via the PAVS (minutes/week), a product of the reported days/week and minutes/day of physical activity. For pediatric patients (5-18 years, n = 255), individuals were categorized into 3 PAVS groups: inactive (PAVS = 0), under-active (1 - 299), and sufficiently active (≥ 300). Pediatric patients were further classified into youth (5-11 years, n = 118) and adolescents (12-18 years, n = 137). Associations were tested between PAVS, BP and BMI utilizing ANOVA. Chi-square-tests were used to compare results to 2015-2016 National Health and Nutritional Examination Survey (NHANES) reported accelerometer data.
Results: Among pediatric patients, PAVS decreased with increasing age ($p = 1x10^{-6}$). The average level of physical activity reported for youth patients was 384.9 ± 218.1 with 72.9% reporting sufficient PA, 24.6% under-activity and 2.5% inactive. Adolescents reported a mean PAVS of 278.3 ± 199.6 with 51.8% reporting sufficient PA, 33.6% under-activity and 15.6% inactivity. Using the PAVS, only 24.3% of adults reported sufficient PA of ≥ 150 minutes per week (mean 97.9 ± 149.4). Similar to adults, pediatric males reported a higher PAVS than females (355.1 vs 298.6; $p < 0.05$). BMI ($p < 3.4x10^{-7}$) and systolic BP ($p < 0.001$) were inversely associated with PAVS in pediatric patients. Similar to adults, patients meeting PA guidelines demonstrated reductions in obesity ($p < 0.05$) and hypertension ($p < 0.05$).
In comparison to NHANES data, a greater number of children report meeting PA guidelines through the PAVS (73% vs. 42% for youth, $p < 0.00001$; 51.8% vs 8% for adolescents, $p < 0.00001$). PAVS values decline with age and by adulthood the inactivity burden leads to a smaller portion of patients meeting PA guidelines (24% vs 60% in NHANES).
Conclusion: The PAVS may under-estimate the burden of physical inactivity in pediatric patients. However, correlations with BP and BMI may suggest a role for the PAVS in identifying youth at risk for obesity and hypertension, which may allow earlier intervention.

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Acute Effect of Three Different Exercise Training Modalities on Executive Function in Overweight Inactive Men: The BrainFit Study

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(No relevant relationships reported)

PURPOSE: There is currently a consensus about the positive effects of physical exercise on cognition. However, the exercise intensity-dependent effect on executive function remains unclear. Thus, the aim of this study was to compare the acute effects of high-intensity aerobic interval training (HIIT), resistance training (RT), or combined training (RT+ HIIT) on the cognitive inhibition and attention capacity in overweight inactive men adults (age 18-30 years old).
METHODS: Randomized, parallel-group clinical trial among 36 (23.6±3.5 years; 83.5±7.8 kg; 28.0±1.9 kg/m²), inactive men (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 randomly assigned to a HIIT (n=12), RT (n=7), RT+HIIT (n=7), and a control group (n=10) until the energy expenditure of 400-500 kcal. Cognitive inhibition and attention capacity were examined using Stroop Test and d2 Test of Attention respectively, before (pre) and 1-min post-exercise for each exercise training modalities.
RESULTS: For cognitive inhibition, significant differences were observed in HIIT and RT+HIIT protocols for congruent and neutral conditions, and in HIIT, RT and RT+HIIT for incongruent condition. The largest effect size was identified in RT+HIIT for congruent condition (d=1.70). Regarding attention capacity, there were significant in RT+HIIT for concentration performance domain, and in RT and RT+HIIT with total performance. The largest effect size was found in RT+HIIT for concentration performance domain (d=1.23).
CONCLUSIONS: Acute RT+HIIT session reported larger effect sizes than RT and HIIT alone for congruent condition. Combined exercise seems to favor acute benefit on executive function and could be particularly recommended in inactive overweight men. Overall, combined RT+HIIT seems to favor acute benefit on executive function in inactive overweight men. **TRIAL REGISTRATION:** ClinicalTrials.gov NCT02915913 (Date: September 22, 2016).

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An Evaluation of an Unstructured and Structured Approach to Increasing Recess Physical Activity

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate the effectiveness of structured and unstructured programs implemented to increase physical activity (PA) for students during the recess period of the school day. **METHODS**: Two suburban school districts in Colorado (USA) implemented different techniques to increase recess PA during the 2015-16 school year. The structured program implemented in one school district included planned activities and games for students, led by a recess paraprofessional. The unstructured program implemented in the second school district provided equipment to students during recess by instructing teachers to roll out equipment carts at the beginning of the recess period. Students were able to use equipment, although it was not required. The amount of available equipment was recorded by the school district implementing the unstructured program. PA was observed using the System for Observing Play and Leisure Activity in Youth (SOPLAY). Evaluators recorded baseline and follow-up observations for sedentary activity, moderate activity (MPA), and vigorous activity (VPA). Observations from individual schools were aggregated so data analyses could be performed at the district level, and the distribution pattern for each variable was examined and noted to be either normally distributed or not normally distributed. Descriptive statistics were calculated for each variable of interest at the district level, and parametric and nonparametric tests were used to determine if the differences were statistically significant after adjusting for compounded error with a Bonferroni correction ($p < 0.004$). **RESULTS**: For the unstructured program (i.e., increased equipment): MPA increased and VPA significantly ($p < 0.004$) increased, while sedentary behavior decreased. For the structured program: MPA and VPA did not increase, whereas sedentary behaviors were higher following the program, though changes were not significant. **CONCLUSIONS**: This study indicates that the degree of effectiveness may vary between structured and unstructured recess PA programs. However, additional variables outside of the scope of this study such as teachers' interaction with students or the fidelity of the program may influence student PA during recess, and should be evaluated in future research.

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Associations Between Self-Efficacy and Acculturation on Leisure-Time Physical Activity in Hispanic Men Enrolled in a Weight Loss Intervention

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(No relevant relationships reported)

Background: Hispanic men have the highest prevalence of obesity-related chronic diseases when compared to men in other racial/ethnic groups. Benefits of regular leisure-time physical activity (LTPA) to improve health outcomes are demonstrable. There is limited information on how acculturation status and self-efficacy for exercise influence LTPA for Hispanic men. **Purpose:** To examine associations between acculturation, changes in self-efficacy for exercise behaviors, and changes in LTPA in response to a gender-and culturally-sensitive weight loss intervention (GCSLWI). **Methods:** Thirty-five Hispanic men (mean age: 41.5 (SD 11.2) yrs.; mean BMI: 34.8 (5.5) kg/m²) enrolled in a 12-week GCSWLI. Participants attended weekly in-person individual sessions guided by a trained bilingual Hispanic male lifestyle coach, were prescribed a daily reduced calorie goal, and 225 minutes of moderate-intensity physical activity per week. A free gym membership was provided to facilitate engagement in LTPA. The Acculturation Rating Scale for Mexican Americans (ARSMA-II) measured acculturation related to language, ethnic identity, and ethnic interaction at baseline. Self-efficacy for exercise and LTPA, assessed by the Global Physical Assessment Questionnaire (GPAQ), were measured at baseline and week 12. **Results:** On the ARSMA-II, 22 (63%) scored Very Mexican or Mexican Oriented, 9 (26%) scored

Slightly Anglo, and 4 (11%) scored Strongly Anglo. None scored Very Assimilated. At baseline, self-efficacy for exercise was 3.82 (SD 0.86) on a 5-point scale with 1 low and 5 high self-efficacy. Over 12-weeks, mean self-efficacy changed slightly by -0.18, (95% CI (-0.46,0.09)), mean LTPA increased by 200.1 (4.01, 396.3) minutes/week, with moderate and vigorous LTPA increasing by 90.1 (-23.2, 203.7) and 109.9 (16.1, 203.6) minutes/week, respectively. Change in vigorous LTPA was weakly positively correlated with change in self-efficacy score (Spearman's rho=0.30, p=0.08). We found no significant associations between ARSMA-II scores and LTPA. **Conclusions:** Significant improvements in LTPA were observed for Hispanic men participating in a GCSWLI. Acculturation and self-efficacy were not associated with this change. Studies examining additional factors that influence LTPA in this health disparate group are needed.

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Low-Frequency High-Intensity Interval Training (HIIT) Improves Cardiorespiratory Fitness and Body Composition in Overweight Adults

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(No relevant relationships reported)

PURPOSE: This study examined the effects of 8 weeks of low-frequency high-intensity interval training (HIIT) on cardiorespiratory fitness and body composition. **METHODS:** Twenty-three overweight/obese young men (mean age 22.7 ± 2.8 years, BMI 25.5 ± 1.8, percent body fat 22.3 ± 2.2%) were randomly assigned to HIIT and no-intervention control (CON) groups. Participants assigned to HIIT group performed 12 bouts of 1-min 30-meter shuttle runs at 90% of heart rate reserve (HRR), interspersed by 1-min of active recovery at 70% of HRR once weekly. Participants in control group were instructed to maintain their daily lifestyle habit for 8 weeks. VO_{2max} was measured by beep test and body composition was assessed by bio-impedance segmental body composition analyzer before and after the study period. **RESULTS:** VO_{2max} was significantly increased after 8 weeks of HIIT intervention (HIIT +17.5% vs. CON -0.3%). Total body fat mass, percent body fat and waist circumference were significantly reduced after 8 weeks of HIIT intervention (fat mass: HIIT -7.9% vs. CON +4.7%, percent body fat: HIIT -7.6% vs. CON +2.9%, waist circumference: HIIT -4.5% vs. CON +0.8%). **CONCLUSION:** Our results demonstrate that low-frequency HIIT (i.e., performed once weekly) improves cardiorespiratory fitness and body composition in overweight/obese men.

Supported by HKU Seed Fund for Basic Research

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The Influence of Nutritional Intervention Program onthe Dietary Habits of High School Students

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(No relevant relationships reported)

The increase in obesity and sedentary lifestyle has caused many educational bodies to develop intervention programs in an attempt to implement healthier life style. **PURPOSE**: To assess the efficiency of an educational program embedded in a high-school curriculum on dietary habits of the students. **METHODS**: Fifty eight 10th grade students (15-16 yrs) participated in this study. 29 students were chosen randomly to attend four lectures on healthy nutrition habits. The lectures were given once a month for 4-month period by their physical education teacher, who had an appropriate background in nutrition. The other 29 students served as a control group and did not attend the lectures. All students were asked to fill-out a questionnaire before the intervention and three month after the last lecture. **RESULTS**: After the intervention program, the study group was found to adopt healthier dietary habits, expressed by higher consumption of grains ($p<0.019$), and vegetables ($p<0.0039$) in comparison to the control group. Interestingly, no differences were found between the two groups in the level of the students' knowledge on nutrition habits at the end of the intervention program. **CONCLUSIONS**: A nutrition intervention program for high school students as part of their curriculum has an effect on their nutritional habits and can lead to a positive change in their eating habits. Including lessons on nutrition and wellness in school should be encouraged, in order to increase students' awareness and implementation of healthy life style behaviors.

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Effect of A Neuromotor Intervention on Balance and Strength

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(No relevant relationships reported)

Falls are the most common mechanism of injury and a leading cause of accidental death in the elderly. Therefore, functional independence for the elderly is clearly contingent upon fall prevention. **PURPOSE** : The purpose of this study was to determine the effectiveness of a neuromotor-based exercise intervention on balance, balance confidence, and strength in older adults. **METHODS** : Nine individuals (eight female) with a mean age of 78.3 ± 9.3 years were assessed before and after a 16-session exercise intervention implemented over eight weeks. Balance was assessed using the Berg Balance Scale (BBS); lower-body strength and endurance was assessed using a 30-second sit-to-stand test (30 SSTS); balance confidence was assessed using the Activities Specific Balance Confidence Scale (ABC); finally, a handgrip dynamometer was used to assess grip strength. Participants were instructed in an exercise session two times per week consisting of the following exercises: squats, chair dips, lunges, band rows, hip flexion and extension, bicep curls, plantarflexion and dorsiflexion with band resistance, and a balance progression series. Two sets of 10 repetitions were completed for each exercise. **RESULTS** : There was a significant difference in balance, as indicated by an improvement in BBS from 44.5 ± 14.5 to 47.6 ± 14.6, ($p < 0.05$) after the intervention. Although not statistically significant, there was an 18 percent increase in 30 SSTS performance, from 11.0 ± 4.7 to 13.1 ± 3.9 repetitions. Similarly, ABC scores improved practically but not significantly, from 73.6% ± 14.8 to 79.2% ± 15.7. Pre- and post-test scores for grip strength performances were not statistically different. **CONCLUSION** : The findings of this study indicate that a 16-session neuromotor-based exercise intervention has a positive influence on balance in older adults. Moreover, there was a clinically significant improvement in 30 SSTS and ABC measures. It is strongly recommended that the elderly be encouraged to participate in similar neuromotor-based training, as this type of intervention may reduce falls and enhance independent living.

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Health And Wellness Coaching Improves Body Composition and Quality Of Life With No Diet Prescription

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(No relevant relationships reported)

Global obesity rates have reached epidemic proportions. However, it is estimated that 95% of the dieters find difficulty in maintaining weight loss and return to gain it for up to 2 years. The desire for long lasting behavioral and weight changes motivated health professionals to seek for new approaches to stop the obesity growing rates. Health and wellness coaching (HWC) comes up as a behavioral change approach, based on a client-centered process, without a diet prescription, and seems to be more likely to promote long lasting changes. The subject of this study had previously tried different diets, all of which failed to achieve lasting weight loss.
PURPOSE:the aim of this case report is to present and evaluate HWC in promoting sustainable lifestyle changes especially in body composition, eating pattern and self-assessment of quality of life.
METHODS: body composition, quality of life (WHOQOL-bref) and nutritional intake were assessed at baseline (P1), after 12 weeks of HWC (P2) and 14 weeks after the end of the intervention (P3). 12 HWC sessions were completed, which were held weekly (1 hour each), and 36 physical activity sessions, which were held 3 times a week (1 hour each). No diet was prescribed during the whole process.
RESULTS: In P3, HWC and physical activity sessions were associated with reductions in body weight (-5.1 kg), fat mass (-5.2 kg), BMI [from 29.6 (P1) to 27.8 kg/m^2 (P3)], and waist circumference (-7.1cm). From P1 to P3, we also observed maintenance of the fat free mass (54,1 kg), a decrease in total energy intake (-300 kcal/day) and fat intake (-44%). Great improvement in all aspects of self-rated quality of life was also shown. This outcomes emphazise the effectiveness of HWC in promoting behavioral changes with high impact in health parameters and quality of life.
CONCLUSIONS: HWC was effective once the new eating pattern and weight loss achieved during the process were maintained in the medium term after the end of the sessions.

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Epidemiology Of Self-reported Physical Activity In Eight Latin American Countries: Findings From Elans Study

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(No relevant relationships reported)

BACKGROUND: The prevalence of physical inactivity in Latin America was one of the highest reported worldwide. The purpose of this study was a comparative international study of population PA prevalence across eight countries from Latin American. **METHODS:** Data from the Latin American Study of Nutrition and Health (ELANS) were included in the analysis. The sample included 9,218 adolescents and adults aged 15-65 years. PA was assessed using the International Physical Activity Questionnaire. PA was compared among countries, gender, age group, socioeconomic, educational level and different PA domains. In addition to using the MET-minutes/week rank, we also used the rating in active or insufficiently active based in minutes/week. Individuals were categorized as active (mean ≥150 min/week) or insufficiently active (mean ≤150 min/week). **RESULTS:** The prevalence of physically active individuals was 52.5%. Men were more active than women in all countries. Only 13.4% of the population had high PA level and 27.4% showed moderate PA level. More than half (59.3%) of subjects exhibited low levels of PA. The prevalence of physically active individuals slightly, increased from low to high socioeconomic level. Regarding the educational level, the prevalence of physically active individuals was similar among those who have a lower educational levels, high school studies, and university degrees (52.4, 52.0, and 52.3%). The largest fraction of transportation time was explained by walking time (87%). Vigorous-intensity PA was the one that contributes the most for the total leisure time (52%). Recreation/sport time contributes with 25% to total leisure time. The total of minutes of PA is explained in 55% by leisure time and in 45% by transportation time. Most of the countries more than 80% of total MET-minutes/week were explained by walking (44%) and vigorous-intensity PA (39%). The only exceptions were Ecuador and Chile, the two countries with the highest levels of PA. **CONCLUSIONS:** The high percentage of Latin American subjects insufficiently active people and with low levels of PA should be of concern. Measures are needed to promote the practice of PA. If assessment methods are used consistently over time within this world region, trend data will inform countries about the success of their efforts to promote PA.

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Efficacy Of A Workplace Wellness Program On The Staff Of A Hemodialysis Clinic

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(No relevant relationships reported)

Current evidence indicates that health and wellness programs in the workplace provide numerous benefits with respect to altering indices of health. **PURPOSE**: The purpose of this pilot study was to assess the feasibility of a workplace wellness program (WOW) as a means of improving participation in habitual physical activity and improving dietary choices amongst the staff at a hemodialysis clinic and to assess the indirect impact of a workplace wellness program (WOW) on the hemodialysis patients. **METHODS**: 16-staff members (age: 45±8 y; BMI: 32±9 kg/m^2) from a hemodialysis clinic (nurses, technicians, and administrative staff) participated in a 12-week workplace wellness program (WOW) consisting of weekly counseling sessions, the provision of educational resources, physical activity incentive challenges, and healthy dietary choices challenges. Body weight (kg), height (cm), blood pressure, BMI (kg/m^2), waist circumference (cm), and hip circumference (cm) were collected 1-week prior to the intervention, at 6-weeks, and within 1-week following the conclusion of the intervention. **RESULTS**: On average participants lost 2.7±3 kg. (P<0.0002). There was a systolic blood pressure change of -16.86±19.81 mm Hg. BMI changed by an average -1±1.7 (P<0.0002). Waist Circumference changed by -2.6±3 cm (P<0.0016) and Hip Circumference changed by -3.29±4 cm (P<0.0001). **CONCLUSION:** Our data demonstrated that the staff of a hemodialysis clinic improved BMI values in response to WOW. The pilot study suggests that a workplace wellness program has the potential to improve health indices of the staff of a hemodialysis clinic and may positively impact the health behaviors in the hemodialysis patients under their care.

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Changes in Physical Activity Using Motivational Interviewing in Law Enforcement Officers

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to investigate the effects on physical activity with the utilization of motivational interviewing (MI) on sedentary law enforcement officers (LEOs). In addition, this study considered the reasons why LEOs choose to be participate in physical activity or to stay sedentary. The incidence of cardiovascular disease and early mortality are prevalent in LEO, additional behavior change technique research may have a potential impact in their long term health and wellness. **METHODS**: The LEOs in this study represent veteran officers from the Midwest region of the United States, over the age of 35 years, who were not getting greater than 150 minutes a week of exercise. of the five officers involved in the study received four MI sessions in 6 weeks. Data collection procedures for this included transcripts from MI sessions, pre/post results from the Self-Efficacy for Exercise (SEE) scale (Bandura, 2006), the Stages of Exercise Behavior Change scale (SEBC) (Marcus, 1992), and 6 weeks of accelerometer data. A descriptive case study of five law enforcement officers was presented with examples drawn from data, followed by a cross-case comparison of the five officers. **RESULTS**: Overall, the number of steps for the participants increased a total of 20.6% from the pre-MI (420,044 steps/week) to the post-MI (506,780 steps/week. The SEE score increased by 18%. Positive movement in the SEBC was seen from pre-MI to post-MI in three out of five of the case study participants. The findings from this study also indicated four major themes regarding why officers make the physical activity choices that they make: (1) their life depends on it, (2) competition is key, (3) I'm too tired, who has energy to exercise, and (4) they choose to fail. **CONCLUSIONS**: Based on this study, sedentary LEOs can increase physical activity, increase SEE and help individuals to move closer to making behavior changes. Motivational interviewing can used an effective behavior change technique in LEOs. It can also be noted that officers have distinct barriers that keep them from participating in physical activity. Allied health care professionals and worksite wellness could benefit from information gained from this study.

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Health Professionals Trained As Diabetes Educators Are Influential In Their DM2 Patients´ Lifestyle

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(No relevant relationships reported)

Diabetes mellitus (DM) is a pandemic disease. In 2015, 422 million people around the world were living with DM, 80% in developing countries. 642 million are expected to have DM by 2040; North America and the Caribbean will contribute with 60.5 million. Since long time ago it has been claimed that DM's treatment for control, as well for secondary and tertiary prevention should be based on education. **PURPOSE**: to compare life style in type 2 DM (DM2) patients being attended by health professionals trained or not as diabetes educators (HP-DE and HP-nonDE, respectively). **METHODS**: 160 DM2 patients, receiving health service in public health centers in Central Mexico, signed an informed consent, and answered a validated questionnaire to assess lifestyle in persons living with DM2 (IMEVID). The survey contains 25 items, distributed in seven domains, i.e. Nutrition, Physical Activity, Information on Diabetes, Adherence to Treatment, Alcohol Consumption, Emotion Management and Tobacco Consumption. Descriptive and inferential analysis was done using SPSSv21. **RESULTS**: 160 DM2 patients (70.6% women and 29.4% men) of 57.7±9.2 years (□±s.d.; n=152) were assigned to two groups: 1) 84 (55.0%) participants being attended by HP-DE; 2) 72 (45.0%) patients being served by HP-nonDE. The IMEVID total scores and the separated dimensions' scores were analyzed with Kolmogorov-Smirnov Tests. Total scores mean, HP-DE = 78.6±10.0/HP-nonDE = 61.3±12.7 were compared using a *Student's t* test for independent samples, resulting statistically different ($p<0.001$). Six out of the seven dimensions were as well different (U-Mann Whitney): Nutrition, Physical Activity, Diabetes Information, Adherence to Treatment (p=0.001 for the previous four), Alcohol Consumption (p=0.02) and Emotion Management (p=0.04). **CONCLUSION**: training health professionals as diabetes educators have a positive impact on the lifestyle of their DM2 patients.

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Enhancing Goal Achievement: Do Implementation Intentions Influence Goal Achievement in a Worksite Pedometer Program?

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(No relevant relationships reported)

For behavioral change, having strong goal intentions does not guarantee goal achievement. Implementation intentions (II) are specific plans of action concerning when, how, and where an intended behavior will be enacted. This self-regulatory skill combined with self-monitoring from daily pedometer use may influence goal achievement. **PURPOSE:** To examine physical activity (PA) goal achievement between participants that used both II and a pedometer and those that just used a pedometer. **METHODS:** Sedentary employees (<150 minutes of moderate to vigorous PA/week) (N = 54) at a mid-sized public university were recruited to participate in an 8-week intervention. A 2-arm randomized trial was used to compare the effectiveness of: 1) only pedometers (PED) (n = 26) and 2) pedometers and II (PED + II) (n = 28) on goal achievement. All participants were asked to track steps daily. Participants in the PED + II group were asked to write three II for each perceived barrier to meeting their step goals in Weeks 1 and 4. Daily step goals for Weeks 1-3 were based on baseline data, increasing daily goals each week 10% (Time 1). At Week 4, participants were able to individually revise or keep their daily step goals for the remainder of the study to promote autonomy (Time 2: Weeks 4-8). Goal achievement was evaluated as whether the participant met their daily step goal each day that week (YES) or not (NO). **RESULTS:** For Time 1, at least one day/week goal achievement was higher in the PED group (97.4%; 25 ± 1) compared to the PED+II group (83.3%; 23.3 ± 3), as well as for Time 2 the PED was higher (84.6%; 22 ±2.8) than the PED+II group (70.0%; 20 ± 5.9). For ≥3 day/week goal achievement, the PED group again had higher goal achievement Time 1 (75.6%; 20 ± 2) and for Time 2 (57.1%; 16 ± 4) compared to the PED+II group (42.3%; 11 ± 5.3) and (35.5%; 10 ± 5.4); respectively. **CONCLUSIONS:** The PED group had higher goal achievement at both time points compared to the participants in the PED+II. Implementation Intentions have been promoted as a behavioral strategy to bridge the gap between intention and behavior, with specific emphasis on improving goal achievement (Gollwitzer & Sheeran, 2006). These results question the utility of II to enhance goal achievement. Further research is needed to examine if this contradictory finding is unique to worksite pedometer-based II.

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Do Bike Fix-It Stations Influence Active Transportation Awareness and Behaviors in a School Setting?

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate the influence of the installation of bike fix-it stations on active transportation (AT) awareness and behaviors among middle school students. Self-reported barriers to active transportation (AT) were also recorded. **METHODS**: Three suburban middle schools in Colorado (USA) installed bike fix-it stations on school property that were available for students to use to perform minor repairs to their bikes. A questionnaire was developed by the school district that inquired about AT behaviors (e.g., day·wk^{-1} biking to school) and awareness and use of the fix-it station. The questionnaire was administered before installation of fix-it stations (pre-survey) at the various schools between October 2015 and October 2016. Approximately one semester after installation of the fix-it station at each school, post-surveys were collected. Survey results from individual schools were aggregated at the district-level. Descriptive statistics were calculated for variables of interest and nonparametric tests were used to determine if the differences existed, pre- to post. **RESULTS**: The vast majority (80%) of respondents had not used their school's fix-it station at the time of the post-survey. There was no significant difference in the number of days respondents biked to school each week, pre-to post-survey. Both those who were aware of the station and those who said they did not need training on its use were more likely to ride their bikes to school, though these relationships were not statistically significant. The most commonly selected barriers to active transportation were time (43%), distance (42%), weather (36%), and having things to carry (38%). Between genders, boys were more likely commute via AT than girls ($p < 0.05$). **CONCLUSIONS**: The installation of bike fix-it stations alone does not appear to increase AT, although the students in this survey were often not aware of or trained to use the station which may have affected these results. Other barriers should be addressed to make AT a more feasible choice for students.

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Comparing Home- And Group-based Physical Activity Interventions For People Living With HIV

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(No relevant relationships reported)

The transition of HIV infection from a terminal illness to a chronic disease requires a focus on lifestyle interventions to address health challenges in this vulnerable population. Social, mental and physical barriers to recruitment/retention of participants can create challenges to acquiring accurate measurements during studies. **PURPOSE**: The purpose of this investigation is to compare the methodologies and results of two approaches to community-based health interventions for people living with HIV (PLWH). **METHODS**: Data from an ongoing support group-based (SGB) intervention designed to improve health-related quality of life (HRQOL) through classes that teach and reinforce healthy lifestyle habits, like increasing physical activity (PA), for disease and symptom management was compared to that of a previously published home-based (HB) intervention by the investigators. The same accelerometer brand and psychometric questionnaires were used in each study. The SGB approach included the addition of Fitbits to help set goals and track progress. The approaches of each investigation were compared using the average changes from baseline in an independent t-test. **RESULTS**: The SGB study participants significantly increased daily steps from 4,326 ± 389.83 to 8,400 ± 487.58 ($p=0.01$), as well as mental health ($p=0.03$) and physical function ($p=0.04$) as measured by the SF-36. A decreasing trend in weight and perceived stress was also observed. The HB approach resulted in no significant change in daily step counts ($p= 0.49$). In comparison the HB intervention was more successful in retention rates and gathering reliable follow-up data with 57 participants. Although only 5 participants (out of 15) were retained at follow-up, the SGB study, however, did have more success increasing daily PA by 94% compared to a -5% change in the HB. **CONCLUSIONS**: Our results indicate that compared to an individualized HB program a SGB approach could be more effective in changing healthy behavior, like increased PA and stress reduction, to improve HRQOL in vulnerable populations. With minimal funding and no incentives offered, the SGB study encountered survival bias so it would be prudent for future investigations to find creative ways to keep participants involved in the program to determine their feasibility and effectiveness more reliably.

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College Students' Situational Motivation and Physiological Outcomes during Single and Double Player Exergaming Conditions

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(No relevant relationships reported)

PURPOSE: College students' psychological and physiological outcomes during single and double player exergaming conditions remain largely unexplored. The purpose of this study was to examine differences in college students' situational motivation, physiological responses and PA levels during single player and double player exergaming conditions.
METHODS: Twenty Chinese elite athletes (18 females; $\bar{X}_{age}$ = 27.3 ± 4.3 years; $\bar{X}_{wt.}$ = 63.5 ± 9.9 kg) completed two separate exergaming conditions: 1) Xbox 360 Reflex Ridge-single player; and 2) Xbox 360 Reflex Ridge-double player. Participants' situational motivation (intrinsic motivation [IM], identified regulation [IR], extrinsic motivation [ER], amotivation [AM]) was examined following each exergaming condition using an established questionnaire. Blood Pressure (BP) response to each exergaming condition was measured using an Omron HEM-705CP digital BP cuff, with light PA (LPA), moderate-to-vigorous PA (MVPA), and energy expenditure (EE) assessed using ActiGraph GT3X+ accelerometers.
RESULTS: One-way ANOVAs suggested that no significant differences were observed for any outcome between the two exergaming conditions, F (1, 38) = 0.002-1.9, p = 0.2-1.0; n^2 = 0.0-0.05. However, it is noteworthy that participants demonstrated higher levels of IM and IR (5.5; 4.7, respectively) compared to ER and AM (3.4; 2.2, respectively) during both exergaming conditions. Further, participants engaged in slightly greater MVPA during the single player condition (8.8 minutes) compared to the double player condition (7.8 minutes)—resulting in greater EE being observed during the single player condition (63.7 kcalories) compared to the double-player condition (52.8 kcalories).
DISCUSSION: Findings suggest both single player and double player exergaming conditions may promote motivational states which are more predictive of long-term PA participation (i.e., IM and IR) and that a single player exergaming condition might be more physically demanding than a double player condition. The non-significance between conditions may due to small sample size, and thus future research with larger samples is warranted.

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Comparison of Caloric Expenditure in a Smart Watch and Portable Metabolic Cart

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(No relevant relationships reported)

Purpose: To validate a Smart Watch (SW) for wheelchair users by comparing caloric energy expenditure (EE) against expired gas analysis. Valid activity tracking will be helpful for clinicians, patients and consumers and may help increase physical activity levels among wheelchair users.
Methods: Five wheelchair users (age=50.0(5.6)) and three able-bodied (age=25.3(3.2)) participants completed a series of exercises including wheelchair treadmill propulsion at 30, 45, and 60 strokes per minute (spm) and arm cycle ergometry at 45, 60, and 80rpm. They were equipped with a SW on their dominant hand, heart rate monitor, and a portable metabolic tracking cart. The bundled workout app was used for each task. Caloric expenditure data was extracted from both devices and compared by Bland-Altman analysis. **Results:** For treadmill tasks, the SW reported the average EE at 30, 45, and 60spm frequencies were 7(2.0), 8(2.3) and 9(2.0) kcals, respectively. At the same frequencies, the metabolic cart expenditures read 10(3.9), 12(5.3), and 15(6.7). Bland-Altman analysis showed relatively poor agreement between the cart and watch at 30spm (mean difference 3 with limits of agreement (LoA) -4–9). Mean absolute percent error (MAPE) was 21.56%. Agreement worsened at higher stroke frequencies, 45spm (4(-4–12)) and 60spm (6(-4–10)). MAPE was 29.11% and 35.88%, respectively. For arm ergometry, the average EE reported by the watch at 45, 60, and 80rpm were 7(1.0), 9(1.5), and 11(1.4). Metabolic cart expenditures were 6(3.0), 7(2.4), and 8(2.8) at the same frequencies. Bland-Altman analysis showed good agreement at 45rpm (-0.4(-6–5)) with a MAPE of 32.69%. Agreement worsened at higher frequencies, 60rpm (-3(-6–1)) and 80rpm (-2(-7–2)). MAPE was 58.57% and 48.54%, respectively. **Conclusion:** While performing a treadmill task, the SW underestimated caloric expenditure, but overestimated for arm ergometry. The activity tracker records EE with good validity only at lower frequency tasks.

B-67 Free Communication/Poster - **Older Adults and Aging**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

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Weight Loss Involving Exercise Increases Older Women's Perceived Ability To Accomplish Their Physical Roles

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(No relevant relationships reported)

PURPOSE: Older women are known to be at higher risk for both obesity and physical disability compared to their male counterparts. Reductions in perceived physical function (P-PFx) contribute to a decreased health-related quality of life (HRQoL). Weight loss can improve HRQoL in the domain of P-PFx, but the weight loss method that elicits the greatest improvements in both P-PFx and physical role limitations (PRL), such as difficulties or limitations in habitual daily physical activities, is less well characterized in older women. Thus, this study aimed to evaluate the relative efficacy of a weight loss program, with or without exercise, on changes in P-PFx and PRL in inactive overweight and obese older women.
METHODS: Women (n=53; 64-77 & 69.3±3.6 yo; 31.0±4.8 kg/m^2) were randomized to either diet only (D; n=19) or diet+exercise (D+EX; n=34) treatment groups for 6 months. The diet component involved reductions of ~500 kcal/day and was designed to elicit ~10% weight loss. The EX program was comprised of 3 x 75-minute sessions/week with cardiorespiratory, resistance, flexibility, and balance modes. Outcomes of interest were related to physical domains and were assessed using SF-36 subscales that measure P-PFx and PRL.
RESULTS: Mean weight loss was similar in D and D+EX groups (9.9% vs. 9.1%, p>0.05). Within groups, both D and D+EX improved in P-PFx and PRL (all p<0.05). ANCOVA, controlling for baseline measures, revealed no group difference for change in P-PFx (p>0.05), but a group effect for PRL was evident with D+EX having a 16.5% greater change compared to D (p<0.01). Comparing groups, Cohen's d effect sizes were 0.18 and 0.86 for change in P-PFx and PRL, respectively. In the total sample, change in weight was not associated with change in P-PFx and PRL (r=-0.09 and 0.04, respectively, both p>0.05).
CONCLUSIONS: P-PFx is improved in older overweight and obese women after a weight loss intervention irrespective of whether it included exercise. Perceived ability to accomplish physical roles improved to a greater extent with exercise inclusion in the weight loss intervention in this older adult cohort.
Funded in part by The Beef Checkoff

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A Comparison of Changes in Strength And Dynamic Balance Following 8 Weeks of Eccentric Training in Older Adults

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(No relevant relationships reported)

PURPOSE: To compare changes in leg strength and dynamic balance following training on an eccentric step trainer. **METHODS:** Participants (N = 14; 63.5 ± 2 years) completed 2 training sessions per week across 8 weeks, with session duration ≤ 10 minutes. Pre- and post-assessments included a 30-second repeated chair stand (RCS), the timed-up-and-go (TUG), and maximal eccentric strength (MES). Pre-test values for the sample were compared to population averages for the RCS and the TUG, to characterize the sample. Percent change was calculated using: [(Pre-test - Post-test)/Pre-test] x 100 and paired sample t-tests were conducted to compare changes on RCS, TUG, and MES. **RESULTS:** All participants met or exceeded the population average on the TUG and, overall, the sample began at a higher level on the TUG relative to this average (p = .031). In contrast, the sample for RCS began training below the population average (p = .041) and only 4 of 14 initiated training at or exceeding the population average. There was a significantly smaller percent improvement for TUG than MES (p < .001) and RCS (p = .001). There was no significant difference in percent improvement between RCS and MES. **CONCLUSIONS:** The positive changes in RCS and MES indicate similar improvements in eccentric and functional strength following the 8 week eccentric training program. The smaller percent change on the TUG may be attributable to the higher baseline performance. Further investigation using other assessments of general function and dynamic balance should be considered for samples with above average TUG performance.

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Changes In Cortical Gray Matter Following A 12-mohth Physical Activity Intervention In Older Adults

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(No relevant relationships reported)

Changes in cortical gray matter following a 12-mohth physical activity intervention in older adults
Chelsea Stillman*[1], Jamie Cohen*[1], Arthur F. Kramer[2], Edward McAuley[3], Kirk Erickson[1]
[1]University of Pittsburgh; [2]Northeastern University; [3]University of Illinois
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PURPOSE: Aging is characterized by reductions in gray matter volume. Cardiorespiratory fitness is associated with higher cortical and subcortical gray matter volume in older adults, and several interventions have indicated that some brain areas might increase in volume after the intervention. However, volumetric changes in *cortical* regions have been under-examined in the context of controlled interventions. In the present study, we examined whether a 12-month randomized, controlled aerobic exercise intervention in older adults would change cortical gray matter volume.
METHODS: 116 participants were assigned to either an aerobic **walking** or **control** (stretching and toning) group. All participants completed MRI sessions before and after the intervention, which included high resolution structural scans. Our initial analyses focused on participants who maintained at least 75% adherence (N = 79 total; mean age = 66.94; 31 males). Thus, our primary analyses include 43 participants from the walking and 36 from the control groups. Gray matter volume was assessed via voxel-based morphometry (VBM) in FSL. Longitudinal VBM analyses were conducted on the images to test for differences between groups.
RESULTS: Following the intervention, gray matter volume increased in the bilateral frontal poles and middle/inferior temporal gyrus, as well as in the left anterior parahippocampus and posterior cingulate in the walking group compared to the control group. Unexpectedly, several regions increased in volume in the control group relative to the walking group, including the cerebellum and precentral gyrus.
CONCLUSIONS: Aerobic exercise is associated with plasticity in cortical gray matter in older adults. Among the most modified regions were those especially vulnerable to aging, including the prefrontal and medial temporal lobes. The reduction in volume in several motor and balance-related regions in the walking versus the control group may suggest that the effects of aerobic exercise on brain plasticity are regionally specific.

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Impact Of BAILAMOS© Dance Program On Self-reported Physical Activity In Older Latinos

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(No relevant relationships reported)

By 2050, 20% of the older population in the US will be comprised of Latinos. However, Latino health is often poorer than that of non-Latinos whites, with a higher prevalence of chronic diseases and Alzheimer's disease. In addition, Latinos engage in low leisure-time physical activity (LTPA) levels. **PURPOSE:** Test the impact of the BAILAMOS© dance program on lifestyle PA at 4 months and BAILAMOS© maintenance activities on lifestyle PA at 8 months. **METHODS:** Older Latino adults (N= 333; M_{age} = 64.89±7.08) were randomized into the dance (n=167) or health education (HE) (n=166) groups. Inclusion criteria were: (1) aged ≥55 years old; (2) self-identification as Latino/Hispanic; (3) Spanish speaker; (4) participation in ≤2 days/week of aerobic exercise; (5) at risk for disability; (6) Mini-Mental State Examination >14; (7) Danced <2 times/month over past year. The dance group participated in 4 months of Latin dancing, two times per week, plus a 4-month maintenance program. The HE group participated in health education classes once per week for 4 months. The Community Healthy Activities Model Program for Seniors (CHAMPS) Physical Activity Questionnaire was administered. A random-intercept mixed model with data imputation was performed, adjusting for baseline covariates of age, sex, education, income, and health status. **RESULTS:** Total PA significantly increased at 4-months in both dance (M=899.3 ± 538.6) and HE groups (M=870.4 ± 555.8) compared to baseline (Dance, M=718.2 ± 529.4; HE, M=702.3± 437.9; Estimate=137.08, SE=57.52, p=0.017). It was also observed that total LTPA increased in the dance (M=578 ± 433.2) and HE group (M=464.2 ± 394.6) at 4 months compared to baseline (Dance, M=385.3 ± 416.9; HE, M=364.8 ± 332.7; Estimate=89.9, SE=43.81, p=0.04); and from baseline to 8 months (Dance, M=536.1 ± 470.6; HE, M=436.3 ± 336.5; Estimate=104.09, SE=47.36, p=0.028). The mean change in LTPA between dance and HE at 4-months was statistically significant (M=114.24, SE=48.84, p=0.019). However, there was no group*time interaction (p > 0.05). **CONCLUSION:** The results demonstrated that both study groups increased their self-reported total and leisure-time PA after 4 and 8 months, suggesting a positive impact of both dance and the HE program on PA levels in older Latinos. Supported by NIH Grant 1R01NR013151-01.

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Effects Of Lower-leg Training With CLX Bands On Balance, Strength, And Mobility In Older Women

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(No relevant relationships reported)

Weakness in the lower-leg, particularly the tibialis anterior, can negatively impact balance and mobility, and thus exacerbate the risk for falls. Although a variety of interventions have been shown to improve strength and balance, such programs often require extensive time and trained professionals. Furthermore, targeting the muscles of the lower-leg is difficult using traditional resistance exercises. The advent of CLX elastic bands with their continuous-loop design has made it easier to perform such exercises. However, the efficacy of such training is unknown. **PURPOSE**: The purpose of this study was to determine if performing two lower-leg exercises using CLX bands for short periods of time (10 min) each day in a home-based setting improves strength, balance, and mobility in older women. **METHODS**: Eleven women (age=78.8±4.8yr) participated in exercise training and 10 women (age=77.7±4.5yr) served as controls. All participants were sedentary retirement community residents. Training consisted of chair-based dorsiflexion and plantar flexion exercises using CLX bands performed in the residents' apartments for 3 sets of 10 repetitions on 5 d/wk for 8 wk. Performance was assessed before and after the intervention. Isometric dorsiflexion and plantar flexion strength was assessed using a hand-held dynamometer. The Limits of Stability (LoS) test, performed on a force platform, was used to assess dynamic balance. Mobility was assessed by the Timed Up-and-Go (TUG) test. **RESULTS**: Compared to controls, CLX band training improved (p<0.05) both dorsiflexion and plantar flexion by approximately 20%. LoS improved in the forward and backward (but not other) directions by 7% and 9%, respectively. TUG performance did not change in either group. **CONCLUSIONS**: Lower-leg training with CLX bands appears to improve dorsiflexion and plantar flexion strength as well as LoS in the forward and backward directions, but not mobility, in older women. These improvements may reduce the risk of falls.

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Combined Aerobic And Resistance Training In The Elderly: Effects Of Exercise Order On Arterial Stiffness

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(No relevant relationships reported)

PURPOSE: Prescribing aerobic and resistance training in conjunction is proposed as an optimum strategy to target cardiovascular as well as musculoskeletal functions in the elderly. However, few studies have examined the effects of intra-session exercise order on arterial stiffness in the elderly. This study investigated the effects of aerobic exercise before and after resistance training on arterial stiffness, body composition, and muscle strength in older men. **METHODS:** Forty-five older men (70.5±3.5 years) were randomly assigned to one of three groups that performed aerobic exercise first (AR: 16), performed resistance training first (RA: 16), and did not perform any training (CON: 13). The AR and RT groups performed aerobic exercise consisted of cycling at 60% heart rate reserve (HRR) and resistance training consisted of 5 types of exercises (leg curl, leg press, chest press, seated row, shoulder press) at 70-80% one repetition maximum (1RM) twice a week for 10-week. Body composition was evaluated by height, weight, body fat percentage, lean body mass and waist circumference. Muscle strength was measured by 1RM and arterial stiffness was evaluated by carotid-femoral pulse wave velocity (cfPWV). Pre- and post-intervention group comparisons were analyzed using a two-way ANOVA with repeated measures. **RESULTS:** A significant group difference was observed in cfPWV (F=3.464, P=0.042). cfPWV significantly reduced in the RA group (9.3±2.1 m/s to 8.2±1.9 m/s,P<0.05), while did not change in the AR group (8.4±2.1 m/s to 8.7±1.5 m/s, P=0.413). Significant group differences were observed in all exercise types (leg press: F=9.814, P=0.001; leg curl: F=26.667, P=0.001; chest press: F=17.223, P=0.001; seated row: F=15.648, P=0.001; shoulder press: F=13.244, P=0.001), and waist circumference (F=10.516, P=0.001). However, there were no significant differences between AR and RA. **CONCLUSION:** Based on our results, aerobic exercise after resistance training reduced arterial stiffness and a difference of intra-session exercise order was observed.

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The Relationships Of Physical Exercise To Executive Function And Mental Health In Elderly Individuals

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(No relevant relationships reported)

PURPOSE: In exchange for a life of greater convenience, the pandemic of physical inactivity has become a worldwide public health concern. This study aimed at evaluating the relationships of the intensity and types of daily physical activity and weight status to cognitive function and mental health among elderly individuals. These examinations may provide a useful evidence of how intense and what types of exercise improve cognitive function and mental health. **METHODS**: The total number of 307 healthy individuals (110 males, 197 females; 42 to 84 years old) was studied. The amount, frequency, intensity, and type of daily exercise were assessed by the questionnaire. The performance of inhibitory control as an index for executive function was evaluated by the Stroop Test. The status of mental health was evaluated by the General Health Questionnaire 28.
RESULTS: As the results, moderate intensity exercise habits were positively related to performance on Stroop Test after controlling for age, sex, and BMI (β = .10, p = .01). The interaction effect between sex and BMI on Stroop Test performance was observed after controlling for age, sex, and exercise habits (β = .10, p = .01). The over-weight was associated with poorer Stroop Test performance in females (β = .12, p = .02) but not in males (β = -.09, p = .16). No significant relationships of exercise type and performance on Stroop Test was detected. No significant relationships of age, sex, weight-status, and exercise habits to mental health status was observed, whereas resistance training was positively associated with mental health status (β = .12, p = .03).
CONCLUSIONS: This study suggests that daily physical activities with moderate intensities, but not with vigorous intensities, are associated with better executive function in elderly individuals. Furthermore, the relationships of weight-status and executive function may be moderated by sex. Resistance training appears to be useful exercise for enhancing mental health status in elderly individuals. Current results provide the evidence to help forming efficient strategies to personalize their active approaches.

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Effects Of 24 Months Resistance And Endurance Training On Muscle Quality, Quantity And Physical Functions In Elderly With Long-term Care

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(No relevant relationships reported)

Muscle quality has been determined the fat tissue content within a skeletal muscle (i.e. intramuscular fat content). Muscle quality become worse with aging and disuse as a result of increasing of intramuscular fat and/or decreasing of muscle tissue. Intramuscular fat content is known as a negative contributor to force production and physical functions. We have reported the unique change of muscle quality by the 12 months resistance and endurance training in elderly; however, it is not well understood how the muscle quality, quantity and physical functions change by further 12 months (totally 24 months) trainings. **PURPOSE**: The purpose of this study was to assesse the effects of 24 months training on muscle quality, quantity and physical functions in elderly who need long term-care. **METHODS**: Ten elderly men and women (6 women and 4 men, age, 77 ± 6 years; height, 154 ± 7 cm; weight, 54 ± 9 kg) participated in this study, and they needed long-term care while they could do almost all activities of daily living. They performed physical training consisting of resistive exercises, stretching, and aerobic exercises as a part of rehabilitation program once or twice a week for 24 months. B-mode transverse ultrasonographic images were taken from rectus femoris (RF) and biceps femoris (BF). Echo intensity (EI) as an index of muscle quality and muscle thickness as an index of muscle quantity was calculated from these muscles. We measured their physical performance tests, i.e. isometric knee extension peak torque (PT), one-leg stand, chair stand, handgrip strength, 5-m normal/maximal walk, and timed up and go, before and after the training. **RESULTS**: EI in RF and BF did not change through the intervention, but BF thickness was significantly increased after the training. PT, 5-m normal/maximal walk, and timed up and go were improved after the 24 months training. Percent change of PT was the only independent variable to explain the percent change of EI in RF (regression coefficient = 1.24, R = 0.91, adjusted $R^2 = 0.82$, $P < 0.001$), implying that improvement of PT could be induced increasing EI in RF. **CONCLUSIONS**: Twenty-four months concurrent training induced muscle hypertrophy with the improvement of physical functions. Furthermore, in this type of long-term training, the increase of EI RF could be a key to improve PT.

909 Board #170 May 30 3:30 PM - 5:00 PM

Physical Function, Cardiorespiratory Fitness, and Body Composition in Older Individuals

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(No relevant relationships reported)

Advanced age is often accompanied by deterioration of body composition and physical function. These alterations can lead to reduced performance of activities of daily living and autonomy. It has been purported that regular aerobic exercise may enhance physical function in older adults.
PURPOSE: To determine the effects of habitual physical activity on physical function (5m gait time, 5m gait speed, and total gait time), cardiorespiratory fitness (VO_{2max}), and body composition (body fat percentage, total lean mass, and bone mineral density) outcomes in older adults.
METHODS: 27 active and 35 inactive older adults (70 ± 5yrs, 73.4 ± 15.0 kgs, 170 ± 8.0 cm, 30.7 ± 7.5% body fat) were recruited for this study. The perceptually-regulated treadmill exercise test was used to estimate VO_{2max}. Body composition was determined by a whole body DXA scan. Gait variables were assessed via the 400m walking test. The Yale Physical Activity Survey (YPAS) was used to determine self-reported activity.
RESULTS: Active individuals had better 5m gait time (2.78 ± 0.24 vs 3.02 ± 0.48 seconds, $p < 0.05$), gait speed (1.81 ± 0.15 vs 1.68 ± 0.24 m/s, $p < 0.05$), total gait time (273.3 ± 21.6 vs 297.4 ± 43.0 seconds, $p < 0.05$), VO_{2max} (41.3 ± 9.1 vs 26.0 ± 4.1 ml/kg/min, $p < 0.01$), and reduced body fat (25.8 ± 6.6 vs 34.1 ± 6.24 %, $p < 0.01$) compared to sedentary individuals. Age was positively correlated with 5m gait time ($r = 0.39$ $P < 0.01$) and negatively correlated with gait speed ($r = -0.40$, $p < 0.01$), but was not a determining variable for any other physical function or body composition outcome. Exercise time (7.9 ± 5.8 hrs/week) was positively correlated with gait speed ($r = 0.27$, $p < 0.05$) and negatively correlated with 5m gait time ($r = -0.30$, $p < 0.05$), total gait time ($r = -0.30$, $p < 0.05$), and body fat percentage ($r = -0.33$, $p < 0.01$). VO_{2max} was negatively correlated with gait total time ($r = -0.258$, $p < 0.05$) and body fat percentage ($r = -0.580$, $p < 0.01$).
CONCLUSION: While aging is considered a main determinant for decrements in physical function, these data suggest that habitual exercise, low body fat percentage, and increased cardiorespiratory fitness are better determinants of improved physical performance in active older men and women.

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Impacts of Multidimensional Exercise Program for Older Adults on Mild Cognitive Impairment

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(No relevant relationships reported)

Substantial evidence suggest that the prevention and improvement were a crucial factor of the early stage of dementia. Although the exercise programs were found to improve positive effects of cognitive function, there is a lack of research on the impacts of their use in multidimensional exercise program design on functional fitness on mild cognitive impairment for older adults. **PURPOSE:** To examine the impacts of multidimensional functional fitness program design on mild cognitive impairment for older adults. **METHODS:** A pre -post one group experimental design for this study. The pool of available participants in this study were 25 volunteer with mild cognitive impairment elder (on age 65 or above) enrolled in a multi-exercise prescription program. For random reasons were not available for 10 subjects.
The final analysis was performed on a sample of 15 volunteer participants.(age: 78.76±7.06,height: 150.9±9.2,weight: 56.4±7.24. The material as measurement on cognitive function for participants was a Mini Mental State Examination, MMSE. The study was implemented during ten- weeks period. Each week was performed 90 min. on a multi-exercise prescription program. A multidimensional functional physical and mental fitness platform designed were performed on the program. Data analysis were applied to each of the dependent variables. A t-test was use for pre -post one group experimental design. After participants completed 10 weeks of training program, a post-test was delivered. Calculations were made using the Statistical Package for the Social Sciences(SPSS). All tests of significance adopted an alpha level of .05.
RESULTS: The participants demonstrated positive increased cognitive function on three dimensions: total score of MMSE (17.07±3.127 vs 21.93±3.845), reaching a significant difference ($p = .001$, $p < .05$). The average score increased from 17.07 before the intervention to 21.93 after the intervention. The results also revealed that two variables among MMSE score were significantly different for cognitive function performance including short-term memory ($p = .000$, $p < .05$) and understanding ($p = .002$, $p < .05$). **CONCLUSIONS:** The multidimensional functional fitness program intervention on mild cognitive impairment may result in older adults processing cognitive function more effective.

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Association Between Light Intensity Physical Activity And Sedentary Behavior Among Active Older Women

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(No relevant relationships reported)

Objective: to examine the association between light intensity physical activity (LIPA) and sedentary behavior (SB) among active older women. **Methods:**Physical activity intensity was based on the accelerometer scale sedentary, light, moderate, total moderate vigorous physical activity (MVPA), vigorous and very vigorous. Sample consisted of 75 women, with mean age 69.2 ±8.6 years old, BMI 20.2 ±14.4 kg/m². They were involved in a exercise program of 2 times sessions per week, 50 min duration each in a Municipal Elderly Center. All off them taken part in the Longitudinal **Project on Aging and Physical Fitness** from São Caetano do Sul. An accelerometer (*Actigraph GT3X+)* was used in the waist by the participants 24 hours per day, during 10 days in a row. Seven days data, including one weekenday, were considered for calculation, and accelerometer data from 6 am to 9 pm were taken for analysis**. Statistical Analysis:** The regression linear model was used with 95% Confidence interval for β to predict LIPA using SPSS 20.0, and a level of $p<.05$ was taken as significant. **Results:** 43% of participants reached the international recommendation for physical activity and health (at least 150 min per week). They spent 9.2 ±1.7 hour per day on sedentary behavior, 5.6 ±1.4 hours per day sitting time and 5.4 ±1.5 hours per day light-intensity physical activity. The prediction between light intensity physical activity (minutes per week) and sedentary behavior (minutes per week) time (β=-.986; 95% -.95 to -.88), and sitting time (β=.278;95% .001 to .009) and other intensities of physical activity are in the table below. **Conclusion:** Objectively measured of light-intensity physical activity time was significantly associated with sitting time,sedentary behavior time, modarate activity time, MVPA time and vigorous time among active older women.

Light Intensity Physical Activity (LIPA) Time (*N= 75*)	Adjusted R Square	95% Confidence Interval	p
Sitting Time	.065	(.001 - .009)	.001
Sedentary Behavior Time	.973	(-.947 - -.876)	.000
Moderate Physical Activity Time	.111	(.702 - 3.024)	.002
Moderate/Vigorous Physical activity Time	.112	(.702 - 2.999)	.002
Vigorous Physical Activity Time	.071	(24.368 - 191.241)	.012

p <.05

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Effects Of A 12-week Self-managed Exercise Program On Fatigability In Older Adults

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(No relevant relationships reported)

Aging is associated with greater fatigability and reduced participation in physical activity. Exercise training in older adults has been associated with a number of health benefits; however, less is known about the effects of self-managed exercise on perceived and performance fatigability. **PURPOSE:** Compare the effects of a 12-week self-managed exercise program on perceived (PercF) and performance (PerfF) fatigability in a group of unimpaired older adults. **METHODS**: 28 older adults participated in a self-managed exercise program (15 men and 13 women; age 71.3 ± 4.2 years). The program consisted of educational lectures on aerobic (AT), resistance (RT), and balance (BT) training methods as described by the National Institute of Aging. 17 adults completed the 12-week program in three exercise groups: AT only (n=8), AT/RT (n=5), and AT/RT/BT (n=4). Fatigability was assessed following a standardized 10-minute walk test at a self-selected speed at baseline (PRE) and at the conclusion of the 12-week exercise program (POST). PercF was calculated at the completion of walking by dividing participant-perceived changes in fatigue by the total distance walked in meters. PerfF was calculated as the change in walking velocity (at 2.5 and 10 minutes), divided by the total distance walked. Within-group data were analyzed with a paired *t*-test and between-group effects using one-way ANOVA. **RESULTS**: Within the AT and AT/RT groups, significantly lower PerfF was observed at POST ($p = .011$ and $p = .035$, respectively) with no differences found in the AT/RT/BT group ($p = .437$). PercF was unchanged in all groups (AT, $p = .50$, AT/RT, $p = .65$, AT/RT/BT, $p = .70$). No difference was observed between groups for PercF ($F(2,14) = 0.443$, $p = .651$) or PerfF ($F(2,14) = .528$, $p = .601$). Further, Cohen's effect size for changes in PerfF was moderate for AT ($d = .48$), AT/RT ($d = .38$), and AT/RT/BT ($d = .38$). **CONCLUSIONS**: Participation in a 12-week self-managed exercise program reduced performance fatigability in unimpaired older adults. However, our results did not reveal specific exercise recommendations for older adults to improve both performance and perceived fatigability. Future studies are needed to investigate the influence of exercise training on measures of fatigability to optimize exercise interventions.

913 Board #174 May 30 3:30 PM - 5:00 PM

Physical Activity And Technology: Older Latinos' Perceptions

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(No relevant relationships reported)

The Latino community in the U.S. experiences a high prevalence of chronic diseases that can be prevented or improved by physical activity (PA), yet Latinos engage less frequently in leisure-time PA (LTPA) than non-Latino whites. Technology can impact PA levels both negatively and positively. **PURPOSE:** To examine older Latinos' motivators and barriers for LTPA engagement and their perceptions on how technology can influence LTPA participation. **METHODS:** Six focus groups were conducted with 27 middle-aged and older Latinos, 55+ years old, who speak Spanish, and own a cell phone. Participants were recruited from a primarily Latino neighborhood in Chicago. Participants were asked about their overall perceptions and experiences with PA and technology. Participants' perceptions of the impact of technology on PA and sedentary behavior (SB) were specifically asked if these themes did not emerge from the discussion. Discussions were recorded, transcribed verbatim in Spanish, and translated to English. Directed content analysis was conducted. **RESULTS:** Participants reported improvements in health as the main motivator for PA engagement. Participants reported walking and dancing as the most common types of PA they participated in. Common barriers to engaging in LTPA were distance to facilities, and the need of companionship and extrinsic motivators. Participants mentioned that technology can both decrease and increase their PA levels. It was stated that the convenience of driving everywhere, using remote controls and paying bills online leads to more SB. On the contrary, participants mentioned that PA levels can be increased using technology with the example of the use of wearables. Perceptions about wearables varied from a great interest in using wearables as a motivating tool to the idea that wearables are unnecessary. **CONCLUSION:** Older Latinos reported being aware of the health benefits of participating in LTPA, and the majority of those who engage in PA participate in culturally-appropriate types of PA. Participants were aware of the negative changes in lifestyle PA with the advances of technologies on a daily bases; however, most of them were interested in using wearables as motivators for PA. Using wearables in PA interventions targeting older Latinos might be feasible.

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Changes in Global Health Status in Older Adults Following a Self-Managed Exercise Program

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(No relevant relationships reported)

Regular exercise has been shown to improve the health status of older adults, however less is known regarding the effects of a short-term, self-managed exercise program**PURPOSE**:To examine the effect of self-directed exercise on global health status in unimpaired older adults. **METHODS**: Older adults attended a series of educational seminars based on the National Institute of Aging guidelines for aerobic (AT), resistance (RT) and balance training (BT). Following exercise clearance by their physician, participants chose a combination of AT, RT and BT to perform over 12 weeks. 17 adults completed the self-managed exercise program and were grouped according to their reported activity: AT only (G1) n=8, 73±2 years; AT&RT (G2) n=5, 68±3 years; AT,RT,BT (G3) n=4, 70±1 years. Before and after the 12-week program, participants completed the PROMIS-43 Adult Profile Instrument to assess global health status, and the International Physical Activity Questionnaire for evaluation of weekly physical activity (expressed as energy expenditure, EE). A one-way ANOVA evaluated within group differences, while Cohen's effect sizes were calculated for combined groups in each domain. A regression analysis assessed the relationship between changes in each domain and EE at each timepoint. **RESULTS**: Depression was improved within G2 (P=0.038), however no difference was observed across other PROMIS-43 domains (P≥0.30) among the 3 groups. A trend toward significance was found for anxiety and sleep disturbance for G2. Collectively, all 3 groups showed large effect sizes for lower depression (d=1), and medium effect sizes for lower anxiety (d=.54) following the 12-week program. Small effect sizes were found for fatigue, social role, physical function and pain interference (d≥.4). EE predicted anxiety scores (β=.2, R^2=.3, P=.01), while G2 showed an association between depression and EE (β=.43, R^2 =.8, P=.026). **CONCLUSIONS**:Improvements in mental health were observed in older adults participating in a self-managed exercise program consisting of AT and RT. However, regardless of the training mode, anxiety and depression were reduced for participants that reported higher EE. This suggests a greater role for physical activity participation over type of exercise in older adults for improving mental health with a self-managed exercise program.

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Reducing Sedentary Behavior and Improving Physical Function in Older Adults

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(No relevant relationships reported)

Older adults spend 60-70% of their waking hours sedentary, increasing their risk for negative health outcomes. Thus, interventions that reduce sedentary behavior (SB) are needed. **PURPOSE:** Three pilot studies were conducted. The first two studies tested a small group intervention to reduce SB and improve physical function in older adults. The third study used a focus group to assess how to engage African American (AA) older adults in similar trials. **METHODS:** The interventions were based on self-regulation theory and consisted of 4 wkly sessions involving group discussions, goal setting, action plans, self-monitoring, and problem solving. SB and physical function were measured via self-report (SB questionnaire & SF-36) and objective measures (accelerometry & the Short Physical Performance Battery). Study 1 participants (N = 12; mean age=69 ± 5 yrs) completed assessments pre- and post-intervention; study 2 participants (N = 9; mean age=68 ± 2 yrs) completed assessments pre- to post-intervention and at a 4 wk follow up. Due to the pilot nature of this research, data were analyzed with effect sizes (Cohen's *d*). A 90-min focus group was then conducted with 10 AA women (mean age=71 ± 6 yrs). The session was recorded, transcribed, and summarized. **RESULTS:** *Study 1:* There were moderate to large reductions in SB (self-report $d = 0.95$; accelerometers $d = 0.53$) and a moderate improvement in physical function (self-report $d = 0.41$) post-intervention. *Study 2:* Post-intervention, there were small to moderate improvements in SB (self-report $d = 0.49$; accelerometers $d = 0.15$) and gait speed ($d = 0.22$) with further improvements at follow up (SB self-report $d = 0.85$; accelerometers $d = 0.57$; gait speed $d = 1.16$). Results from the focus group revealed positive attitudes towards the intervention, potential barriers for participation

(e.g., scheduling, location), and specific marketing strategies (e.g., pictures of AA adults on brochures, partner with a community sponsor). **CONCLUSION:** A group-based intervention targeting sedentary time showed promise for changing SB and improving function in older adults. With attention to scheduling, location and marketing, this intervention may be translatable to AA communities.
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Physical Activity Policy for Older Adults in China:A Textual Analysis

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(No relevant relationships reported)

PURPOSE: As a country under increasing financial pressure and with the largest aging population, China has launched a series of policies to promote the health of older adults through physical activities (PA). The purpose of this study was to analyze those policies. **METHOD:** An effort was made first to collect all related policies enacted between 1960 and 2017. The taxonomy of innovation policy proposed by Rothwell and Zegveld (1981) was then used to build the analysis framework for this study. Accordingly, 3 policy groups and 5 influencing factors classifications were derived to textually analyze policies collected. **RESULT:** A total of 44 related policies were identified. It was found that the Chinese government took an active role in environmental related polices (58%), followed by demand (14%) and supply (28%) related policies as figure 1. Specifically, the government focused more on launching strategies, developing infrastructure, and setting objectives for implementation. While the government still plays a key role in facilitating PA promotion for older adults, it also started to increase efforts to promote organizational participation. However, PA policies to support older adults' individual needs and PA in more scientific way in different settings, such as communities, workplace, and senior centers, were overlooked as figure 2. **CONCLUSION:** Presently, the policy for promoting PA among older adults by the Chinese government has been focused on environmental aspects. Future policy should recognize the diversity of older adults by taking into consideration of their health conditions so as to promote PA at a variety of ability levels. Finally, more scientific evidence-based health promotion programs should be developed and promoted through multi-sector and collaborative partnerships along with all related governmental offices.

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Efficacy Of Bingocize®: A Game-centered Mobile Application To Improve Physical And Cognitive Performance In Older Adults

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Reported Relationships: K. Crandall: *Intellectual Property; Western Kentucky University.*

PURPOSE: Adherence to health-promoting programs is a significant barrier to improving the health and well-being of older adults. The present study examined whether Bingocize®, a game-centered mobile app that combines exercise, health education, and bingo, could improve community-dwelling older adults' physical and cognitive performance. METHODS: Participants (N=85) used the app for approximately one hour, twice per week, for 10 weeks. Each using a tablet, they played the game in small social groups, and were randomly assigned to either an Experimental (Bingo + Health Education + Exercise; n=47) or Control (Bingo + Health Education; n = 38) group. Pre and Post-intervention assessments of (a) functional performance, (b) fluid cognition, and (c) knowledge of two health topics (osteoarthritis and fall risks) were administered. RESULTS: Two (Experimental/Control) x Two (Pre/Post) interactions were found for Arm Curls (F (1,81)=4.78, p=.03, ES=.06) and Chair Stands (F (1,81)=4.44, p=.04, ES=.05) and one domain of cognition (updating, a component of executive functioning) (F (1,79)=5.75, p=.02, ES=.07), such that the Experimental group improved more relative to the Control group. Both groups improved their knowledge of the two health topics (F (1,83)=275.56, p<.001, ES=.77). Alpha was set at .05. CONCLUSION: Our findings suggest the fun and interactive nature of Bingocize® may serve as an effective way to potentially improve multiple aspects of quality of life for community-dwelling older adults.

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The Effects of Pedometers on Body Weight and Metabolic Factors in Patients with Prediabetes

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(No relevant relationships reported)

Sedentary behavior, increased total body weight, elevated blood glucose levels and hyperlipidemia increase the risk of prediabetes. Individuals diagnosed with prediabetes (fasting blood glucose (FBG) between 100-125mg/dL) are recommended to perform a minimum of 150 minutes of physical activity (PA) per week and decrease total body weight by 7% to reduce the likelihood of developing type 2 diabetes. However, there is little known about the role of pedometers with regards to a Diabetes Prevention Program (DPP) **PURPOSE:** To determine if pedometer use could aid in the reduction of total body weight, cholesterol, and blood glucose levels as a part of the Centers for Disease Control National DPP. **METHODS:** Body weight, FBG and lipids (total cholesterol, high-density lipoproteins (HDL) and low-density lipoproteins (LDL)) were measured prior to the start of the DPP and 16 weeks following the intervention. All participants were either diagnosed as prediabetic or at risk for prediabetes based on the CDC screening tool. The pedometer group (PG) (n=9) received pedometers and the control group (CG) (n=8) did not. All participants received the same educational sessions that explained dietary changes and strategies to increase PA. The PG was asked to wear a pedometer on their belt for all waking hours of the day, seven days a week, for sixteen weeks. At each weekly DPP meeting, step counts from pedometers were recorded and pedometers were reset and returned to the participants. A 2x2 ANOVA was performed to examine differences. **RESULTS:** The PG experienced significant ($p<0.05$) weight loss from pre to post-test (186.2lbs $\pm$ 9.7 to 180.7 $\pm$ 8.9) while the control group did not (191.3lbs $\pm$ 16.8l to 190.1 $\pm$ 17.0). Interestingly, HDL significantly decreased from pre to post-test ($p>0.05$) in the PD group (58.1mg/dL $\pm$ 4.0 to 54.1mg/dL $\pm$ 3.6) while the CG remained unchanged (50.9mg/dL $\pm$ 5.1 to 50.5mg/dL $\pm$ 4.8). There were no differences between any other variables. **CONCLUSION:** It appears that the addition of pedometers into the DPP can contribute positively to weight loss. It is possible participants experienced a sense of greater accountability due to the added tracking tool. Further research and a larger participation population is needed to elucidate the mechanisms that contribute to the changes in body weight and lipid profile.

B-68 Free Communication/Poster - Chronic Disease

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MVPA And DXA-derived Adiposity In Adolescents With And Without Down Syndrome

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(No relevant relationships reported)

PURPOSE: Obesity is a highly prevalent secondary health condition among adolescents with Down syndrome (DS). It is thought that low levels of physical activity may promote excess adiposity in this population. However, reported associations between body mass index (BMI) and moderate-to-vigorous physical activity (MVPA) have been small and non-significant. The purpose of this study was to compare group differences in adiposity derived from dual-energy x-ray absorptiometry (DXA) and accelerometer-measured physical activity between adolescents with and without DS and then examine associations within each group.
METHODS: Thirty-nine adolescents (22 with DS and 17 typically developing (TD) controls), aged 12-18 years participated in the study. Groups had similar distributions of age, sex, and Tanner pubertal stage. Body composition was assessed by DXA, BMI, and BMI percentile. MVPA was measured with Actigraph GT3X+ accelerometers over 7 days. Group differences were analyzed with multivariate analysis of covariance (MANCOVA) while controlling for age, sex, Tanner pubertal stage, and accelerometer wear-time. Pearson product-moment correlation coefficients and linear regression were used to examine the associations between MVPA and adiposity among adolescents with DS and TD.
RESULTS: Adolescents with DS had significantly higher BMI, BMI percentile, and DXA-derived percent body fat (BF%), as well as lower minutes of MVPA compared to TD controls ($p < .05$). Associations between MVPA and BF% in adolescents with DS were moderate ($r = -.39$, $p = .07$), but substantially stronger than BMI ($r = -.19$, $p = .40$). However, linear regression analyses identified Tanner stage ($\beta = -.77$, $p <$

.001) and MVPA (β = -.34, p = .047) as statistically significant predictors of BF%. No relevant associations between body composition and MVPA were observed in adolescents with typical development (p > .05).
CONCLUSION: Our findings suggest that MVPA is associated with adiposity among adolescents with DS when properly measured with DXA. This study also provides further evidence of significantly higher levels of adiposity and significantly lower levels of physical activity among adolescents with DS compared to their TD peers, clearly reflecting a source of health disparity and need for targeted intervention.
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920 Board #181 May 30 2:00 PM - 3:30 PM

Cancer Cachexia: Metabolic Changes In Carbohydrate Metabolism Of The Liver

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(No relevant relationships reported)

One negative side effect of cancer that dramatically affects cancer prognosis is the development of cancer cachexia. Cancer cachexia is defined as cancer-associated muscle wasting. This is thought to be at least partially mediated by increased energy expenditure and is responsible for the death of 20-40% of all cancer patients. Although the liver is known to be the predominant regulator of whole body metabolism, there is little known about its relationship to the development of cancer cachexia. **PURPOSE:** The purpose of this exploratory study was to investigate alterations in liver metabolism by examining measures of glycogen storage throughout the progression of Lewis Lung Carcinoma (LLC) induced cancer cachexia. **METHODS:** C57BL/6J mice were injected with $1X10^6$ LLC Cells in the left posterior leg, and the control group with phosphate buffered saline (PBS). The experimental groups included PBS, 1wk, 2wk, 3wk, and 4wk of cancer progression with 10-16 in each group. Sections of liver (n=~8/group) were cut and periodic acid-Schiff (PAS) stain for glycogen was completed. Images were analyzed for total area of stain as well as intensity of stain using NIS-Elements imaging software. A Welch's one-way analysis of variance was used to determine differences between groups, a Tukey post hoc was used to determine differences between means. Significance was denoted at p<0.05. **RESULTS:** 4wk animals had ~30% larger livers compared to all other groups with no other differences detected (~1000mg compared to ~1300mg, p<0.05). However, there were no statistical differences detected between groups on either PAS area stained (~50% across groups, p>0.05) or intensity of stain (Arbitrary Intensity Unit ~30 across groups, p>0.05). Furthermore, neither glycogen area nor intensity correlated with liver size (r = 0.12 and r = 0.16 respectively). **CONCLUSION:** Differences in liver sizes are not attributable to glycogen storage. Though there were no differences in glycogen content, the increase in liver size suggests disruption of other processes in the liver. For future projects, we will further investigate mechanisms for liver hypertrophy in order to determine the relationship between the liver and cancer cachexia progression.
This study was supported by The Arkansas Bioscience Institute and National Institutes of Health R15AR069913.

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Time-Dependent Alterations in Liver and Adipose Mitochondrial Respiration During Colon-26 Cancer Cachexia

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(No relevant relationships reported)

Nearly half of all cancer patients undergo cachexia, a life-threatening condition characterized by weight loss and skeletal muscle atrophy. Recent frameworks describe cachexia a systemic condition in which several non-muscle organs are reprogrammed or remodeled. Mitochondria are organelles with a major role in cellular energy metabolism, and impairment of mitochondrial function is linked with a number of diseases. Adipose and liver are energy-regulating tissues implicated in cachexia. The control of mitochondrial respiration in these tissues during the induction and progression of cancer cachexia is not well-defined. **PURPOSE:** To investigate oxidative phosphorylation (OXPHOS) and electron transfer system (ETS) capacity in white adipose and liver during colon-26 tumor-induced cachexia. **METHODS:** Balb/c males (10 wks) were assigned to control or colon-26 (C26). C26 mice were injected with 10^6 tumor cells and euthanized for tissue at 7, 14, and 21 days post-injection. By day 21, C26 mice exhibit significant muscle atrophy. Controls were injected with PBS and euthanized for day 0 tissue. Epididymal white adipose tissue (eWAT) was immediately analyzed by high-resolution respirometry. The liver was permeabilized via mechanical separation prior to respiration. Saturating levels of substrates were used to evaluate Complex I OXPHOS (CI_p), Complex I+II OXPHOS ($CI+II_p$), and ETS. **RESULTS:** In comparison to day 0 liver (78±15 pmol/s/mg), CI_p was lower at day 14 (26±6, p=0.08) and day 21 (8±4, p<0.05). CI_p was also lower in day 21 liver vs. day 7 (p<0.05) and day 14 (p=0.06). In comparison to day 0 liver (157±26 pmol/s/mg), $CI+II_p$ was lower at day 14 (49±5 pmol/s/mg, p=0.05) and day 21 (34±11, p<0.05). $CI+II_p$ was also lower (p<0.05) in day 14 and day 21 livers when compared to day 7 (112±9). In comparison to day 0 liver (221±38 pmol/s/mg), maximal ETS was lower at day 14 (70±13, p=0.06) and day 21 (40±14, p<0.05). ETS was also lower (p<0.05) in day 14 and day 21 livers when compared to day 7 (176±14). Respiration of eWAT was not different across time points (p>0.05). **CONCLUSION:** Coupled respiration with electron supply from Complex I and I+II, and non-coupled respiration (i.e. ETS) decreased during the progression of cachexia, suggesting that changes in liver oxidative capacity are associated with the development of this comorbidity.

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Dietary Fat Intake Predicts Aortic Stiffness Independent of Physical Activity

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(No relevant relationships reported)

PURPOSE: To determine if increased dietary fat consumption predicts aortic stiffness independent of physical activity.
METHODS: Men and women 18-60 years of age were recruited for this cross-sectional study. Body mass, height, body fat percentage (bioelectrical impedance analysis), aortic stiffness (carotid-femoral Pulse Wave Velocity; cfPWV), habitual dietary intake (NIH's validated Dietary History Questionnaire-II; DHQ-II), and physical activity (International Physical Activity Questionnaire; IPAQ) were assessed for all subjects. Univariate linear regression analyses were implemented to determine dietary correlations with cfPWV, and partial correlations were employed to adjust for traditional risk factors using SAS 9.4.
RESULTS: The study population consisted of predominately young men and women (23.5 ± 7.9 years, 70.0% female) with a normal body mass index (BMI = 23.6 ± 4.3 kg/m^2) and mean cfPWV of 5.8 ± 0.9 meters/second. Weekly physical activity was estimated at 5,547.6 ± 5,478.2 MET-minutes per week. Habitual daily caloric intake was 1,921.0 ± 798.9 calories, consisting of 46.0 ± 0.1% carbohydrate, 36.8 ± 0.1% fat, and 16.3 ± 0.0% protein. Greater consumption of total discretionary solid fat was associated with increased cfPWV (R^2 = 0.155, P = 0.031). However, total calories from dietary fat (R2 = 0.093, P = 0.101), total grams of fat (R^2 = 0.047, P = 0.248), and total discretionary oil fat (R^2 = 0.008, P = 0.650) were not associated with cfPWV. The correlation between discretionary solid fat and cfPWV remained after adjustment for age, body fat percentage, BMI, and physical activity (R^2 = 0.160, P = 0.043). Among food choices contributing to the increased discretionary calories from solid fat, cheese intake was positively correlated with cfPWV (R^2 = 0.134, P = 0.047). Additionally, specific fatty acids that predicted cfPWV included trans fatty acid, trans-hexadecenoic acid (R^2 = 0.179, P = 0.020), and monounsaturated fatty acids, hexadecenoic acid (R^2 = 0.148, P = 0.036) and myristoleic acid (R^2 = 0.206, P = 0.012).
CONCLUSIONS: Increased dietary discretionary fat consumption within the habitual diet predicts aortic stiffness independent of physical activity. Cheese consumption and specific fatty acids may be novel contributors to increased aortic stiffness independent of regular physical activity.

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High Intensity Circuit Training Versus Moderate Strength Training On Body Composition In Obese Adults

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(No relevant relationships reported)

Weight loss has been shown to adversely affect body composition due to the loss of fat free mass that accompanies fat mass loss during negative energy balance. Exercise has been recommended as a therapy to ameliorate fat free mass loss during weight loss interventions.**PURPOSE:** The primary purpose of this study was to compare the effectiveness of high-intensity circuit training (HICT) versus moderate strength straining (ST) on body composition in obese adults. **METHODS:** Obese adults (10 women and 1 man) completing a medically supervised weight loss program were randomized into one of two 12-week exercise training groups: HICT (n=5) or ST (n=6). Baseline (BL) testing included height, weight, and DEXA scans to assess total and regional body composition. Each group underwent a supervised exercise training program of upper and lower body exercises (30 minute sessions; 3 times per week for 12 weeks); follow-up (FU) testing was performed after 12 weeks. The HICT consisted of 8-12 exercises of 2-3 sets, with rest periods of approximately 30 seconds. Exercise intensity corresponded to 80-95% of their VO_2peak. The ST group completed progressive resistance training which included 2-3 sets of 10-12 repetitions

of each exercise. **RESULTS:** When examining changes in body mass index (BMI), total fat mass (FM), total fat free mass (FFM), trunk fat mass (TFM) , and estimated visceral fat mass (VFM), mixed model ANOVA revealed no significant group x time interaction (p>0.05) nor a main group effect (p>0.05) for the variables. However, there was significant time (BL vs FU) main effect for BMI (38.7 ± 1.5 vs. 33.1 ± 1.7, respectively, p<0.001); FM (48.4 ± 4.0 vs 38.7 ± 3.8 kg, respectively, p<0.001); TFM (26.1 ± 2.1 vs. 19.6 ± 1.8 kg, respectively, p=.001); and VFM (1.5 ± .19 vs. 1.0 ± .13 kg, respectively, p=.001). **CONCLUSION:** Both the 12-week HICT and ST program in conjunction with the medical weight loss program produced successful weight loss and FM changes. Furthermore, FFM was retained in both groups, suggesting both programs are viable options to improve or maintain body composition through substantial weight loss.

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Continuous Exercise Training Reduces Arterial Stiffness In An Exercise Dose Dependent Manner in Adults With Prediabetes

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(No relevant relationships reported)

PURPOSE: Although prior work highlights an exercise dose-response relationship for glucose regulation, no study has assessed if exercise energy expenditure is related to reductions in arterial stiffness in an intensity based manner. We tested the hypothesis that increased exercise dose would correlate with reduced arterial stiffness in obese adults with prediabetes. **METHODS**: In this randomized trial, 26 adults (Age: 61.4±2.5 y, BMI: 32.1±1.0 kg/m^2) were screened for prediabetes using American Diabetes Association criteria (75g OGTT and/or HbA_{1c}). Aerobic fitness (VO_2peak) was measured on a cycle ergometer by indirect calorimetry. Subjects performed either supervised continuous exercise (CONT; n=13) at 70% of HR_{peak} or underwent interval training (INT; n=13) for 3 min at 50% HR_{peak} and 3 min at 90% HR_{peak} for 60min/d over 2-weeks. Arterial stiffness (augmentation index; AI) and glucose tolerance were determined during a 75g OGTT and analyzed by total area under the curve (tAUC) before and after training. Exercise dose was assessed using VO_2-heart rate derived linear regression equations. **RESULTS**: Mean energy expenditure during CONT and INT training was 312.5±12.0 and 399.9±19.6 kcal/session, respectively (P=0.001). Exercise training had no effect on body weight, but it did significantly improve VO_2peak (P=0.001), independent of intensity. Both CONT and INT intervention also reduced glucose $tAUC_{180min}$ (P=0.01) and AI $tAUC_{180min}$ (P=0.03). However, this reduced arterial stiffness tended to correlate with increased exercise energy expenditure from CONT (r=-0.53, P=0.06) but not INT (r=-0.005, P=0.98) training. Improved VO_2peak was also related to reduced AI $tAUC_{180min}$ (r=-0.63, P=0.02) only after CONT exercise. **CONCLUSIONS**: Short-term exercise training reduces arterial stiffness independent of intensity. However, only CONT training improves arterial stiffness in an energy dose-dependent manner. These findings suggest that intensity of exercise may exert different mechanisms for enhancing vascular function in adults with prediabetes to lower diabetes and cardiovascular risk.

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Influence Of Sex On The Relationship Between Two Estimates Of Visceral Adipose Tissue

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(No relevant relationships reported)

Magnetic resonance imaging (MRI) is the gold standard for estimating visceral adipose tissue (VAT) area. However, MRI machines are not available to all laboratories, and other methods of estimating VAT, including dual-energy X-ray absorptiometry (DXA) and B-mode ultrasound (US), are often more readily available, cost effective, and feasible. DXA and US have been reported to be valid methods of VAT determination, but their relationship has yet to be evaluated. PURPOSE: To determine the relationship between estimates of VAT derived from DXA and US in college-aged females and males with a normal body mass index (BMI). METHODS: Sixty-three female (Mean ± SD; Age= 19.6 ± 1.4 yrs; Height= 1.64 ± 0.07m; Weight= 58.7 ± 6.3kg; BMI= 21.7 ± 1.6) and 29 male (Age= 19.3 ± 1.6 yrs; Height= 1.79 ± 0.09m; Weight= 71.6 ± 9.9kg; BMI= 22.3 ± 2.0) subjects were enrolled in this study. Exclusion criteria included age <18 or >25 years old and BMI <18.5kg/m^2 or >24.9kg/m^2. The participants reported to the laboratory 8 hours fasted, and were required to have abstained from alcohol consumption and vigorous physical activity for at least 24 hours prior to testing. DXA scans were completed, and estimates of VAT mass (kg) were reported using the core scan feature of a total body scan (Lunar iDXA). US scans of the abdomen were completed 2 cm above the umbilicus, and VAT depth (cm) was estimated by measuring the distance between the posterior surfaces of the linea alba and the descending aorta. RESULTS: There was no significant correlation between VAT estimates derived from DXA and US (R=0.07, p>0.05) in females. However, there was a significant correlation in males (R=0.77, p<0.001). Furthermore, there was a significant relationship when combining males and females (R=0.45, p<0.001). CONCLUSIONS: There was no relationship between the two estimates of VAT quantity in females in this population, but there was a significant relationship in males and in the combined sample. This highlights the importance of considering sex as an important moderating variable when selecting an instrument to assess body composition.

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The Effect Of Single Stair-Climbing/Descending Bouts Of Varying Lengths On Postprandial Glycemic Responses

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(No relevant relationships reported)

Impaired glucose tolerance is strongly associated with cardiometabolic disease risk. Single bouts of exercise can improve insulin sensitivity and attenuate the rise in postprandial glucose.
PURPOSE: To investigate the effects of moderate intensity stair climbing of various durations on postprandial glycemic responses in healthy men and women.
METHODS: Eight males (27.1±5.9y) and seven females (25.7±5.4y) completed a 75g oral glucose tolerance test (OGTT). On three subsequent visits, participants completed an OGTT combined with either 1min, 3min, or 10min of stair-climbing, all ending 28 min after completion of glucose consumption in randomized order. Blood measurements were taken at baseline and thirty minutes post-glucose consumption and analyzed for glucose and insulin as well as insulin resistance and sensitivity.
RESULTS: All stair-climbing trials reduced peak (30 min) postprandial glucose levels compared to control, however the 10 min bout yielded a significant difference (30.5±5.9mg/dL, p<.001), whereas neither the 1 min bout (8.6±5.6mg/dL, p=.147) nor the 3 min bout (6.3±4.9mg/dL, p=.221) were significant. Insulin concentration was also significantly reduced following the 10 min trial (5.18±1.68µIU/mL, p<.010), however there were no significant differences for the 1 min trial (0.62±0.94µIu/mL, p=.524) or the 3 min trial (1.41±0.83µIu/mL, p=.113) compared to control. There was a significant decrease in HOMA-IR following the 10 min bout (3.96±0.79, p<.001) compared to control. No significant differences in HOMA-IR were seen for the 1 min (0.82±0.64, p=.222) or 3 min (0.89±0.46, p=.077) trials. Insulin sensitivity index values increased significantly following the 10 min trial (2.24±0.71, p<.007), while no significant differences were seen for 1 min (0.35±0.62, p=.584) or 3 min (0.02±0.79, p=.980) trials compared to control. **CONCLUSIONS**: Ten minutes of moderate intensity stair-climbing/descending exercise is effective at improving postprandial glycemic responses in healthy adults while shorter bouts of 1 and 3 min were not.

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Self-Regulation in Early Childhood Predicts Adolescent Metabolic Syndrome Profile Membership

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(No relevant relationships reported)

The prevalence of full-blown clinical metabolic syndrome (MetS) in adolescence ranges between 5-9%. Many adolescents fail to meet the rigid criterion thresholds for MetS but may still have an increased risk for chronic disease. Thus, a continuous MetS score has been used to circumvent these issues. Recent research suggests, however, that other factors, such as self-regulation, may influence chronic disease through a variety of processes and may be critical for identifying cardiometabolic risk in younger populations. **PURPOSE**: To determine if self-regulation in early childhood predicts MetS profile membership in adolescence. **METHODS**: As part of a large longitudinal study, adolescents visited a lab (N=117, 59% female) and completed anthropometric measures, resting blood pressure and a fasted blood draw at age 16. All biomarkers were assessed using colorimetric assay techniques using commercially available items or a multiplex system. All dimensions of self-regulation were assessed at age 5 using age-appropriate, laboratory-based tasks and parent-report measures. Latent profile analysis (LPA) and one-way analysis of variance (ANOVA) were employed to address the study aims. **RESULTS**: The best-fitting LPA model identified 3 groups (BIC=6597.12, Entropy=.92, Adj. p LMR-LRT=81.65, p=ns); a low risk group (LRG; n=48) had low leptin (L), glucose (G), and non-HDL, but high HDL, a moderate risk or dyslipidemic group (DLG; n=58) had high G and non-HDL, but low HDL, L, waist circumference (WC), mean arterial pressure (MAP), and C-reactive protein (CRP), and a high-risk group (HRG; n=11) had high L, G, WC, MAP, CRP, and moderate non-HDL. Adolescents in the HRG showed lower emotion regulation (F = 5.19, p < .01), attentional focusing (F = 6.39, p < .01), and inhibitory control (F = 2.66, p < .05), at age 5 compared to adolescents in LRG. Physiological self-regulation (assessed by vagal withdrawal or RSA) at age 5 was higher (greater self-regulation) in LRG

compared to the DLG ($F = 3.23$, $p < .05$). **CONCLUSIONS**: These data suggest that self-regulation in early childhood is a significant *modifiable* construct influencing risk for cardiometabolic disease in adolescence and should be investigated as a potential target for future behavioral interventions. Funded by NICHD R01HD078346

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Changes In Liver And Skeletal Muscle Sensitivity In Response To Acute And Chronic Calorie Restriction On A Low Carbohydrate Diet

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(No relevant relationships reported)

PURPOSE: We determined the effects of acute and chronic calorie restriction with a low-carbohydrate diet on hepatic and skeletal muscle insulin sensitivity. **METHODS**: Twelve obese subjects (body-mass index, 36.1±1.0kg/m^2) followed a low-carbohydrate (<60g/d) energy-deficit diet (1,200kcals/day). Magnetic resonance spectroscopy, muscle biopsies, and a euglycemic-hyperinsulinemic clamp were used to determine insulin action, cellular insulin signaling and intrahepatic triglyceride content before, after 48 h, and after ~12 wks (7% weight loss) of diet therapy. **RESULTS**: Intrahepatic triglyceride content significantly decreased at both 48-h (28.6±3.8%) and 7% weight loss (-38.0 ± 4.5%; p<0.05) compared to baseline. Basal glucose production rate significantly decreased at 48 h (21.8±3.2%, p<0.001) and after 7% weight loss (20.8±3.4%, p<0.001). Insulin-mediated glucose uptake did not significantly increase at 48 h (4.4±12.7%, p>0.05) but did significantly increase at 7% weight loss (35.2 ± 8.4%, p<0.05). Insulin-stimulated phosphorylation of Jun N-terminal kinase decreased by (-15.4 ± 18.1%, p>0.05) and -41.3 ± 19.5, p<0.05) and phosphorylation of Akt increased by 19.2 ± 26.9% (p>0.05) and 36.1 ± 12.4%,(p<0.05), after 48-h and 7% weight loss respectively. **CONCLUSIONS**: A low carbohydrate calorie diet acutely reduced intrahepatic triglyceride content and improved hepatic insulin sensitivity whereas moderate weight loss is necessary to improve insulin sensitivity in the skeletal muscle.

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Exercise Training Attenuates Non-Alcoholic Fatty Liver Disease in rats with Diabetes via Endoplasmic Reticulum Stress

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(No relevant relationships reported)

Non-alcoholic fatty liver disease (NAFLD) is highly prevalent in type 2 diabetes (T2D). Recent evidence supports that endoplasmic reticulum (ER) stress plays a critical role in the development of NAFLD. Although exercise training has been commonly prescribed for the treatment of NAFLD, the effects of different types of exercise on ER stress in NAFLD under type 2 diabetic condition are largely unknown. **PURPOSE**: The purpose of this study was to determine the effects of aerobic and resistance exercises on hepatic ER stress response and NAFLD in rats with T2D. **METHODS**: Male Sprague-Dawley rats were randomly assigned to four groups (n=10/group): Control (CON), T2D, T2D with aerobic exercise (T2D+AE; treadmill walking at 30 m/min, 0° incline, 60 mins/day, 5 day/week, for 8 weeks) and T2D with resistance exercise (T2D+RE; climbing a 80° incline vertical ladder with weights progressively increased from 50% to 100% of maximal carrying capacity on the tail, 3 times/day, 5 days/ week, for 8 weeks). Liver tissue samples were collected for histopathological analysis of the density of lipid droplets, and immunoblot analysis of expression levels of ER stress proteins, including glucose-regulated protein (GRP78), C/EBP homologous protein (CHOP), caspase 12, and c-Jun N-terminal kinase (JNK). One-way ANOVAs and Tukey's -test were used for data analysis. **RESULTS:** The density of lipid droplets in the liver was significantly higher in the T2D group than in the CON group (p<0.01), but was significantly lower in the T2D+AE and T2D+RE groups when compared to the T2D group (both p<0.01). In addition, the T2D group had significantly higher levels of protein expression of GRP78, CHOP, caspase 12 and JNK when compared to the CON group (all p<0.01). Both exercise groups had significantly lower levels of protein expression of GRP 78, CHOP, Caspase 12 and JNK when compared to the T2D group (p<0.05 to p<0.01). **CONCLUSION**: Our findings suggest that both aerobic and resistance exercises are protective against NAFLD in rats with T2D by potentially regulating proteins involved in ER stress response.

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Effect of Exercise and/or Spirulina maxima On Body Composition In Overweight/Obese Humans

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(No relevant relationships reported)

Overweight and obesity are the main risk factors for cardiovascular diseases, which are the leading causes of death worldwide. As a consequence of this, it is indispensable to apply a nutritional intervention involving both a healthy diet adjustment and to promote an active lifestyle, since they are effective in preventing and reducing weight gain and excessive accumulation of body fat.
PURPOSE: To determine the independent and synergistic effect of a systematic physical exercise program and/or *Spirulina maxima* supplementation on body composition in overweight and obese subjects.
METHODS: Through a randomized, double-blind, placebo-controlled, counterbalanced crossover study design, overweight and obese adults (N= 52, 25.12 ± 4.88 y, 1.71 ± 0.11 m, 88.14 ± 16.99 kg) were evaluated during a 12 wk of 4.5 g a day of supplementation (6 wk *Spirulina maxima* and 6 wk placebo) and/or a systematic physical exercise program (three days a week 20 to 30 min of aerobic exercise with intensities between 50% and 80% of maximum heart rate (HR max) and two days 20 to 30 min between 80% and 90% of HR max using high-intensity interval training (HIIT) intervention); the participants were divided in four groups: exercise and *Spirulina maxima* supplementation (ES), exercise and placebo supplementation (E*), Spirulina maxima* supplementation without exercise (S), and the control one, placebo without exercise (C). Body weight, body mass index (BMI) and body fat percentage (BFP) were assessed. Differences between treatments comparisons in all response variables were made using and ANOVA test. The present study was approved by bioethics committee of Universidad Autónoma de Ciudad Juárez.
RESULTS: The differences between individuals usually are of wide range, for that reason the results are shown like differences between final and initial evaluations. All the treatments showed statistical differences compared with the control in body weight (kg) (ES= -2.36 ± 0.84, E= -0.89 ± 0.68, S= -0.91 ± 0.73, C= 0.04 ± 1.28), BMI (kg.m^{-2}) (ES= -0.72 ± 0.41, E= -0.26 ± 0.29, S= -0.31 ± 0.48, C= 0.01 ± 0.44), and BFP (%) (ES= -1.15 ± 0.20, E= -0.49 ± 0.21 S= -1.46 ± 0.45, C= -0.04 ± 0.13).
CONCLUSION: *Spirulina maxima* intake joint a HIIT have an individual and a synergistic effect on body composition (decrease of body weight, BMI and BFP) in overweight and obese adults.

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Restricted Carbohydrate Diet and Exercise Increase BDNF, Cognitive Function, and Metabolic Profiles

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(No relevant relationships reported)

Metabolic syndrome (MetS) has been recognized as one of the most important clinical challenges and global health issues of today. Growing evidence suggests that mechanisms of energy metabolism may play a key role in mediating aspects of cognitive function. Brain-derived neurotrophic factor (BDNF) is one such factor well known for its critical role in neuronal plasticity, including memory and learning, and more recently metabolic processes, including body weight control, food intake and energy homeostasis. **PURPOSE**: The purpose of this study was to investigate the effect of diet and exercise on cognitive and metabolic function in individuals characterized with MetS. **METHODS**: Eleven subjects with MetS followed a crossover design with two 4-wk interventions, including a restricted carbohydrate paleolithic-based diet (RCPD) with high intensity interval training (RCPD-Ex) and a RCPD with sedentary activity (RCPD-Sed), separated by a 4-wk washout period. A two-way analysis of variance with repeated measures was performed with post-hoc analysis using simple effects analysis with a Bonferroni adjustment. The level of statistical significance was established a priori as $P < 0.05$. Values are reported as means ± SD. **RESULTS**: Compared to baseline, RCPD-Sed and RCPD-Ex improves cognitive function, including improving serum BDNF by 20% and 38% (15.4 ± 5.2 verse 18.5 ± 4.6 and 21.2 ± 6.4 ng/mL), psychomotor speed and cognitive flexibility (-14%, -14%), and self-perceived cognitive symptoms and functioning (+8%, +16%), respectively. Compared to baseline, RCPD-Sed and RCPD-Ex also improves metabolic markers, reducing waist adiposity (15%, 18%), weight loss (-3%, -5%), body fat % (BF%; -7%, -12%), fasting plasma glucose (GLU; -20%, -27%), triglycerides (TG; -47%, -52%), mean arterial pressure (MAP; -28%, -34%), and increases HDL-C (+22%, +36%), respectively. RCPD-Sed and RCPD-Ex reduces fasting insulin by -34% and -39% (12.8 ± 9.1, 11.3 ± 9.4 µUI/ml), HOMA-IR by -37% and -41% (1.7

± 1.4, 1.4 ± 1.7), and increases adiponectin by +33.7% and +38% (6.18 ± 2.8, 6.89 ± 3.9 ng/ml), respectively, when compared to baseline. **CONCLUSION**: RCPD-Sed and RCPD-Ex were able to improve cognitive and metabolic factors, while RCPD-Ex outperformed RCPD-Sed in all measured factors. These effects may be dependent on BDNF as a metabotrophin mediator.

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Normalized Grip Strength Thresholds for the Detection of Metabolic Syndrome in Colombian Collegiate Students

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(No relevant relationships reported)

PURPOSE: Evidence shows an association between grip strength and health; however, grip strength cut-offs for the detection of metabolic syndrome (MetS) risk in Latin-American populations are scarce. The purpose of this study was to determine cut-offs of normalized grip strength (NGS) in a large collegiate student population from Colombia (2014-2017). **METHODS**: A total of 1,795 volunteers (61.4% female, mean age = 20.68 (2.9) years old), ranging between the ages of 18 and 30 years participated in the study. Strength was estimated using a hand-held dynamometer and normalized to body mass (handgrip strength [kg]/body mass [kg]). Anthropometrics, serum lipids indices, blood pressure, and fasting plasma glucose were measured. Body composition was measured by bioelectrical impedance analysis (BIA). MetS was defined as including ≥3 of the metabolic abnormalities according to the International Diabetes Federation definition. A metabolic risk score was computed from the following components: waist circumference, triglycerides, high-density lipoprotein cholesterol, glucose, and systolic and diastolic blood pressure. Receiver operating curve (ROC) analysis showed a significant discriminatory accuracy of NGS in identifying the thresholds and risk categories. **RESULTS**: Lower strength was associated with increased prevalence of MetS. In males, weak, intermediate, and strong NGS values at these points were <0.47, ≥0.47 to 0.62, and >0.62, respectively. In females, these cut-off points were <0.33, ≥0.33 to 0.44, and >0.444, respectively. **CONCLUSIONS**: In summary, our sex-specific cut-off points of NGS could be incorporated into a clinical setting for identifying college students at cardiometabolic disease risk.

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Effect Of 12-weeks Of Moderate Versus High-intensity Interval Exercise Training On Postprandial Lipemia, Vascular Function And Arterial Stiffness After High-fat Meal Ingestion In Inactive Adults

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(No relevant relationships reported)

PURPOSE: The aim of this study was to determine the effect of 12-weeks of moderate continuous training (MCT) and high-intensity training (HIT) on postprandial lipemia, vascular function and arterial stiffness after high-fat meal (HFM) ingestion in inactive adults. **METHODS**: A randomized clinical trial was conducted in 20 healthy, inactive aged adults (31.6 ±7.1 years). Participants completed two exercise protocols, namely, HIT and MCT, for 12 weeks. To induce a state of postprandial lipemia (PPL), all subjects received an HFM containing 1049 kcal, 31 g of protein, 79 g of fat (31 g of saturated fat), 666 mg of cholesterol and 69 g of carbohydrates. Endothelial function was measured using flow-mediated vasodilation (FMD), normalized brachial artery FMD (nFMD), aortic pulse wave velocity (PWV) and augmentation index (AIx). Plasma total cholesterol, High-density lipoprotein cholesterol (HDL-c), triglycerides and glucose were also measured. The effects of the HFM were measured in a fasted state and 60, 120, 180, and 240 minutes postprandially. **RESULTS**: The area under the curve from 0 to 240 minutes [$AUC_{(0\text{-}240)}$] for glucose was lower after HIT than after MCT (10%, P=0.008). FMD and nFMD $AUC_{(0\text{-}240)}$ were increased in HIT compared with MCT (46.9%, P=0.021 and 67.3%, P=0.009, respectively). Regarding between-group differences, the results showed for glucose, and nFMD. In addition, the average delta of nFMD value was significantly higher in HIT than MCT (P = 0.03) **CONCLUSIONS**: Supervised exercise-training mitigate endothelial dysfunction and glucose response induced by PPL. Exercise intensity plays an important role in these protective effects, suggesting that HIT might be more effective than MCT in reducing postprandial glucose levels and attenuating vascular impairments.

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The Acute Effect of Moderate Intensity Stair-Climbing on Postprandial Blood Glucose

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(No relevant relationships reported)

PURPOSE: To investigate the effects of moderate intensity stair-climbing of various durations on postprandial glucose response in healthy men and women. The postprandial glucose response is strongly associated with cardiometabolic disease risk. **METHODS**: Twenty males (26.8±6.0y) and fourteen females (24.8±4.5y) completed a 75g oral glucose tolerance test (OGTT). On three subsequent visits, participants completed an OGTT combined with either 1min, 3min, or 10min of stair-climbing, all ending 28 min after subjects finished the drink. Fingerstick blood glucose measurements were taken at baseline and every fifteen minutes thereafter for one hour. **RESULTS**: All stair-climbing trials reduced peak (30 min) postprandial blood glucose levels compared to the control (12±31 to 35±30mg/dL, $p \leq .001$-.038). At the 45min time point, there were significant reductions compared to the control for the 3 and 10min trials (11±29 and 23±30mg/dL, $p = .037$ and $p \leq .001$), but not between 1min and control (2±33mg/dL, $p = .701$). No significant differences exist in BG between any trials at baseline, 15, or 60min time point (Δ=-0.3- 5.1mg/dL, $p = .391$-.882). There were significant differences in AUC compared to the control for the 3min and 10min trials (436±1126and 896±1108mg/dL*min, *$p = .036$* and $p \leq .001$) but not for the 1min (272±1112mg/dL*min, $p = .177$). For iAUC, there were significant differences compared to the control for the 3 min and 10 min trials (424±1124 and 901±903mg/dL*min, $p = .038$ and ≤.001) but not for the 1 min (107±918mg/dL*min, $p = .509$). **CONCLUSIONS**: Moderate intensity stair-climbing bouts as short as one minute in duration are effective at attenuating peak postprandial blood glucose with longer bouts producing more substantial benefits.

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Increase In Beta-hydroxybutyrate After High-fat Meal In Metabolically Healthy Overweight/obese Adults

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(No relevant relationships reported)

Ketone synthesis is of interest for several clinical purposes including obesity, weight loss and diabetes. Beta-hydroxybutyrate (BHB) is the predominant ketone found in the blood and an indicator of ketone synthesis, which is elevated when carbohydrate availability is low. However, little is known about ketone synthesis in metabolically healthy overweight/obese (MHO) adults with mixed diets.
PURPOSE: To investigate BHB concentrations and responses to a high-fat meal in MHO adults.
METHODS: Adults (n=23), 23-54 y of age with BMI 27-35 $kg \cdot m^{-2}$ were assessed for body composition, self-reported physical activity level, and VO_2max. After Fasting blood collection, a high-fat meal (50g fat, 54g carbohydrate, and 12g protein) was consumed and blood was collected hourly for 4 hours for measurement of glucose, insulin, triglycerides, and BHB.
RESULTS:

Metabolic Responses to High-Fat Meal					
Time (h)	0	1	2	3	4
BHB (mmol/L)	.23 (.01)	.23 (.01)	.22 (.01)*	.25 (.01)	.31 (.02)*
GLU (mg/dl)	96.9 (1.5)	108.4 (3.6)*	95.6 (2.7)	93.0 (1.6)*	91.9 (1.5)*
TG (mg/dl)	139.4 (16.8)	158.1(17.2)*	193.7 (19.8)*	216.1 (24.0)*	225.0 (32.2)*
INS (µU/ml)	8.1 (1.3)	35.3 (4.7)*	18.1 (2.9)*	10.4 (1.5)	8.2 (1.4)
Values = mean (SEM); *p <0.05 compared to time 0					

Glucose and insulin both increased 1 hour after a high-fat meal. At 2 hours post meal, insulin was still elevated and BHB decreased. At 3 and 4 hours post-meal, glucose decreased below fasting levels and BHB elevated above fasting levels. These data indicate that there was an inverse relationship between BHB with blood glucose and insulin levels, and that a potential rebound increase in BHB occurred when blood glucose dropped below fasting levels and insulin returned to baseline. Blood TG increased at each measurement over the course of 4 hours.
CONCLUSION: These findings support a pattern in the sequence of metabolic responses to a high-fat meal of increased then decreased blood glucose and insulin levels followed by increased BHB. An unexpected increase in blood BHB 4 hours after a single high-fat meal containing a significant amount of carbohydrate warrants additional research.

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Postprandial Serum Concentrations of Trimethylamine N-oxide in Metabolically Healthy Adults with Low and High Inflammation

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(No relevant relationships reported)

Trimethylamine (TMA) is a bioactive amine made by gut microbes that is converted to trimethylamine-N-oxide (TMAO) in the liver. The conversion of TMA to TMAO is downregulated by insulin. TMAO is pro-inflammatory and has been linked with the development of atherosclerosis. It is hypothesized that TMAO may be an underlying factor differentiating metabolically healthy overweight or obese (MHO) individuals with low (LO) versus high (HI) systemic inflammation.
PURPOSE: To compare serum TMAO concentrations and metabolic responses to a high fat meal challenge between LO and HI MHO individuals.
METHODS: Adults (n=25), 28-54 years old with BMI 27-35 $kg \cdot m^{-2}$ were measured for interleukin (IL)-1β, IL-6, IL-17, IL-23, tumor necrosis factor-α (TNF-α), and granulocyte-macrophage colony-stimulating factor (GM-CSF) measured after an overnight fast. A subsample of individuals was grouped to LO (n=5; above median in ≤ 1 of 6 cytokines) and HI (n=4; above the median in ≥ 5 of 6 cytokines). Blood samples were collected immediately before ingestion of a high-fat meal (50g FAT, 54g CHO, 12g PRO) and hourly for 4 hours postprandial for measurement of TMAO, glucose (GLU), insulin (INS), and triglycerides (TG). TMAO concentrations were determined through ultra-high performance liquid chromatography-tandem mass spectrometry.
RESULTS: Fasting TMAO concentrations were similar in HI compared to LO (11.0 ± 5.5 vs 5.9 ± 2.8 $\mu mol \cdot l^{-1}$). After correction for fasting insulin concentrations and removal of one outlier participant, TMAO decreased from fasting (9.6 ± 2.2 $\mu mol \cdot l^{-1}$) to 1 h ($p=0.061$; 6.2 ± 1.1 $\mu mol \cdot l^{-1}$) and 3 h ($p=0.04$; 3.7 ± 0.9 $\mu mol \cdot l^{-1}$). Postprandial increases ($p<0.05$) were measured for glucose at 1 h, insulin and 1-2 h, and TG at 1-4 h.
CONCLUSION: Our preliminary analysis indicates that TMAO concentrations were not higher in MHO individuals with higher inflammation. However, TMAO decreased in the postprandial period after insulin was elevated. Thus, TMAO concentrations fluctuate postprandially and its influence on inflammation warrants further investigation, particularly to determine if TMAO synthesis increases with insulin resistance.
Funding acknowledgement: Montana State University Research Initiative 51040-MUSRI2015-03 and USDA-NIFA 2017-67018-26367.

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Obese Hispanic Females Improved Plasma Glucose and Lipid Profiles Following Aerobic Exercise Training

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(No relevant relationships reported)

Obesity is strongly associated with elevated morbidity and mortality, especially, within the population of Hispanic women. Although exercise can improve obesity, the role of different intensities of exercise in plasma glucose and lipid profiles has not been explored in the obese Hispanic population. **PURPOSE:** To examine the effects of 12-week aerobic exercise training at low- and high- intensity on plasma glucose and lipid profiles in obese Hispanic females. **METHODS:** Thirty sedentary, obese females (age = 26.07±4.4 years, height = 161.4±4.1cm, body weight = 89.8±8.1kg, and % body fat = 40.9±4.9%) were randomly assigned to three groups: control (n=10, no exercise), low-intensity (LI, n=10, 50% VO_2max), and high-intensity exercise (HI, n=10, 70% VO_2max). Participants in low- and high-intensity exercise groups performed a supervised treadmill exercise training for 12 weeks according to the following progressive exercise protocol: weeks 1 - 4 (3 days per week to expend 13.5 METs·hr/w), weeks 5 - 8 (4 days per week to expend 18.0 METs·hr/w), and weeks 9 - 12 (5 days per week to expend 22.5 METs·hr/w). Overnight fasting blood samples were collected at pre- and post-exercise training (POST). Changes in plasma glucose and lipid parameters, including total cholesterol (TC), lipoprotein (a) [Lp(a)], low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C) were analyzed using a 2 x 3 analysis of variance with repeated measures along with a Tukey post-hoc test ($p < 0.05$). **RESULTS:** Both LI and HI groups decreased body weight up to 2.1 and 3.4kg, respectively. TC at POST in the LI group (116.53±5.32 mg/dL) was significantly lower ($p=0.012$) than in the control (139.12 mg/dL). The LI group also had significantly lower LDL-C at POST (50.25±5.24 mg/dL) than the control (67.17±5.24 mg/dL, $p=0.006$) and the HI group (62.83±5.24 mg/dL, $p=0.036$), respectively. Plasma glucose at POST in both LI (75.32±2.71 mg/dL, $p= .024$) and control groups (80.1±2.71 mg/dL, $p=0.001$) was lower than in the HI group (90.77±2.78 mg/dL). **CONCLUSION:** Although the 12-week aerobic exercise training at either low- or high-intensity can improve body weight and body composition, it seems that low-intensity exercise training can provide more favorable effects on plasma glucose and lipid profiles in obese Hispanic women.

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Downregulation Of Angptl6 Expression By Exercise In Mice And Human

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(No relevant relationships reported)

Angiopoietin-like protein 6 (ANGPTL6) has been introduced as an anti-obesity and insulin-sensitizing hepatokine in mice models. But in human studies, paradoxical upregulations of ANGPTL6 were reported in type 2 DM and metabolic syndrome. Although these phenomena have been understood as compensatory ones, regulatory mechanisms still remain unclear. **PURPOSE**: The objective of this study is to investigate the changes of ANGPTL6 levels by exercise in mice and human.
METHODS: 1) Animal study: Male C57BL/6 mice were grouped into standard chow diet-fed, high fat diet-fed, and high fat diet-fed with swimming exercise. After 12 weeks of intervention, serum and liver tissues were harvested for analysis. 2) Human study: 20 healthy female subjects (47.75±2.09 years) performed one hour of supervised aerobic exercise four to five times per week for 12 weeks. Pre and post-training measurements were made. **RESULTS**: 1) Animal study: Swimming exercise significantly inhibited weight gain (final body weight 36.61±0.61 vs. 29.46±0.56g, $p<0.001$) and visceral fat accumulation on high fat diet in mice. Increased serum leptin levels on high fat diet were diminished on exercise intervention (41.5±6.3 vs. 28.1±4.5ng/mL, $p<0.001$). Hepatic *Angptl6* expressional profile showed same trend of leptin (relative expression 1.00±0.06 vs. 0.72±0.04, $p<0.01$). 2) Human study: After training program, there was a significant increase in maximal exercise capacity (VO_2max 31.25±1.18 vs. 35.51±1.17ml/min/kg, $p<0.001$) with decreased body mass index (24.80±0.66 vs. 24.05±0.64kg/m^2, $p<0.001$). Serum leptin (7.49±1.24 vs. 5.22±0.69ng/ml, $p=0.022$) and ANGPTL6 (414.02±24.93 vs. 348.25±18.45ng/ml, $p=0.015$) concentrations were significantly decreased by exercise intervention.
CONCLUSIONS: Our study shows that habitual exercise significantly decreases ANGPTL6 expression in mice and human. As alterations of leptin were accompanied with ANGPTL6 changes, regulation of ANGPTL6 might be related to leptin signaling.

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Coagulation Activation Pathway May Be Altered in Individuals Comorbid with HIV and Type 2 Diabetes

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(No relevant relationships reported)

The expected lifespan of persons living with human immunodeficiency virus (PLWH) has increased significantly due to improved treatment options. However, an unintended consequence has been an increased prevalence of chronic diseases such as type 2 diabetes mellitus (T2D). It is therefore important to explore underlying biological mechanisms for this increased risk of T2D among PLWH as it is not yet well understood. Investigation of specific biomarkers may help define the pathogenesis of T2D in PLWH and yield positive outcomes including the detection of at risk individuals as targets of early interventional strategies along with identification of new diagnostic criteria. **PURPOSE:** The aim of this research was to identify specific biomarkers which differentiate PLWH and those comorbid with HIV and T2D (PLWH+T2D). **METHODS:** 16 PLWH (47.9±2.7 y/o; 10 male) and 16 clinically diagnosed PLWH+T2D (53.6±1.4 y/o; 10 male) were recruited for the study. Blood was drawn via venipuncture for assessment of HbA1c and biomarkers associated with inflammation (IL-1β, IL-6, hsCRP, insulin, adiponectin, leptin, and TNF-α, along with soluble receptor counterparts sIL-1RI, sIL-1RII, sIL-6RI, sTNF-RI, and sTNF-RII), vascular function (ADAMTS13, slCAM-1, sVCAM-1, SAA, and, SAP), and coagulation activation (fibrinogen, D-dimer, and, vWF). **RESULTS:** As expected, HbA1c was lower in PLWH (5.8±0.1 vs 7.0±0.4%, $p<0.05$). As further confirmation of T2D diagnosis, all individuals in the PLWH+T2D group were taking prescribed oral diabetes medication. Predictably, hsCRP levels were elevated; however, not significantly different between groups (7.8±1.4 vs 11.0±2.8 mg/L, $p>0.05$). Differences were found between PLWH and PLWH+T2D in indicators of coagulation activation, specifically vWF (2.39±0.42 vs 3.88±0.55 mg/dL, $p<0.05$) and fibrinogen (1425±103.1 vs 1914±184.2 ng/mL, $p<0.05$). No significant differences between PLWH and PLWH+T2D were seen in any biomarkers associated with vascular function or inflammation. **CONCLUSIONS:** We believe this is the first time biomarkers of vascular function and coagulation activation have been assessed in this comorbid

population. The significant increase in vWF and fibrinogen in PLWH+T2D suggests that pathways involving coagulation may be the first altered in the transition to this comorbid state.

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Antibiotics Reduce While Forced-Exercise Increases Inflammation in the Small Intestine

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(No relevant relationships reported)

Risk of metabolic and intestinal inflammatory disorder development increases significantly with age. In contrast, exercise has shown to reduce disease risk and promote longevity. Interestingly, adenylyl cyclase 5 knock out (AC5KO) mice demonstrate an enhanced exercise capacity and improved longevity. **PURPOSE:** We aimed to examine the inflammatory status along the gastrointestinal tract of AC5KO mice compared to Wild type (WT) mice. **METHODS:** 21 C57BL WT and AC5KO male mice were randomly assigned to one of 2 groups: (1) sedentary and (2) exercise for 12 weeks. Mice had *ad libitum* access to food and water. Exercised mice were trained for 4 weeks at 60-70% max speed for 1 hr each session, 5 d/wk. WT sedentary and exercised groups were given antibiotics via oral gavage during the last 7 days of the exercise protocol. At the end of 4 weeks, mice were sacrificed and intestinal tissues were fixed for histological analysis and immunohistochemistry for cyclooxygenase-2 (COX-2), a marker of inflammation. Group means of staining score were analyzed using a one-way ANOVA and LSD post hoc tests. A difference of mean with a p value of ≤ 0.05 was considered statistically significant. **RESULTS:** In the duodenum, COX-2 expression was isolated in the lamina propria and staining occurred predominately within macrophages. COX-2 expression in the duodenum was less in sedentary animals given antibiotics ($p \leq 0.015$). In the ileum, COX-2 expression was localized to both the crypts and lamina propria. Expression in ileal crypts was less in sedentary animals given antibiotics compared to WT exercised animals ($p = 0.02$) while expression in the ileal lamina propria was increased in WT exercised animals ($0.001 \leq p \leq 0.009$). **CONCLUSIONS:** Antibiotics reduce small intestinal inflammation. COX-2 expression localizes differently in the mucosa along the small intestine. Forced-exercise increases inflammation to a greater degree in the lamina propria of the distal small intestine.

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Effects of Early Life Undernutrition on Maximum Treadmill Running Capacity in Mice

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(No relevant relationships reported)

Undernourishment in early life has been shown to impair cardiovascular function, which could potentially influence maximum exercise capacity in adulthood. **PURPOSE:** To determine the effects of early life undernutrition on maximal exercise capacity in adulthood. **METHODS:** Using a cross fostering model, pups were undernourished either during gestation (GUN) or lactation (PUN; PN1-21) by feeding the dam a low-protein diet (8% protein) to decrease milk production. Control pups were born and suckled to dams fed an isocaloric diet with 20% protein content. At postnatal day 21 (PN21), all mice were weaned and switched to a control diet. To assess exercise capacity, mice began a 5-day treadmill acclimation protocol at PN61. At PN67, mice underwent a maximum work test, which began at 10 meters/minute with a 10% grade. Speed was increased every two minutes until exhaustion. The amount of work completed by each mouse was calculated as: Maximum Work(J)= 9.8 x Maximum Speed (m/min) x grade(radians) x Time (min) x Weight (kg). A two-way ANOVA was used to determine differences in maximal work and cardiac parameters between groups with the effects of gender and diet. **RESULTS:** GUN (0.3312±0.037 J) mice performed higher than PUN (0.2527±0.050 J) and CON (0.2674±0.030 J) mice on a maximum work test ($p<0.05$). There was no gender effect. **CONCLUSION:** Undernourishment during lactation leads to lower work capacity, indicating that developmental programing during the first 21 days of life impairs work capacity during adulthood.

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Metabolic and Microbial Responses to Exercise in C57 Wild-type and Adenylyl Cyclase 5 KO Mice

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(No relevant relationships reported)

Healthy aging has been observed in our adenylyl cyclase type 5 knock out (AC5KO) model. Aging is also associated with alterations in composition and diversity of the gut microbiota. The extent to which the microbiota contributes to the healthy aging phenotype is unknown. **PURPOSE**: To examine the role of the microbiota in diabetes and exercise tolerance in AC5KO mice compared to wild type (WT). **METHODS**: 17 (n=6/group) 6-week old C57BL/6J male WT and AC5KO mice were randomly assigned to one of the following four groups: (1) wild type-exercise (WT-EX), (2) wild type-sedentary (WT-CON), (3) AC5-exercise (AC5-EX) and (4) AC5-sedentary (AC5-CON). Mice underwent a treadmill test to determine maximal oxygen uptake (VO_2max) and max exercise performance (i.e. running distance). Mice were exercised via forced treadmill running at 60-70% VO_2max for 60-minutes 5 days/week, for 5 weeks. Following exercise training, mice were given oral antibiotics for five days to eliminate gut microbiota. Measurements were taken: 1- prior to exercise, 2- post training/pre-antibiotic and 3- post antibiotic. Fecal samples underwent phenol-chloroform extraction and ribosomal operons were amplified with 10 ng of genomic DNA using the universal 16S rRNA-27Forward primer, 23S rRNA-2241Reverse primer and a High Fidelity/Proofreading Taq polymerase. The MinION was used for library preparation and we used Poretools and Geneious sequence analysis software for sequencing. Finally, fasted glucose tolerance (i.p; 2 ul/kg [BW]) and insulin tolerance (i.p;1 ul/kg [BW]) were measured. **RESULTS**: AC5KO mice have a unique microbiota with *Helicobacter typhlonius & Bacteroides sartorii spp.* being dominant in AC5KO and not in WT mice. Furthermore, AC5-EX mice showed altered glucose tolerance (33325 vs. 23025 AUC, $p<0.05$) and reduced exercise performance (517m vs. 258m, $p<0.05$) following antibiotic treatment. Post antibiotic AC5-EX mice showed insulin sensitivity following antibiotic treatment. **CONCLUSION**: AC5KO mice have a unique microbiota compared to WT mice and their insulin/glucose control phenotype may be dependent on the microbiota.

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Anti-apoptosis Effects Of Diosgenin In D-galactose-induced Aging Brains

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to evaluate the effects of diosgenin on the D-galactose-induced cerebral cortical widely dispersed apoptosis.
METHODS: Male Wistar rats at 12-week-old were divided into four groups: Control (1 mg/kg/day of saline, i.p.), DD0 (150 mg/kg/day of D-galactose, i.p.), DD10 and DD50 (D-galactose+10 or 50 mg/kg/day of diosgenin orally). After eight weeks, histopathological analysis, positive TUNEL and Western blotting assays were performed on the excised cerebral cortex from all four groups.
RESULTS: TUNEL-positive apoptotic cells, the components of Fas pathway (Fas, FADD, active caspase-8 and active caspase-3) and mitochondria pathway (t-Bid, Bax, cytochrome *c*, active caspase-9 and active caspase-3) were increased in the DD0 group compared with the Control group whereas they were decreased in the DD50 group ($p<0.05$). The components of survival pathway (p-Bad, Bcl-2, Bcl-xL, IGF-1, p-PI3K and p-AKT) were increased in the DD50 group compared to the Control group, whereas the levels of Bcl-xL, p-PI3K and p-AKT were also compensatorily increased in the DD0 group compared to the Control group ($p<0.05$).
CONCLUSIONS:Taken together, diosgenin suppressed neuronal Fas-dependent and mitochondria-dependent apoptotic pathways and enhanced the Bcl-2 family associated pro-survival and IGF-1-PI3K-AKT survival pathways, which might provide neuroprotective effects of diosgenin for prevention of D-galactose-induced aging brain.

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The Characterization of Normal Weight Obesity in College Students

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(No relevant relationships reported)

While normal weight obesity (NWO) has become an important health topic, to date no data exist describing physiological characteristics among this group. **PURPOSE:** The primary aim was to characterize NWO in college-age males and females through body composition and cardiometabolic measures. The secondary aim was to observe the relationship between waist to hip ratio (WHR) and body mass index (BMI) with body fat percentage (BF%). **METHODS:** Ninety-two college students (Mean ± SD; Age: 19.5 ± 1.4 yrs.; Height: 171.9 ± 9.4 cm; Weight: 67.9 ± 8.2 kg, BF%: 26.0 ± 6.2 %; males n=29; females n=63) participated in this study. NWO was defined being above NHANES body fat 25th percentile based on age and sex. Body composition variables including BF%, lean mass (LM), and visceral adipose tissue (VAT) were assessed by dual energy x-ray absorptiometry. The same technician measured waist and hip circumferences. Mean arterial pressure (MAP) and metabolic biomarkers [total cholesterol (TC), high density lipoproteins (HDL), non-high density lipoproteins (NHDL), and glucose (GLU)] were evaluated for cardiometabolic health. Blood pressure was measured in a seated position with an automated cuff; biomarkers were assessed by a fasted blood draw. **RESULTS:** Forty percent of the sample (n=37) was identified as NWO, with 31% of the females (n=19) being NWO, whereas 62% of males (n=18) were. NWO individuals had significantly higher BF% (28.4 ± 6.7% vs. 24.4 ± 5.2%, p<0.001), VAT (0.20 ± 0.15 kg vs. 0.07 ± 0.10 kg, p=0.002), and larger WHR (0.76 ± 0.40 cm 0.72 ± 0.41 cm, p=0.003) compared to normal weight lean (NWL). Although not significant, NWO had higher LM (46.2 ± 8.5 kg; NWL: 41.7± 10.3 kg, p>0.05) and MAP (NWO: 84.4 ± 6.8 mmHg; NWL: 82.5 ± 7.0 mmHg, p>0.05) compared to NWL. NWO also had higher levels of GLU, and lower levels of TC, HDL, and NHDL; however, biomarkers were not significantly different between groups (p>0.05). While WHR was significantly correlated with BF% (R= -0.293, p=0.005), BMI was not (p>0.05). **CONCLUSION:** The occurrence of NWO among otherwise healthy college students is high. Identification of these individuals may be an effective approach to obesity prevention and treatment. Determining effective methods to measure both body fat and abdominal obesity in this population is essential, as BMI may mask obesity in a young adult population.

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Effects of Acute Exercise and Green Tea Supplementation on Glucose Homeostasis in Overweight/Obese Postmenopausal Women

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(No relevant relationships reported)

Menopause is associated with decreased estrogen levels, increased adiposity, negative changes in adiponectin and TNF-α, and increased insulin resistance. Decreased adiponectin and increased TNF-α are associated with impaired glucose uptake. Exercise enhances glucose uptake several hours post-exercise. Polyphenols in green tea extract (GTE) increase insulin sensitivity and adiponectin while decreasing TNF-α. Orzechowski (2003) proposed using antioxidants as a "preconditioning" method to prevent development of Type 2 Diabetes (T2D). **PURPOSE:** To investigate independent and combined effects of acute exercise or GTE on glucose homeostasis and adipokines in overweight to obese postmenopausal sedentary women. **METHODS:** Eight women (52 ± 7 yrs, BMI 32.04 ± 4.95 kg/m^2) were randomly assigned to complete four trials (Control [C], green tea [GT], exercise [EX], green tea + exercise [GTEX]). For each trial the participant consumed 400 mg of placebo (rice flour, C and EX) or green tea extract (GT and GTEX) with lunch and dinner the day prior and the morning of (1 hr prior) an oral glucose tolerance test (OGTT). Exercise trials (EX and GTEX) consisted of walking exercise at 65% heart rate reserve (400 Kcal) and were completed 12-14 hours prior to the OGTT. **RESULTS**: Fasting glucose (C 5.7 ±.8, GT 6.1 ± 1.7, EX 5.6 ± .8, GTEX 5.4 ± .8 mmol) and insulin (C 11.93 ± 4.75, GT 11.66 ± 6.17, EX 11.31 ± 4.12, GTEX 12.23 ±6.05µU/ml) were not different between trials as well as no differences in area under the curve for both glucose and insulin. There were also no differences between trials for TNF-α (C 5.45 ± 3.68, GT 4.73 ± 1.38, EX 3.55 ± 1.46, GTEX 3.87 ± 1.81 pg/ml) or total adiponectin (C 7443 ± 2941, GT 4497 ± 3070, EX 10060 ± 7393, GTEX 5335 ± 3193 ng/ml). **Discussion:** An acute bout of exercise or green tea supplementation may not be sufficient to see a favorable impact in glucose homeostasis or adipokines within this population. Elevated TNF-α (> 1.36 pg/ml) and low adiponectin levels observed in all trials may reflect an inflammatory state that could be associated with menopause. Inflammation is known to alter glucose metabolism. Postmenopausal woman present a unique challenge with prevention of T2D, as increased adiposity and decreased estrogen levels negatively effects adipokines, which negatively impacts glucose homeostasis.

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Family History of Diabetes Does Not Affect Exercise-Induced Improvements in Insulin Sensitivity and Metabolic Flexibility

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(No relevant relationships reported)

A Family History of Diabetes Does Not Affect Exercise Induced Improvement in Insulin Sensitivity and Metabolic Flexibility

Manuel Amador, Cesar Meza, Mario A Garcia, Christopher Figueroa, George King, Andrew McAinch, Sudip Bajpeyi

A family history of diabetes (FH+) is considered a risk factor to develop insulin resistance and type 2 diabetes. However, it is not known whether exercise induced improvement in insulin sensitivity (IS) and metabolic flexibility (MF) are impacted by a FH+, compared to those without (FH-).

PURPOSE: To determine if a FH+ limits exercise induced improvements in IS, MF, body composition, and strength following an 8-week combined aerobic and resistance training intervention.

METHODS: 19 sedentary, normoglycemic, Mexican-American males underwent 8 weeks of combined exercise training 3 times/week (35-min aerobic & 45-min resistance training/session). A controlled diet was provided 5 days before pre/post intervention tests. IS was assessed by hyperinsulinemic euglycemic clamp. MF was assessed by change in respiratory quotient (ΔRQ) at the insulin stimulated state of the clamp compared to the fasted state. Body composition was measured using DXA. Upper/lower body strength were measured by 1 repetition maximum bench press and leg strength dynamometer.

RESULTS: IS significantly improved in both groups (FH- 2.95±31 to 3.84±0.31ml/kg estimated mean body size (EMBS), p=0.03; FH+ 3.6±0.5 to 4.8±0.5ml/kg EMBS; p=0.002). MF significantly improved in both groups (FH- 0.72±0.009 to 0.78±0.008, p=0.001; FH+ 0.70±0.01 to 0.80±0.02, p=0.0001). Fat free mass significantly improved in both groups (FH- 56.6±2.1 to 58.5±2.1kg, p=0.01; FH+ 51.8±1.95 to 53.4±1.79kg, p=0.01). Upper body strength (FH- 172.78±20.95 to 200.56±20.74lb, p=0.0001; FH+ 136.5±14.06 to 168.33±15.29lb, p=0.0001) and lower body strength (FH- 368.89±31.02 to 431.11±22.58lb, p=0.007; FH+ 341.0±22.03 to 412.78±16.22lb, p=0.0001) significantly increased in both groups. Degrees of improvement in IS was not different between groups (FH- 28.3±13.6% vs. FH+ 41.66±11.9%; p>0.05).

CONCLUSION: FH+ is not a limiting factor for exercise induced improvements in IS, MF, body composition, and strength in normoglycemic Mexican Americans.

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Physical Activity and Glycemic Control in Low Versus High Inflammation Phenotypes in Metabolically Healthy Adults

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(No relevant relationships reported)

Metabolically healthy overweight or obese (MHO) individuals may be studied to better understand the relationship of low-level inflammation to physical activity (PA) and fitness, metabolic syndrome, glycemic control, and postprandial responses. It was hypothesized that individuals with lower inflammation would have greater volume of PA, cardiorespiratory fitness (VO_2max), and metabolic health.

PURPOSE: To compare PA, VO_2max, glycosylated hemoglobin (HbA1c), metabolic syndrome criteria, and metabolic responses to a high-fat meal between low (LO) and high (HI) inflammation phenotypes within a group of MHO adults.

METHODS: Adults (n=25), 23-54 y of age with BMI from 27-35 kg·m^{-2} were assessed for body composition, self-reported PA, VO_2max, and fasting/resting concentrations of interleukin (IL)-1β, IL-6, IL17-, IL-23, tumor necrosis factor-α (TNF-α), and granulocyte-macrophage colony stimulating factor (GM-CSF). LO (n=11) were below the group median for ≥ 4 of the cytokines; HI (n=12) above for ≥ 4. Two participants were between phenotypes. After fasting blood collection, a high fat meal (50 g fat, 54 g carbohydrate, and 12 g protein) was consumed and 4 hourly, postprandial blood samples were collected for measurement of glucose, insulin, and triglycerides (TG).

RESULTS: Mean cytokine concentrations were 1.8 to 4.3-fold higher (p<0.05) in HI compared to LO for IL-1β, IL-6, IL17-, IL-23, TNF-α, but not (p=0.12) GM-CSF. The frequency of aerobic activity was higher (p<0.05; mean ± SEM; 5.2 ± 0.5 vs 3.1 ± 0.4

d·wk^{-1}) while VO_2max was similar (p=0.21; 42.9 ± 2.7 vs 38.3 ± 2.2 ml·kg·min^{-1}) for LO vs HI. Contrary to our hypothesis, LO were higher (p<0.05) in HbA1c (5.38 ± 0.08 vs 5.10 ± 0.07%) and 1-h postprandial glucose (116.6 ± 5.7 vs 102.1 ± 3.5 mg·dl^{-1}). TG and insulin responses, BMI, body fat (%), visceral adipose (l), and metabolic syndrome criterion scoring for waist circumference, blood pressure, and fasting TG, glucose and HDL were similar between groups.
CONCLUSION: The current data support the beneficial influence of physical activity on inflammation; however, the unexpected finding of healthier glycemic control in individuals with higher inflammation warrants additional research.
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Reduced Insulin Sensitivity in Young, Normoglycemic Subjects, Alters Tissue Oxygenation During Post Occlusive Reactive Hyperemia

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(No relevant relationships reported)

INTRODUCTION: Near-infrared spectroscopy (NIRS) measures of the tissue oxygen saturation ([StO_2]) reperfusion rate during post occlusive reactive hyperemia (PORH) has recently been correlated with flow mediated dilation (%FMD) of the popliteal artery (McLay et.al. 2016). Cardiovascular disease is associated with impairments in %FMD. Reduced insulin sensitivity may negatively affect the vascular system for many years prior to a pre-diabetic/diabetic diagnosis. **PURPOSE:** To determine if static and dynamic, [StO_2] parameters during PORH are correlated with metabolic markers in healthy, young, normoglycemic subjects. **METHODS:** Glucose (G) and insulin (I), both in fasting (F) conditions and during an oral glucose tolerance test (OGTT), were measured in twenty-three, young (18-26y), healthy subjects (12M/11F). Each subject underwent upper limb, PORH with oxy- ([O_2Hb]) and deoxy- [hemoglobin + myoglobin], ([HHb]) measured in the skeletal muscle of the antebrachium by NIRS. [StO_2] was calculated [O_2Hb]/ Total hemoglobin ([O_2Hb] + [HHb]) at rest, during the cuff, and during PORH. Parameters describing the amplitude and time course of the response were measured. Hepatic insulin sensitivity (ISI_{HOMA}), whole body insulin sensitivity (Matsuda Index), area under the curve for I and GLU, FI and FG and 2-HR GLU were measured. **RESULTS:** FI
(range 2.43 - 12.51 µIU/ml) was significantly negatively correlated (r=0.43, P=0.02) with the amount of change of [StO_2] during reperfusion (Δ [StO_2]) (range 13.94 - 38.66%) and significantly positively correlated (r=0.52, P=0.005) with the minimum [StO_2], a measure of extraction, during the cuff (Min [StO_2]) (range 35.97 - 61.87%). ISI_{HOMA} (range 0.37-2.07) was significantly positively correlated (r=0.57, P=0.002) with Δ [StO_2] and significantly negatively correlated (r=0.56, P=0.006) with Min [StO_2]. There was no significant correlation between any metabolic parameter and [StO_2] upslope (initial slope of [StO_2] following cuff release). **CONCLUSIONS:** Δ [StO_2], a measure of the amount of reperfusion, and Min [StO_2], a measure of extraction during the cuff, were correlated with FI and ISI_{HOMA}, two of the longest used markers of metabolic function. NIRS-derived [StO_2] may be a useful tool for assessing levels of reduced insulin sensitivity in normoglycemic, young adults.

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Lower Glucose Tolerance in Normoglycemic, Healthy Hispanics with a Family History of Type 2 Diabetes

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(No relevant relationships reported)

Obesity and type 2 diabetes are associated with impaired glucose homeostasis and blood lipid profiles. Further, a family history of diabetes (FH) increases the risk for development of insulin resistance. However, it is unclear whether differences in glucose tolerance, blood glucose and lipid profiles exist between individuals with/ without a FH.
PURPOSE: To investigate whether a FH impairs glucose tolerance and blood lipid profile in healthy, sedentary Hispanic males.
METHODS: 22 sedentary, normoglycemic, Mexican American males (mean±SEM: age:23±0.56 yrs; BMI: 26.9±0.98 kg/m^2) with/without FH participated in the study. Glucose tolerance was assessed by calculating glucose area under the curve (AUC) following an oral glucose tolerance test. Participants were fed a 5-day standardized diet (55/15/30% Carbohydrate/Protein/Fat) before testing. Serum was collected for analysis of blood glucose and lipid panels by a diagnostic center (Lab Corp, Burlington, NC).
RESULTS: AUC was significantly greater in individuals with a FH compared to controls without FH (FH- vs FH+: 311.91±7.30 vs 355.35±11.91 AU; p=0.008). Fasting glucose (75.9±2.07 vs 79.1±2.85 mg/dL; p=0.40) and HOMA-IR (2.64±0.48 vs 1.81±0.19 AU; p=0.26) were not different between groups. There was no difference in fasting insulin between groups. Lastly, no differences in total cholesterol (p=0.18), triglycerides (p=0.28) or LDL cholesterol (p=0.24) were detected regardless of FH.
CONCLUSION: Fasting glucose, insulin, insulin resistance measure by HOMA-IR, and lipid profiles were not different between individuals with and without a FH. However, glucose AUC may be an early indicator of risk for developing insulin resistance in young adults with a family history of type 2 diabetes, despite an otherwise normal clinical health status.

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Restricted Carbohydrate Diet and Exercise Improves Metabolic and Inflammatory Profiles in Metabolic Syndrome

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(No relevant relationships reported)

One approach to slow the pandemic of obesity and chronic disease is to look to our evolutionary past for clues of the changing behaviors contributing to the emergence of 'diseases of civilization'. Diet and exercise that resemble our ancestral behaviors independently reduce risk factors for the development of chronic disease. To date, little research has examined the effects of combining a Paleolithic diet with high intensity exercise. **PURPOSE**: The purpose of this study was to investigate the effects of diet and exercise patterns that more closely resemble those of our evolutionary past on inflammatory and metabolic profiles in individuals characterized as having Metabolic Syndrome (MetS). **METHODS**: Eleven subjects with MetS followed a crossover design with two 4-wk interventions, including a restricted carbohydrate Paleolithic-based diet (RCPD; ≤50gCHO) with high intensity interval training (RCPD-Ex) and a RCPD diet with sedentary activity (RCPD-Sed), separated by a 4-wk washout period. A two-way analysis of variance with repeated measures was performed with post-hoc analysis using simple effects analysis with a Bonferroni adjustment. The level of statistical significance was established a priori as $P < 0.05$. Values are reported as means ± SD. **RESULTS**: Compared to baseline, RCPD-Sed and RCPD-Ex improves VO^2_{max} by 22% and 29% (28 ± 5.5, 31 ± 6.1 mL·kg-1·min-1), respectively and improves metabolic markers including waist adiposity (-15%, -18%), weight loss (-3%, -5%), body fat % (BF%; -7%, -12%), fasting plasma glucose (GLU; -20%, -27%), triglycerides (TG; -47%, -52%), HDL-C (+22%, +36%), mean arterial pressure (MAP; -28%, -34%), fasting insulin (-34%, -39%), HOMA-IR (-37%, -41%), adiponectin (+33.7%, +38%), and leptin (+33.7%, +38%), levels, respectively when compared to baseline. RCPD-Sed and RCPD-Ex also improves inflammatory markers reducing hsCRP by -32% and-36% (2.8 ± 1.4, 2.5 ± 1.4 pg/mL), TNF-alpha by -35% and -41% (2.3 ± 0.6, 1.9 ± 0.4 pg/ml), and IL-6 by -29% and -40% (2.7 ± 0.8, 2.1 ± 0.6 pg/ml), respectively, when compared to baseline. **CONCLUSION**: Adopting behaviors from our evolutionary past, including diet and exercise, shows favorable metabolic and inflammatory profiles in those that characterize with MetS.

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Metabolic Inflexibility Among Obese Pregnant Women May Lead to Unfavorable Downstream Metabolic Outcomes

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(No relevant relationships reported)

PURPOSE: The inability to upregulate fat oxidation in response to a high-fat meal during pregnancy (i.e. metabolic inflexibility) may result in a positive lipid balance and excessive gestational weight gain (GWG); both of which may lead to long-term obesity. Metabolic inflexibility may also lead to lipid accumulation and subsequent impaired insulin signaling; playing a role in exaggerated insulin resistance during pregnancy. With obesity, excessive GWG, and insulin resistance being some of the most common and concerning obstetric issues, understanding mechanisms that contribute to these conditions is vital. The purpose of this study was to determine the role of obesity on metabolic inflexibility during pregnancy, and how metabolic inflexibility may contribute to subsequent maternal and neonatal outcomes.
METHODS: After an overnight fast, baseline lipid oxidation (via indirect calorimetry) and insulin resistance (HOMA-IR) were assessed in pregnant women (32-39 weeks gestation). A high-fat shake was consumed (62% fat) and the same metabolic parameters were assessed 4 hours post-shake consumption. Metabolic inflexibility was calculated as fold change in lipid oxidation from baseline to 4-hours post high-fat shake. **RESULTS**: Participants included 56 pregnant women: 31 lean (pre-pregnancy BMI= 22.3±1.6 kg/m^2, age= 30.1± 4.6 y), 11 overweight (pre-pregnancy BMI=

26.9±1.2 kg/m^2, age: 29.9 ±1.0 y), and 14 obese women (pre-pregnancy BMI= 35.9± 5.3 kg/m^2, age= 29.0 ± 3.6 y). Fasted lipid oxidation values were higher among obese women (0.09±0.03g/min) compared to lean women (0.07±0.04g/min) (p=0.05), and were positively correlated to GWG among all participants (r=0.38, p<0.01). Obese pregnant women were less able to upregulate fat metabolism in response to the high-fat meal (i.e. metabolically inflexible) compared to lean women (fold change in lipid oxidation- lean: 59.6 ± 50.6% vs. obese: 36.5 ± 49.9%, p=0.06). There was a trending relationship between metabolic inflexibility and insulin resistance (r=0.33, p=0.07). Data collection and analysis are ongoing. **CONCLUSIONS**: Obese pregnant women failed to upregulate lipid metabolism to the same extent as lean pregnant women in response to a high-fat meal. This "metabolic inflexibility" may contribute to unfavorable maternal and neonatal outcomes.

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Exercise And Diet In Circadian Control Of Postprandial Glycemia

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(No relevant relationships reported)

PURPOSE: On the recommended 45 to 65% high-carbohydrate, low-fat diets, evening meals, but not morning meals, produce glucose intolerance (GLU-INT). We have recently tested the hypothesis that the high carbohydrate (CHO) content of the diet contributed to evening postprandial GLU-INT and found a 30% reduction in evening postprandial insulin and in HOMA-IR measure of insulin resistance after one day of low (30%), relative to 60% CHO diet (Lin & Borer, PLoS ONE 2016). Two hours of exercise before the two daily meals did not alter this dietary effect but increased GLU-INT after both diets. The purpose of the present study was to test the hypothesis that (1) one day of low-CHO diet will reduce postprandial insulin and glucose at both extremes of the circadian period, and (2) that exercise after the meals will lower or eliminate evening GLU-INT.
METHODS: Subjects were 8 postmenopausal women who for 24 h ate a 25%-CHO diet with the final meal at 7 am or 7 pm . Meal was followed by 10-minute blood collection over 4.5 hours for measurement of glucose and insulin. Two trials were sedentary and in two others 1 h of moderate-intensity exercise started 40 minutes after the test meals. Glucose oxidase was used to measure glucose and radioimmunoassay for insulin.
RESULTS: Circadian time had no effect on postprandial insulin in either sedentary or exercise trials. However, postprandial GLU-INT was observed after evening compared to morning meals. Post-meal exercise attenuated by about 50%, but did not abolish, evening GLU-INT.
CONCLUSIONS: Evening postprandial GLU-INT persists even on 25%-CHO diet. Higher postprandial insulin resistance after evening relative to morning meal reflects higher plasma glucose but unchanged insulin response in the evening compared to morning. One h of exercise after the meals attenuated, but did not eliminate, evening postprandial GLU-INT. Therefore, a combination of low-CHO diet and post-meal, but not pre-meal, exercise reduces evening GLU-INT.

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The Postprandial Glycemic Response to Acute Bout of Exercise in Healthy Adults

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(No relevant relationships reported)

Short bouts of exercise can better fit into a busy schedule and have been shown health benefits for glycemic control. However, postprandial glycemic response to a short bout of exercise during mid-day remains to be explored. **Purpose:** This study was to examine glucose responses to short bouts of exercise following different meals at lunch time among healthy adults. **Methods:** Ten healthy young adults (28.2±7.7 yrs) participated in the study with a 2×2 factorial design. Each participant completed four different trials on nonconsecutive days with a different meal and exercise combination. The meal offered was either a standard burger, approximately 740 calories or a prepacked Mediterranean Sandwich, approximately 560 calories. Thirty minutes after the meal, the participants performed either a 10-min treadmill walking at 3 mph with no incline or a 10-min stair stepping on a 7-inch step at a cadence of 92 steps per minute. The combination of meal and exercise was randomized for each trial. Blood glucose was monitored at baseline, 5 minutes post meal, 30 minutes post meal, 5 minutes during exercise, immediately post exercise and 15 minutes post exercise. Blood pressure, heart rate, RER, and VO_2 were also monitored at the corresponding time points. **Results:** Statistical analysis was performed to determine the effect of diet and exercise on glycemic response. Blood glucose level (mg/dL) was measured as 95.13 ± 20.46 at baseline with a significant increase at 30 min post meal (112.73 ± 20.54, P = 0.00). Blood glucose was significantly reduced at 5 min during exercise (105.43 ± 20.06, P=0.024), immediately post exercise (94.51 ± 23.6, P = 0.00) and 15 min post exercise (102.97 ± 17.34, P = 0.005) compared with 30-min post-prandial blood glucose. Multivariate analysis shows a significant main effect for exercise (P = 0.037). No significant effect was found for diet (P = 0.305) or interaction of diet by exercise (P = 0.386). Post hoc analysis further revealed that the only exercise effect was found at 5 min post meal, which was disregarded due to no true exercise effect. **Conclusion:** The finding suggests that a 10-min short bout of exercise significantly lowered post-prandial blood glucose among healthy individuals during midday. The types of the meal consumed and exercise performed made no difference on glycemic responses.

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Low-Calorie Diet Plus Interval Exercise Training Improves Metabolic Flexibility and Insulin Sensitivity in Obese Women

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(No relevant relationships reported)

PURPOSE: Metabolic flexibility has been implicated in the regulation of insulin sensitivity and glucose homeostasis. Although low-calorie diets (LCD) and interval exercise (INT) have been independently shown to improve metabolic flexibility and insulin sensitivity, the combined effect of these therapies is unknown in obese adults. We tested the hypothesis that LCD+INT would enhance fuel selection to a greater extent than a LCD alone, and this change would correlate with insulin sensitivity.
METHODS: Twenty-four women (Age: 48.2±2.4y, BMI: 37.8±1.3kg/m^2) were randomized to a LCD (n=12; mixed meals of ~1200kcal/d) or LCD+INT (n=12; 60min/d of supervised INT at 90% and 50% HR_{peak} for 3 min each, respectively). LCD+INT subjects received an additional 350kcal post-exercise to equate energy availability between groups. Fitness (VO_2peak), percent body fat (BodPod), and insulin sensitivity (Matsuda Index; 180min 75g OGTT) were assessed pre- and post-intervention. Respiratory exchange ratio (RER; indirect calorimetry) was measured at 0, 60, 120, and 180 min of the OGTT to determine metabolic flexibility, which was defined as the slope of fasting to post-prandial (PP; average of 60-180 min) RER.
RESULTS: LCD and LCD+INT had similar reductions in caloric intake (P<0.001), percent body fat (P<0.001), fasting plasma glucose (P=0.04), fasting RER (P<0.001) and improvement in insulin sensitivity (P=0.02). However, LCD+INT improved VO_2peak (P=0.04), insulin $iAUC_{180min}$ (P=0.08), and metabolic flexibility (P=0.007) as well as maintained PP RER (P<0.001) compared with LCD. Maintenance of PP RER (r=-0.50, P=0.01) and reductions in percent body fat (r=-0.45, P=0.02) were significantly associated with improved insulin sensitivity. Further, increased metabolic flexibility was directly associated with improved VO_2peak (r=0.48, P=0.01).
CONCLUSIONS: Adding INT to a LCD accentuates metabolic flexibility in relation to insulin sensitivity in obese women. These findings highlight that INT-induced adaptations may be additive for glucose regulation during a weight-loss intervention.

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The Effects Of Age And Sex On Obesity And Insulin Action In C57bl/6j Mice

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(No relevant relationships reported)

PURPOSE: The purpose of this study was to determine the effects of age and sex on body composition, energy expenditure, physical activity, and glucose tolerance in C57BL/6J mice. **METHODS:** Young (YG, 20-25 weeks old) and aged (AG, 72-76 weeks old) mice were housed in metabolic cages to measure energy expenditure (EE) and physical activity (PA), underwent body composition analysis by magnetic resonance imaging, and were subjected to an intraperitoneal glucose tolerance test (GTT) to assess insulin action. **RESULTS:** Body composition analysis revealed that AG male mice had a significantly greater body mass (42.2±1.9 vs 30.0±0.4 g, P<0.0001), fat mass (18.7±2.0 vs 3.3±0.4 g, P<0.0001), and percent body fat (43.0±3.0 vs 11 vs 11.0±1.5%, P <0.0001) than YG male mice. In AG female male mice, body mass was significantly higher (32.8±1.6 vs 26.3±0.9 g, P<0.02), but fat mass (13.3±2.0 vs 9.5±1.3 g, P<0.24) and percent body fat (37.8±4.8 vs 35.5±3.8%, P=0.67) were similar when compared to YG female mice. Interestingly, lean body mass was higher in AG female mice (16.9±0.6 vs 14.7±0.6, P<0.008) but lower in AG male mice (18.4±0.4 vs 22.6±0.5, P<0.0001) when compared to their young counterparts. AG male mice had significantly higher body mass (42.2±1.9 vs 32.8±1.6 g, P=0.001) and fat mass (18.7±2.0 vs 13.3±2.0 g, P=0.04) compared to AG females, however, percent body fat (43.0±3.0 vs 37.8±4.8%, P=0.28) was similar between AG male and female mice. Surprisingly, EE was higher in both AG male (24.0±0.8 vs 19.0±0.4 kcal/hr, P=0.004) and female mice (26.4±2.0 vs 20.7±0.4 kcal/hr, P=0.001) compared to respective YG mice; however, EE does not appear to explain the sex-dependent differences in body composition. Physical activity tended to be higher in AG female mice compared to AG male mice, but this effect was not significant (P=0.12).

Regarding the effect of aging on insulin action, the area under the GTT curve was significantly higher in AG males (95,102±6,818 vs 64,005±2031, P=0.002) but not AG female mice (50,168±2345 vs 47,369±4,089, P=0.55). **SUMMARY:** Our findings indicate that C57BL/6J female mice, unlike male mice, are protected from age-related obesity and insulin resistance. The mechanism responsible for this protection is yet to be identified.

B-69 Free Communication/Poster - **Nutrition and Immunology**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

957 Board #218 May 30 3:30 PM - 5:00 PM

Bovine Colostrum Has No Effect on Mucosal Immunity Before or After Exercise in a Hot and Humid Environment

Trevor Gillum, Zachary McKenna, Quint Berkemeier, Ashley Naylor, Austin Kleint, Felipe Gorini. *California Baptist University, Riverside, CA.*

(No relevant relationships reported)

Intro: It is known that strenuous or prolonged exercise can lead to exercise-induced immune impairments in mucosal immunity. Further, exercise in the heat reduces salivary lysozyme (Lys). Bovine Colostrum (BC) can enhance mucosal immunity associated with strenuous exercise. However, the effects of BC remain unclear during exercise in hot and humid conditions.
Purpose: The purpose of this study was to quantify the effects of BC supplementation on salivary lactoferrin (Lac) and Lys following exercise in a hot and humid environment.
Methods: 10 males (20±2 years, VO_{2max} 55.8±3.7 mL kg^{-1} min^{-1}, 11.8±2.7% body fat) ran for 46±7.7 min at 95% of V_T in 40° C and 50% RH following a 14-day double-blinded supplementation with either BC or isocaloric placebo (Pla). There was a 3 week washout period before the groups were switched and the procedures repeated. Core temperature, skin temperature, heart rate, and rating of perceived exertion were recorded every 5 min during exercise. Unstimulated salvia was collected pre, post, 1 h, and 4 h post exercise. Lac and Lys concentrations were quantified via ELISA.
Results: Exercise resulted in an immediate increase in concentration and secretion rate for Lac and Lys ($p<0.05$), but BC had no effect. Mean body temperature was similar between groups (beginning: 36.11 ± 0.30°C, ending: 39.52 ± 0.28°C (BC); beginning: 35.96 ± 0.43°C, ending: 39.42 ± 0.38°C (Pla)). Saliva flow rate was not different between groups (pre: 0.54 ± 0.3, post: 0.44 ± 0.3, +1: 0.67 ± 0.3, +4: 1.0 ± 0.4 mL/min (BC); pre: 0.58 ± 0.2, post: 0.37 ± 0.1, +1: 0.63 ± 0.2, +4: 0.83 ± 0.4 mL/min (Pla)).
Conclusion: Contrary to previous work, exercise in the heat did not reduce mucosal immunity. Further, despite similar supplementation protocols that showed enhanced mucosal immunity, BC provided no benefit, either at baseline or in response to exercise. Thus, 45 min of running near V_T, in a hot and humid environment, did not impair mucosal immune parameters.

	Lac Conc. (µg/ml)		Lys Conc. (µg/ml)		Lac Sec. Rate (µg/min)		Lys Sec. Rate (µg/min)	
	BC	PLA	BC	PLA	BC	PLA	BC	PLA
Pre	22.9 ± 19.3	12.2 ± 5.3	8.2 ± 10.0	3.3 ± 2.15	11.9 ± 10.0	7.2 ± 4.7	4.9 ± 7.1	2.1 ± 1.9
Post	67.2 ± 55.6*	75.1 ± 61.1*	25.6 ± 13.7*	23.6 ± 12.6*	25.2 ± 20.6*	26.1 ± 18.5*	12.7 ± 1337*	8.2 ± 4.8*
1-Hr Post	21.2 ± 17.1	17.3 ± 9.1	13.8 ± 12.8*	11.1 ± 10.9*	12.5 ± 8.4	10.8 ± 7.2	10.6 ± 11.9*	6.9 ± 7.6*
4-Hr Post	17.4 ± 11.0	17.2 ± 8.6	13.3 ± 11.0*	9.6 ± 7.7*	18.4 ± 14.2	12.11± 5.3	14.0 ± 11.4*	6.8 ± 5.2*

*p<0.05 from pre, *n* = 10.

958 Board #219 May 30 3:30 PM - 5:00 PM

Phd2/hif-1α Axis Regulates Intestinal Barrier Function After Strenuous Swimming

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(No relevant relationships reported)

PURPOSE: Exercise decreases tissue blood flow in the gastrointestinal (GI) system. The hypoxia inducible factor-1α (HIF-1α) and its regulator, prolyl hydroxylases 2 (PHD2), are pivotal in the transcriptional responses to the oxygen flux. Strenuous exercise induces immunosuppression and may lead to intestinal barrier dysfunction. Therefore, we hypothesized that PHD2/HIF-1α axis is involved in the intestinal barrier function after strenuous swimming.
METHODS: Four mouse models were used in this study (male, 8-week, n=6/group). (1) ROSA26 ODD-Luc/+ mice were applied to monitor HIF-1α expression in the intestine. (2) C57BL/6 mice were randomized into 4 groups (n=8/group): control (C), strenuous swimming (S), intraperitoneal injected PHDs inhibitor DMOG (D); injected HIF-1α inhibitor PX-478 before swimming (PS). Intestinal segments were stained with HE and AB-PAS. Intestinal permeability was quantified with FITC-dextran. Bacterial translocation was determined by quantification of colony forming units (CFUs) in cultured mesenteric lymph nodes, livers, kidneys and spleens. (3) Villin-Cre mediated, intestine-specific deletions of HIF-1α (Vil-Hif1a$^{-/-}$) or (4) PHD2 (Vil-PHD2$^{-/-}$) mouse models were developed to verify the function of PHD2/HIF-1α axis in regulating the intestinal antimicrobial responses related genes expression.
RESULTS: (1) One session of strenuous swimming markedly increased *in vivo* HIF-1α in the intestine (C: $Radiance_{max}$ = 0.31, S: $Radiance_{max}$ = 2.17, 10^7p/sec/cm^2/sr, P<0.01). (2) One session of strenuous swimming increased bacteria translocation (C: 0.61±0.15, S: 6.25±2.49, 10^5CFU/g, P<0.01) and intestinal permeability (C: 1, S: 1.87±0.21, folds, P<0.01). (3) The antimicrobial responses related genes expression was significantly decreased in Vil-Hif1a$^{-/-}$ (P<0.01, compared to the controls), including Il12a, Irak3, Irf5, Lbp, Lyz2, Nlrp1a, Ticam2, Tlr4, Tlr9 and Tnfa.
CONCLUSION: Strenuous swimming induces intestinal barrier dysfunction. PHD2/HIF-1α axis plays an important role in the regulation of intestinal barrier dysfunction related genes expression after strenuous swimming in mice.
Funding: the National Natural Science Foundation of China (31471135, 31701040)

959 Board #220 May 30 3:30 PM - 5:00 PM

Effects Of Diet Before Endurance Exercise On Hepcidin Response In Young Females

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(No relevant relationships reported)

PURPOSE: The purpose of the present study was to examine the effects of diet before prolonged exercise on hepcidin response in young female subjects. **METHODS**: Ten young, untrained-female subjects [age 20.6 ± 0.8 years; height 157.5 ± 1.0 cm; weight 54.4 ± 1.5 kg; peak oxygen uptake (VO2max) 35.9 ± 1.1 ml/kg/min] participated in the present study. Subjects completed a 60-min bout of cycling at 65% of VO2max after with consuming (FED) or not consuming (CON) a meal before the exercise. The two experimental sessions were conducted with a crossover design, and these sessions were separated by about a month (each trial was performed during the follicular phase). Blood samples were collected before exercise, immediately after exercise and 3-h after exercise. **RESULTS** : Blood glucose levels were significantly elevated immediately after exercise in the FED (from 91 ± 2 mg/dL to 114 ± 5 mg/dL, $P < 0.05$). Serum iron level was significantly elevated after exercise in both FED (from 82 ± 14 µg/dL to 99 ± 16 µg/dL, $P < 0.05$) and CON (from 70 ± 14 µg/dL to 83 ± 15 µg/dL, $P < 0.05$). However, plasma interleukin-6 and hepcidin levels were not altered significantly during 3-h of post-exercise period in either condition (interaction, main effects for trials and time, $P > 0.05$). **CONCLUSIONS** : Diet before endurance exercise did not affect exercise-induced hepcidin elevation in young females.

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Aerobic Training Status Enhances the Pentraxin 3-Mediated Innate Immune Response Following Maximal Exercise

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(No relevant relationships reported)

PURPOSE: Pentraxin 3 (PTX3) is a vital regulator of innate immune function. Although plasma PTX3 concentrations are enhanced by aerobic exercise, the capacity of aerobic exercise to alter PTX3 functioning at the cellular level in aerobically trained (Tr) and untrained (UTr) subjects remains unknown.

METHODS: Fifteen Tr and 15 UTr participated in an acute bout of maximal exercise to examine *ex vivo* PTX3 production from whole blood (WB) and isolated peripheral blood mononuclear cells (PBMCs) exposed to LPS or palmitate. The capacity of PTX3 to regulate the *ex vivo* production of inflammatory cytokines was also examined in isolated PBMCs.
RESULTS: Elevated plasma PTX3 concentrations prior to exercise were positively associated with the percent change (pre to post exercise) in plasma PTX3 concentrations following acute exercise ($r = 0.428$, $p = 0.018$), independent of training status and cardiorespiratory fitness (VO_{2max}). In response to acute exercise, while *ex vivo* PTX3 production from LPS stimulated WB was unaltered following acute exercise in all subjects, the production of PTX3 from LPS stimulated PBMCs tended to be lower in Tr compared to UTr subjects ($p = 0.098$). Likewise, PTX3 production from palmitate stimulated PBMCs was reduced in Tr compared to UTr subjects ($p = 0.017$). In addition, plasma PTX3 concentrations in Tr, but not UTr, subjects were positively associated with the LPS- and palmitate-mediated production of PTX3 from PBMCs at rest and in response to acute exercise ($p \leq 0.050$). Next, isolated PBMCs were stimulated with PTX3. As a result, PTX3-mediated production of the anti-inflammatory cytokines IL-10 and TGF-B1 decreased following acute exercise in both Tr and UTr subjects ($p = 0.004$, $p \leq 0.001$, respectively). To the contrary, although PTX3-mediated IL-6 production was unaltered following acute exercise, the percent change in IL-6 production was positively associated with elevated plasma PTX3 concentrations at rest and in response to acute exercise in Tr subjects only ($p \leq 0.050$).
CONCLUSIONS: Aerobic exercise training may enhance the utility of plasma PTX3 concentrations to serve as a biomarker of the PTX3-mediated innate immune response to acute exercise.

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The Effect Of Exercise On CD4+ T-cell Activation And Their Susceptibility To HIV-1

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(No relevant relationships reported)

HIV-1 can efficiently infect and replicate in activated CD4+ cells, including T cells and macrophages. Quiescent CD4+ T cells are susceptible to virus binding and entry, but infect poorly due to a lack of transcriptional and metabolic factors. We previously showed that circulating T cell populations undergo significant functional changes after short episodes of intense exercise. We hypothesize these changes can prime T cells for HIV-1 infection, and possibly facilitate the development of latent infection. **PURPOSE:** To identify if exercise-induced changes in CD4+ T cell physiology alter susceptibility to HIV-1 infection. **METHODS:** Subjects participated in both a control (no exercise) and exercise session. Venous blood samples were obtained at baseline (Pre) and immediately after each session (Post) in sodium heparin vacutainers. Blood samples were immediately processed and CD4+ T cells isolated with a human CD4+ T cell enrichment kit. A subset of cells was activated by stimulation with anti-CD3 and -CD28 antibodies. Unstimulated cells were immediately inoculated with NLX HIV-1 at a multiplicity of infection (MOI) of ~0.1 for 4 h, washed, and cultured in XF T Cell media supplemented with 50 U/mL IL-2. After 3 d of stimulation, the activated cells were similarly infected and cultured. Cultures were incubated for 17 d and supernatants collected, clarified by centrifugation, and stored at -20°C every 3-4 d for measurement of virus replication. At 14 d post infection, the resting cells were activated for 3 days with human CD3/CD28/CD2 T cell activator beads to test for latent infection (activated cell group was not restimulated). Virus replication was quantified by HIV reverse transcription assay. **RESULTS:** Preliminary data from the initial subjects suggests there is not a statistically significant change in viral replication levels between baseline and post exercise cells. In one subject however, a 1702% increase was observed in viral replication after reactivation of control resting cells compared to a 55% increase in reactivated exercise cells. **CONCLUSIONS:** While evidence suggests acute exercise alters the phenotypic state of T cells, it may not alter overall T cells susceptibility to infection with HIV-1.
Supported by an award through the Dr. George F. Haddix President's Faculty Research Fund at Creighton University.

962 Board #223 May 30 3:30 PM - 5:00 PM

High-fat Diet Attenuated Plasma sCD130 and sCD163 In Trained Men

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(No relevant relationships reported)

High-fat (HF) diets have been shown to favorably influence weight management and exercise performance. Inflammation is closely related to cardiovascular and other metabolic diseases. Yet, the responses of inflammatory markers to HF diets have not been extensively studied. **PURPOSE:** To examine the effects of a short-term high-fat (HF) diet and an acute bout of exercise on inflammatory markers in trained men. **METHODS:** Aerobically trained men (N = 8, VO_2max = 48.5±4.5 mL/kg/min, age = 39.5±9.9 years) that had been on a typical high-carbohydrate (HC) diet (60-70% of carbohydrate) maintained their HC diet during the first phase of the study and switched to the HF diet (~70% of total calories from fat with carbohydrate < 50 g) for 3 weeks during the second phase. At the end of each phase, the participants performed a treadmill exercise for 50 minutes at varying race paces followed by an outdoor 5-km time trial. Overnight fasting serum samples were collected at pre- and 24-hours post-exercise at the end of each phase to analyze the inflammatory markers, including sCD30, sCD163, chitinase-3-like protein 1, glycoprotein 130, TNF-α, sTNF-R1, IL-1, IL-6, and CRP by a multiplex flow immunoassay. Data were analyzed using a factorial analysis of variance with the Sidak's multiple comparisons when necessary ($p < 0.05$). **RESULTS:** The inflammatory markers were not altered following an acute bout of exercise. However, the 3-week HF diet significantly lowered the following markers: sCD30 (421.61±27.71 to 290.25±23.80 pg/mL, p=0.09), sCD163 (87570.01±8081.49 to 61708.73±6754.50 pg/mL, p=0.020), chitinase-3-like protein 1 (8127.80±775.56 to 5481.72±606.47 pg/mL, p=0.020), and gp130 (41472.71±1761.09 to 33603.12±2048.81 pg/mL, p=0.029), whereas other inflammatory markers were not different between the HC and HF diets. **CONCLUSION:** High-fat diets have been typically thought to negatively influence cardiometabolic health. However, a short-term high-fat diet demonstrated its positive role in inflammation in trained middle-aged men. It is highly recommended that the future studies focus on examining the effects of a long-term high-fat diet on inflammatory markers in a variety of subject populations.

963 Board #224 May 30 3:30 PM - 5:00 PM

Adding Short-Term Interval Exercise to a Low-Calorie Diet Favorably Influences Appetite in Obese Adults

Emily M. Heiston, Nicole M. Gilbertson, Natalie Z.M. Eichner, Julian M. Gaitan, Monique E. Francois, James H. Mehaffey, Taryn E. Hassinger, Peter T. Hallowell, Arthur Weltman, FACSM, Steven K. Malin, FACSM. *University of Virginia, Charlottesville, VA.* (Sponsor: Steven Malin, FACSM)

(No relevant relationships reported)

Purpose: Appetite is influenced by gut-derived hormones and behavioral factors. Caloric restriction is suggested to reduce satiation and increase hunger, thereby contributing to challenges in long-term weight loss. Although intense exercise is suggested to attenuate appetite, no data exist testing the effects of interval exercise (INT) during a low-calorie diet (LCD) on appetite regulation. We hypothesized that LCD+INT would favorably influence satiety when compared with LCD in obese adults. **Methods**: Seventeen obese adults (50.5 ± 3.0 yrs; 35.9 ± 1.4 kg/m^2) were randomized to either LCD (n=8; mixed meals of ~1200 kcal/d) or LCD+INT (n=9; 60 min/d of supervised interval exercise at 90% HR_{peak} for 3 min and 50% HR_{peak} for 3 min). An additional 350kcal (shake) was provided to LCD+INT individuals post-exercise to equate energy availability between groups. Total PYY, acyl ghrelin (AG) and des-acyl ghrelin (dAG) were measured at 0, 30 and 60 min of a 75g OGTT before and after the intervention. Visual analog scales were also administered at 0 and 120 min of the OGTT to assess subjective appetite. Food logs were recorded prior to and during the intervention to evaluate caloric intake. **Results:** Both interventions decreased food intake (P=0.001) and body fat (P<0.01). LCD+INT decreased fasting PYY (P<0.01) and increased post-prandial PYY stimulation (27.0 ± 7.0 vs. 37.0 ± 11.0%) when compared with LCD (20.1 ± 11.6 vs. 15.8 ± 3.4%, P=0.11). LCD+INT increased fasting AG (P=0.07) and increased suppression (6.8 ± 5.1%) compared to LCD (-8.3 ± 5.9%, P=0.08). Both interventions increased circulating dAG following the OGTT (P = 0.06). Interestingly, LCD+INT attenuated the rise in fasting hunger seen with LCD (P=0.05). **Conclusion:** Interval exercise favorably influences PYY, AG and perceived hunger during a LCD in obese adults. Further research is warranted to determine how adding interval exercise to long-term caloric restriction may mitigate obesity and related cardiometabolic disease.

964 Board #225 May 30 3:30 PM - 5:00 PM

Effects Of Obesity And Exercise On Bone Marrow And Leukemia Cells Following Radiation

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(No relevant relationships reported)

Radiation-induced leukemia is a serious late effect of radiation therapy partially due to long-term alterations in the bone marrow (BM) environment. Obesity and sedentary lifestyles, two host factors that remodel the bone marrow, are common amongst cancer survivors and linked to increase leukemia risk. Whether alterations to the bone marrow environment induced by obesity and physical activity alter leukemia risk following ionizing radiation (IR) exposure remains unknown. **PURPOSE:** Determine how exercise training and obesity modulate the BM environment and leukemia blast viability following sub-lethal IR exposure. **METHODS:** 4 week old CBA mice were fed a control (CON; n=20) or 45% high fat diet (HF; n=20). At 9 weeks old, CON and HF mice were divided into sedentary (SED, n=10) or exercise groups (EX,

n=10). At 13 weeks, mice were administered a uniform radiation dose of 3 Gy and continued their specific diet and exercise regimen for 4 weeks. BM stromal cells were quantified by flow cytometry and marrow adipose tissue (MAT) was determined by μCT. Conditioned media (CM) from isolated BM stromal cells was analyzed by cytokine array and applied to the KG-1 leukemia cell line to assess cell viability by MTT assay. **RESULTS:** The number of mesenchymal stromal cells in CON+EX increased compared to CON+SED ($p<0.05$). EX increased the quantity of osteoblasts and endothelial progenitor cells compared to SED mice (both $p<0.05$). EX reduced MAT compared to SED, even in the presence of HF diet following sub-lethal IR ($p<0.05$). Inflammatory cytokines were also increased in the CM of HF-SED compared to CON-SED, and this effect was reduced with EX. CM from HF mice increased KG-1 viability, but not CM from EX ($p<0.05$). **CONCLUSION:** Overall, exercise increased BM stromal cell content and reduced BM inflammation while obesity increased BM adiposity and leukemia cell viability. These data suggest that exercise may be a therapeutic intervention to reduce secondary leukemias following radiation therapy, particularly in obese cancer survivors.

965 Board #226 May 30 3:30 PM - 5:00 PM

Exercise-induced Th17 Lymphocyte Response And Their Relationship To CVD Risk Factors In Obese, Post-menopausal Women

Maria A. Cardenas[1], Michael M. Levitt[1], Bryan Richie[1], Shaohan Lu[1], Elise E. Erickson[1], Carmen Cook[1], Jay Haynes[2], Andreas Kreutzer[1], Joel B. Mitchell, FACSM[1], Melody D. Phillips, FACSM[1]. *[1]Texas Christian University, Fort Worth, TX. [2]John Peter Smith Hospital, Fort Worth, TX.* (Sponsor: Melody Phillips, FACSM)

(No relevant relationships reported)

Obesity-induced inflammation promotes type 2 diabetes and cardiovascular disease (CVD). A causative link between adaptive immunity and pathogenesis of obesity-associated diseases has been established.
PURPOSE: To examine the effects of exercise on circulating T-helper (Th) 17 lymphocytes in overweight/obese post-menopausal women.
METHODS*:* Twenty-seven overweight/obese women (BMI 32.7 ± 5.1 $kg \times m^{-2}$, 55-75 yr) were randomly assigned to the exercise (EX, n=14) or education (ED, n=13) groups. EX performed a 25-min walk (75-80% HRR) and 2 sets of 8 resistance exercises (70-80% 1RM) with blood samples obtained at: pre-exercise, post-exercise, one-hour and two-hour post-exercise. Blood samples were obtained at the same time points in resting ED. Whole blood was stained using the extracellular markers CD4, CD196, CD194, CD26, and CD161 to identify Th17 lymphocytes via flow cytometry.
RESULTS: Acute exercise increased lymphocyte number ($p = 0.0001$), but decreased percent of $CD4^+$ cells ($p = 0.019$) at PO. We observed a diurnal response (main effect) where CD26 expression was significantly lower by 2H compared to PRE (PR: 10631 ± 208; 2H: 9961 ± 271 MFI). There was a main effect ($p=0.024$) of group for CD26 expression (EX: 10745 ± 251; ED 9880 ± 260 MFI). The difference may have been driven by the apparent exercise-induced plateau of CD26 expression at 2H, which minimized the diurnal reduction observed in ED ($p > 0.05$). There was a tendency ($p = 0.09$) for a group x time interaction in Th17 cell number at 1HR (EX = 25.3 ± 4.8; ED =37.2 ± 5.2 x 10^3 cells x ml^{-1}). BMI was significantly correlated with Th17% ($r = 0.5$, $p = 0.008$). HbA1c was positively correlated with Th17 number and percentage ($r = 0.598$, $p = 0.003$; $r = 0.614$, $p = 0.001$, respectively), as well as $CCR4^+$ Th17 cells ($r = 0.421$, $p = 0.036$). Multiple regression analysis revealed that BMI and HbA1c were significant predictors (50%, $r^2 = 0.497$) of Th17 cell %.
CONCLUSION*:* Exercise reduced CD26 expression, the receptor responsible for Th17 cell migration, but did not significantly alter Th17 concentration ($p = 0.09$). CD26 upregulation may indicate that Th17 cells, via chemokine release, promote the stress-dependent migratory response of T-helper cells ($CD4^+$). Obese individuals may experience a preferential differentiation of Th17 cells, based on their association with adiposity (BMI) and HbA1c.

966 Board #227 May 30 3:30 PM - 5:00 PM

Acute Exercise-Induced Response of Platelet-Monocyte Complexes in Obese Postmenopausal Women

Michael M. Levitt[1], Maria A. Cardenas[1], Bryan Richie[1], Carmen A. Cook[1], Kara Steck[1], Shaohan Lu[1], Jay Haynes[2], Andreas Kreutzer[1], Joel B. Mitchell, FACSM[1], Melody D. Phillips, FACSM[1]. *[1]Texas Christian University, Fort Worth, TX. [2]John Peter Smith Health Network, Fort Worth, TX.* (Sponsor: Melody D. Phillips, FACSM)

(No relevant relationships reported)

Inactivity-related diseases such as cardiovascular disease (CVD) are linked to chronic low-grade, systemic inflammation. Platelet-monocyte complexes (PMCs) are markers of *in vivo* platelet activation and atherosclerosis, and may be early indicators of subclinical inflammation.
PURPOSE: To examine the effects of a single exercise bout on PMCs in those at risk for CVD.
METHODS: Twenty-five overweight-obese (BMI 32.7 ± 5.2 $kg \cdot m^{-2}$, 55-75 yr) women were randomly assigned to either the exercise (EX, n=13) or non-exercise control (CON, n=12) group. EX performed 2 sets of 8 resistance exercises and a 25-min treadmill walk at 70-80% HRR. Blood was obtained pre-exercise (PR), post- (PO), 1-hour and 2 hours post-exercise (1HR and 2HR). Blood was obtained at the same time points in CON. PMCs were identified via flow cytometry and analyzed in each monocyte phenotype. Monocyte phenotypes were defined as: Mon1 ($CD14^+CD16^-CCR2^+$), Mon2 ($CD14^+CD16^+CCR2^+$), and Mon3 ($CD14^+CD16^+CCR2^-$). All events positive for both CD14 and CD42a (marker for platelets) were considered PMCs.
RESULTS: A main effect for time revealed an increase in total PMC number at PO ($p=0.036$). This increase appears to have been driven by EX (EX = 61.5%; CON = 33.8% increase). Mon1 and Mon2 PMC responses were similar. A significant time x group interaction for Mon3 PMCs ($p=0.002$) indicated an increase from PR to PO (PR = 5218±1170 cells·ml^{-1}, PO = 8195±1152 cells·ml^{-1}), and a decrease from PO to 1HR and 2HR (1HR = 3767±820 cells·ml^{-1} 2HR = 3818±814 cells·ml^{-1}). PMC number remained constant for CON at all timepoints. Estimated VO2max was negatively correlated with CD42a MFI (a marker of platelet density per monocyte) ($r = -0.583$, $p = 0.003$). Systolic blood pressure (SBP) positively correlated with percent PMC (% CD42a positive monocytes; $r = 0.458$, $p = 0.042$).
CONCLUSIONS: Aerobic fitness appears to reduce platelet activation indicated by the negative relationship between VO2max and CD42a MFI. Chronic elevations in resting SBP are linked to PMC percentage, possibly due to sheer stress-induced platelet activation. It is possible that PMC elevation at PO is at least partially driven by exercise-induced increases in BP. These results support previous literature, indicating that PMCs are a marker CVD risk and may elucidate one mechanism by which physical fitness reduces risk for CVD.

B-70 Free Communication/Poster - Concussion I

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

967 Board #228 May 30 3:30 PM - 5:00 PM

Effects Of A Musculoskeletal Injury On Rebaseline Concussion Assessment Performance

Kelsey Bryk[1], Ryan DeWolf[2], Jessie Oldham[1], Melissa DiFabio[1], Katherine Breedlove[3], Thomas Kaminski[1], Thomas Buckley[1]. *[1]University of Delaware, Newark, DE. [2]Massachusetts General Hospital, Boston, MA. [3]University of Wisconsin - Eau Claire, Eau Claire, WI.*

(No relevant relationships reported)

A multifaceted baseline concussion assessment is a crucial component of properly assessing and managing concussions with post-injury values compared to baseline performance. While concussion adversely affects performance on these tests, musculoskeletal injury (MSI) also adversely affects test performance acutely post-injury; however, the prolonged effect of a MSI on concussion test performance is unknown. If MSI has a prolonged adverse effect on concussions testing, this could reduce the efficacy of the concussion test battery in the event of a suspected concussion.
PURPOSE: To determine the effects of lower-body MSI on pre-season baseline concussion tests.
METHODS: Division I collegiate student-athletes completed annual baseline concussion assessments in successive years. Athletes who sustained a lower-body MSI prior to their rebaseline tests (n=33) were compared to uninjured matched controls (n=33) based on sex, height, weight and sport. Baseline assessment included the Standard Assessment of Concussion (SAC), Balance Error Scoring System (BESS),

King-Devick (KD) Test, Clinical Reaction Time (CRT), a computerized neurocognitive assessment (CNT), and tandem gait (TG). A 2 (group) x 2 (time) repeated measures ANOVA was performed for each dependent variable.
RESULTS: There were no statistically significant interactions for any of the dependent variables. There were significant main effects of time with improved performance during the second year for SAC (Baseline 1: 26.5 ± 1.9 and Baseline 2: 27.3 ± 1.8, p = .001), KD Test (Baseline 1: 38.4 ± 6.4 sec and Baseline 2: 37.1 ± 6.3 sec, p = .025), and CRT (Baseline 1: 204.3 ± 24.3 msec and Baseline 2: 195.4 ± 24.6 msec, p = .013), but no differences in BESS, CNT, and TG. There were no significant group effects for all tests.
CONCLUSION: Sustaining a MSI did not adversely affect performance on the concussion baseline tests. This suggests that a student-athlete's initial concussion baseline assessment performance is valid to compare with post-injury performance, even if a lower body MSI was sustained after the initial assessment. As expected, improvements on certain tests were observed with repeat administration. These results suggest that a rebaseline concussion assessment for collegiate student-athletes is unnecessary.

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Fighting In The Nhl 5 Year Review: Fists Of Fury But Few Concussions, Believe It!

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(No relevant relationships reported)

In recent years, there has been a unified call to end fighting in the NHL to reduce concussive injury. However, no published data to prove fighting leads to more concussions has been produced, only anecdotal cases. Purpose:To analyze a consecutive NHL Fights from 2010-11 to 2014-15 seasons, recording all resulting injuries and number of games that the player missed. Methods: Public domain 'Hockeyfight' web sites were used to identify and view all fights and injuries were confirmed through two independent sources, the NHL and/or the team or independent press sources. The study received IRB waiver for use of public data. Stat Analysis was performed using available software. Results: The NHL had 992 fights in 1,950 games over 2 seasons with a fight/game rate of: 50.9% (range 38.-65% annually in NHL over past decade). 30 injuries resulted to the 1,984 combatants (n=992 fights) for an injury rate of 1.5/100 per fighters. Specifically looking at concussions, 6 mTBI resulted (20% of injuries) for a rate: 0.2/100 mTBI/fight rate which is ten-fold less than the reported concussion rates in standard NHL play (3.0 mTBI per 100 player games). The 10 players with most fights in NHL annually, for the past 5 seasons, tallied 1,012 fights from 50 players (fights/season range 17-33) with: all injury rate of 3/100 fights and mTBI rate of .15/100 fights. Discussion: Although fighting may appear a direct causative factor to concussions the data does not prove it. The difference of punching on ice compared to land appears to actually offer some protection over significant forces being generated and may explain the greater 'safety' of fighting in the NHL without injury. Currently, we are compiling similar data from the 2015-16 and 2016-2017 to compare changes in injury rates following NHL rule changes intended to better protect players. We expect to have this data completed and ready for presentation at the time of ACSM18. <!--EndFragment-->

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Determining the Appropriate Timing of Administration of Computerized Neurocognitive Testing Following Maximal Exertion- Preliminary Analysis

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(No relevant relationships reported)

Computerized neurocognitive testing (CNT) is part of a multi-faceted approach to sport-related concussion assessment. Accurate baseline (pre-injury) CNT scores aid post-concussion management which allows the athlete to serve as their own control. Prior research suggests maximal exertion negatively affects CNT scores immediately following exercise. However, the appropriate wait time for administering CNT following maximal exertion is unknown. **PURPOSE:** To compare differences in neurocognitive performance and symptoms following maximal exertion with varied recovery intervals in healthy college-aged students. **METHODS:** A prospective, randomized cross-over, repeated measures design was used for this study. Twenty-six participants (22 ± 2y) completed four experimental visits. Three visits consisted of a maximal effort graded exercise treadmill test (VO_2 max), with a prescribed post-exertion rest period, and CNT administration. Prescribed post-exertion recovery intervals were defined as: <2 min (immediate), 10-min, or 20-min. The fourth visit served as a control (baseline); participants performed a CNT without a preceding VO_2 max test. All four experimental visits occurred at least one week apart and were randomly counterbalanced. A series of one-way repeated measures analysis of variance (ANOVAs) were performed on CNT composite outcome and symptom scores. Statistical significance was set at a Bonferroni-corrected $p \leq .01$. **RESULTS:** There was a significant within-subjects effect for prescribed post-exertion recovery intervals on total symptom scores (*Wilks* $\lambda = .62$, $F[3, 23] = 4.64$, $p = .01$, $\eta^2 = .38$). Total symptom scores were significantly higher at the immediate ($p < .001$), 10-min ($p = .02$), and 20-min ($p = .05$) post-exertion recovery intervals compared to baseline. There were no significant differences for processing speed ($p = .05$), visual memory ($p = .07$), verbal memory ($p = .06$), or reaction time ($p = .40$). **CONCLUSION:** Baseline symptom scores were negatively influenced by maximal exertion, and continued to be elevated 20 minutes post-exertion. However, cognitive performance was unaffected. Sports medicine professionals should wait at least 20 minutes following maximal exertion to obtain a more accurate representation of symptoms.

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Does Greater Susceptibility to Neck Injury Put Females at Higher Risk of Prolonged Sport-Related Concussion Recovery?

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(No relevant relationships reported)

PURPOSE: An increase in female participation in contact sports has resulted in an increase in female athletes presenting with sport-related concussion (SRC). It has been theorized that females have longer SRC recovery time related to lower neck strength compared to males, which may also relate to concomitant neck injury. We proposed that female athletes with SRC have a higher incidence of acute cervical strain, resulting in a longer duration of SRC symptoms. Additionally, we investigated if athletes with acute cervical injury were more likely referred to a neuropsychologist in the post-SRC period compared to those without neck injury.
METHODS: This retrospective study assessed male and female youth, high school, and collegiate athletes (n=431; ages=12-21 years old) for post-SRC symptoms. We analyzed whether females who suffer a SRC are more prone to having an accompanying neck injury in comparison to males. Additionally, we assessed whether athletes who suffer an SRC with a neck injury display longer post-SRC recovery times, leading to increased referrals to a neuropsychologist; Statistical analyses were conducted using chi-square tests.
RESULTS: Of the 431 SRC cases, 92 reported concomitant acute neck strain. When comparing recovery time between male and female athletes, a significant difference was seen with females requiring more time to recover ($p<0.001$). However, when comparing recovery time in males and females with SRC and acute cervical strain, no significant differences were found ($p=0.416$). Additionally, when comparing the initial symptom burden using the post-concussion symptom scale in athletes with acute neck injury, females have a non-significant increased number of symptoms compared to males ($p=0.157$). Athletes with an SRC and neck injury are more likely to need a neuropsychology referral compared to those without a neck injury ($p=0.027$).
CONCLUSIONS: Evidence has been established that females have an extended recovery time following SRC when compared to males. A sex-based difference in regards to neck injury altering the recovery time were not found in our study. However, a concomitant neck injury with SRC increases the likelihood of neuropsychology referral. Further research is warranted to determine etiologic factors contributing to more prolonged SRC recovery in females versus males.

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The Interrelationship and Diagnostic Utility of Memory and Reaction Time in Concussed Students

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(No relevant relationships reported)

More than 40 million American youth participate in interscholastic, community-based, and collegiate sports. A risk of participation is traumatic brain injury (TBI). In up to 40% of TBI cases, athletes experience persistent functional and cognitive deficits. It is important to understand the variables that lead to these deficits to improve diagnosis and prognostic management. **PURPOSE:** To evaluate memory and reaction time as markers of TBI severity among patients experiencing prolonged recovery. **METHODS:** We retrospectively analyzed student-athletes admitted to a Midwestern outpatient clinic for neuropsychological evaluation; 78 patients had relatively comprehensive profiles and were included in the analysis. We conducted a health history, a 22-item post-concussion symptom inventory, and the ImPACT computerized test, which evaluated memory and reaction time. Pearson's and point-biserial correlation coefficients tested the direction and strength of association between memory, reaction time, and markers of injury severity. Logistic, negative binomial, and linear regressions tested memory and reaction time as predictors of whether symptoms

were reported, the number of reported symptoms, and the severity of symptoms. **RESULTS:** Patients were 16.0 ± 2.6 years of age, 56.3% were male, and they had experienced 1.2 ± 1.5 previous concussions. Reaction time was 0.64 ± 0.13 seconds; visual motor speed score was 44.7 ± 34.6; visual memory score was 92.0 ± 69.3; verbal memory score was 98.0 ± 80.9; cognitive efficiency score was 0.34 ± 0.12. Reaction time was a significant predictor ($p<0.05$) of balance problems, dizziness, mental fogginess, and sensitivity to light and noise; it was a trending predictor ($p=0.061$) of the summed severity of symptoms. Verbal memory was a significant predictor ($p<0.05$) of balance problems, sleeping problems, and fatigue. Visual memory, visual motor speed, and cognitive efficiency index were poor predictors of injury severity. **CONCLUSIONS:** Reaction time and memory are common components of testing batteries for concussed athletes. In our sample, reaction time and verbal memory emerged as useful predictors of severity among patients suffering long-term symptoms of TBI. It may be of value for coaches and athletic trainers to establish baseline values at the onset of a competitive season.

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No Increased Lower Extremity Injury Risk Following Concussion in Youth Tackle Football Players

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Reported Relationships: R.C. Lynall: *Contracted Research - Including Principle Investigator; Funding was provided by USA Football. The content of this abstract is solely the responsibility of the authors and does not necessarily represent the official views of the program sponssor:.*

A growing body of literature suggests athletes are at increased risk for acute musculoskeletal injury following return to play after concussion. The association between concussion and musculoskeletal injury has yet to be explored in youth athletes. **PURPOSE:** Compare the proportions of acute lower extremity injuries between youth football players following concussion and upper extremity injury. **METHODS:** Injury surveillance was conducted on 19 youth tackle football leagues (336 teams; 5,177 unique athletes; 6,799 athlete-seasons) from 2012-2015. Athletic trainers entered injury information into an electronic medical record, from which data were de-identified and aggregated for analysis. Musculoskeletal injuries to the lower (at and distal to the hip joint) and upper (at and distal to the shoulder joint) extremities and concussions were identified. The proportion of subsequent acute lower extremity injuries was compared between athletes suffering one of two initial injuries: 1) Concussion, or 2) Time-loss (sport participation loss > 24 hours) upper extremity injury. Only musculoskeletal injuries in the same season as the index injury were analyzed. **RESULTS:** Of the 209 unique athletes who suffered a concussion, 14 had a subsequent same-season acute lower extremity injury (6.7%; 95% CI: 3.2%, 10.2%). Of the 141 unique athletes sustaining a time-loss upper extremity, 10 sustained a subsequent same-season acute lower extremity injury (7.1%; 95% CI: 2.7%, 11.5%). There was no difference in the proportion of youth athletes who sustained an acute lower extremity injury after concussion or time-loss upper extremity injury ($p=0.89$; mean diff.=0.4%; 95% CI: -4.9%, 6.5%). **CONCLUSIONS:** This is the first study to examine musculoskeletal injury risk in youth football athletes following concussion. Although evidence suggests that high school, college, and professional athletes are at increased risk for musculoskeletal injury following concussion, no increased risk was observed in this sample of youth football players. Our findings may be limited by the short time span of the youth football season, providing limited opportunity for re-injury. Despite these null findings, further research is needed to clarify the relationship between concussion and subsequent musculoskeletal injury in youth football athletes.

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Head Impact Exposure of Youth Football Players During Their 7th and 8th Grade Seasons

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(No relevant relationships reported)

Nearly 70% of US football players are younger than high school age, yet little is known about the potentially damaging effects of repetitive head impacts in this population. Cross-sectional studies indicate that head impact exposure increases with older levels of play, though little is known about changes in the same group of players from year to year. **PURPOSE**: To evaluate changes in head impact exposure among youth football players between their 7th and 8th grade seasons. **METHODS**: During a five-year span (2012-2016), head impact exposure of thirty middle school football players (12.6 ± 0.4 yr) was assessed during their 7th and 8th grade seasons while participating in a community tackle football program. Subjects played on the same team during their 7th and 8th grade seasons. Head impact frequency, severity (linear acceleration [LA]; rotational acceleration [RA]) and location during each practice and game were measured using the Head Impact Telemetry (HIT) system, consisting of a helmet-mounted accelerometry array. **RESULTS**: Mean head impacts per player were significantly higher in practices (7.4 vs. 5.8 impacts / player; $P = 0.035$) but not significantly different in games (10.1 vs. 12.4 impacts / player; $P = 0.134$) comparing the 7th to 8th grade seasons, respectively. Furthermore, from the 7th to 8th grade season, mean LA (25.30 *g* vs. 25.95 *g*; $P = 0.345$), median LA (20.77 *g* vs. 21.39 *g*; $P = 0.225$), mean RA (1741 rad • sec^{-2} vs. 1744 rad • sec^{-2}; $P = 0.950$) and median RA (1481 rad • sec^{-2} vs. 1503 rad • sec^{-2}; $P = 0.538$) did not differ significantly. Finally, no differences in distribution of head impacts by location (Front: 46% vs. 48%; $P = 0.461$; Top: 10% vs. 11%; $P = 0.607$; Back: 26% vs. 23%; $P = 0.159$; Right: 9% vs. 10%; $P = 0.382$; Left: 8% vs. 8%; $P = 0.717$) were found between the 7th and 8th grade seasons, respectively. **CONCLUSIONS**: Individual head impact exposure was similar during two consecutive seasons of youth football, despite increased age and playing experience during the second season. Thus, extrinsic factors such as game rules, practice structure and coaching style may have a greater influence on head impact exposure from year to year in youth football, making those aspects of play key targets for strategies aimed at reducing repetitive head impacts in this population.

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Concussion Baseline Performance on Rapid Number and Picture Naming Tests

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(No relevant relationships reported)

Concussion may inflict widespread disturbance throughout the brain, including visual network impairments. The King-Devick (KD) test is a rapid number naming test of oculomotor functioning, however, it is limited to evaluating networks involved with saccadic eye movements and vergence. Recently, the Mobile Universal Lexicon Evaluating system (MULES), which requires object identification and color perception, was developed to encompass additional networks which may be a beneficial addition to concussion assessment. However, no published data describes MULES scores in an athlete-specific cohort.
Purpose: To compare the relationship between KD and MULES scores in an athletic population. **Methods**: Twenty-nine ice hockey players (17.1±3.3 years old, 27M/2F) completed both tests at baseline. The MULES consists of two cards, totaling 54 color pictures of foods, animals and objects; KD consists of 3 cards totaling 120 numbers in random order. Both tests were administered twice and the fastest time without errors was recorded as the "best" time. Descriptive statistics were used to describe test scores and a Pearson correlation examined the relationship between the tests. **Results**: Mean scores of "best" KD and MULES trials were 47.8± 9.4 seconds (Range: 31.77-68.0) and 37.7±6.7 (Range: 27.73-50.47), respectively. Every MULES trial 2 improved from trial 1 with a mean improvement of 6.8±3.7 seconds; KD mean change between trials was 2.4±7.3 seconds, where 8/29 subjects performed slower on the second trial. Pearson correlation revealed a significant ($p=0.003$) moderate relationship between KD and MULES best times ($r=0.543$). **Conclusion**: These data are the first to report on MULES test scores in an athletic-specific cohort. While the significant correlation denotes a relationship exists between the two tests, the moderate strength suggests that the two may be providing somewhat different information. This may be due to the MULES utilizing additional neurological resources as it requires additional object and color recognition. These findings support the use of MULES in a clinical concussion testing battery, as it is also easy to administer and takes a short time to complete. Future studies should focus on MULES scores through concussion recovery.

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Concussion recovery trajectories among United States Service Academy Members

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(No relevant relationships reported)

Purpose: Describe concussion/mild traumatic brain injury (mTBI) recovery durations by sex and injury-related activities in US Service Academy cadets.
Methods: Injury data (2014-2017) from three US Military Service Academies were examined to describe concussion/mTBI characteristics (n=800 injuries, 301 female). Of the documented injuries, there were 738 injured individuals, of which, 679 had one injury, 56 individuals had two injuries and three individuals had three injuries. The recovery trajectories for all injuries were examined across sex and injury activity. Three durations were examined: days until asymptomatic, duration of return to activity (RTA) protocol, and days of total time lost. Duration was examined using Kaplan-Meier and log-rank tests. Due to the right skewed distribution, medians and interquartile range (IQR) are reported.
Results: Across all cadets, the median days until asymptomatic was 9 (IQR: 5-16). The median duration of RTA protocol was 5 days (IQR: 5-7). The total time lost due to concussion/mTBI was 20.68 days (IQR: 12.78-33.12). There was a significant effect of sex for days until asymptomatic and total time lost (p's < 0.01). Across all recovery metrics, females were more likely to have more days until asymptomatic (11 vs. 8.0 median days) and total time lost (24.6 vs 18.8 days). A significant effect of injury activity was observed for days until asymptomatic and total time lost (p's < 0.05). Injuries occurring during free-time activities had the greatest median number of days until asymptomatic (13 days IQR: 10-15) while injuries occurring during varsity athletics or academy specific training had the fewest median days until asymptomatic (both 6 days). Injuries occurring during varsity athletics had the shortest median total time loss of 12.9 days (IQR: 11.95-15.73). All other injury mechanisms were associated with median time loss of more than 20 days.
Conclusions: These analyses show significant effects of sex and injury activity on recovery duration. Differences may also reflect varying approaches to injury management by the medical provider. Further investigation is needed to determine an individualized approach to clinical care.

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Discordance of Autonomic Discharge to the Cardiovascular System following Concussion

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(No relevant relationships reported)

Previous evidence indicates that a transient cardiovascular autonomic dysfunction emerges after concussion. The baroreflex buffers perturbations to systolic blood pressure (SBP) through changes in efferent autonomic discharge to the sino-atrial node inducing a reciprocal change in heart rate (HR) and to the vascular smooth muscle to modulate peripheral resistance. Mayer waves (MW) represent these baroreflex adjustments to the target tissue and appear in the low frequency (LF) band of the HR and SBP power spectrum at a frequency of 0.1Hz. **PURPOSE**: To evaluate changes in MW amplitudes in recently concussed athletes and non-injured controls during the first week following injury. **METHODS**: A prospective, parallel-group, and repeated-measures study was performed in 19 athletes with concussion (age: 20±2 years; height: 1.76±0.14 meters; weight: 75.3±15.1 kilograms) and 19 non-injured athletes (age: 20±1 years; height: 1.71±0.11 meters; weight: 70.2±14.4 kilograms). Cardiovascular autonomic function (i.e., digital electrocardiogram and continuous beat-to-beat BP) was assessed at rest within 48 hours (48H) of concussion and 1 week (Wk1) later. Fast-Fourier transform was performed and power calculated from HR and SBP components for LF spectra and MW activity. The variables (e.g., LF-BP, LF-HR, MWBP, MWHR) were $\log_{10}$ transformed and a difference score was computed between the MWBP and MWHR (CMW) for each subject. **RESULTS**: Data are presented as group mean (95% CI) and there were no group differences for demographics, HR, SBP, LF-BP, LF-HR or MWHR at 48H or Wk1. At 48H, the concussion group had a significantly lower MWBP [p<0.05; 1.38 (1.11, 1.68) vs. 1.92(1.64, 2.21) mmHg2/Hz] and CMW [p<0.01; -3.06 (-3.35, -2.77) vs. -2.49 (-2.78, -2.20)] compared to the control group. These group differences were gone by Wk1. **CONCLUSIONS**: These findings demonstrate that efferent autonomic discharge to the peripheral vasculature was reduced as evidenced by the MW, but not the LF-BP, LF-HR. The CMW demonstrated a dramatically greater discordance in autonomic discharge after concussion such that the majority of the concussion group distribution fell below the lower limit of the 95% CI of controls. Thus, the central autonomic mechanism(s) regulating MW discharge were discordant after concussion with apparent resolution by 1 week.

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Effects of 3D Multiple Object Tracking on Head Impacts and Cognition in Ice Hockey

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(No relevant relationships reported)

Ice hockey is a high intensity contact sport with elevated risk of injuries including concussion. Three dimensional multiple object tracking (3D MOT) has been proposed as an intervention to reduce the incidence of concussion, and potentially improve cognitive function. **PURPOSE:** The purpose of this study was to examine the effect of using 3D MOT on the frequency and force of head impacts and cognitive function (CTMT and Stroop) in men's ice hockey. **METHODS:** Eight male collegiate ice hockey players (NCAA Division III) (mean age = 22.87 ± 1.46 yrs; mean ht = 177.48 ± 16.82 cm; mean wt = 90.31 ±1.46 kg), had head impacts and cognitive function assessed throughout the regular season without 3D MOT versus with 3D MOT. Paired samples t-tests were performed to test for differences between first half (without 3D MOT) and second half (with 3D MOT) for all measures. **RESULTS:** Utilizing 3D MOT did not reduce the number of head impacts. With 3D MOT there was an increase in rotational force versus without 3D MOT (rotational acceleration (p = 0.010) 3.49 ± 2.31 vs. 3.88 ± 2.29 krads sec^{-2} respectively); (rotational velocity (p = 0.001) (16.21 ± 8.71 vs. 14.35 ± 8.38 krads sec^{-1} respectively); as well as force applied to the right side (p = 0.001) (13.10 ± 7.34 vs 16.67 ± 9.73 krads sec^{-1}), and base of the head (p = 0.019) (13.26 ± 8.40 vs 17.25 ± 9.43 krads sec^{-1}). CTMT improved with 3D MOT (p = 0.004) (49.57 ± 35.97 vs 65.15 ± 36.36%), while Stroop had no significant differences. **CONCLUSION:** The use of 3D MOT during the second half of the competitive ice hockey season did not reduce the number of head impacts. The increase in rotational forces when using the 3D MOT may be attributed to the different time in the season that 3D MOT was utilized, where more aggressive play leading to higher forces was possible. CTMT improvement was not surprising as the CTMT measures all qualities the 3D MOT intervention improves, while the Stroop only measures working memory and opposition to distraction.

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Baseline Visual Measures in High School Football Players With and Without Previous Concussion

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(No relevant relationships reported)

Visual impairments are common following sport-related concussion and may negatively affect athlete performance and safety if unresolved. **PURPOSE:** To examine differences in baseline visual assessment measures in high school football players with and without previous concussion. A secondary purpose was to examine the correlations between these asesments. **METHODS:** High school varsity football players (n=64, n=24 with concussion history) from a single high school (mean age=15.6±1.3 years) were enrolled in the study. Participants completed the following assessments prior to the start of the competitive football season: 1) three near-point of convergence (NPC) trials, 2) vision and sensory performance testing via the Senaptec Sensory Station, and 3) a demographic questionnaire. The independent variable was previous concussion history (with vs. without). Primary outcomes were average NPC across three trials (measured in centimeters) and the Senaptec Sensory Station scores for: visual clarity, contrast sensitivity, depth perception, near-far quickness, perception span, multiple object tracking, and hand-reaction time. Independent samples t-tests were used to examine differences in visual assessments between those with and without previous concussion. Pearson correlations examined relationships between all Senaptec Sensory Station and mean NPC measures. Alpha level was set to $P < 0.05$ *a priori*. **RESULTS:** Over half (62.5%) of those who reported a concussion history indicated that their most recent concussion was within the last year. There was no significant effect of concussion history on any of the visual assessment measures. There was a significant, but clinically insignificant correlation between mean NPC and binocular visual clarity (r=0.26; P=0.03). No other significant correlations among the visual assessment measures were identified (P < 0.05). **CONCLUSION:** High school football athletes, regardless of concussion history, exhibit similar baseline clinical and

performance visual measures. Our data suggest that NPC and binocular visual clarity, while statistically correlated are clinically independent of one another and both worthy of evaluation in assessing concussion.

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The Affect of ADD on Baseline King-Devick and Clinical Reaction Time Performance In The Pediatric Population

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(No relevant relationships reported)

PURPOSE: It is estimated that 1.5-3.5 million concussions occur annually in the US related to sports participation. Recent studies of the King-Devick (KD) and Clinical Reaction Time Test (CRT) have shown promise in the diagnosis and management of concussive injuries in older teens and young adults. The purpose of this study is to evaluate if a history of ADD may affect the baseline performance and hence interpretation of these novel tests in the pediatric and adolescent population.
METHODS: Non-concussed, 6-18 year-olds were recruited from sports medicine clinics during evaluation of other conditions or during participation in their schools' baseline concussion surveillance program. Participants whom were felt to be limited in their ability to perform these tests due to comorbid conditions or injuries were excluded from the study. History of ADD or related medication use was assessed through review of the patient's intake questionnaire or through examination of their past medical history and medication list as previously documented in the EMR on the day of assessment. Subjects completed the KD and CRT tests as previously described in the literature.
RESULTS: 563 participants (333 M, 230 F) were included in the study. Participants (44) were categorized as having a diagnosis of ADD (20 M, 24 F). The average age in the normative group was 12.55(±2.71) versus 14.25(±2.38) years in the ADD group. Baseline KD performance was 50.17(±12.42)s in the normative group versus 48.54(±11.89)s in the ADD group (p=0.43). CRT-RH was measured at 232.32(±23.27) ms versus CRT-RH=223.89(±22.71)ms (p=0.02) and CRT-LH=231.81(±23.38)ms versus CRT-LH=224.75(±22.75)ms (p=0.07) in the normative and ADD groups, respectively. Stratification by age group (6-13 vs. 14-18) did not reveal a difference in performance between groups on either test.
CONCLUSIONS: Baseline performance on the KD and CRT tests did not differ in this population of subjects with or without a history of ADD. Although limited by sample size, this study provides evidence that children with ADD perform similar to their peers on these baseline measures. Clinicians may therefore interpret these scores without adjustment. Additional factors which influence test performance need to be evaluated.

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Treating Pediatric Acute Sport-Related Traumatic Brain Injuries with Hyperbaric Oxygen Therapy: A Case Series

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(No relevant relationships reported)

Athletes often experience symptoms and neurologic deficits following sport-related concussion. Higher initial symptom burden is associated with longer recovery times. The current standard of care for concussed athletes includes cognitive rest and non-specific subthreshold physical activity until self-reported symptom resolve and objective concussion measures demonstrate clinical recovery. There is a paucity of treatment options beyond this wait-and-see approach. Hyperbaric oxygen (HBO_2) therapy has benefited severe and moderate traumatic brain injury patients. It is unknown how HBO_2 therapy affects acute post-injury symptom burden and recovery time following concussion. **Purpose:** To explore the effect of HBO_2 therapy on reducing initial symptom burden in acutely concussed high school student-athletes compared to two different placebo treatments. **Methods:** Eight high school student-athletes suffering from sport-related concussion were randomly assigned into one of three blinded clinical intervention groups: 1) HBO_2 therapy (n=3); 2) hyperbaric therapy with compressed medical-grade air (HBA) (n=2); or 3) normobaric 100% O_2 therapy (n=3). All groups completed five one-hour treatments within the first 10 days following their injury. Main outcome measures included change from initial post-concussion symptom burden and days until the physician (blinded to study group) permitted the student-athlete to return to activity. **Results:** The HBO_2 treatment group experienced a considerably larger mean symptom reduction (Δ symptom score = -54.5) than the HBA (Δ symptom score = -27.8) or O_2 placebo treatment groups (Δ symptom score = -22) over the 5 treatment sessions. Despite the considerably higher symptom burden of those randomly assigned to the HBO_2 therapy arm, all treatment and placebo groups returned to activity in a similar timeframe (HBO_2 = 13.7±5.1 days; HBA=13.0±5.7 days; O_2 =19.0±16.5 days). **Conclusion:** HBO_2 therapy may be an effective option to acutely treat post-concussion symptoms, particularly in young athletes presenting with high symptom burdens. Future research is needed to determine appropriate and standardized treatment protocols for HBO_2 therapy in this population following concussion.
Supported by the National Operating Committee on Standards for Athletic Equipment

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Emerging Practice of Speech-Language Pathologists in Sport Related Concussion Care: A Systematic Review

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(No relevant relationships reported)

Speech-Language Pathologists (SLP) prevent, assess, and treat cognitive-communication and swallowing disorders. Due to their experience in caring for people with cognitive-linguistic disorders following traumatic brain injury, SLPs have the potential to play an important role in the management of sport-related concussion (SRC) using strategies that promote increased focus, attention, memory and mental agility.**PURPOSE**: The goal of this systematic review was to summarize the emerging practice roles of SLPs in SRC concussion management.**METHODS**: The following databases were accessed: MEDLINE, CINAHL, PsycInfo, Cochrane Library, and SPORTDiscus. Key words included in the searches were: concussion, mild traumatic brain injury, speech-language pathologist, speech-language pathology, speech therapy and cognitive communication. All articles included were published in peer-reviewed journals prior to October 2017. Studies on traumatic brain injury or papers that investigated concussion and military personnel were excluded. **RESULTS**: A total of 360 articles were identified for formal review. Forty-two articles met our inclusion criteria. The earliest published article was in 2002, but 41 articles (97.6%) were published 2009 or later. Only three studies (7.14%) were level III evidence and one (2.38%) level IV case series was identified. Thirty-seven papers (88.1%) were either literature reviews or perspectives on the role of SLPs in concussion management. Our search revealed no high-quality, randomized controlled trials or systematic reviews related to the role of SLPs in concussion management.**CONCLUSIONS:** A common theme of the studies we reviewed suggest a recent interest in highlighting the value of SLPs in a comprehensive team approach to concussion care. Concussion management continues to evolve, including the identification of clinical subtypes and rehabilitation trajectories. SLPs may assist in neurocognitive testing administration and the assessment of verbal memory, language processing, attention deficits and behavioral aspects of communication. Finally, SLPs may contribute to the planning and implementation of academic accommodations and returning to learning strategies.

B-71 Free Communication/Poster - Exercise-Diabetes

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

982 Board #243 May 30 2:00 PM - 3:30 PM

Maintenance of Health-Related Fitness Gains Following Underwater Treadmill Training in Adults with Type 2 Diabetes

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(No relevant relationships reported)

PURPOSE: To document short- and long-term effects of a 12-week aquatic exercise walking program on components of health-related fitness in middle-aged adults with type 2 diabetes.
METHODS:Thirteen adults with type 2 diabetes (age = 59.5 ± 4.5 yrs; 7 females, 6 males) completed 12 weeks of underwater treadmill training (UTT) ($3d{\cdot}wk^{-1}$), followed by a 12-week follow-up period that involved no UTT. Exercise intensity and duration, which were initially set to 40-50% of heart rate reserve (HRR) and 30 minutes (three 10-min bouts) were systematically and progressively increased to 50-70% HRR and 60 minutes (three 20-min bouts) by week 12. During the follow-up period, study participants maintained their current diet and were given permission to perform any type or amount of physical activity except a formalized exercise program.

Primary outcome variables included cardiovascular function [resting heart rate (RHR) and 6-min walk for distance (6MWFD)]; body composition [body mass (BM), body fat percentage (BF%), waist circumference (WC)]; and leg strength [hamstring and quadriceps isokinetic peak torque at 30°·sec^{-1}and 60°·sec^{-1})]. Baseline, post-UTT, and post-follow-up scores were analyzed using 1-way repeated measures analysis of variance.
RESULTS: Compared to baseline scores, significant ($p < .05$) improvements in cardiovascular function (decreased RHR, increased 6MWD), body composition (decreased BM, BF%, and WC), and leg strength (greater peak hamstrings torque at 60°·sec^{-1}, and peak quadriceps torque at 30°·sec^{-1}), were observed after UTT. Three months following completion of UTT, positive changes in nearly all HRF variables (6MWD, BM, BF%, WC, peak hamstrings torque at 60°·sec^{-1}, peak quadriceps torque at 30°·sec^{-1}) were maintained ($p < .05$) relative to baseline values.
CONCLUSIONS: Our findings indicate that improvements in HRF resulting from 12 weeks of UTT persist three months after cessation of UTT in middle-aged adults with type 2 diabetes.

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A Bout of High-Intensity Interval Training Increases Seric Musclin in Adults with Metabolic Syndrome

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(No relevant relationships reported)

Musclin is a myokine which induces insulin resistance (IR) in vitro, also proposed to favor aerobic capacity in murine models, which seems contradictory. Because of that, and since exercise contributes to improve IR in metabolic syndrome (MS) probably by regulating myokines, it is necessary to understand exercise´s role in regulating musclin in humans. **PURPOSE**: to study the effect of a bout of high-intensity interval training (HIIT) on seric musclin in adults with MS and IR. **METHODS**: 11 men and 4 women with MS and IR were evaluated in an experimental, pilot study. Musclin was measured by ELISA, and both glycemia and insulin by standard methods, at: 1) fasting conditions, 2) 60 minutes after a breakfast of 408 Kcal (55.1 g carbohydrates, 17.4 g fat, 9.2 g proteins), and 3) immediately after a session of HIIT (100 min after breakfast). Homeostatic model assessment (HOMA-IR) was used as indicator of IR. The HIIT session lasted 19 minutes and consisted of 5 cycles, each of them with one minute of high intensity (85% of VO2max) and two minutes of moderate intensity (50% of VO2max). Three minutes of warming up and cooling down at 3 MET intensity was always done. Data are presented as median (interquartile range). Comparisons were done with Friedman test. **RESULTS**: patients had an age of 52 years (45-59), a body mass index (BMI) of 26.8 kg·m^{-2} (24.9-30.1), oxygen consumption (VO2max) of 34.6 ml·kg^{-1}·min^{-1} (30.2-38.2) and HOMA-IR of 3.3 (2.6-4.3). Musclin values post-HIIT (709.6 pg·ml^{-1} (585.2-833.9)) showed a trend to be higher than fasting (599.1 pg·ml^{-1} (506.2-724.5), P=0.088) and refeeding (593.0 pg·ml^{-1} (466.4-918.2), P=0.061) conditions. Fasting musclin correlated with diastolic blood pressure during the HIIT bout (r=0.62, P<0.05). Insulin of 13.9 µU mL^{-1} (10.4-16.6), 59.4 µU mL^{-1} (23.1-159.8) and 30.8 µU mL^{-1} (22.4-41.5) and glycemia of 102.4 mg dl^{-1} (89.9-108), 111 mg dl^{-1} (84.4-127.4) and 97.1 mg dl^{-1} (87.3-110.3), were measured at conditions 1 to 3, respectively. **CONCLUSIONS**: a bout of HIIT trend to increase circulating musclin in humans with MS and IR, which does not support the idea of a myokine that induces IR. Future experiments will test if the increase in musclin could be explained by an increase in insulin. Colciencias 111562638757. CODI 2605. Interinstitucional 2016-1341. Colciencias Doctoral scholarships 727-2015.

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Time-efficient Sprint Interval Exercise Improves 24-h Glycaemic Control In Men With Type 2 Diabetes

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(No relevant relationships reported)

PURPOSE: Reduced-exertion high-intensity interval training (REHIT) is a genuinely time-efficient exercise intervention that has been shown to improve aerobic capacity and blood pressure in men with type 2 diabetes. However, the acute effects of REHIT on 24 h glycaemic control in type 2 diabetes have not been determined. **METHODS**: Eleven men with type 2 diabetes (mean ± SD: age, 52±6 years; BMI, 29.7±3.1 kg/m^2; HbA_{1c}, 7.0±0.8 %) participated in a randomised four-trial crossover study, with continual interstitial glucose measurements captured during a 24 h period including either: (1) no exercise (CON); (2) 30 min of continuous exercise (CE); (3) 10 x 1 min at ~90 HR_{max} (HIIT; time commitment, ~25 min); and (4) 2 x 20 s 'all-out' sprints (REHIT; time commitment, 10 min). Nutritional intake and timings of consumption were standardised within participants. The 24 h monitoring period started prior to breakfast and the exercise was performed 30 min after breakfast. Comparisons for 24 glycaemic variables were made using one-way repeated measures ANOVA and Holm-Sidak corrected t-tests for pre-planned contrasts (exercise conditions *versus* control). Cohens *d* was used as a measure of effect size with the following thresholds: small (*d* = 0.2), medium (*d* = 0.5) and large (*d* = 0.8) effect. **RESULTS**:Compared with CON (8.1±1.1 mmol/l), both REHIT (7.5±0.9 mmol/l, $p<0.05$, $d=0.55$) and CE (7.7±1.1 mmol/l, $p=0.06$, $d=0.35$) lowered mean 24 h glucose, and this was largely driven by a markedly lower glycaemic response (AUC) to dinner in both instances (-11%, $p<0.05$ and $d>0.8$ for both). The prevalence of hyperglycaemia was reduced with all three exercise bouts compared with CON (REHIT: -112 min; CE: -115 min; HIIT -125 min, all $p<0.05$, all $d>0.5$), whilst measures of glycaemic variability were not significantly altered. **CONCLUSIONS**: These data suggest that REHIT may offer a genuinely time-efficient alternative exercise option for improving 24 h glycaemic control in men with type 2 diabetes.

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The Acute Effects of Exercise Intensity on Blood Glucose Levels in Type 1 Diabetics

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(No relevant relationships reported)

For individuals with Type 1 diabetes mellitus (T1DM), regular physical activity is a fundamental strategy in the management of glycemic control. Previous studies have shown that continuous, moderate-intensity exercise in individuals with T1DM decreases blood glucose concentrations, often resulting in hypoglycemia, whereas vigorous-intensity exercise can increase blood glucose, impacting the risk of hyperglycemia. Sprint interval training (SIT), characterized by brief, all-out bursts of supramaximal exercise, has been shown to improve indices of cardiometabolic health, despite a minimal time commitment. However, the effects of low volume SIT on individuals with T1DM is largely unknown. **PURPOSE**: to contrast the acute effects of exercise intensity on blood glucose levels in Type 1 diabetics. **METHODS**: Four recreationally active college-age students with T1DM, completed a treadmill test to determine maximal aerobic speed (MAS), and performed each of the following 20-min treadmill-based protocols: 1) Moderate-intensity continuous training (MICT): 5-min warm-up (WU), 10 minutes at 70% MAS, 5-min cool-down (CD); 2) high-intensity interval training (HIIT): 5-min WU, 1-min at 90% MAS, 1-min at 30% MAS repeated 5 times, 5-min CD; 3) SIT: 5-min WU, 30-sec at 120% MAS, 2-min, 50-sec at 30% MAS repeated 3 times, 5-min CD. Blood glucose was monitored via glucometer every 5-min during exercise and for 45-min after. **RESULTS**: A statistically significant decline in blood glucose was observed in both the MICT and HIIT conditions ($p < 0.001$, respectively) but not in the SIT condition ($p = 0.696$). From baseline to the 45-min mark, blood glucose decreased by 27% in both the MICT (180 ± 27 to 132 ± 39) and HIIT (183 ± 29 to 132 ± 15) protocols, but only 11% in the SIT (193 ± 41 to 165 ± 70) protocol. **CONCLUSIONS**: The results of this study provide initial proof-of-concept that a low volume SIT protocol can maintain target blood glucose levels while exercising in individuals with T1DM.

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Exercise Reduces HbA1c in Type 2 Diabetics, but Improved Strength Associates with Poorer Outcomes

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(No relevant relationships reported)

More than 25 million Americans have type 2 diabetes. Exercise is an effective method to prevent, delay, or manage the disease; however, fewer than 40% of patients report engagement in physical activity and more than 20% of this group overestimate their engagement. Structured exercise is warranted. Both aerobic and resistance training may be more effective than either mode in isolation, but studies reporting this are limited by their combined groups having greater volumes of exercise. **PURPOSE:** To evaluate different volumes of combined aerobic and resistance exercise on HbA1c levels in adults with diabetes. **METHODS:** 67 patients were randomly assigned to one of two groups: Group 1 performed supervised aerobic and resistance exercise twice per week. Group 2 performed the same exercise as Group 1 but also walked for 60 min on two additional days. At baseline, health history, seven tests of physical functioning, and measured cardiometabolic parameters, including HbA1c was performed. Following 10 weeks of exercise, follow-up data were collected. Independent-samples t tests compared baseline data and rates of improvement between the two groups. Multiple linear regression tested predictors of improvement in HbA1c. **RESULTS:** Group differences at baseline were minimal. Patients in Group 2 were 4.7 years older ($p=0.063$), body mass index was 3.3 points lower ($p=0.058$), and they walked an additional 72.7 meters in the 6-minute walk ($p=0.009$). There were no differences in

body fat percent (p=0.507), HbA1c (p=0.512), other cardiometabolic parameters, or the other six assessments of physical functioning. The patients who completed the exercise intervention improved in 13 of 15 assessments (p<0.05), including HbA1c (p=0.045). There were no differences in improvement between exercise groups. Regression analysis found elevated baseline body fat percent (p=0.001) and improvements in strength, assessed by arm curls (p=0.009) and grip strength (p=0.042) to correspond to poorer outcomes in HbA1c; the overall model was significant (R^2=0.733; p<0.001). **CONCLUSIONS:** Ten weeks of combined aerobic and resistance exercise improved cardiometabolic profiles of diabetic patients, including HbA1c. Additional volume of aerobic exercise did not enhance outcomes and improvements in strength associated with poorer outcomes.

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The Effects Of Simulated Hypoxia Bouts On Resting Blood Glucose Levels And Hemodynamics Of A Type 1 Diabetic: A Case Study

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(No relevant relationships reported)

Individuals diagnosed with diabetes may choose adventure travel vacations at higher altitudes, thereby perturbing formerly controlled sea level (SL) blood sugar (BG) levels. **Purpose:** We sought to describe change in resting BG concentration, heart rate (HR), and mean arterial pressure (MAP) during repeat acute exposure to simulated altitude bouts in a type 1 diabetic (T1D) vs a non-diabetic (ND). We hypothesized T1D would encounter less stable readings on all variables. **Methods:** Two male participants (n=2), a T1D and ND, 22 and 23 years old, respectively, completed this case study. Participants, simultaneously, visited a lab on six different days [i.e., three days in a row one week (M, T, W) and the same three days the following week (M, T, W)]. They ingested the same meals the night before and day of (1.5-hrs before chamber use). At each visit, BG (Contour Next Link; Parsippany, NJ), HR (Polar, Lake Success, NY), and MAP (Briggs Healthcare, Waukegan, IL) were assessed at rest at SL and during 2-hr/bouts at 10-min intervals using a hypoxic chamber (Hypoxico Inc., New York, NY) set randomly to varying altitudes: SL; 915 m; 1,829 m; 2,743m; 3,658m; and 4,572m. **Results:** For each variable, magnitude of change (Δ) was averaged over the 6 lab visits and compared at SL and across altitude levels. SL ΔBG (mg/dL), ΔHR (bpm), and ΔMAP (mmHg) for T1D and ND, respectively, were: 19, 16, 18; and 34, 18, 12. T1D maintained a more stable BG at SL over 6 days. When averaging the five altitude levels over 6 days, ΔBG (mg/dL), ΔHR (bpm), and ΔMAP (mmHg) for T1D and ND, respectively, were: 58, 9, 10; and 47, 9, 10. Notably, T1D had a less stable BG during hypoxic exposure. **Conclusion:** Simulated hypoxia perturbed BG to a greater extent in T1D. This could have practical application for when a T1D travels to higher, natural elevations, at which point they should more closely monitor their BG levels with normal food and fluid intake.

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Effects of Aerobic Exercise on Plasma Metabolites in Prediabetes Subjects

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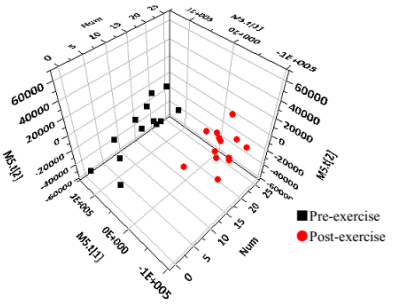
(No relevant relationships reported)

Objective: Regular exercise can improve the insulin sensitivity in Prediabetes(PDM). However, the mechanisms remain unclear. This study aimed to examine the effect of aerobic exercise on PDM subjects plasma metabolites. **METHODS:** 24 PDM subjects were selected [mean age of (54.41±10.34) yr, body mass index of (25.70±3.80)kg/cm^2, 8 males]. Each 10 age and sex-matched normal subjects and new-onset T2DM subjects were enrolled. PDM subjects received exercise (n=13) or health education (n=12) for 12 weeks. Exercise training: 3 times/week, 50 min per session at 40%-60% of of VO_2 reserve. The body composition (dual-energy x-ray absorptiometry) and cardiorespiratory fitness (VO_2peak) were detected before and after exercise. Plasma metabolites were analyzed by using liquid chromatography/mass spectrometry (LC/MS). **RESULTS:** After training, the body fat percentage, 2-hour OGTT plasma glucose, and low density lipoprotein cholesterol of PDM patients were significantly reduced (by 4.6%, 16.22% and 9.27%, on average). The metabolic characteristics were significantly different before and after exercise, there were 31 endogenous metabolites (VIP > 1 and P < 0.05), of which 25 were increased and 6 were decreased. Main metabolites that changes with training included phosphatidylcholine, lysophosphatidylcholines, sphingomyelin, betaine, linoleic acid,oleic acid and docosahexaenoic acid. **CONCLUSION:** Aerobic exercise intervention has a marked effect on the plasma metabolites in PDM patients, which can improves the glucose and lipid metabolism by regulating the metabolic pathway of linoleic acid and phospholipid. These findings may lead to a better understanding of the mechanism of aerobic exercise in preventing T2DM. Supported by Key Projects of State General Sports Administration of China (2014B007),Specialized Research Fund for the Doctoral Program of Higher Education of China (20131112110002).



PLS-DA models of LC/MS metabolomics data for pre and post exercise

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A Curious Relationship Between Obesity, Diabetes, and Dementia

Megan L. Darling[1], J. Mark VanNess[1], Jonathan M. Saxe[2], Michelle M. Amaral[1], 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)

Among American adults (age ≥ 18), 36.5% have obesity, 9.3% have diabetes, and more than 4 million have dementia. These pathologies do not develop and progress independently. Compared to adults with a body mass index (BMI) less than 23, overweight adults (BMI>25) have a 10-fold increase in the odds of developing diabetes. In turn, body weight and diabetes appear to exert independent effects on the risk of dementia. More work is necessary to elucidate these relationships. **PURPOSE:** To assess the effects of obesity and diabetes on incidence of dementia. **METHODS:** We analyzed a hospital population that included 2,306 consecutively admitted patients. We conducted a health history, diagnosed cerebral, metabolic, and cardiovascular diseases, and measured anthropometric and cardiometabolic parameters. Chi-square tests analyzed rates of dementia among patients with and without obesity and diabetes. Logistic regression tested the effects of obesity and diabetes on odds of a dementia diagnosis, holding constant potential confounders. **RESULTS:** Across the total sample, 16.3% of patients were obese, 14.3% had diabetes, and 4.6% had dementia. Among obese patients, 26.0% had diabetes; 12.0% of non-obese subjects had diabetes (p<0.001). Among obese patients, 1.6% had dementia; 5.1% of non-obese patients had dementia (p=0.003). Among patients with diabetes, 8.8% had dementia; 3.8% of patients without diabetes had dementia (p<0.001). Logistic regression, holding age and history of stroke constant, found trends for obesity to reduce odds of dementia by 56% (p=0.079) and diabetes to increase odds by 63% (p=0.060). Sex (p=0.418), depression (p=0.608), mean arterial pressure (p=0.837), smoking status (p=0.920), and histories of heart attack (p=0.250), congestive heart failure (p=0.627), and peripheral vascular disease (p=0.943) were not significant. Among patients age ≥ 65 (n=724), 13.8% were obese, 27.2% had diabetes, and 14.0% had a diagnosis of dementia. The same logistic regression preserved its trends for obesity (OR=0.376; p=0.054) and diabetes (OR=1.600; p=0.079). **CONCLUSIONS:** Obesity appears to carry a protective role, lowering risk of dementia, while diabetes elevates risk. Given the absence of a relationship with vascular disease, this is more likely a consequence of glucose, insulin, and amyloid metabolism.

990 Board #251 May 30 2:00 PM - 3:30 PM

The Dose Effect of Whey Protein on Insulin Responses in Pre-Diabetic and Type 2 Diabetics

Todd J. Castleberry, Christopher Irvine, Michael Oldham, Matthew Brisebois, Sarah E. Deemer, Ryan Gordon, Aubrien Henderson, Vic Ben-Ezra. *Texas Woman's University, Denton, TX.* (Sponsor: David Nichols, FACSM)

(No relevant relationships reported)

BACKGROUND: People with pre-diabetes and type 2 diabetes have shown an increase in insulin secretion after ingesting 55 g of whey protein coupled with a glycemic challenge. However, the effect of lower amounts of whey protein on insulin responses remains unclear. Our hypothesis was that both 20 g and 30 g of whey consumption prior to an oral glucose tolerance test (OGTT) would produce an increase in insulin secretion, with 30 g producing the greatest increase compared to a control.

PURPOSE: The purpose of this study was to examine the effect of two different doses of whey protein ingested 30 min prior to a 50 g OGTT on glucose, insulin, C-peptide, and glucagon responses.
METHODS: Diabetic or pre-diabetic participants (n=9, mean ± SD; age: 64.3 ± 8.1 yrs; BMI: 29.4 ± 6.0 kg/m^2; body fat percentage: 42.5 ± 7.8 %; fasting plasma glucose: 6.9 ± 1.2 mmol/l; HbA1c: 6.4 ± 0.6 %) completed three trials. The randomly assigned trials consisted of: 250 ml of water (CON), 250 ml of water + 20 g whey (20g), and 250 ml of water + 30 g whey (30g), followed by an OGTT. Blood was collected at -30, 0, 15, 30, 60, 90, 120, and 150 min for the measurement of glucose, insulin, C-peptide, and glucagon. The whey protein mixture was administered immediately following the -30 min blood draw, and the 50 g OGTT began immediately following the 0 min blood draw. Glucose was analyzed using a YSI 2900D glucose analyzer and insulin, C-peptide, and glucagon were measured via multiplex fluorescent detection (MagPix). A one-way repeated measures ANOVA ($p<.05$) with a Bonferroni post hoc was used for statistical analysis for each dependent variable.
RESULTS: Integrated area under the curve (AUC) for glucose presented no difference between the 3 trials. Insulin AUC was significantly increased from CON to 20g (p=0.004, 36.3%), CON to 30g (p=0.002, 61.7%), and 20g to 30g (p=0.030, 18.6%). C-peptide and glucagon AUC significantly increased from CON to 20g (p=0.018, 20.6%; p=0.046, 33.1%) and CON to 30g (p=0.001, 30.1%; p=0.017, 33.7%).
CONCLUSION: Whey protein elicited a dose response on plasma insulin, increasing concentrations from CON to 20g, and 20g to 30g, however plasma glucose was unaffected. 20g and 30g displayed similar responses for glucagon. Neither 20 g nor 30 g of whey protein may be adequate to provide glycemic improvement in the disease management of type 2 or pre-diabetes.

B-72 Free Communication/Poster - **Hypertension, Exercise Response, and Aging**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

991 Board #252 May 30 2:00 PM - 3:30 PM

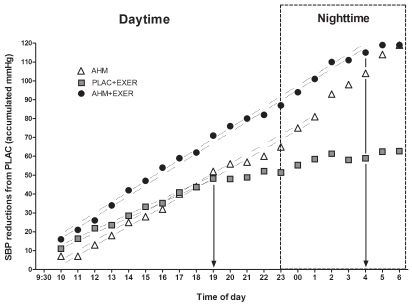
A Bout Of Intense Exercise Cannot Substitute Antihypertensive Medication But When Combined, Enhances Medicine Actions.

MIGUEL RAMIREZ-JIMENEZ, FELIX MORALES-PALOMO, JUAN FERNANDO ORTEGA, RICARDO MORA-RODRIGUEZ. *UNIVERSIDAD DE CASTILLA-LA MANCHA, TOLEDO, Spain.*

(No relevant relationships reported)

Purpose: We studied the blood pressure lowering effects of a bout of exercise and/or antihypertensive medicine with the goal of studying if exercise could substitute or enhance pharmacologic hypertension treatment. **Methods:** Twenty-three hypertensive metabolic syndrome patients chronically medicated with angiotensin receptor blockade antihypertensive medicine underwent 24-hr monitoring in four separated days in a randomized order; *a)* after taking their habitual dose of antihypertensive medicine (AHM trial), *b*) substituting their medicine by placebo medicine (PLAC trial), *c)* placebo medicine with a morning bout of intense aerobic exercise (PLAC+EXER trial) and *d*) combining the exercise and antihypertensive medicine (AHM+EXER trial). **Results:** In trials with AHM subjects had lower plasma aldosterone/renin activity ratio evidencing treatment compliance. Before exercise, the trials with AHM displayed lower systolic (130±16 vs 133±15 mmHg; P=0.018) and mean blood pressures (94±11 vs 96±10 mmHg; P=0.036) than trials with placebo medication. Acutely (i.e., 30 min after treatments) combining AHM+EXER lowered systolic blood pressure below the effects of PLAC+EXER (-8.1±1.6 vs -4.9±1.5 mmHg; P=0.015). Twenty-one hours monitoring revealed no differences among trials in body motion. However, PLAC+EXER and AHM lowered systolic blood pressures below PLAC during the first 10 hours, time at which PLAC+EXER effects faded out (i.e., at 19 PM). Adding exercise to medication (i.e., AHM+EXER) resulted in larger reductions in SBP that lasted most of the night (Figure 1). **Conclusion:** One bout of intense aerobic exercise in the morning cannot substitute the long-lasting effects of antihypertensive medicine in lowering blood pressure, but their combination is superior to their separated effects.

Figure 1



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The Impact of Peripheral Hemodynamics on Derived Central Pressure Waveforms

Gabriel H. Zieff[1], James Faulkner[2], Simon Fryer[3], Keeron Stone[3], Lee Stoner[4], Claudio Battaglini, FACSM[4]. *[1]University of North Carolina Chapel Hill, Carrboro, NC. [2]University of Gloucestershire, Winchester, United Kingdom. [3]University of Gloucestershire, Gloucestershire, United Kingdom. [4]University of North Carolina Chapel Hill, Chapel Hill, NC.*

(No relevant relationships reported)

THE IMPACT OF PERIPHERAL HEMODYNAMICS ON DERIVED CENTRAL PRESSURE WAVEFORMS. Gabriel Zieff[1], Simon Fryer[2], Keeron Stone[2], James Faulkner[3] Lee Stoner[1].[1]UNC Chapel Hill, NC. [2]University of Gloucestershire. [3]University of Winchester. **Introduction:** Central hemodynamic parameters, such as aortic systolic pressure (cSBP), augmentation index (AIx), and pressure wave forms (Pb) may offer clinicians superior prognostic information to peripheral systolic pressure (SBP). It is unknown whether changes in peripheral hemodynamics affect central hemodynamic measurements. **Purpose:** To investigate whether changes in peripheral hemodynamics, induced using upper limb tilting, affect central hemodynamic parameters. **Methods**: A single visit, repeated measures design, 20 healthy young adults (BMI: 24±2.8; 55% F). Brachial pressure waveforms were simultaneously measured in a supine position using an oscillometric device on an experimental (SphygmoCor XCEL) and control (Oscar, SunTech) arm. The experimental arm was positioned 30^0 above, 30^0 below, and at heart level, in a randomized order. The control arm remained at heart level. **Results**: For the experimental arm, there was a large effect change in SBP (eta=0.82, $p<0.001$) and cSBP (eta=0.81, $p<0.001$) when the arm was above (cSBP Δ4.9, SBP Δ4.6) and below (cSBP Δ-12.5, SBP Δ-9.8). AIx increased (p=0.023) when the arm was below but not above. No change occurred in Pb. In the control arm, no change occurred in SBP or cSBP, but AIx decreased when the experimental arm was above (p=0.04). **Conclusions:** Changes in peripheral hemodynamics result in large changes in cSBP and AIx, but not in Pb. Findings provide a rationale for standardizing the upper limb position during BP measurement, and may have important clinical implications regarding pharmacological prescription.

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Body Composition and Blood Pressure Comparisons of Older Runners and Younger Non-Running African American Women

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(No relevant relationships reported)

African American women(AAW) are among the more sedentary and obese segments of the American population. A major question is if body composition and blood pressure responses of active older AAW (OAAW) are different than younger sedentary AAW (YAAW)? **Purpose**: This study was designed to determine if body fat percentage (fat%), bone density and blood pressure (BP) would be different between OAAW and YAAW. **Methods**: A cross-sectional research design with 61 women (18 older runners -age 59.6 5.7 yrs. and 43 younger runners -age 40.6 8.2 yrs.) was evaluated for DXA body composition and blood pressure. The older runners had been runners for a minimum of 12 months and ran a minimum of 10 miles per week. **Results:** The women differed ($p<0.05$) on fat% (OAAW 38.4 ± 6.0 and YAAW 33.2 ± 9.5%), bone mineral density (BMD) (OAAW 1.133 and YAAW 1.217 g/cm^2) and the groups were near different (p=0.054) for systolic BP (OAAW 119 ± 10.8 and YAAW 113.4±10.9). **Discussion:** The anticipated difference between the groups due to age was not

observed for many of the body composition and diastolic BP variables. The differences observed for BMD and fat% may have been related to the number of years the OAAW had been running. These data suggest that greater physical activity participation by AAW can aid in managing many aspects of body composition. Since BP and fat% are cardio-metabolic risks for cardiovascular disease, an active lifestyle may aid in increasing the quality and perhaps the quantity of their lives.

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Effect of Intra-Venous Antioxidant Infusion on the Development of Neuromuscular Fatigue During Whole Body Exercise in Hypertensive Middle-Age Individuals

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(No relevant relationships reported)

PURPOSE: To investigate the effect of intravenous antioxidant supplementation on the development of neuromuscular fatigue during whole body exercise in middle-age hypertensive patients. **METHODS:** Clinically diagnosed hypertensive males performed fatiguing, constant-load cycling exercise to exhaustion (80% W_{peak}, 150 ± 27 W) following both a 2 g intra-venous infusion of L-ascorbic acid (AOX; dissolved in 20 mL saline) and saline (PLA; 20 mL) randomized and separated by at least 5 days. The trial characterized by shorter exhaustion time was later repeated (i.e., iso-time) under the opposite supplemental condition. Peripheral fatigue was quantified as the pre- to post-exercise change in quadriceps twitch torque (ΔQ_{tw}; supramaximal electrical femoral nerve stimulation), maximal rate of force development (ΔmRFD), and peak relaxation rate (ΔPRR). Central fatigue was quantified as the exercise-induced change in voluntary activation (ΔVA). Femoral arterial blood flow (Doppler ultrasound; Q_L) was quantified during cycling at 25, 50, and 75 W. Cardiopulmonary responses were recorded continuously. Exercise-induced fatigue was quantified during time-matched trials. **RESULTS:** AOX had no effect on blood pressure at rest (MAP: 107 ± 2 mmHg) or during the final minute of exercise (MAP: 137 ± 3 mmHg; $P < 0.05$). Q_L was similar between conditions at baseline and during exercise (~0.2, ~1.5, ~2.1, ~2.7 L/min, respectively). Furthermore, heart rate (~153 BPM), minute ventilation (~117 L/min), O_2 consumption (~2.2 L/min), and CO_2 production (~2.5 L/min) during the final minute of exercise were similar between trials. While ΔVA (~-6%) and ΔmRFD (~-45%) were not altered by AOX, ΔQtw and ΔPRR were attenuated in AOX compared to PLA (-40 ± 9% vs -58 ± 9%; -19 ± 12 vs -44 ± 9%, respectively; $P < 0.05$). Finally, AOX had no effect on cycling time to exhaustion (PLA: 488 ± 22 s vs AOX: 487 ± 65 s). **CONCLUSION:** AOX attenuates the development of fatigue while not altering the cardiopulmonary response and locomotor muscle blood flow during cycling exercise in hypertensive males. This ergogenic effect is likely determined by intracellular mechanisms and independent of muscle O_2 transport. Importantly, the observed AOX-induced reduction in the development of peripheral fatigue does not appear to improve endurance capacity in hypertensive patients.

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Effects of High Intensity Interval Exercise Training on Blood Pressure in Patients with Hypertension

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(No relevant relationships reported)

PURPOSE: To compare the effects of HIIT and CAE on changes in blood pressure reduction and endothelial function in hypertensive patients.
METHODS: Seventeen hypertensive patients, aged 52.1±7.6, participated in this study, tapered off their medications, if necessary, and were randomized to either HIIT (n=9) or CAE (n=8) group. HIIT was composed of 5 sets of 3 min exercise at 80% HRR, and each interval was separated by 3 min recovery at 40% HRR. CAE was composed of 35 min exercise at 60% HRR. Both groups were designed to use same energy expenditure, and performed exercise 5 days per week for 4 weeks. Endothelial function was determined by assessing endothelial progenitor cells (EPCs) using flow cytometry and flow mediated dilation (FMD) using ultrasonography. Arterial stiffness was measured by pulse wave velocity (PWV). Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured at rest and during exercise at 60% HRR by using automatic blood pressure monitor.
RESULTS: At rest, SBP was significantly decreased in HIIT ($p<0.01$) and CAE ($p<0.05$), and DBP was significantly decreased in HIIT ($p<0.001$), but not in CAE. During exercise, SBP was significantly decreased in CAE ($p<0.05$), but not in HIIT, and DBP was significantly decreased in HIIT ($p<0.01$), but not in CAE. FMD and EPCs were significantly improved in HIIT ($p<0.01$ and $p<0.05$, respectively), but not in CAE. There were significantly different changes in DBP during exercise and EPCs between groups ($p<0.05$). However, PWV was not changed in both groups.
CONCLUSIONS: The results of this study suggest that HIIT and CAE equally have beneficial effects on blood pressure reduction at rest and during exercise. However, HIIT may improve endothelial function greater than CAE. Therefore, HIIT could be a better exercise program than CAE for hypertensive patients.

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24 Hour Ambulatory Blood Pressure Dipping And Variability Characteristics Following Maximal Treadmill Exercise In Community Dwelling Healthy Older Adults.

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(No relevant relationships reported)

Abnormal blood pressure (BP) response to maximal exercise may lead to compromised cardiovascular health. **PURPOSE**: To examine the 24-hour ambulatory blood pressure response in older adults following a maximal exercise treadmill test. **METHODS**: Ambulatory BP was recorded every 30 minutes (daytime) and 60 minutes (nighttime) on the day preceding and then 24 hours following a symptom limited maximal exercise treadmill test. Participants were a convenience sample of healthy older adults free of cardiovascular and musculoskeletal limitations who were participants in a community-based exercise program in London, Ontario, Canada. Symptom limited exercise was performed in the AM in a fasted state, during which VO2max was estimated. The study outcomes included mean systolic and diastolic BP (daytime, nighttime and 24-hour), as well as mean change in BP from daytime to nighttime (BP dipping), and BP variability (average real variability [ARV]). Mixed between-within ANOVA was used in the statistical analysis, exploring main effects for time (pretest vs posttest), grouping factors (presence of hypertension [normotensive vs hypertensive], gender [men vs women], and fitness level [low, average and high VO2max]), and interaction effects for time × grouping factors.
RESULTS: 11 men and 9 women, mean age 71.5 (SD=5.4) years were included in the analysis. Mean VO2max was 34.8 (SD=7); 10 subjects had documented hypertension. No difference in the mean pre-exercise systolic ABP was 129.2 (120.3-138.1) vs 124.8 (116.7-132.9) and post-exercise systolic ABP was 126.3 (118.8-133.9) vs 122.8 (116-129.6) in normotensive and hypertensive subjects respectively (p=0.7). Nighttime diastolic BP dipping differed according to VO2max groups, whereby it increased in participants with low VO2max, while it decreased in those with average VO2max and high VO2max (p=0.037). As well, post-exercise systolic BP variability was decreased in men but increased in women (p=0.07). **CONCLUSIONS**: Healthy older normotensive and hypertensive subjects had similar post 24-hour systolic BP dipping. However, nighttime diastolic blood pressure as significantly different according to fitness level and systolic BP variability was reduced in men suggesting low fitness and male gender may alter BP response to maximal exercise in older adults.

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Post-isometric Exercise Hypotension After Moderate intensity Handgrip Exercise In Hypertensive Elderly

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(No relevant relationships reported)

Hypertension is common in people aged 65 or more. The isometric handgrip (IHG) is a model of effective exercise in reducing blood pressure (BP). However, the mechanisms involved in post-isometric exercise hypotension (PIEH) remain unclear. Nitric oxide (NO) is a potent vasodilator and may be involved in PIEH.**PURPOSE**:To determine the response hypotensive and mechanism involving in older with arterial hypertension. **METHODS**:Ten sedentary hypertensive elderly (73.2±2.2 years), underwent two experimental sessions using a portable isometric handgrip dynamometer Jamar; (i) sham session with 3 percent of maximal voluntary isometric contraction (MVIC); and (ii) experimental isometric session with 30 percent of MVIC, total of 8 sets of 1 min contraction and 1 min rest pause. The BP and heart rate (HR) were evaluated at rest and post-exercise (1, 5, 10, 15, 30, 45 and 60 min). Saliva samples were collected at rest, 0, 30 and 60 min post-exercise. **RESULTS**: Systolic BP (SBP) presented a reduction from the 10th min post-exercise to 30 percent MVIC ($p < 0.05$). At 60 min post-exercise the SBP was lower 30 percent vs. 3 percent MVIC ($p = 0.006$). There were no differences for diastolic BP, mean arterial pressure, HR and NO metabolites. The results demonstrated that IHG exercise at 30 percent MVIC was tolerated by elderly individuals and induced an PIEH for up to 60 min, but there was no association with NO- salivar metabolite. **CONCLUSIONS**: Yet, this portable equipment of cost-effective, easy performance and short duration can be an excellent adjuvant strategy in the control and prevention of arterial hypertension in elderly.
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Effects Of Isometric Handgrip Versus Aerobic Exercise On Blood Pressure In Elderly Hypertensive Patients

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(No relevant relationships reported)

PURPOSE: The aim of this study was to compare the antihypertensive effects of isometric handgrip exercise (IHE) versus aerobic exercise (AE) on office, central and 24-h ambulatory blood pressures in elderly hypertensive patients. **METHODS**: We conducted a randomized controlled trial with a three-arm design. Thirty-seven elderly hypertensive patients (mean age 69±6 years) were randomized to IHG training (n=14), AE training (n=11), or non-exercise control group (n=12) for 12 weeks. Bilateral IHG training was performed at 30% of maximal voluntary contraction using a digital handgrip device. AE training was performed brisk walking for 30-min at moderate intensity with 3 times per week. Resting office, central, and 24-h ambulatory blood pressures were obtained at baseline and after intervention. **RESULTS**: No group differences were found at baseline for any variable. Following 12 weeks, resting office blood pressures decreased in both IHG and AE groups (IHG: SBP 135.4±14.1 to 125.8±9.9mmHg (p=0.004), DBP 84.8±8.5 to 79.6±5.8mmHg (p=0.005); AE: SBP 130.3±13.3 to 123.1±8.1mmHg (p=0.022), DBP 80.5±7.0 to 76.8±5.0mmHg (p=0.037)), without any improvement in the control group. Furthermore, central SBP (122.0±13.5 to 117.0±9.8mmHg (p=0.05)) and mean 24h ambulatory DBP (80.3±8.8 to 75.6±7.2mmHg (p=0.021)) decreased only in the IHG group, but not in the AE or control groups. **CONCLUSIONS**: These findings suggest that both IHG and AE trainings reduce resting office blood pressure, but only IHG training is effective in improving central and ambulatory blood pressures. Thus, IHG training may be an alternative antihypertensive therapy for the elderly hypertensive patients.

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Effects of Whole-body Vibration On Strength, Body Composition, and Function in Skilled Nursing Home Residents

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(No relevant relationships reported)

PURPOSE: To compare the effects of 12 wks of whole-body vibration training (WBVT: n=10) to standard care, which served as the control (CON: n=10), on strength, body composition, and functional performance in 20 (16 female) pre-frail and frail skilled nursing home residents (82±5 yrs).
METHODS: Participants were screened for frailty syndrome using the FRAIL scale. Isometric knee extension strength (KE) was measured using a mechanical push-pull dynamometer. Bioelectrical impedance analysis was used to measure lean mass (LM) and fat mass (FM). The short physical performance battery (SPPB) was used to assess function. Participants were assigned to 12 wks of WBVT (2x/wk) or CON. WBVT consisted of 3 sets of 10 reps of 4 lower body exercises (partial squat, narrow squat, wide squat, calf raises) during vertical vibration (25-40 Hz). Data were analyzed using two-way ANOVA (group x time) and post-hoc paired t-tests. Significance was set at $p \leq 0.05$.
RESULTS: There were no changes in LM or FM. There were significant group-by-time interactions for KE and SPPB. Post-hoc paired t-tests found WBVT improved KE (WBVT: 22.3±4.0 to 29.0±4.5 kg; CON: 23.8±6.3 to 23.6±9.6 kg) and improvement in SPPB performance approached significance (WBVT: 4.5±2.3 to 5.2±2.1 units, p=0.09; CON: 4.1±1.9 to 3.7±2.3 units).
CONCLUSIONS: WBVT was well tolerated and occurred without adverse health complications. WBVT can be used to counteract losses in leg strength. Interventions of greater frequency and duration may help improve functional performance in pre-frail and frail older adults. WBVT was well tolerated and occurred without adverse health complications. WBVT can be used to counteract losses in leg strength. Interventions of greater frequency and duration may help improve functional performance in pre-frail and frail older adults. This study was supported by grants from the College of Human Sciences and FSU.

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The Association of Muscular Strength and Treadmill-Based Walking Economy in Older Men and Women.

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(No relevant relationships reported)

Ageing is linearly associated with increased body fat percentage (BF%) and decreased muscular strength, which may lead to lower force production and decreased physical function (PF) in older adults (age 60+ yrs.). The magnitude at which age-related decrements affect energy expenditure associated with walking economy (WE) is not well understood. A better understanding of the relationship between BF%, lower body muscular strength (LBMS), and PF, and the degree to which these variables are related to WE is important for the clinical exercise approach with older adults. **PURPOSE:** To determine the association of BF%, LBMS, and PF on WE in older adults when walking at three separate treadmill speeds. **METHODS:** Twenty-three older adults (12 men, 11 women; age 70 ± 6 yrs.) were recruited to participate. Session 1 included screening, protocol familiarization, and body composition assessment measure (BodPod®). During sessions 2 and 3, participants performed either a treadmill walking (TMW) protocol (three separate 6-minute TMW bouts at set speeds of 0.45, 0.89, and 1.34 $m \cdot sec^{-1}$) or a LBMS measure (1RM Leg Press) and PF test battery (SPPB). Session, walking speed, and strength/functional testing order was counter-balanced and WE was calculated as an index ($kcal \cdot min^{-1} \cdot W^{-1}$). Steady state oxygen uptake was used to calculate energy expenditure for all TMW bouts. A linear mixed effects model was used to determine associations between BF%, LBMS, and PF on WE at the three TMW bouts. An *a priori* alpha of $p \leq 0.05$ was set for statistical significance. **RESULTS:** Twenty-one older adults (11 men, 10 women; age 70 ± 6 yrs.) completed the study. There were no significant correlations for BF% ($r^1 = 0.19$, $p^1 = 0.41$), LBMS ($r^1 = -0.07$, $p^1 = 0.78$), and PF ($r^1 = 0.14$, $p^1 = 0.55$) on WE at the 0.45 $m \cdot sec^{-1}$ speed. Correlations were also not significant on WE at the 0.89 $m \cdot sec^{-1}$ speed [BF% ($r^2 = -0.22$, $p^2 = 0.34$), LBMS ($r^2 = 0.01$, $p^2 = 0.96$), and PF ($r^2 = 0.18$, $p^2 = 0.44$)] and the 1.34 $m \cdot sec^{-1}$ speed [BF% ($r^3 = 0.09$, $p^3 = 0.71$), LBMS ($r^3 = 0.14$, $p^3 = 0.54$), and PF ($r^3 = -0.26$, $p^3 = 0.25$)]. **CONCLUSION:** BF%, LBMS, and PF may not be associated with age-related decrements in WE with older adults during treadmill walking. Future research is needed to better determine the interactions of these variables on WE in older adults.

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Passive Mobilization-induced Vascular Function: Adaptations In Bedridden Oldest-old.

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(No relevant relationships reported)

PURPOSE: With aging, vascular function (VF) declines. Indeed, a conspicuous number of oldest-old individuals are in chronically bedridden, and literature indicates that chronic immobility exacerbates VF decline. Although studies have suggested that passive mobilization of the limbs (PM) may improve local VF, the effect of PM on nitric oxide (NO)-mediated VF has not been studied yet. Therefore the aims of this study were determine whether PM is effective to counteract VF worsening in bedridden oldest-old. We hypothesized that bedridden patients who underwent a month of PM would have gained significant improvement in NO-mediated VF. **METHODS**: Twenty bedridden individuals (86±7 yrs) were randomly assigned to PM or control (CT) group, treated with standard therapies only. PM groups underwent a program of 30 min of passive knee (flexo-extension) mobilization (4-week, twice a day/5 days a week) in addition to their standard therapies. Pre and post treatment, NO-mediated VF was measured by means of single passive limb movement (sPLM) test.
RESULTS: All PM patients completed all sessions. Concerning sPLM test, PM group improved significantly $sPLM_{peak}$ (+33%), ΔPLM (+55%), as well as Area Under the Curve (AUC, +200%). CT group did not exhibit any change in VF.
CONCLUSIONS: Results suggest that the reduction in VF exhibited in chronically bedridden oldest-old individuals can be reversed by a PM program. PM seems to be an effective strategy to counteract the deleterious effects of bedridden.

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Comparing Post-Exertional Symptoms Following Serial Exercise Tests

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(No relevant relationships reported)

Post-exertional malaise (PEM) is an exacerbation of symptoms that leads to a reduction in functional ability. Recognizing the triggers, onset, symptoms and duration of PEM is important for the diagnosis of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). PEM following serial exercise tests has not been examined. **PURPOSE**: To compare descriptions of symptoms by ME/CFS and control subjects after two maximal exercise tests, each separated by 24 hours. **METHODS**: Open-ended questionnaires were provided to 11 control subjects and 49 ME/CFS patients who underwent two maximal exercise tests, 24 hours apart. Each subject evaluated how they felt immediately after the first exercise test, before and immediately after the second exercise test, and in the week following the tests. Responses were analyzed and categorized by two reviewers, blinded to subject diagnosis. Repeated measures ANOVA was used to examine differences between groups. **RESULTS**: Over the two days of testing, ME/CFS subjects reported an average of 15.4±7.7 symptoms compared to 5.5±1.8 in the control group. Following the tests, ME/CFS subjects reported an average of 5.0±2.8 symptoms compared to 0.1±0.3 in the control group. Among the ME/CFS subjects, fatigue, cognitive dysfunction, and sleep problems were reported with the greatest frequency. Out of the eighteen symptom categories, ME/CFS subjects reported seventeen at a higher frequency than control subjects. The largest differences were observed in cognitive dysfunction, headache, light-headedness, muscle/joint pain and weakness. Other symptoms included decreased function, pain, flu-like and gastrointestinal symptoms. Forty-nine percent of ME/CFS subjects recovered within an average of 4.5 days while fifty-one percent had not recovered by day seven. In contrast, all but one control subject recovered within 1 day. **CONCLUSION**: A standardized exertional stimulus produces prolonged and more diverse symptoms in ME/CFS subjects compared with those seen in control subjects. Understanding PEM more comprehensively may provide clues to the underlying pathophysiology of ME/CFS and lead to improved diagnosis and treatment.

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Exercise Ventilatory Limitation To Exercise In Dyspneic Iraq And Afghanistan Veterans

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(No relevant relationships reported)

Veterans of Iraq and Afghanistan frequently report dyspnea on exertion following deployment despite the presence of normal pulmonary function testing. Determining underlying causes of exertional dyspnea is difficult due to the variety of potential contributing factors, but a ventilatory limitation to exercise is one factor that may contribute to the perception of dyspnea. **PURPOSE:** The goal of the present study was to determine the frequency of ventilatory limitation to exercise and compare pulmonary function between those individual with (VL+) and without (VL-) ventilatory limitation. **METHODS:** 83 deployed Iraq and Afghanistan Veterans (43.5±9.8 years; 72 men and 11 women) were referred to our dyspnea clinic and completed pulmonary function and cardiopulmonary exercise testing (CPX). VL+ during CPX was defined as a peak exercise ventilation (VE) that was ≥ 80% of the maximal voluntary ventilation (VE/MVV > 0.80). All Veterans completed pulmonary function testing (PFT) including body plethysmography, spirometry, diffusing capacity and forced oscillometry testing (FOT). Veterans with abnormal baseline PFTs and current smokers were excluded from analysis. **RESULTS:** 30.1% of our sample (25 of 83) demonstrated VL+ during exercise. Groups were similar in age (VL+ vs. VL-; 43.9±9.9 vs. 43.2±9.7 years) and body mass index (31.7±5.6 vs. 30.3±3.7 kg/m^2). In comparison to VL-, Veterans with VL+ had a reduced total lung capacity (TLC % pred; 90.5±9.3 vs. 97.4±13.8, p = 0.027); however, all other pulmonary function indices were similar between groups. CPX patterns differed between groups such that Veterans with a VL+ demonstrated greater peak exercise capacity (Peak VO2 % pred: 90.6±18.0 vs. 73.4±13.7%, p < 0.001) and ventilatory anaerobic threshold (% of peak VO2: 57.2±11.5 vs. 48.9±12.1%, p = 0.015). **CONCLUSIONS:** Approximately 30% of our clinical sample referred for evaluation of dyspnea demonstrated a ventilatory limitation to exercise (VL+). However, pulmonary function was similar between groups, and CPX performance was superior in those with VL+. Given the persistence of respiratory symptoms across both groups, these data may suggest that VE/MVV is an insensitive method to evaluate exertional dyspnea in this population.

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The Validity of an Energy Cost Prediction Equation for Unloaded Cycling

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(No relevant relationships reported)

American College of Sports Medicine (ACSM) metabolic equations estimate energy cost from known workloads. These equations may be used in healthy and clinical populations for exercise testing and prescription to determine the metabolic cost and required intensity associated with a desired level of energy expenditure. A constant of 3.5 mL/kg/min is used in the cycle ergometry equation to represent resting VO_2 and a constant of 3.5 mL/kg/min represents the energy cost of 'unloaded' cycling; however this does not account for the energy cost variability in RPMs. **Purpose:** The purpose of this study was to evaluate the validity of ACSM's energy cost prediction equation for unloaded cycling at various RPMs in college females. **Methods:** Subjects included 10 females (20-26 y/o) who performed three exercise trials. Prior to the exercise trials, seat height on a Monark cycle ergometer was standardized with a 5-10 degree knee bend in the pedal-down position with the sole of the foot parallel to the floor. The subjects pedaled at 50, 70, and 90 RPM with no belt resistance on the flywheel for 7 minutes each with 10 minutes of rest between trials. Heart Rate (HR) and VO_2 were recorded for each minute. Data from the 6th and 7th minutes were averaged and used for statistical analysis. A one-way within subjects ANOVA was conducted to compare the effect of RPM on HR and VO_2. Bonferroni correction was applied for post hoc comparisons. **Results:** Mean HR was 98 ± 12 bpm at 50 RPM, 102 ± 13 bpm at 70 RPM, and 115 ± 13 bpm at 90 RPM. Mean VO_2 was 6.68 ± 0.78 mL/kg/min at 50 RPM, 8.03 ± 0.88 mL/kg/min at 70 RPM, and 11.23 ± 1.45 mL/kg/min at 90 RPM. There was a statistically significant difference in HR between 50 and 70 RPM ($p = 0.030$) and between 70 and 90 RPM ($p < 0.001$). Statistically significant differences were found in VO_2 between all of the RPM trials ($p < 0.001$). When comparing the VO_2 data from each RPM trial to a constant of 7 mL/kg/min, statistical significance was found at 70 RPM ($p = 0.030$) and 90 RPM ($p < 0.001$) with no significance at 50 RPM ($p = 1.000$). **Conclusion:** The effect of RPM on energy cost revealed VO_2 at 70 and 90 RPM to be significantly greater than the constant of 7 mL/kg/min used in ACSM's metabolic cycling equation. This may have negative health implications when prescribing a constant level of exercise intensity, particularly for low-level exercise in a clinical population.

1005 Board #266 May 30 2:00 PM - 3:30 PM

Metabolic Cost of Walking in Low Functioning Older Adults

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(No relevant relationships reported)

PURPOSE: The metabolic cost of walking increases with age, but the effect of functional status that accompanies aging remains unknown. The purpose of the study was to compare the metabolic cost of walking between low functioning (LF) and high functioning (HF) older adults.
METHODS: Ten HF and ten LF older adults (70+ years), pair matched by age (±3 Yrs) and gender, were categorized using the Short Physical Performance Battery (SPPB) that ranks participants from 0 (worst performance) to 12 (best performance) based on balance, walk speed, and chair stand tests. High functioning participants scored >10 (11.5 ± 0.7) and low functioning participants scored <8 (6.06 ± 1.4). Participants walked over ground at self-selected usual and rapid paces. Participants also walked at a standard pace on the treadmill at 0.76 m/s. Expiratory gases were measured using a portable indirect calorimeter. Gross metabolic rate was defined as W·L/kg/min. Metabolic cost was expressed as gross metabolic rate by walking speed (W·L·s/kg/min/m). Peak energy expenditure was measured during a graded exercise treadmill test to normalize walking metabolic rate (e.g. walking metabolic rate as a percent of peak metabolic rate).
RESULTS: HF participants walked faster than LF participants: usual (1.14 vs. 0.81 m/s, p < .001) and rapid (1.41 vs. 1.13 m/s, p = .006) pace. Gross metabolic rate was 21% higher in HF adults compared to LF adults for usual paced walking (3.3 ±.67 vs. 4.2 ± 0.83, respectively) and 27% higher for rapid-based walking (3.9 ± 0.84 vs. 5.3 ± 0.79, respectively). However, no group differences were noted for walking at usual (-0.46, 95% CI: 0.54, -1.46), rapid (0.31, 95% CI: 0.44, -1.07), or standard pace (0.11, 95%, CI: 0.75, -.51). There was a strong trend for LF participants to walk at a higher percent of VO2 peak on usual (71% vs. 55%, p =.12), rapid (85% vs. 75%, p =.31) and standard pace walk tests (89% vs. 71%, p =.01).
CONCLUSIONS: In comparison to HF older adults, LF older adults had lower gross metabolic rate due to their slower walking speed. Despite their slower pace, LF older adults walk at a higher percentage of their peak energy expenditure. Collectively, these

results support the notion that LF older adults favor a walking speed that optimizes metabolic cost, but are susceptible to higher relative energy expenditure due to their lower peak capacity.

B-73 Exercise is Medicine®/Poster - **EIM: Exercise and the Older Adult**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1006 Board #267 May 30 3:30 PM - 5:00 PM

Comparative Th1 Th2 of Elderly Women Engaged in a Program of Resistance or Aerobic Exercise

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(No relevant relationships reported)

It is well-known the alterations that occur in the immune response with aging that can generate an imbalance of the immune response leading to a low-grade chronic inflammation. Some studies have described the decrease in proliferative capacity of Th1 cells in elderly. The imbalance between Th1 and Th2 cells seems to play a role in the development of autoimmune and inflammatory diseases. **PURPOSE:** Therefore, the aim of this study was to evaluate Th1 and Th2 responses and verify Th1/ Th2 ratio in elderly women engaged in different exercise programs. **METHODS:** Initially, 27 elderly women (65± 3.2 years old) were selected and distributed into four groups accordingly to exercise program that they practiced: 1. sedentary (SED); 2. resistance training practitioners (RE); 3. aerobic exercise practitioners (AE); 4. resistance and aerobic exercise practitioners (REAE). Th1 and Th2 cell populations were assessed by flow cytometry. **RESULTS:** Th1 response was higher in RE groups (RE, 16.7± 5.8% ; REAE 15.7± 4.7%) when compared with AE (12.5± 2.9%), and SED (12.9± 4.4%). Inversely, Th2 had a trend to decrease in exercise programs (SED, 10.4± 5.3; REAE, 9.2± 4.9; AE, 7.6± 3; RE, 4.9± 2.4 %) Finally, the Th1/ Th2 ratio was higher in RE (3.2± 1.4) versus REAE (2.2± 1.4), AE (1.9± 0.9) and SED (1.3± 0.3). **CONCLUSIONS:** Increased Th1/Th2 ratio was due to a higher response of Th1 cells and lower response of Th2 cells. These findings suggest an improvement in Th1 response in elderly women engaged in exercise program, mainly in resistance exercise groups.

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The Effects Of Core Muscle Training Combined With Lower Limbs Strengthening On Physical Fitness Of community Elderly

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(No relevant relationships reported)

According to the long-term care service planning proposed by the Ministry of Health and Welfare in Taiwan, 80% of the aging population requiring long-term care service would also require community-based or home-base care. The strength of lower limbs and core muscle plays important role in prevention against fall behavior, especially for the community elderly.**PURPOSE**: To evaluate the physical fitness of the elderly in local community care-concern center in Taiwan, a four-month course of regular core muscle training and lower limbs strengthening was conducted.**METHODS:** Four elderly (Age: 66±1.6 years of age; Body height: 156.7±6.6 cm, Body weight: 62.5±13.7 kg) without any severe illness were included in this study. The training of core muscle training and lower limbs strengthening last for four months with 3 sessions per week, 60 min per session, and an intensity of 5-6 on the Ratings of Perceived Exertion scale. Physical fitness was evaluated one week before and after the intervention. Data of multiple variables were collected by using questionnaire and examination on functional fitness including grip, two-min step test, back scratch test, and 8-foot up-and-go test. The ranges of motion and isometric strength of lumbar spine and knee were measured by the microFET3. Descriptive statistics, independent sample t-test, and paired-samples t test were used to evaluate the effects of the intervention. **RESULTS:** The results showed significant improvement after the 4-month course in back scratch test, 2-min step test, chair sit-and reach test, and isometric strength of lumbar spine and knee ($p < 0.05$). Among the other tests, no significant differences were observed. **CONCLUSION:** Core muscle training combined with lower limbs strengthening for community elderly can improve physical fitness and isometric strength of low back and knee.

1008 Board #269 May 30 3:30 PM - 5:00 PM

Multicomponent Exercise Program Effects On Functional Capacity And Cognition In Frail Hospitalized Patients

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(No relevant relationships reported)

Frail older adults have reduced functional and physiological reserves, rendering them more vulnerable to the effects of hospitalization, which frequently results in failure to recover from functional decline related to the hospitalization and new disability**.** **PURPOSE**: To analyze the effects of a multicomponent exercise program on functional capacity and cognition in frail hospitalized patients. **METHODS**: Randomized clinical trial conducted in 326 patients admitted in an Acute Care Unit were randomly assigned to the intervention (IG) or control group (CG). The intervention consisted of a multicomponent exercise training program, composed of supervised progressive resistance exercise training at low-moderate intensities 30-60%RM (Repetition Maximum), balance training, and walking for 5-7 consecutive days. Evaluations of functional capacity (Short Physical Performance Battery (SPPB), Gait velocity Test (GVT), GVT under dual task conditions, Barthel index), strength assessments; maximal isometric force of handgrip (HG), knee extension and hip flexion, 1RM test in leg press, chest press and knee extension exercises, and cognitive tasks; Mini Mental State Examination (MMSE), Trail Making Test Part A (TMT-A) and verbal fluency test were conducted at admission and previous to discharge in both groups. **RESULTS**: 326 completed pre/post evaluations (IG n= 126, CG n=141). Drop-out rate was 18%. In the IG, significant improvements were observed at discharge in all the functional capacity outcomes (SPPB 4.4 vs. 7.0 points, GVT 14.1 vs. 10.9s., Verbal GVT 17.6 vs. 13.2s., Arithmetic GVT 17.6 vs. 12.9s., $p<0.001$ and Barthel score 83.8 vs. 85.9 points $p<0.05$) strength measurements (HG 17.2 vs. 18.8kg., knee extension 97.8 vs. 112.7N., hip flexion 90.8 vs. 104.4N., 1RM leg press 57.7 vs. 76.3kg., 1RM chest press 24.2 vs. 28.4kg., 1RM knee extension 38.5 vs. 47.0kg, $p<0.001$) and cognitive tasks (MMSE 22.1 vs. 24.3 points, TMT-A 154.6 vs. 121.3s., verbal fluency 6.0 vs. 8.0 words, $p<0.001$). In contrast, in the CG, no significant improvements were found in those outcomes. **CONCLUSIONS**: A multicomponent exercise program, with special emphasis in progressive resistance training, is an effective therapy to improve functional capacity and cognitive function in frail patients during hospitalization.

1009 Board #270 May 30 3:30 PM - 5:00 PM

Correlation between One-leg Standing Time and Trail Making Test in Japanese Older Adults

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(No relevant relationships reported)

PURPOSE: For older adults maintaining the ability to control balance is closely associated with the risk of falling, an independent mobility, including walking, and engagement with active life. The aim of this study was to examine the one-leg standing time with eyes open and its association with physical, cognitive, and psychological functions in community-dwelling older adults residing in Japan. **METHODS**: Sixty-five women aged 65 years and over (mean age 73+7 yrs.) participated in the study. They were being involved in habitual physical activity at least once a week for three months prior to the study. At the first assessment session, participants completed a demographic questionnaire and one-leg standing balance test. The participants were then divided into two groups according to time of one-leg standing time with eyes open: 1) longer than 15 seconds (n=46, high group - HG: 75.4+61.7 sec.) and 2) shorter than 15 seconds (n=19, lower group - LG: 7.8+3.0 sec.). All participants performed hand-grip strength (HGS), chair-stand (CS), timed up-and-go (TUG), 10-m maximal gate speed (MGS), mini-mental state examination (MMSE), and trail making test (TMT). Data were analysed using unpaired t-test and ANCOVA. **RESULTS**: For all participants the mean length of one-leg standing time was 60.2+45.2 sec. (2 - 120 sec.). Significant difference ($p<0.05$) were observed between two groups: age (HG; 70.3+3.4, LG; 72.3+3.6 yrs.), HGS (HG;24.9+3.8, LG;22.2+5.8 kg), CS (HG;8.0+2.1, LG;9.0+2.2 sec.), TUG (HG;5.2+1.0, LG;5.7+0.8 sec.), MGS (HG;1.82+0.24, LG;1.69+0.28 m/sec.), MMSE (HG;28.4+1.8, LG;26.9+2.2 score). After adjusting for age, the only significant difference ($p<0.05$) observed between the two groups was for TMT (HG;90.5+23.0, LG;119.8+49.3 sec.).

CONCLUSIONS: Physical, cognitive, and psychological functions were significantly related to one-leg standing time. The results of this study also identified the balance ability and cognition decline. Future studies need to confirm these observations in larger samples to track balance-cognitive decline over time among older adults.

1010 Board #271 May 30 3:30 PM - 5:00 PM

Effects of Personal Training on Body Composition and Physical Fitness in Older Adults with DLSD

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(No relevant relationships reported)

Exercise treatment is recommended for older patients with lumbar spine diseases that result in degeneration of muscles and the skeletal system and a resultant decline in function. However, it is often difficult for patients to exercise by themselves and assistance from an exercise professional can be valuable to maintain health status and improve quality of life. **PURPOSE**: This study was designed to evaluate the effect of personalized exercise instruction on changes in body composition, physical fitness and pain management in older adults with degenerative lumbar spinal disorders (DLSD). **METHODS**: Three individuals ($Range_{age}$=66-78 yrs), who no prior experience with a personal trainer and who reported chronic low back pains for more than 12 weeks, participated in the study. This study was conducted by a researcher and a professional personal trainer who had more than 10 years' experience in the personal training area. The data was collected by employing a single-subject, ABA repeated measure design. In addition, schematic analysis was utilized to visualize the changes of participants' body composition, physical strength and rating of perceived pain. A paired t-test using SPSS WIN 20.0 was employed to examine before-and-after differences for key outcome measures. **RESULTS**: The results showed that muscle mass was increased and body fat mass and central obesity were decreased at the end of phase B, which coincided with the period of supervision by the personal trainer. Additionally, there were statistically significant changes in strength of upper and lower extremity, cardiovascular endurance, upper and lower body flexibility and the rating of perceived pain. **CONCLUSIONS**: This study resulted in better understanding of the role for individualized instruction by exercise professionals for older adults with degenerative lumbar spinal disorders. Furthermore, the results may have some applicability to the design and implementation of future personal training programs for seniors with similar conditions.

1011 Board #272 May 30 3:30 PM - 5:00 PM

Knowledge And Practices Of Primary Health-care Providers To Counsel About Physical Activity And Fall Prevention

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(No relevant relationships reported)

The benefits of regular physical activity on health, fall prevention, and quality of life are widely recognized. However, only a small percentage of older adults meet the current recommendations for aerobic exercise and strength. Primary care providers are in a unique position to counsel patients about exercise and provide them with exercise locations and prescription. PURPOSE: The aim of this study was to assess the perceptions of health care providers regarding knowledge and confidence to assess and counsel older adult patients about physical activity and fall prevention. METHODS: One hundred and twenty health care providers in Pierce County, Washington received a link to an online survey. The survey consisted of 35 questions including demographic and general practice questions, and questions that assessed knowledge and counseling practices of primary care providers about physical activity and fall prevention. Chi-square was used to determine if categorical variables differ from one another. Significance was set at $p < 0.05$. RESULTS: Thirty-four (28.3% response rate) individuals responded to the questionnaire. Most of the respondents were physicians (56%). Fifty-six percent of the respondents ($\chi^2 = 0.25$, $p = 0.17$) indicated that they routinely counsel their patients to participate in exercise programs that promote fall prevention. Only 12.5% ($\chi^2 = 8.38$, $p < 0.05$) of the primary care providers responded that they refer their clients to an exercise specialist. The majority (93.8%) of the health care providers were not aware of the Exercise is Medicine® website ($\chi^2 = 12.25$, $p < 0.01$). Eighty-seven percent ($\chi^2 = 9.0$, $p < 0.01$) of the respondents described their knowledge of fall prevention assessment and management as "not very knowledgeable" to "somewhat knowledgeable." Most of the health care providers (68.8%, $\chi^2 = 2.25$, $p = 0.13$) indicated that they routinely administer fall risk screening. CONCLUSION: These results show that while half of these primary care providers counsel their patients to participate in exercise programs, only a small percentage of them refer their clients to an exercise specialist. Furthermore, the lack of knowledge of the Exercise is Medicine® initiative and website by health care providers indicates the importance of further education of health care providers.

1012 Board #273 May 30 3:30 PM - 5:00 PM

Golf Intervention Improves Fast but Not Self-selected Gait Speed.

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(No relevant relationships reported)

Title: Golf Intervention Improves Fast but Not Self-selected Gait Speed. Gait speed (GS) is an important global indicator of successful aging, and slow gait speeds are associated with poor health outcomes in later life, such as falls, hospitalization and mortality. Slower GS may also limit social interaction, functional capabilities and independence; thus, attenuating the slowing of GS should be a priority for seniors. Using golf as an exercise intervention, we hypothesized that golf may improve GS and walking endurance in older adults. **PURPOSE:** The objective of the preliminary investigation was to examine the influence of a 12-week golf intervention on GS in older adult military veterans. **METHODS:** GS (m/s) was measured pre-and post a 12-week golf intervention in 4 older, male military veterans (65-79 years). The 12-week golf training was conducted at a 9-hole, Par-3 course. The training consisted of warmup exercises, swing practice at the net, and progressive golf play culminating in playing all 9 holes during weeks 11 and 12. Participants completed 3 gait trials (10m) of each condition: self-selected (SSGS) / habitual walking and walking "as fast and as safe as possible" (FGS) in a motion analysis laboratory. A 6-minute walk test (6MWT) was completed outside on an even, concrete walking path. Participants were instructed to "walk as fast and safe as possible, covering as much distance as possible in the 6-minute time limit." **RESULTS:** SSGS did not change. FGS improved by 6.08% (ES 0.76) and GMWT distance increased by 4.1% (ES: 0.78). **CONCLUSION:** Following the 12-week golf intervention, participants improved their FGS and their 6MWT distance; however, SSGS did not change. This demonstrates that fast gait may be an important outcome measure to consider when investigating older adult activity interventions. The ability to walk faster and for longer distances can have salient effects on overall wellbeing and safety. In everyday life, habitual GS may **not** be sufficient when challenges in the environment emerge, such as the need to cross a street quickly or get out of the way of a moving vehicle. Results from this study suggest that a 12-week golf training intervention changed the walking ability in older military veterans. Our study also demonstrates the utility of including other measures of walking performance in addition to SSGS.

1013 Board #274 May 30 3:30 PM - 5:00 PM

Correlations Among Subjective vs. Objective Physical Activity, Diet, and Medication Use in Older Adults

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(No relevant relationships reported)

Due to the increased burden of chronic disease, prescription medication use in older adults is high. This rise in the use of multiple medications (polypharmacy) is concerning due to its relationship with adverse drug related events (ADEs), drug-drug interactions, and increasing healthcare costs. Level of physical activity (PA) and habitual dietary nutrient intake are lifestyle factors that may influence prescription medication use and associated complications. The **PURPOSE:** of this study was to identify correlates among PA level measured subjectively and objectively, habitual nutrient intake, and prescription medication use in older adults. **METHODS**: In 96 older adults (58F, 38M, 77±7.7 years) prescription medication use (Rx), subjective PA level (Community Healthy Activities Model Program for Seniors, CHAMPS), and objective PA level (Accelerometer, Actical, Phillips Respironics) were measured. In a subset of 73 subjects, habitual dietary intake of nutrients was assessed (3-Day Diet Log). Partial correlations were run between variables while controlling for age, sex, and body mass index (BMI). Significance was set to $p < 0.05$. **RESULTS**: Mean values±SE for the variables include: moderate-to-vigorous subjective PA (MVPA-S): 1353±120 kcal·wk^{-1}, moderate-to-vigorous objective PA (MVPA-O): 51.2±5.1 min·day^{-1}; Rx number: 3.4±0.3; total caloric intake: 2107±64 kcal·d^{-1}; and percent polyunsaturated fatty acid (PUFA) intake: 10.4±7.0 g·kcal·d^{-1}. Rx was inversely correlated with MVPA-S ($r = -0.24$, $p < 0.05$) and with MVPA-O ($r = -0.31$, $p < 0.05$). MVPA-S and MVPA-O were positively correlated ($r = 0.64$, $p < 0.01$). Rx number was inversely correlated with percent dietary intake of PUFA ($r = -0.31$, $p < 0.01$). There were no significant correlations between Rx and other nutrients. **CONCLUSION**: Preliminary data show that Rx use in older adults is inversely associated with subjectively and objectively measured PA level. These data also show a strong correlation between the subjective and objective measures of PA, which could be important when looking at measurement possibilities in clinical settings and for future studies. Additionally, these data show an inverse correlation with Rx number and PUFA. These preliminary data suggest that lifestyle factors may significantly influence Rx use and associated complications.

1014 Board #275 May 30 3:30 PM - 5:00 PM

Standing Balance,Muscle Strength And Proprioception of Each Lower Limb Joint- Which Are Significant Predictors For Mobility In Community-dwelling Older Adults?

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(No relevant relationships reported)

Lower limb proprioception, muscle strength and standing balance are all proposed as important factors in relation to mobility of the elderly. However, it is not clear what the relative contributions are for hip, knee and ankle proprioception, and strength and postural sway.
PURPOSE: To determine the relative contributions of proprioception at each lower limb joint, muscle strength and standing balance, to mobility in community-dwelling older adults.
strength.
METHODS: A group of 102 community-dwelling adults, with mean age of 68.4 years, volunteered. Hip, ankle and knee joint proprioception were measured in standing using joint-specific versions of the active movement extent discrimination apparatus (AMEDA). Muscle strength was determined by grip strength with a hand dynamometer as a proxy variable, and bipedal postural sway was assessed via the Biodex Balance System, tested in anterior-posterior and medio-lateral directions, with eyes open and with eyes closed. Mobility was measured using the timed-up-and-go test (TUG).
RESULTS: TUG scores for the group were significantly worse with low ankle proprioception ($r = -0.29$, $p<0.01$) and low hand grip strength ($r = -0.25$, $p = 0.01$), and across age in years, TUG scores showed an inverted-U shaped function ($p < 0.001$) with the greatest decline after 75 years of age. From multiple regression, ankle proprioception was shown to be the most important factor in predicting TUG performance (Adj $R^2 = .13$, $p < 0.001$).
CONCLUSIONS: Results here add a specific proprioceptive component, ankle proprioception in standing, to the known association of strength with mobility in the elderly. Further, these results suggest that to effectively improve mobility in the elderly, and reduce falls risk, intervention methods should focus on improving ankle proprioception ability as well as increasing strength.

1015 Board #276 May 30 3:30 PM - 5:00 PM

Exercise Prescription Intervention Plan for Pre-frail and Frail Elderly in New Taipei City

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(No relevant relationships reported)

In response to the aim of active aging promoted by the World Health Organization, a plan for intervention in elderly frailty through exercise is in urgent need. In 2016, New Taipei City's elderly health check-up program introduced frailty assessments and exercise intervention. However, 10-57% of frail elderly showed no immediate improvement after exercise intervention.
PURPOSE: The establishment of "Exercise is Medicine"(EIM) Taiwan personnel training and standardized training modules through EIM Taiwan, in the hope of enhancing exercise intervention effectiveness for individuals assessed as pre-frailty or frailty in New Taipei City's elderly frailty assessments.
METHODS:1. Planning of exercise intervention options and training courses: Training content included assessment before exercise and exercise recommendation principles, and exercise prescriptions and recommendations for various chronic diseases. 2. EIM training for physicians and allied health professionals: The EIM Taiwan training included 16-hour courses for physicians and allied health professionals, respectively. Through the training of EIM Taiwan professional personnel, the provision of individualized exercise plans for pre-frail and frail elderly can be implemented.
RESULTS: On March 14, 2017, Eric Liluan Chu, the mayor of New Taipei City cosigned a Memorandum of Cooperation (MOU) with EIM Global. After signing the MOU, a total of 195 physicians and 344 allied health professionals were trained as the EIM-certified professional personnel in Taiwan. Through these EIM-certified physicians, individualized exercise prescriptions were given to elderly assessed as pre-frailty or frailty, with exercise plans then implemented through the guidance of allied health professionals. In 2017, a total of 24,778 people have taken elderly frailty assessments and 23.8% of above elderly received the implementation of exercise plans.
CONCLUSIONS: In addition to continuing to implement exercise intervention for pre-frail and frail elderly, our program aims to establish an EIM Taiwan training guidance handbook. Through these actions, it is expected to enhance exercise intervention effectiveness and reverse frailty in New Taipei City.

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The Effect Of Two Low-dose Strength/Balance Programs On The Physical Function Of Mobility-limited Older Adults

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(No relevant relationships reported)

Background: Strength and balance training are critical to maintaining physical function and delaying the onset of major mobility disability in older adults (OAs). The minimum amount of this training required to yield clinically meaningful improvements in physical function is not clear. **Purpose**: To evaluate the effect of two low dose strength/balance programs on physical function in mobility-limited OAs. **Methods**: Twenty community-dwelling OAs with mobility limitations were randomized to one of two strength/balance doses (n=10/dose), held 3x/week at a local YMCA for 10 wks. Eligible participants were ≥ 65 yrs of age, exhibited mild to moderate mobility impairment (short physical performance battery (SPPB) score of 3-9 out of 12), sedentary (<125 minutes/week of any kind of physical activity, determined by 7-day pre-baseline accelerometry), and had no major medical issues that would preclude exercise. Exercise doses were as follows: Low dose (L): 1 set each of chair stands, hip abduction, step-up and back with head turns, toe raises, and a balance stand). Higher dose (H): 2 sets of the previous mentioned exercises were performed. Each exercise had three variations of difficulty to accommodate different participant abilities and the number of reps were based on an RPE of 7 out of 10. Participants were assessed on SPPB score and 400m walk speed before and after the intervention by individuals blinded to which dose that participant was randomized to. Clinically meaningful improvements were defined as an SPPB improvement of 0.5 points and a 400m walk speed improvement of 0.05 m/sec. Data was analyzed using a t-paired test. Results are expressed as means (± std deviation). **Results**: SPPB score improved by 2.5 (± 1.1) points among the entire cohort ($p<0.001$). Improvement was significant for each dose alone (L: 1.5 (± 0.6), $p<0.05$), (H: 3.0 (± 0.82), $p<0.001$). The improvement in SPPB score in the higher dose was significantly different from that observed with the lower dose ($p<0.05$). There was no significant effect of either dose on 400m walk speed. **Conclusion**: A 10 wk strength/balance program performed 3x/week and consisting of a single set each of select strength/balance exercises was sufficient to elicit clinically meaningful improvements in physical function for OAs with mild to moderate mobility limitations.

1017 Board #278 May 30 3:30 PM - 5:00 PM

Associations Between Grip Strength And Generalized Anxiety Disorder: Results From Tilda

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(No relevant relationships reported)

There is a need to identify risk factors for anxiety in older adults that can be targeted for prevention. Associations between grip strength and Generalized Anxiety Disorder (GAD) in older adults are not established.
Purpose: To investigate associations between grip strength and both concurrent probable GAD and the development of GAD during two-year follow-up**.**
Methods: The Irish Longitudinal Study on Ageing (TILDA) is a large prospective cohort study that assesses the social, economic, and health circumstances of community dwelling adults aged ≥50 years and their partners of any age in Ireland. Participants completed a hand grip strength assessment with a Baseline hydraulic hand dynamometer. A score of ≥23 on an abbreviated version of the Penn State Worry Questionnaire defined caseness of probable GAD at baseline. At follow-up, GAD was assessed with the Composite International Diagnostic Interview – Short Form. Participants were divided into sex-specific tertiles based on strength. Data were analysed with linear and logistic regression in September 2017.
Results: Adjusting for age, sex, waist circumference, social class, smoking status, and physical activity, the middle and high strength tertiles were associated with 27.3% ($p\leq0.002$) and 23.1% ($p\leq0.017$) lower odds of prevalent GAD, respectively. A one-standard-deviation increase in strength was associated with 12.1% ($p\leq0.004$) lower odds. The incidence of GAD was 2.0% (n=84). The middle and high strength tertiles were associated with 31.4% ($p>0.38$) and 66.5% ($p\leq0.05$) reduced odds of incident GAD, and a one-standard-deviation increase in strength associated with 24.2% ($p>0.18$) lower odds. There was no significant interaction between strength tertiles and sex in predicting Wave 1 worry symptoms, and no significant interaction between sex and strength tertiles or continuous strength in cross-sectional or longitudinal logistic regression models (all $p>0.20$)
Conclusion: The current findings provide initial support for the protective effect of grip strength on GAD among older adults. Increased hand grip strength may protect against GAD in older adults, although further research with larger samples is needed. Additionally, experimental research is needed to establish causal and mechanistic relationships between strength and worry in older adults.

1018 Board #279 May 30 3:30 PM - 5:00 PM

Thermoregulation, Strokes, And Dementia: A Healthy Heart Begets A Healthy Brain.

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(No relevant relationships reported)

More than 5 million Americans live with dementia; it affects 10% of the population over age 65. There is no cure, but recognition of risk factors could be helpful for prevention. Identifying demographic, genetic, and behavioral risk factors can improve the prescription of lifestyle choices, such as exercise training, to minimize risk. **PURPOSE**: To evaluate predictors of dementia in a patient population. **METHODS**: We obtained the patient registry of a hospital in the Midwestern United States. Demographic data, vital signs, health history, and current diagnoses were recorded. There were 2,244 consecutive patients admitted over a 3-year period who met inclusionary criteria; 105 of these patients had a diagnosis of dementia. Logistic regression tested the effects of age, sex, vital signs, and diagnostic history on incidence of dementia in this sample. **RESULTS**: Significant predictors of dementia were age ($p<0.001$), diastolic blood pressure ($p=0.048$), core temperature ($p=0.040$), presence of a bleeding disorder ($p=0.028$), and diagnosis of a previous stroke ($p<0.001$). For each degree F that core temperature increased, the odds of dementia were elevated by 44% (95% CI: 1.02 to 2.05). A history of stroke was the most pronounced predictor of dementia (95% CI: 1.89 to 7.57). When history of stroke was analyzed as the dependent variable, core temperature continued to be a significant predictor ($p=0.025$); holding all other variables constant, each additional degree F associated with a 48% elevation in the odds of a stroke (95% CI: 1.05 to 2.10). **CONCLUSION**: Age and cardiovascular function are known risk factors for strokes, and strokes are a known risk factor for dementia. In this sample, core temperature emerged as a significant predictor of both stroke and dementia. While poor thermoregulation may be a consequence. rather than a cause, of dementia, a possible consideration is the relationship between heat in the brain, cerebral oxygen demand, and blood brain barrier permeability. The brain's energy demand is several orders of magnitude greater than other body cells, and thus temperature dissipation for the brain is vitally important. Because exercise training improves thermoregulatory capacity, it is possible that this capacity could benefit the brain in previously unidentified ways.

1019 Board #280 May 30 3:30 PM - 5:00 PM

Changes in Cardiovascular Health Following Exercise in Older Men and Women at Risk for Dementia

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(No relevant relationships reported)

Purpose: To investigate the effects of a 24-week multiple-modality exercise intervention with additional mind-motor training on cardiovascular health and fitness. The secondary objective was to investigate whether the intervention had gender-specific effects on the study outcomes. **Methods:** Community-dwelling older adults (n = 127, age = 67.5 [7.3] yr, 71% women) were randomized to a 45-min multiple-modality exercise intervention with additional 15 minutes of either mind-motor training (M4 group) or an active control intervention (15 minutes of balance, range of motion and breathing exercises, [M2 group]). Assessment occurred at: baseline, 24 weeks (intervention endpoint), and 52 weeks (after a 28-week no-contact follow-up). The study outcomes were: predicted maximal oxygen consumption (pVO2max), automated office blood pressure (BP), carotid atrial compliance (cAC), intima-media thickness (cIMT), as well as body weight. Mixed between-within ANOVA was used to examine: i) main effects of time (baseline vs 24 weeks), intervention group (M4 vs M2) and gender (men vs women); ii) interactions of time x intervention group, and time x gender. **Results:** Results at 24 weeks: both M4 and M2 demonstrated improvements in pVO2max (*p<.001*), with no interaction effects for group or gender (all *p>.05*). For BP measures, both groups showed reduction in systolic *(p<.001)* and diastolic (*p=.001*) BP, with no interaction effect for intervention group; however, women showed greater reduction in diastolic BP compared to men (*p=.02*). No significant changes were observed in cIMT, cAC, or body weight. Results at 52 weeks: improvements in pVO2max were retained (*p<.001*), however, the M4 group showed higher pVO2max when compared to M2 (*p=.005*), with no interaction effects for gender. Significant reduction in systolic BP (*p<.001*) was observed for both M4 and M2, with no interaction effects for group or gender. For diastolic BP, M4 showed significant reduction compared to M2 (*p=.04*); women also demonstrated greater reduction compared to men (*p=.02*). There was no significant change in cIMT, cAC or body weight. **Conclusion:** Our results suggest that women may be more likely to benefit from group-based, multiple-modality exercise programs in measures of cardiovascular health.

B-74 Exercise is Medicine®/Poster - **EIM: Exercise Programs**

Wednesday, May 30, 2018, 1:00 PM - 6:00 PM
Room: CC-Hall B

1020 Board #281 May 30 3:30 PM - 5:00 PM

The Effect of Two Training Protocols on Post Exercise Lactate Clearance in Heart Failure Patients

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(No relevant relationships reported)

Introduction: Heart failure (HF) patients suffer from functional aerobic impairment due to reduced cardiac output and O_2 delivery. This condition leads to metabolic and physiological changes, such as longer recovery time from physical activity. It was shown that aerobic exercise confers a beneficial effect on quality of life (QOL) and physiological parameters in HF. High intensity interval training (HIT) has been argued by some studies to have a superior rehabilitative effect compared to moderate aerobic training (MAT). We hypothesized that HIT has a superior effect on lactate clearance and, by extension, on recovery from exercise. **Methods:** Twenty-nine HF patients were randomized into two exercise groups: MAT or HIT, and trained twice a week for 12 weeks. Before and after completion of the exercise program patients were assessed for QOL, six-minute walk test (6MWT) and a cardiopulmonary exercise test (CPET). Blood lactate concentration was measured after the CPET and lactate clearance kinetics were fit to each patient by a bi-exponential time function. **Results:** HIT group showed a significant improvement compared to baseline in QOL and aerobic capacity (VO2 max 21.4±7 *vs.* 17.5±3 ml/min/kg, 6MWT 461±71 *vs.* 355±58 m). Both exercise groups improved lactate clearance, as represented by the $\gamma 2$ constant. While the MAT group showed a trend towards significance (0.061±0.020 units) ($p=0.07$), the HIT group improved lactate clearance significantly (0.074±0.020 units) ($p<0.01$). **Conclusions**: HIT improves lactate clearance kinetics; thereby can partly explain the improved QOL attributed to exercise training

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Effects Of 12 Weeks Of Yoga Program in Middle Aged Women With Frozen Shoulder

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(No relevant relationships reported)

PURPOSE: The aim of this study is to identify the effects of yoga exercise program on muscle function and pain of shoulder in middle aged women with frozen shoulder. **METHODS:** Subjects were divided into 2 groups; yoga group (n=8) and control group(n=8).They participated in yoga exercise program 3days per week, 50minutes every day during 12 weeks and were measured Visual Analogue Scale, Shoulder Pain and Disability Index, Range of Motion, Strength, Pressure threshold to develop rehabilitation program for frozen shoulder. Data of the results was analyzed by using the SPSS/PC Window version 21.0 statistics program. To verify interaction between the groups, Two-Way ANOVA was conducted. All the statistical significance level was set at p<05.
RESULTS: In VAS, there was a significant interaction between the groups and time(p=.002). In SPADI(Shoulder Pain and Disability Index), Yoga group showed significantly decreased score after exercise with interaction in times and groups(p=.020). In shoulder Pressure threshold, Yoga group showed a significant increase at subscapula (p=.024) and teres minor of affected shoulder with interaction in times and groups(p=.012).
CONCLUSION: As a result, yoga exercise program is considered as helpful for middle aged women with frozen shoulder to relieve pain. However, correlation of shoulder muscle strength and range of motion were not clearly identified in this study. In future study, experiments for change of range of motion and muscle strength during yoga exercise and various groups of subjects might be required to establish theoretical basis.

1022 Board #283 May 30 3:30 PM - 5:00 PM

VO_2 Peak, Energy Cost and Stress Biomarkers Responses to High Intensity Interval Protocol (HIIT)

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(No relevant relationships reported)

High Intensity Interval Training (HIIT) Protocols are well stabilished in the literature as a beneficial health inducing strategy to improve health, fitness levels and metabolic biomarkers. Risks management of participation of HIIT programs is challeging despite benefits. Cardiovascular, Musculoskeletal and Metabolic issues, such as dehydration status may play an important role on pre-participation screening of participants. **Purpose:** The purpose of this study was to evaluate energy cost and metabolic stress biomarkers due a HIIT protocol. **Methods:** 8 males (23±6years) were evaluated during a HIIT protocol (30 minutes of CrossFit based multitask pattern) using a Portable Metabolic Analyzer (K4b^2 - Cosmed®) for VO_2, energy expenditure and substrate oxidation. Blood samples were taken before and after protocol for Creatine-Kinase (CK), Creatine-Kinase Myocardial Band (CK-MB), Lactate Dehydrogenase (DHL), and Cortisol levels analysis. **Results:** VO_2 peak during HIIT protocol were 53.1mL/kg.min^{-1}±6.2mL/kg.min^{-1}; with peak energy cost of 17.3±4.1kcal.min^{-1}; being the fat oxidation less than 10% during the role protocol. Pre *vs* Post levels for CK, CK-MB, DHL and Cortisol were 1129,6±213.6U/L *vs* 1300,8±341.2U/L; 57,1±3.2U/L *vs* 68.0±3.7U/L; 646,1±27.1mg/dL *vs* 720,8±32.7mg/dL and 12,1±1.1µg/dL *vs* 17,2±1.8µg/dL respectively. **Conclusions:** Energy cost of the HIIT protocol evidences some of the benefits, thus leading to weight-loss strategy. Stress biomarkers CK, CK-MB, DHL and Cortisol responses to HIIt protocol suggests metabolic overload on systemic and local: skeletal muscle and myocardial tissue, despite clinical outcomes (pain or claims). Risk *versus* Benefit analysis of HIIT protocols should be focused on general populations and specific patients, wich may lead to detrimental health outcomes.

1023 Board #284 May 30 3:30 PM - 5:00 PM

Patterns of Physical Activity and Muscle Strengthening Exercise in U.S. Undergraduates

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(No relevant relationships reported)

BACKGROUND: Universities and colleges are target settings for the *Exercise is Medicine®* (EIM) on Campus initiative, aiming to make physical activity a part of campus culture and to foster collaboration between campus organizations for physical activity assessment and promotion.**PURPOSE**: To describe the prevalence of meeting targets for aerobic (PA) or muscle strengthening (MS) exercise of U.S. undergraduates, by gender, and across various university and college types, sizes, and settings.**METHODS**: Data from undergraduate respondents to the 2011 American College Health Association-National College Health Assessment II (ACHA-NCHA-II) were classified by meeting or not meeting target PA and MS recommendations. Data were analyzed by cross tabulation analysis ($^{(}X^2$) by PA and MS status by gender, and across university designation (public vs. private), region of the country (Northeast, South, West, or Midwest), campus size (by student enrollment) and by 4-year or 2-year community college (type).**RESULTS**: The sample of undergraduates, aged 18-24 years (n=75,511), included 33.5% men 46.3% women and (0.2%) transgender (TG) students. Among these, there were significant differences (p< 0.001) across genders and meeting PA and meeting MS: 55.2% men, 48.4% women, and 35.9% TG students met PA, and 47.7% men, 32.6% women, and 25% TG met MS. Meeting PA was significantly different by campus size (p<0.001) and type (p<0 .05), but not by region (p= 018) or designation (p= 0.775). Significant differences for meeting MS were found across regions (p< 0001), campus size (p< 001), type (p =0.49), and university designation (p<0 .001).
CONCLUSIONS: PA and MS exercise participation in college students is modest at best, and it varies across geographic locations and differing campus characteristics. These results suggest that targeting college students with *EIM on Campus* is indicated, particularly sub-populations where PA and MS participation is low.

1024 Board #285 May 30 3:30 PM - 5:00 PM

Multiple Strength Assessments to Evaluate Adaptations to High-Load and Low-Load Blood Flow Restricted Exercise

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(No relevant relationships reported)

Differences in muscle strength adaptations between high-load (HL) and low-load blood flow restricted (BFR) resistance training protocols may be due to the type of strength test performed (e.g isotonic, isokinetic and isometric). **PURPOSE:** To assess differences in isotonic, isometric and isokinetic strength adaptations in older adults following HL and BFR resistance training. **METHODS:** Thirty-six males and females (mean: 75.6±7.6 years, 1.67±.09 m, 74.3±13.2 kg) classified as being at risk of mobility limitations were randomly assigned to HL (70% 1-RM) or low-load BFR (30% 1-RM coupled with a vascular restriction) exercise for the knee extensors twice per week for 6 weeks. A control group performed light upper body resistance and flexibility training. Knee extension 10-RM to predict 1-RM strength, isometric maximum voluntary contraction (MVC) and isokinetic strength at 60·s^{-1}, 180·s^{-1}, and 300·s^{-1}were measured before and after 6-weeks of training. **RESULTS:** HL and BFR training increased predicted 1-RM strength 34% (P<.001) and 24% (P<.001) respectively, from baseline to 6-weeks of training. HL training produced a 16% increase in MVC (P=.002) while BFR training did not change (P=.91). No interventions, included the control, resulted in changes in isokinetic strength at the various speeds (P>.20). **CONCLUSION:** Strength improvements from HL resistance training carried over to other strength tests. This favorable adaptation did not occur following BFR exercise which may limit the effectiveness of this training program. Isotonic training does not carry over to isokinetic strength adaptations and therefore may be a drawback when implementing resistance training programs for older adults. Supported by NIH grant 1R15 A6040700-01A1.

1025 Board #286 May 30 3:30 PM - 5:00 PM

Oral Creatine Hydrochloride Supplementation: Acute Effects on Intermittent, Submaximal Bouts of Resistance Exercise

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(No relevant relationships reported)

PURPOSE: Creatine hydrochloride (CrHCl) supplementation and its effects on muscular performance and body composition remains largely unexplored. The purpose of this study was to examine the acute effects of oral CrHCl supplementation on three intermittent, submaximal bouts of bench press and repeated vertical jump exercises (maximal repetitions) and body composition measures (body weight [BW], fat-free mass, and fat mass).
METHODS: Fifteen resistance trained males ($\bar{X}_{age}$ = 22.8 ± 2.0 years; $\bar{X}_{wt}$ = 81.6 ± 9.9 kg) completed 3 sets of the barbell bench press (70% 1RM) and 3 sets of the repeated counter-movement vertical jump (CMJ; 85% maximal CMJ height), with 2 min rest between sets, before and after a 7 d CrHCl intervention (4 g·d^{-1}). Participants continued their normal resistance training and nutrition routines. A two-factor repeated measures ANOVA was used to determine significant main effects (time and set) and interaction effects (time x set) for bench press and CMJ performances from pre- to post-intervention. A one-factor repeated measures ANOVA was used to assess pre- to post-intervention differences in body composition.
RESULTS: Significant main and interaction effects for time and set were found in the bench press from pre- to post-intervention, F (2, 28) = 4.2-268.3, p < 0.005; n^2 = 0.2-0.9, with post-hoc analysis indicating increased performance on later sets (eg, Set 3 > Set 2 > Set 1). Significant main effects for time and set were found in the CMJ test from pre- to post-intervention, F (2, 28) = 27.5-55.6, p < 0.005; n^2= 0.7-0.8, but no interaction effect was found (p > 0.05). Post-hoc analysis indicated increased performance on later sets (eg, Set 3 > Set 2 > Set 1). BW was the only body composition measure to reach significance (p < 0.005).
DISCUSSION: Findings suggest 7 d of CrHCl supplementation (4 g·d^{-1}) to increase repetitions completed on three sets of the intermittent, submaximal bench press and CMJ exercises and BW. The non-significance in the time x set interaction for CMJ performance may due to small sample size, and thus future research with larger samples is warranted.

1026 Board #287 May 30 3:30 PM - 5:00 PM

A Comparison of Two Tai Chi Interventions Tailored for Different Health Outcomes

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(No relevant relationships reported)

Tai Chi can be tailored based on five major styles, over 108 forms, and three fundamental elements that include breathing techniques, mental relaxation, and movement principles. However, it is not clear if Tai Chi interventions tailored for specific health outcomes will result in different health benefits. **Purpose**: To compare the health benefits of two different Tai Chi interventions targeted for improvements in blood pressure (BP) (PRESSURE) or balance (BALANCE). **Methods**: We tailored PRESSURE to emphasize breathing techniques and mental relaxation; and BALANCE to emphasize movement principles that challenge balance. Participants were randomized based upon baseline values to PRESSURE (n=12), BALANCE (n=13), or CONTROL (n=10). Tai Chi was practiced 3 sessions/week, 60 minutes/session, for 12 weeks. CONTROL (n=10) performed normal daily activities. We measured a variety of cardiovascular, balance, and functional fitness health outcomes pre-and post-intervention. Differences among groups were tested with analyses of covariance with age, body mass index, heart rate, and baseline BP as covariates. **Results**: Participants were older (78.9±5.7 yr), overweight (25.9±4.3 Kg/m^2) adults, with pre-hypertension (systolic BP[SBP]/diastolic BP, 126.5±14.4/69.3±8.4 mmHg), and mostly women (82.9%) and naive to Tai Chi (97.1%). PRESSURE improved Chair Sit-to-Stand Test (CSTS) by 1.0±1.8 times/30s versus CONTROL (p=0.029); and BALANCE improved Single Leg Stance Test by 5.4±18.0 s (p=0.049) and CSTS by 1.0±1.7 times/30s (p=0.027), and tended to lower SBP by 4.2±16.0 mmHg (p=0.052) versus CONTROL. However, there were no differences between PRESSURE and BALANCE versus CONTROL for any health outcome (p>0.05) **Conclusion:** Contrary to our hypothesis, Tai Chi interventions tailored for specific health outcomes did not result in different health benefits. Yet, our results suggest that older adults who are naive to Tai Chi achieve a variety of health benefits from different types of Tai Chi practice within the first few months of participation.

1027 Board #288 May 30 3:30 PM - 5:00 PM

ICT Use and Physical Activity & Implication for Musculoskeletal Pains among Tertiary Institution Students in Kwara State Nigeria

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(No relevant relationships reported)

PURPOSE: Recent studies show that prolonged ICT use is associated with increased sedentariness and postural imbalances. This has implication for the prevalence of musculoskeletal pains among ICT users. To investigate the implications of ICT use for physical activity level and musculoskeletal pains among tertiary institution students in Kwara state.
METHODS: The research design was ex-post facto. Multistage sampling comprising stratified, purposive and simple random sampling was used to select 2,442 students with average age of 22.8 years from three tertiary institutions in Kwara state. The institutions consisted of federal, state and private. Validated (Rho = .71) ICT Use, Physical Activity and Musculoskeletal Pain Questionnaire (IUPAMP-Q) was used for data collection. ICT referred to mobile phones, tablets/i-pads, computers and television sets. Percentage and Mean were adopted for demographic descriptions, physical activity level and ICT use while hypotheses were tested with t-test and Multiple Regression at a 0.05 alpha level. **RESULTS**: The study revealed that only 56.4% (1,377) of the students performed the recommended physical activity. Mean physical activity level (PAL) of moderate ICT users was higher than excessive ICT users by 178.9METs/wk, which was statistically significant (N = 2426; t (2424) 6.227; p = .001). Majority reported musculoskeletal pain after continuous ICT use for at least 1hour; neck pain = 75.7% (1,836), shoulder pain = 59.9% (1,137) and back pain = 74.4% (1,805). ICT use positively correlated with musculoskeletal pains; it predicted 27% shoulder pain, 30% neck pain and 16% back pain (F(2,2421), 16.769; 18.475, 9.886; p = .001) respectively. **CONCLUSIONS**: use of ICT is a risk factor for musculoskeletal pain and mobile phone was the highest predicting factor. A collaborative effort within tertiary institution communities to inculcate physically active lifestyle and individualised structured ICT use is recommended.

1028 Board #289 May 30 3:30 PM - 5:00 PM

Bedside Exercise Device for Heart or Liver Transplantation Recipients in Early Postoperative Period

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(No relevant relationships reported)

PURPOSE: The aims of this randomized, assessor-blinded clinical trial are to investigate the effect of exercise 25 min or more per day on the bedside exercise device in heart or liver transplantation recipients who are at-risk for functional deterioration during a long inpatient stay after transplantations. **METHODS**: Adult patients who received a heart or liver transplantation were randomized to either UCFit exercise group or usual care group. UCFit exercise group will exercise on the bedside exercise device which uses foot pedals that record exerted forces against adjustable resistances, measure repetitions of upper and lower extremity cycling movements, and give feedback about performance via a wireless internet connection. Usual care group was only encouraged to increase the amount of physical activities. The outcome measure was level of independence for walking, walking speed, 6-minute walking distance, Short-Form 36 health-related quality of life, heart rate variability, knee strength, and cardiorespiratory fitness. **RESULTS**: Thirty-five patients who received a heart (n=13) or liver (n=22) transplantation participated at a median of 8 days after surgery. No adverse events were reported during the median study period of 15 days. The UCFit exercise group (n=15) showed increased standard deviation of all NN intervals (SDNN) from 16.5±13.0 ms to 26.3±18.7 ms, compared to the usual care group (n=20) from 18.4±18.9 ms to 16.6±17.9 ms (p= 0.01 during interaction analysis); and increased the square root of the mean of the sum of the squares of differences between adjacent NN intervals (RMSSD) from 8.8±7.6 ms to 22.3±24.9 ms, compared to the usual care group from 18.4±32.8 ms to 16.5±30.4 ms (p= 0.03). The UCFit exercise group achieved a trend toward greater 6-minute walking distance and higher knee strength at discharge compared to the usual care group. No significant between-group differences were detected in the other outcomes of interest. **CONCLUSIONS**: In this ongoing trial of bedside exercise with remote monitoring for inpatient organ transplantation rehabilitation, exercise 25 min or more per day showed increased heart rate variability of the study subjects in the early postoperative period. Supported by Grant MOST 104-2314-B-002 -221 -MY3 from Ministry of Science and Technology, Taiwan.

1029 Board #290 May 30 3:30 PM - 5:00 PM

Improving College Students' Health-Related Fitness Through Physical Activity Classes

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(No relevant relationships reported)

PURPOSE: College period is usually associated with weight gain and physical fitness decline among population of college students. This study investigated whether and to what extent physical activity (PA) classes could reverse this tendency.
METHODS: Participants were 124 college students (mean age: 20.76±1.03, 73 males and 51 females) who enrolled in 16-week PA classes in a university in the US. The PA classes met two or three times a week with a total of 150 minutes/weekly, focusing on different activities addressing health-related physical fitness. Body mass index (BMI), 20-meter Progressive Aerobic Cardiovascular Endurance Run (PACER), curl-ups, push-ups, trunk lift (in inches), and sit and reach (in inches) tests were administered to the participants at the beginning (pretest) and the end (posttest) of the semester. Performances of each measure at the two test points were compared with paired-samples t test. All data analyses were conducted by sex, and cases were excluded pairwise. The numbers of students who participated in each paired assessment (i.e., having a measure at both test points) ranged from 59 to 71 for males and 42 to 51 for females.
RESULTS: For males, significant improvement ($p < .001$) occurred in PACER (Pretest 59.41±21.78 vs. posttest 64.58±22.39), curl-ups (55.40±20.73 vs. 62.10±19.04), push-ups (23.56±6.62 vs. 27.21±7.79), and trunk lift (10.21±2.20 vs. 12.54±2.08). Sit and reach showed a non-significant improvement (17.27±2.99 vs. 17.52±3.01, $p < .10$). BMI was the only measure remaining unchanged (25.83±4.65 vs. 25.80±4.50, $p = .38$). As for females, significant improvement ($p < .005$) was observed in PACER (35.31±11.74 vs. 40.67±12.68), curl-ups (43.59±21.78 vs. 50.39±20.40), push-ups (18.76±6.64 vs. 21.06±8.05), trunk lift (11.82±2.48 vs. 13.04±1.72), and sit and reach (18.56±3.57 vs. 19.31±3.86). The only measure remaining unchanged was BMI (23.62±3.10 vs. 23.60±2.99, $p = .73$).

CONCLUSIONS: While there is a tendency of weight gain and fitness decline among university students, PA classes addressing health-related physical fitness are effective in maintaining body weight and improving other health-related physical fitness components for college students.

1030 Board #291 May 30 3:30 PM - 5:00 PM

Retrospective Analysis Of A Supervised Exercise Program Offered To Post-hematopoietic Stem Cell Transplant Patients

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(No relevant relationships reported)

A growing number of cancer patients receive hematopoietic stem cell transplants (HSCT), a potentially curative treatment, but engenders adverse symptoms of fatigue, reduced physical function and decreased quality of life. Maintaining physical fitness for functional independence and the ability to perform activities of daily living is a high priority for patients. Exercise programs have been found to be effective in improving physical fitness and quality of life and reducing fatigue level in haematological cancer patients, and recently supervised programs have been offered to patients as part of Wellness treatment. **PURPOSE:** To evaluate adherence, safety and physiological effects of an eight-week supervised exercise program in post HSCT patients. **METHODS:** A retrospective study including 55 patients (N=22 female) referred to the optional exercise program after undergoing HSCT for a haematological malignancy. Safety and adherence information was collected throughout the program. Physiological outcomes were measured at baseline and post program (fatigue, quality of life, strength, 6 minute walk test (6MWT), balance and body composition). **RESULTS:** No adverse events were reported during the program and patients demonstrated a high (86.1%) adherence to supervised sessions. Fatigue decreased (4.6±1.9 to 3.4±2.1, p=.003) and Quality of Life increased (105.9±17.8 to 113±17.8, p=.040) from baseline to post intervention. Physical function increased in all measures (6MWT, 413.8±97.2m to 497.4±82.5m, p<.001; 1RM leg press 56.3±34.7kg to 68.0±36.6kg, p=.011; 1RM seated row, 32.7±15.0kg to 40.0±17.5kg, p=.001; Chair stand, 12.0±3.7 to 15.0±3.0, p<.001). Reported weekly physical activity also increased (114.2±132.7min to 205.7±137.8min, p<.001). Body mass, fat free mass and body fat percentage did not change. **CONCLUSIONS:** In line with prior findings, this supervised exercise program was an effective treatment for comorbidities associated with HSCT. Importantly, these results include participants who self-enrolled in the program, and paid a contribution to the cost. The high adherence and significant improvements confirm the efficacy of an exercise program and support the continued offerings of such Wellness treatment as part of usual care.

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Shriners Hospitals For Children® At Galveston Exercise Prescription Guidelines For Children With Severe Burn Injury

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PURPOSE: Burn trauma is associated with metabolic abnormalities coupled with prolonged immobilization and deconditioning, where burned patients have markedly reduced strength and aerobic exercise capacity. Over the last 20 years, Shriners Hospitals for Children®—Galveston has endeavored to improve the rehabilitation of burned children. A key contribution from this work has been identifying the benefits of rehabilitation exercise training (RET) in restoring function in burned children. Currently, there are no clear guidelines for the implementation of RET in burned individuals. Therefore, we quantified the training logs for exercise intensity, frequency, and duration of 6 weeks of this program in order to develop a basic framework for outpatient RET in patients recovering from severe burns.
METHODS: Thirty-three children (mean±SD, 11 female, 12±3 yrs, 145±18 cm, 40±11 kg) with severe burns (49±15% body surface area burned, with 35±22% third-degree burn) completed a 6-week resistance and aerobic exercise training program. Cardiorespiratory function (peak VO_2), strength and power, and lean body mass (LBM) were measured pre- and post-RET. Outcome measures were analyzed as a relative percentage of the age-sex matched non-burned counterpart (n=33, 11 females, 12±3 yrs, 154±20 cm, 49±22 kg).
RESULTS: At discharge, LBM was attenuated by 77% [of non-burned values], peak torque by 53%, power by 62%, and cardiorespiratory fitness by 56%. After 6 weeks of training, LBM increased from pre-training values by 5% (82% of non-burned values), peak torque by 18% (71%), power by 20% (81%), and cardiorespiratory fitness by 18% (74%; P<0.0001 for all). The quantification of exercise logs found that physical capacity can be improved by aerobic exercise training at 5 metabolic equivalents (74% of peakVO_2) performed at least 3 days per week and 150 min per week and by resistance training performed at volume loads [reps × sets × weight] of 280 (19% of total body mass, TBM) for the upper body and 590 (42% TBM) for the lower body at least 2 days per week.
CONCLUSIONS: For the first time, we quantify our RET program and provide exercise prescription guidelines specific to burn populations. Future research should build upon this work and individualize exercise prescription to optimize rehabilitation benefits in severely burned children.

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Post-menarcheal Trabecular Bone Score as a Function of Organized Physical Activity

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PURPOSE: Trabecular bone score (TBS) grades lumbar spine trabecular texture based on DXA scan gray level variation. In adults, TBS correlates with trabecular density indices and predicts fracture risk, independent of areal bone mineral density (BMD). However, few pediatric studies have evaluated TBS, with none demonstrating significant exercise loading associations. Bone accrual accelerates circum-menarche; thus, we hypothesized that circum-menarcheal organized physical activity (OPA, h/wk) would correlate with post-menarcheal TBS, suggesting potential for improvement of baseline adult trabecular texture via circum-menarcheal exercise.
METHODS: Annual DXA scans and semi-annual OPA records were collected via a prospective, longitudinal study of exercise and bone accrual. Analysis inclusion criteria were: 1) a postero-anterior lumbar spine DXA scan (Hologic, Waltham MA) from 0-1 year post-menarche; 2) prior year OPA records. Raw TBS data were generated using proprietary TBS iN-sight software (v2.2, Medimaps, France), adjusted for pediatric-specific soft-tissue effects. Multiple regression evaluated linear and quadratic associations between prior year OPA and TBS, accounting for gynecological age; β and significance are reported for each predictor. To reduce variance inflation, the quadratic function was mean-centered.
RESULTS: Data were included for 111 girls, with means as follows: age 13.4 yrs (10.0 to 15.6, sd 1.1), age at menarche 12.9 yrs (sd 1.1), gynecological age 0.5 yrs (sd 0.3), OPA 8.0 h/wk (sd 5.8) and TBS 1.38 (1.15 to 1.58, sd 0.08). In a regression model entering OPA, OPA^2 and gynecological age, a significant non-linear association was observed with OPA (respective β= 0.003, -0.001, 0.043, p=0.08, 0.003, 0.12).
CONCLUSIONS: Our data suggest a target circum-menarcheal OPA range of 5 to 15 h/wk. Further research is needed to confirm that TBS is modifiable via pediatric exercise to optimize baseline adult trabecular texture.